

Enhancing Milk Productivity, Output & Quality in India

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ABSTRACT

During 2015-16, 70 million farmers' families engaged in dairying in India contributed to the record milk production of 146 million tons. Ambitious target of producing 300 million tons of milk by 2020 has been set. This necessitates the availability of livestock, animal health care, quality animal feed and fodder, efficient distribution, packaging and complete value chain system, among others. India among 194 countries should have seized opportunity to celebrate 16th World Milk Day on 1st June 2016 to create the awareness among all stakeholders the potential of milk & milk products to address country's nutritional security & livelihood of 70 million farm families. For this, the need is greater now than before to double the milk yield per animal & significantly improve the milk quality to conform international standards. The goal of dairy farming in India cannot be just to maintain its number one position in milk production in the world but it should make dairy farming economically viable & financially bankable for small & marginal farmers and agricultural labourers and internationally competitive. Against this background, this article reviews the significant growth of dairy industry in India and suggests the strategic action plan to double the per animal milk productivity & 250 million tons of milk output by 2021-22 as estimated by the NDDB from 142 million tons in 2014-15.

Keywords: Dairy Industry, Raising Milk Productivity, National Dairy Plan, Stakeholders, NDDB, Dairy Entrepreneurship Development Scheme, PRI, NDP, GCMMF, PMJDY, APEDA

Low Cost Model

According to the Livestock Census 2012, India has the largest cattle population of 191 million in the world which includes both descript and non-descript and 40 million crossbred and exotic breeds. They provide milk, draft animal power, organic manure, biomolecular and other products most useful to mankind, besides being a source of sustained traditional livelihood and nutritional security for landless and resource poor farmers.

Around 80-90 million farm families are gainfully occupied in dairying and related activities. Milk yield per animal is significantly low in India and the cost of milk production is 30% lower than major milk producing countries. Hence, the Indian model of milk production is characterized by *low input-low output*. Despite most farmers have limited ability to rear dairy animals scientifically, adopt cost-efficient feeding &

management practices and gradually declining pasture/grazing land & inadequate water availability, dairy farming is on the rise. Dairying in developed countries has a competitive edge over India in terms of milk productivity per animal and quality.

Milk Production

Milk production was meagre at 17million ton [MT] in 1950. Its annual growth rate was only 1.2% during 1950s and 1960s, which with the implementation of the Operation Flood program increased to 4.3% propelling India to be the largest milk producer in the world from 1998. Operation Flood established a national milk grid where every year over 13 million tons of milk are procured. In 2014-15, it increased to 142 MT & the value of milk produced was Rs.4.18 trillion. Uttar Pradesh accounted for 17% of country's milk output followed by Rajasthan [11%], Andhra Pradesh [9%] Punjab & Gujarat [8% each]. Growth

rate in Andhra Pradesh was the highest at 41%, followed by Rajasthan [28%], Kerala [24.8%], Karnataka [24%] & Gujarat [23.7%]. Since 1998, India has been the number one in milk output in the world surpassing the U.S

Milk production in Million Tons [1950-2014]

Year	Output	Year	Output	Year	Output	Year	Output
1950	17.0	1990	57.4	2007	107.9	2012	127.9
1960	20.0	2000	78.3	2008	112.2	2013	133.0
1970	21.2	2005	91.0	2010	116.4	2014	140.0
1980	30.4	2006	102.6	2011	121.8	2015	142.0

Milk Yield: India is, also, one of the largest consumers of milk and milk products in the world and the industry size is estimated at Rs.430 billion. Though at national level the industry size appears to be a little bit impressive but in terms of 70 million rural households engaged in the industry it means a meagre value of Rs.6143 per household. This is because the average number of milch cattle per rural household is 1-3 animals and the production system is scattered over a large number of dairy farmers producing on an average less than 4.00 litres a day. During three decades [1982 to 2012] average milk yield of cattle and buffalo per day has grown from 1.9 kg to 3.9 kg and 3.7Kg to 6.2 kg respectively. Although milk yield of cross bred cattle is 7.10 kg/day it is, also, significantly lower than that in UK [25.6], USA [32.8] & Israel [36.6]. This can be attributed largely to following factors.

- Quite a large number of small & marginal farmers [S&MF], rural women and landless actively pursuing dairy farming have inadequate resources, technical know-how and low level of capability to manage cattle efficiently.
- Other factors responsible for low milk productivity are attributed to both intrinsic (low genetic potential) and extrinsic (poor nutrition/feed management, inferior farm management practices, inadequate veterinary and extension services and inefficient implementation of breed improvement programs).
- The milk production at individual farmer's level is constrained due to inadequate investment & efforts [both by the government & farmers] in arresting the declining key natural grazing resources in particular.

Consumption: Food accounts for the highest share of monthly household expenditure in India at 31%. Within food, milk and milk products account for the highest share after cereals. As milk products are becoming a staple food for most people, consumption of yogurt, cheese, butter and ice cream is on the rise. In 2011-12, urban households spent about 20% of their food-cost on dairy products. Milk consumption is growing at around 6.00% annually against 4.00% rate of production. With the growing demand for milk and milk products because of increasing income of middle class, rapid urbanization & industrialization, milk productivity per animal in particular and output in general has to be stepped up.

Availability: The per capita milk availability in India has increased from 126 gm/day in 1960 to 307 grams in 2013-14 & further to 359 grams in 2014-15. Across the country, Punjab has the highest per capita availability of milk [937 grams/day] followed by Haryana [679], Rajasthan [538], Himachal Pradesh [446] & Gujarat [435]. This is despite population has increased to three times during the period. Global per capita milk availability has declined by 9% over the past decade.

Demand: By 2025, India will have estimated 1.4 billion people and by 2060, about 56% Indians will reside in urban areas and 44% in rural areas. This shows India needs a continuous increase in milk output. The NDDDB has projected the demand for milk at 155MT by 2016-17, 177 MT by 2019-20 and 200MT by 2021-22. This means that India has virtually to plan for doubling the yield per animal along with significant improvement in the quality of milk and value added products. Government has invested Rs.22.42 billion to help meet a national demand of 150 million tons of milk by 2016-17.

Government's Initiatives: From time to time, the government has initiated following programs to substantially increase the milk output.

- The Livestock Census (2012) data reveal the emerging threat that cross-breeding poses to home-grown livestock. While the number of exotic and cross-bred cattle has increased in the last five years by nearly 35% from 14.4 million to 19.42 million, that of indigenous ones have remained almost static at around 48 million. Acknowledging that the downturn in the

proportion of animals belonging to recognised domestic breeds cannot be ruled out, recently the government has launched the Rashtriya Gokul Mission for conserving and developing indigenous breeds.

- Apart from enhancing the inherent productivity of local livestock strains, the mission aims at establishing indigenous cattle centres near metropolitan cities, raising elite breeding stocks, encouraging the selection of animals on the basis of field performance and pedigree, and promoting the formation of cattle breeders' societies.
- The government proposes to set up two breeding centres with an outlay of Rs.500 million to raise productivity of indigenous cattle and buffalo to meet the growing demand for milk and its products. As currently, there is no national breeding centre in the country for development of cattle and buffalo, the government has decided to set up National Kamdhenu Breeding Centres, one each in north and south India. The purpose of the centre is to raise productivity of indigenous cattle and buffalo through intensive research, instead of fully concentrating on foreign breeds for higher milk yields.
- Dairy Entrepreneurship Development Scheme introduced in 2015-16 aims at [i] generating self-employment and providing infrastructure for dairy sector [ii] setting up modern dairy farms and strengthening infrastructure for production of safe & quality milk [iii] encouraging heifer-calf rearing for conservation and development of high quality breeding stock [iv] bringing structural changes in the unorganized sector, so that initial processing of milk can be taken up at the village level [v] upgrading traditional technology to handle milk on a commercial scale and [vi] providing value addition to milk through processing and production of milk products. Eligible beneficiaries include individual farmers & rural youths, prospective entrepreneurs and groups of unorganized sector, SHGs on behalf of their members, dairy cooperative societies, milk unions on behalf of their members, milk federation, PRIs, etc.
- The cost of milk production involves cost of feed and fodder, family labour, health care and farm management. Indian milk producers are competitive in global space with low cost of milk production primarily due to cheap labour.

Scientific measures to enhance fodder and milk productivity can help further sustain low cost of milk production. The current deficit level of green fodder and concentrates is to the extent of 34%. There is, also, a demand-supply gap for quality forage seeds. Government has launched Accelerated Fodder Development Program and a Sub-mission of Feed and Fodder Development that aims at undertaking R &D activities to enhance fodder productivity and production of fodder from non-forest, wasteland, rangeland, grassland & non-arable land, cultivation of coarse grains and dual purpose crops; production, procurement and distribution of fodder seeds; distribution of hand driven & power chaff cutters, etc. promotion of Regional Feed Fodder Banks to enhance milk production in summer months when most cattle and buffaloes in India go dry.

- Sub-Mission on Livestock Development incorporates risk management and insurance cover and is implemented in all districts against 300 selected districts earlier. All animals are now covered viz. indigenous cattle, cross bred milch animals, pack animals and other livestock [goat, sheep, pigs, rabbit, yak, and mithun instead of only cattle and buffaloes]. The subsidy amount has been raised subject to maximum to five cattle unit/beneficiary household.
- NDDDB & DD Kisan have jointly launched a program to disseminate up-to-date technical know-how to farmers to improve their livelihood and income by sharing & exchanging knowledge and information among existing & prospective farmers on various technical and managerial issues related to modernizing dairying and farming.

National Dairy Plan

To meet the projected demand of 200 MT by 2021-22, the NDDDB has formulated a 15-year perspective National Dairy Plan [NDP] envisaging an outlay of Rs.173 billion. On April 19, 2012 NDP-1, a new central sector scheme was launched which accidentally also coincided with the launch of country's Twelfth Five Year Plan [2012-17]. NDP in order to increase milk output from the current level of 4% per annum to 6% in next few years emphasises on production of high genetic merit along with import of high quality semen and aims at increasing the productivity of

milch animals by adopting focused scientific and systematic processes and help rural milk producers greater access to the organized milk processing sector. Under NDP, village level infrastructure will be created or strengthened for milk procurement along with testing equipment and improving the supply chain.

It will cover about 1.2 million milk producers in 23,800 villages and aims at increasing milk procurement by cooperatives from current level of 30% to 65% in next 15 years. In order to enable cooperatives to perform better the constitution of existing cooperatives is amended to increase transparency in the cooperative sector and facilitate setting up of producer companies or new generation cooperatives. NDP-1 is a six-year plan with an outlay of Rs.22.42 billion of which 80% will be financed through International Development Association of the World Bank and the rest will be funded by the government of India. The NDDDB will implement through its End Implementing Agencies located in each of the 14 major milk producing States viz. Uttar Pradesh, Punjab, Haryana, Gujarat, Rajasthan, Madhya Pradesh, Bihar, West Bengal, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Orissa and Kerala

Strategic Action Plan

India, to become globally competitive, will need to create an efficient supply chain network through significant investment in infrastructure and human resources. Milk output can be enhanced by sustaining the cost of production, augmenting Rand D efforts towards increasing milk yield per animal and its quality, fodder productivity and risk mitigation. This requires developing innovative farming models and motivating a large number of small milk producers to adopt them. Linking the production system to the consumer demand and processing units require a robust value chain, intensive research and technology infusion. These strengths can further be leveraged with balanced growth of crop and livestock farming system. Strategic action plan should, therefore, focus on following aspects.

- **Equal Status:** For years, dairy farming has a status of a subsidiary activity to agriculture which now deserves to be given equal status in view of its share in agricultural GDP and employment.

Village-level milk producing units should be brought in the organized sector and promoted in a systematic manner to convert existing individual sustenance dairy farms and traditional family farms into collective, community & commercial farms operating as business farms. This would call for intensive training and capacity building of dairy farmers [human resources] with focus on business-like operations, financial and marketing management.

- **Data Base:** On lines of National Sample Survey, India should have a robust system & mechanism to regularly & periodically generate survey based data & information on critical aspects of dairy sector that can help formulate five year perspective plan for targeted milk production State-wise bridging the gaps & deficiencies in institutional & physical infrastructure. India should develop a system to compete with developed countries where every milch animal is tagged with a number and every drop of milk processed, value added, marketed and instantly recorded.
- **Safety Standards:** Milk consumption is growing at around 6% per annum as against 4%-5% of production. Unfortunately, a large share of the supply or production still does not conform to the domestic, leave alone global food safety standards. This is due to adulteration, lack of awareness & rigorous enforcement of Food Safety Standards and inadequate infrastructure comprising technology & trained manpower.
- **Illegal, unethical practices:** To increase yield, the cows are sometimes injected with Oxytocin, a hormone banned in India under the Prevention of Cruelty to Animals Act and section 12 of Food and Drug Adulteration Prevention Act, 1960. According to an animal rescue organization Udaipur, "Studies around the world show that cows injected with Oxytocin have a greater incidence of abortions, mastitis and lower conception rates, and their calves suffer higher than normal infant mortality and delayed puberty,"
- **Milk production environment:** The Union government reported some time ago that 68.4% of milk in the country did not conform to standards laid down by the food regulator. The report revealed that the most common adulterants were detergent, caustic soda, white paint and refined

oil, all of which are considered “very hazardous” for health. This is attributed to lack of appreciation/awareness, deliberate adulteration, grossly ineffective enforcement of laws and rules governing food safety standards. This may be one of the key reasons for India’s 0.4% share in global export despite India accounts for 17% of the global milk output. To remedy the situation, it requires significant investments in terms of purchasing electronic milk-testing machines, electronic weighing systems as well as chilling and transportation equipment. If this is accomplished, the quality of milk collected directly from farmers will be better, unadulterated and relatively cheaper. Above all, milk producers [and not the middlemen] should be at the centre of the system. The environment under which milk is produced, collected, transported, processed and distributed should be fully conducive and that animal raising practices related to sanitation, quality of drinking water, feed and fodder, type and quality of pipelines etc. must be aligned to the goal of healthy milk. Farmers need to be trained/guided to display high degree of hygiene and know-how of animal health and nutrition. Europe invested significant resources to develop healthy practices and put in place efficient system to monitor the implementation of stringent quality standards since late 1990s.

- **Organized sector:** Growth in milk production will need substantial increase in milk handling capacity and marketing in organized sector since about 80% of milk produced is still handled in the unorganized sector and only remaining 20% is shared between cooperatives and private dairies. The organized dairy sector [comprising cooperatives and private sector] will have to progressively and systematically plan to expand their coverage of milk producers, penetrate into interior villages and improve their current share of marketable surplus from 30% to 65% by 2021-22. This would in turn make available larger volumes of good quality milk at competitive prices to consumers.
- **Capitalizing the Strength of Cooperatives:** For 900 million people residing in 6,40,867 villages in India, dairying is not only just a large economic activity but also an integral part of our social and cultural heritage. Its uniqueness lies in its unifying power as no other industry touches lives of

millions of farmers of which 70% are landless. Dairy cooperatives as the peoples’ institutions are the result of dairy farmers’ entrepreneurship to exploit the potential of dairy markets in India. These institutions have to be driven like businesses enterprises combining professional management with technical & financial expertise. The need is to nurture dairy entrepreneurs through effective training of rural youths at the village level coupled with dedicated leadership and professional management of farmers’ institutions/organizations. This will in the long-term instil efficiency in the system so that farmers are not tempted to demand grants/subsidies and external support for financing the inbuilt inefficiencies of the system. Amul & Mehsana dairy pay Re.0.84 to farmers for every rupee collected from the consumers whereas the MNCs pay Re.0.40-0.45 and even deprive the farmers from voting rights. Amul & Mehsana dairy farmers have been receiving higher prices of milk as compared to others because they own not only production but also processing and marketing of milk and milk products. Also, a significant part of their earnings comes from value-added products rather than bulk sales. In order to ensure that milk producers derive the maximum benefits of cooperative societies, need is to [i] provide them training covering technical, financial & managerial aspects to significantly increase milk yield per animal and [ii] build institutional arrangements such as Farmer- Producer companies on lines of Small Farmers’ Agri-business Consortium to increase bargaining power of the farmers.

Success of second milk revolution depends upon wider & deeper application of technology, continuous stream of innovations and dairy-entrepreneurship among rural youths that can ultimately double the current level of milk yield/animal, improve milk quality of international standards, increase processing capacities in the organized sector & sell milk products in international markets. This would require investing in research institutions & marketing infrastructure, putting in place adequate technical manpower in strategic areas & training them, strengthening dairy cooperatives on lines of Amul & GCMMF, encouraging private sector in organised production, processing & marketing of milk & milk products,

promoting farmers' organization and putting in place robust monitoring & management information system.

- **Five Pillars:** A significantly spruced up breeding programme, efficient feed management interventions, broad-basing the scale and scope of veterinary services, adoption of superior farm management practices and an efficient extension network are the five pillars on which the dairy sector shall have to be laid to achieve the full potential of the Indian dairy sector. For this, a perspective plan for every five years and annual action plan will need to incorporate components viz. improved breeding, balanced feeding, animal health care, efficient management practices, strengthening & professionalizing dairy cooperatives, developing innovative dairy models and seeking private sector participation, among others.
- **Cross Breeding:** History records that a crossbred cow Jill [a combination of Ireshire bull and Haryana cow] gave 65 litres of milk per day in 1927 at NDRI, Bangaluru. This shows the extent of milk yield potential that can be harnessed through scientific cross-breeding techniques. However, strategies to achieve 200MT milk output by 2022 should consider realistic assessment of the options available for production enhancement specific to each agro-ecological region and socio-economic conditions of milk producers. Cross breeding has been one of the most promising options, but not the only one. A comprehensive review and a social and economic analysis of our experiences of cross breeding in past three decades can better guide the strategic planning for future.
- **Indigenous Cattle:** According to the 2012 Census, India's indigenous cattle population has declined by 8.9% between 2007 and 2012 whereas the numbers of exotic/crossbred cows and female buffaloes have increased by 28.8% and 8% respectively. The trend is a reflection of rational economic choices made by farmers. Traditionally, cattle and buffaloes were reared for the purposes, viz. draft power for agricultural operations, dung for manure & fuel, and milk for food. The advent of tractors, chemical fertilizers and kerosene/LPG cylinders has undermined the first two roles as a result of which farmers use bovines mainly as

milch animals. This partially explains why despite overall declining number of cattle, the adult females [cows] within them have increased from 64.36 million to 72.95 million between 1992 and 2007. This has resulted in a premium on female animals and the decline in male animals between 2007 and 2012 is much sharper at 18.8% for cattle and 17.9% for buffaloes. Even within females, indigenous cattle lose out not only to their crossbred counterparts that yield more milk, but also to buffaloes that produce more milk with higher fat content. Buffaloes accounted for about 53% of India's total bovine milk output in 2011-12 and even within the balance 47% from cows, nearly 54% was accounted for by cross-bred cows containing superior genetic material of 'western' cattle stock such as Holstein Friesian, Jersey and Brown Swiss. So, farmers find it far more remunerative to maintain buffaloes and cows containing genetic material of 'western' breeds such as Holstein Friesian and Jersey. Only a little over a fifth of the country's milk is now sourced from indigenous or *desi* cows. At the current rate of decline, they are threatened with total marginalization. One can draw a parallel here with many of our traditional tall wheat or paddy cultivars that have been displaced by semi-dwarf high-yielding varieties in the post-Green Revolution era.

The share of cattle in India's bovine population has declined from 78% to 65% since Independence. The fall is sharper in respect of milch animals. While buffaloes make up 34.6% of the country's total bovines, the proportions are higher for Haryana (79.3), Punjab (74), Uttar Pradesh (55.8), Andhra Pradesh (54.2), Gujarat (52.4), Rajasthan (47.8) and Bihar (34.8). Most of these are states where the cow is specially revered. On the other hand, the buffalo percentages are just 3.2 in Kerala, 3.8 in West Bengal and 4.6 in the North-East states. The need is to conserve precious germplasm from India's finest indigenous cattle breeds, viz. Sahiwal, Tharparkar, Rathi, Red Sindhi, Gir, Kankrej and Ongole. These valuable animal genetic resources are now getting lost, because of a combination of random breeding (most of *desi* cattle are 'nondescript', having no recognisable pedigree or breed characteristics), unregulated slaughtering and growing buffaloesation. The best breeding tracts and organised farms for the Sahiwal and Tharparkar cattle are now in Pakistan.

Gir cows, which were once gifted to Brazil, have today become the most popular with as many as five million cows in that country.

The Government's policy decision to preserve, improve and promote desi cattle needs to be considered from a wider perspective. Admittedly, the white revolution that made India the world's largest milk producer was mostly the outcome of cross-breeding local cows with exotic breeds to increase their milk yield. Other factors need to be considered too, such as the overall maintenance cost of cross-bred animals, their fodder and feed requirement, adaptability to local ways of keeping farm animals and susceptibility to common diseases and parasites, among others. Where milk output is concerned, some good Indian strains have also displayed genetic potential to yield 2,000 to 3,000 litres of milk in a 305-day lactation (milking cycle), which does not compare poorly with the productivity of most cross-bred cattle. With well-judged scientific interventions, these animals may be able to compete better with cross-bred cattle without inheriting their limitations. Besides, Indian cattle are known to possess several useful genetic traits that make them unique in some respects. Animal breeders from across the world have historically been utilizing these genes to impart sturdiness and disease tolerance to their cattle populations. The well-known Brahman breed found widely in the US, Argentina, Brazil and some other countries has been derived from Indian cattle strains. Animal husbandry experts feel that the indiscriminate cross-breeding of the kind that has been going on for the past several decades is not a healthy trend. This has adversely impacted the genetic purity of desi strains. According to the ICAR, "The distinct biodiversity of Indian cattle breeds has been diluted due to changing breeding policies and adoption of a few improver breeds in India's cattle improvement program," Today, less than 12% of all cattle in India qualify to be categorized into 44 different well-marked populations, including 37 registered cattle breeds. The rest are nondescript animals.

More realistic approach could be to undertake systematic breeding and genetic upgradation of India's finest indigenous cattle, viz. Sahiwal, Red Sindhi, Gir, Kankrej and Rathi which are, in fact, good milk producers. An organised effort to conserve and propagate elite germplasm from nucleus breeding herds will facilitate poor farmers to rear *desi* cattle

more economical. Effective implementation of the Rashtriya Gokul Mission launched in 2014 that aims at the development, preservation and conservation of indigenous cattle breeds "in a focused and scientific manner" can improve indigenous breeds and substantially enhance the indigenous milk production system.

- **Managing costs:** Managing cost of milk production is the immediate challenge for dairy farmers in view of the fast declining common grazing lands in villages, diversion of straw to alternative uses [bio-fuel, paper, packaging etc.] and increasing export of oil-meals which were hitherto almost sources of free fodder and feed supplies. The sector will have to research for cost-efficient measures in respect of feeding, health care & management practices that can improve return on the investment on one hand and on the other increase milk procurement, processing and marketing of milk & milk products.
- **Rural Infrastructure:** State governments need to have annual budgetary provision for investment in rural infrastructure that can sustain dairy development on a continuing basis across districts within the State viz. all-weather arterial roads, electric power, cold chain and communication system including ICT system.
- **Artificial Insemination:** At present there are 51 semen stations in India with a production capacity of 81 million doses /year whereas the current demand for bovine semen is around 100 million doses and is likely to increase to 150 million doses in the next few years. Most of the semen stations cater to the demand for buffalo semen and germplasm of exotic and cross bred cattle. The country needs to augment trained manpower including veterinary personnel to provide quick service delivery. Besides, provide quality equipment and appropriate training to avoid artificially inseminated cows becoming infertile and developing infections.
- **Feed management:** With rapidly shrinking land and natural resources, availability of feed and fodder and their quality has been posing serious challenge. About 34% is the current deficit of green fodder and concentrates. Further, there is a supply-demand gap for quality forage seeds too. Imbalanced nutrition due to lack of farmers' knowledge about appropriate use of existing feed resources is also a major factor responsible for

low livestock productivity. Application of newer technology to produce large scale feed blocks, feed enzymes and other innovative feed resources, needs to be deployed. Development of an innovative silage business model by way of partnerships amongst seed companies, service providers (for baling and supply chain functions) and rural retail channels can be a significant step in this direction. Effective implementation of the Ration Balancing Programme of NDDDB and Accelerated Fodder Development Programme of the Government can ensure better feed availability and improved nutrition.

- **Veterinary services:** On time & quality veterinary services at affordable costs are an important enabler for enhancing milk yield. But currently due to lack of adequately trained manpower and their mobility, the services provided do not create desired impact. An authentic, concurrently updated database for prevalence and emergence of diseases is essential for identification, onward prevention and control. Infrastructure of vaccine and diagnostic production units, semen stations and AI breeding farms that is largely owned by the government can be more efficiently utilised by way of appropriate participation of the private sector.
- **Market Access:** Dairy industry's potential for inclusive/equitable growth and income distribution in villages can be harnessed by enhancing market access & offering stable and remunerative prices to farmers. Integrating dairy & crop farming with value chain system can be a better source of sustainable livelihood of rural poor & most vulnerable families.
- **Export:** India contributes about 17% of the global milk output but its share in global export is insignificant at 0.4%. A large quantity of milk still remains unprocessed. India is surrounded by countries and regions that are milk-deficient viz. Bangladesh, China, Singapore, Thailand, Malaysia, Philippines, Japan, the UAE, Oman and other gulf countries all of which are located very close to India. At present, the population of South Asia alone is growing at 1.3% rate a year and likely to be 2.2 billion by 2050. India, therefore, needs to have a systematic research & feasibility studies under PPP mode to explore these hitherto unexploited international markets and initiate specific policy & programs on lines of APEDA in

consultation with Commerce Ministry, Indian Institute of Foreign Trade & our embassies in these countries. Rich experience of the GCMMF can be fruitfully utilized in the area of export of milk & milk products. While increasing milk productivity and seizing domestic and international markets, India must prioritize improving the quality of inputs and output.

- **Institutional Credit & Insurance:** Institutional credit and insurance cover in the dairy sector need to be widened & intensified to cover progressively all dairy farmers in a time-frame. In particular, all those actively engaged in dairy farming in villages should be explained the significance & utility of the recently launched PMJDY and motivated to take its full advantage for dairy activities, viz. overdraft facility for purchase of nutritive & balanced cattle feeds, veterinary medicines, insurance cover in the event of accident and/or unexpected death and claim-settlement procedure.
- **Livestock Calamity Fund:** There is need to create livestock calamity fund in the event of outbreak of major disease to compensate a large number of S&MF dairy farmers.
- **Best Practices:** Resourceful farmers in India can be motivated & incentivized to learn from best practices across the world. For example, Super Cows in Israel produce 12,000 litres milk a year because of superior breeding techniques, balanced nutrition, & management practices including better health care.
- **Bharatiya Agro-industries Foundation Experiment:** BAIF has successfully demonstrated the scope for increasing milk productivity without increasing the livestock population through additional purchases. Probably, dairy husbandry is the only program where poor families are able to build new assets in the form of high financial value cross bred cows produced every year. There are also successful technologies to improve the supply of superior quality of feed and fodder to facilitate S&MFs to take up economic milk production. Establishment of complete decentr
- alized feed production units and treatment of agricultural by-products to improve its nutritional qualities should be popularized by providing technical support. There is need to re-orient veterinary health care mobile services to provide preventive and curative animal health services. This will reflect on milk quality and cost-efficient

milk production. Research and development efforts need to be intensified to propagate the use of cow dung as source of organic manure in commercial farming & promoting organic farming. Capacity building of women SHGs and joint liability groups to own and manage dairy units profitably should be prioritized.

- **Make in Rural India:** If the “*Make in India*” initiative, advocated by our Prime Minister in 2015 to create jobs is systematically implemented in rural India, through scientifically promoting the dairy sector which touches lives of millions twice a day, can create substantial number of rural jobs including attracting rural youths. For this, intensive R&D efforts have to be directed to evolve agro-ecological region-specific crop-livestock farming & production cycle that can be easily adopted by a vast number of small dairy farmers to make milk production system sustainable. The components of the system include, measures to enhance milk productivity at individual farmer’s level through creating better breeding infrastructure; making available adequate quantity of fodder & feed resources and efficient utilization of currently available resources; capacity building of S&MFs for better management practices; improving quality and safety of milk & milk products; evolving innovative dairy farming models; increasing efficiency in dairy marketing chain; milk producers’ access to efficient & reliable markets. Based on current field experiences, substantial improvement is required in delivery of services for providing timely animal health care, extension-education, institutional credit & insurance cover and risk mitigation measures.

References

- [1]. Government of India [2012], Twelfth Five Year Plan 2012-17, Planning Commission, New Delhi
- [2]. Government of India [2013a], Agricultural Statistics at a Glance, Department of Agriculture & Cooperation, Ministry of Agriculture, New Delhi
- [3]. Government of India (2015). Annual Report. Department of Animal Husbandry, New Delhi
- [4]. Anonymous [2015], Indian Dairyman, Indian Dairy Association, New Delhi
- [5]. Joshi, P.K.[2015]Has Indian Agriculture Become Crowded and Risky? Status, implications and the way forward. Joshi, *Indian Journal of Agricultural Economics*, 70[1] 1-41.
- [6]. Kalkoti,G. et al [2012], Producing Milk for Millions, Bank Credit to Agriculture in India, Pp 70-85, Manan Prakashan, Mumbai
- [7]. National Bank for Agriculture & Rural Development (2015). *Annual Report*. Mumbai.
- [8]. Reserve Bank of India (2015). *Annual Report*. Mumbai