Current Problems and Challenges Confronting the Dairy Industry in India

B. N. Mathur
National Dairy Research Institute, (ICAR), Karnal – 132001 India

ABSTRACT: For the Indian Dairy Industry, efforts need to be directed to accelerating the pace of application and adoption of modern technologies to improving productivity, and to reducing costs of operations and ensure greater availability of milk and milk products. To attain this, national development programs need to be dovetailed with state Governments programmes on animal husbandry and dairying, poverty alleviation programmes, R&D strategies, Agricultural Universities and other developmental agencies. Infrastructure needs to be strengthened for the improvement of milch breeds of cattle and buffaloes in context with the 14 agro-climatic zones of the country. Intensive financial and scientific inputs are needed to mechanise the processes for the manufacture of indigenous milk products. Scope is also indicated for the development of a new range of dairy products to meet the needs of the urban consumer for health, safety, convenience and shelf-life.

Key Words: India, Dairy Industry, Problems, Challenges

INTRODUCTION

In sharp contrast to the industrially advanced nations of the world, dairying in India differentiates itself in several socio-economic features. It ranks first in the bovine population with 196 million cattle and 80 million buffaloes (a total 276 million animals), and accounts for about 51 percent of Asian and about 19 percent of the world bovine population. With an annual increase of 4.7% in milk production since 1971, dairying has played a prominent role towards household nutrition security and also in strengthening the rural economy. It has also been recognised as an instrument to bring about socio-economic transformations in the rural sector. The dairy sector has helped the national economy by emerging as the highest milk producing country in the world. According to FAO’s Economic and Social Development estimate (FAO, 1998), India’s milk production has increased from a mere 17 million tonnes produced in 1951 to 74 million tonnes in 1998. This is now 13.5 percent of the world’s milk production. This progress made by India in the field of dairying may be attributed to the concerted efforts of a large number of milk producing farmers, scientists, planners, NGOS, dairy co-operatives and the industry.

Presently, in the Agriculture Sector, milk is the largest contributor towards India’s GNP. The unique feature is that 70 million rural families with holdings of 2-4 cattle are engaged in milk production. This is in contrast to specialised dairy farmers in the western world, where a much smaller section of the population is engaged in milk production activity with large cattle holdings. We have come a long-way towards food security and have been able to raise the per capita availability of milk from 132 g/day (1950s) to 214 g/day (1997). Further efforts are needed to raise this to the minimum recommended level of 240 g/day.

Projections for the demand of milk and milk products over the next two decades, indicate that rising incomes, high income elasticity of demand and population growth, will generate a demand growth at the rate of about 7 percent per annum, pushing the total annual demand of milk up to 170 MT by the year 2020. In the competitive environment of liberalised economies, it is a matter of concern whether India would be able to exceed the current 4.5 percent annual growth in milk production to meet the anticipated increase in demand. Efforts for sustenance of growth of dairy industry under the liberalised economies of the WTO regimen present formidable challenges.

CONSTRAINTS TO STRENGTHENING MILK PRODUCTION

The indigenous (zebu) cattle (Bos indicus) are well adapted and thrive well in the tropical climatic conditions by virtue of their superior resistance towards heat and tropical diseases. These are also known to be the efficient converters of feeds into milk and have the genetic potential to produce 2500 – 3000 kg of milk per lactation. Among the various indigenous breeds Sahiwal, Red Sindhi and Tharparkar are preferred for milk production. However, only a very small population of these breeds remains in India as their home locality has been partitioned to Pakistan. The need for their conservation and multiplication using a Hitech approach, is being favored by planners.

In India, the buffalo is an important dairy animal, and contributes 52 percent of the total milk production. There has been an increase in buffalo milk production from 22.8 MT in 1984 to 31.2 MT in 1994, representing an annual growth rate of 3.1 per cent. Among the riverine buffaloes of the subcontinent, the best-known breeds are Murrah, Mehsana, Surti and Nili Ravi.
While most of the buffaloes from the best-known Murrah and Neeli Ravi breeds produce between 1500 – 3000 kg of milk per lactation, the best animals amongst these breeds have a recorded milk production of over 5000 kg per year.

The major constraints facing development of the dairy sector are the low productivity and very large numbers of animals across both species of dairy animals, cows as well as buffaloes. Nearly 80 percent of the cattle and 60 percent of the buffaloes are nondescript and have a very low milk yield and work output. The unproductive animals in the country consume over 90 percent of the limited feed resources. Very often the large number of animals are justified as being required to provide draught power for the crop sector. However, the contribution of draught animals to farming operations has been steadily declining from 72 percent in 1991 (Kurup, 2000). It is anticipated that in the coming years, augmentation of mechanical power will reduce the dependence on animal draught power. Small holdings of 2-3 animals, by millions of farmers, further complicate endeavors to reduce the large animal population. With a view to developing the appropriate policy intervention to augment feed resources, the Ministry of Environment and Forest, of the Government of India, estimated that in 1993 that there was a deficit of 31 percent of dried fodder, 23 percent of green and 47 percent of concentrates. The total area of Common Pasture Resources has shrunk by 30 percent during the last four decades, now being 130 million Ha (Patel, 2000). These Common Pasture Resources are in an advanced state of denudation, and degradation, have a scanty biomass covering and are almost at the point of no return. They can no longer support any meaningful livestock production.

The shape of the udder, teats and milk let down characteristics of buffalo vary significantly from those of cattle (Ganguli, 2000). Machine milking of these animals was not practiced until very recently. However, physiological studies have helped to develop specialised milking machines. These use a pulsation ratio of 50:50, a rate of 40 pulsations of per minute and a vacuum of 46-51 mm of Hg. They permit maximum milk flow rate and efficient milking of the buffaloes.

Livestock production in India is seriously handicapped by recurrent ravages of epidemics across all species. This leads to annual production losses of over Rs. 50 billion. Support services in the livestock sector such as veterinary services and artificial insemination, are offered almost exclusively by the State Departments of Animal Husbandry. The overwhelming presence of the government in the delivery of free services, has somewhat compromised their quality and accountability.

Nearly 80 percent of the breedable family stock is not covered by well-defined breeding policies suitable for the 14 distinct agro-climatic zones of the country. The State Governments provide coverage for less than 20 percent of the breedable female cattle and 10 percent of the buffalo.

Progeny testing and evaluation programmers are virtually non-existent, so virtually no genetic progress takes place from generation to generation. Breeding of buffalo receives much better attention from farmers. However, any effort for genetic up-gradation is undermined by the high demand for high yielding buffaloes in metropolitan areas such as Bombay and Calcutta. The lucrative demand for beef in these places exerts a very high negative selection pressure on dairy animals as the very best among them perish in the cities without having opportunities to reproduce during their current lactation. The genetic drain on the elite buffaloes has been going on for decades and hundreds or thousands of best quality germplasm is destroyed, year after year. (Aneja and Puri, 1997).

Despite the obvious need for extension support to promote agricultural production, the delivery of services by the State Departments in the livestock sector has remained far from satisfactory. Socio-religious compulsions have prevented culling of unproductive animals in this country. Over 30 percent of the adult females among cattle are not suitable for further propagation. Lack of good quality semen and coverage of artificial insemination has seriously impaired attempts for genetic improvement of the national milch herd. Accelerating livestock sector development in India has to be balanced with the compulsions to conserve the ecology, as livestock component of the cattle is the major cause of environmental degradation. The uncontrolled growth of the cattle population far beyond the capacity of cultivated land to support it and is a threat that needs well-focused policy interventions, while the concomitant potential for milk production, employment generation and poverty alleviation, needs support.

**INFRASTRUCTURE FOR MILK PRODUCTION**

A cattle and buffalo breeding policy needs to be framed, keeping in view the production traits, economic performance and draftability of breeds of animals in context with the agro-climatic factors, existing infrastructure and support systems. Accordingly a National Production Policy for milk production and draft animals has been defined:

**Cattle:**
- Genetic improvement and conservation of nationally important indigenous breeds of cattle through selective breeding in their home tracts to increase milk production potential and draught ability.
- Cross-breeding of low producing non-descript cattle with exotic dairy breeds.
- Inter-se-mating among cross bred cattle using proven/pedigreed cross bred bulls.
Buffaloes:
- Genetic improvement and conservation of nationally important buffalo breeds through selective breeding in their home tracts to increase their milk production potential.
- Genetic improvement of non-descript buffaloes through upgrading with improved breeds.

In view of the available poor germplasm of dairy animals, cross breeding of local cattle with elite exotic breeds and upgrading of buffaloes have been widely adopted as a national policy to improve animal productivity and milk production in the country. The total crossbred bovine population in India is about 5.2% of the total indigenous cattle population. The breedable crossbred bovine population in India in 1993 was 5.5 million and the projected figure for 2000 AD is 7 million. The percentage of the overall increase in the crossbred population is higher (59%) than indigenous ones (36%). The contribution of crossbred cows to the country’s milk production was 22% of the total cow milk in 1996 and is expected to rise still further. However, genetic improvements in heat tolerance, disease and pest resistance in higher yielding cattle and pasture management, need further efforts to bring about targeted improvements in national milk production enhancement programmes through cross breeding. Further reinforcement with the use of the frozen semen technology, proven bulls, embryo transfer technology, progeny testing, sexing and cloning of embryos through biotechnology and genetic engineering needs to be attempted to accelerate the pace of developmental for generating a National Milk Herd capable of anticipatory performance.

About 70% of the infrastructure for breeding of bovine is provided by State Departments of Animal Husbandry and Dairy Development, with almost all of the remainder provided by the State Milk Cooperative Federations. There is also some provision by some NGOs, voluntary agencies and a few private practitioners engaged in providing artificial insemination services. The approximate number of insemination providing agencies under this system is 40 thousand, of which nearly 21 thousand are equipped to handle frozen semen (Kurup, 2000).

One of the most severe constraints to India’s dairy industry is the difficulty in reaching the millions of small holders with technologies and skills appropriate to their resource base. Plans to bring about a perceptible change in production systems, therefore, present a formidable and socially difficult task. Such an effort involves increasing the average holdings to an intermediate level of 5 to 10 milch animals by providing credit and market access. Almost 40 percent of milk producers live below the poverty line and would need a package of credit for them to be transformed into viable intermediate producers. The family through household labour, could easily manage the modest holdings.

CONSTRAINTS OF THE PROCESS INDUSTRY

Quality of milk: With increasing trends towards globalisation, quality standards of milk and milk products cannot stay at variance with the International market standards. Although milk produced by the farmer is reasonably clean, there is a lack of infrastructure for handling of milk in the rural areas. The Indian dairy industry is moving steadily towards self-reliance. It lacks necessary cold chain facilities and appropriate infrastructure to procure quality milk from the producers. The quality of milk can be improved by developing cooling facilities at village level and an efficient collection system. In addition some price incentives need to be provided for clean milk production.

PROCESSING QUALITY OF BUFFALO MILK

The chemical make-up of the milk constituents in buffalo milk is distinctively different from that of cow milk. The higher percentage of fat, protein and mineral (especially calcium) content of buffalo milk makes it richer in nutrient vis-à-vis cow milk. In general, fat content tends to vary between 7.2-12.6%, proteins between 3.6-6.0%, lactose between 3.7-5.5% and ash between 0.7-0.8%. Besides, the gross compositional differences, the make up of caseins, whey proteins and lipid components also differ in the milks of two species. Higher total solid content, denser white appearance, higher viscosity etc. are some of the useful attributes, which make buffalo milk eminently suitable for the manufacture of certain dairy products such as tea/coffee whitener, casein and caseinates, whey protein concentrates, lactose and its derivatives, mozzarella cheese, ice-cream and frozen desserts, concentrated milk products, fat rich products etc. Caseins of buffalo milk are larger in size, more resistant towards heat denaturation and lack water holding capabilities compared to those of cow milk (Ganguli, 2000). Furthermore, caseins resist enzymic degradation. The rate of microbial growth is slower. Consequently, technologies already developed for the manufacture of cheese and concentrated milk products cannot be applied to buffalo milk without appropriate modifications. Such technologies have been developed for majority of the products, including many cheeses.

PROSPECTS FOR NEWER PRODUCTS

Changes in the food market structure during the new millennium are expected to be significant. With an increase in life expectancy, the proportion of older people in the population will increase, and this could emphasise a demand for special nutritional products.
Growing automation in homes (cooking robots, microwave ovens) would also influence the kind of new dairy products that are going to be needed. A growing tendency to outdoor eating would influence packaging. With the growing attention to the safety of dairy products, there is going to be an emphasis on quality above price. A spectacular increase in demand for convenience foods is being projected by marketing experts. Furthermore, an increased emphasis on the health aspects of foods and human slimness, fitness, strength and energy are already evident. In the cities, consumers are looking for newer dairy products with an extended shelf-life. All of these future trends indicate an enlargement of organised food marketing channels with a greater link with farmer co-operatives.

National policy planners have favoured introduction of UHT-milk in place of pasteurised milk to meet the requirements of fluid milk in cities. This would help overcome continuous problems associated with maintaining the ‘cold chain’ which is so critical for the marketing of pasteurised milk products. Long shelf-life under ambient conditions would provide the necessary flexibility to ensure success of the distribution systems.

In context with the present day concepts for nutritional packages and modes of milk processing, provisions for a very diverse range of fluid milk designations (cow milk, buffalo milk, standardised milk, toned milk (3.0% fat, 8.8% SNF) have become superfluous. It would be desirable to rationalise the PFA Act provisions so that milk with a uniform SNF content (on an all India basis) could be marketed with a pre-designated fat content. The level of fat could be determined by the processor to meet consumer preferences or dietary objectives. Fluid milk could be then labeled accordingly in the markets for the new millennium.

TRADITIONAL DAIRY PRODUCTS

Traditional milk products represent the most prolific segment of the Indian Dairy Industry. Despite the immense volume of milk handled, preparation and marketing are confined to the unorganised sector. Since most of the western-type dairy products, manufactured by the organised sector of the dairy industry are reaching near saturation level in the existing domestic and international markets, the entire range of Indian milk products represent the most promising venue for diversification. There is growing awareness that future growth of the dairy industry in India should favor promotion of traditional milk products through the organised sector. The needs of the market will determine future changes in technology that will be required (Mahadevan, 2000). The fast changing socio-economic environment will drive the requirement for traditional dairy products to be processed and packaged in new forms. Appreciation of the prospects for traditional milk products in the newly emerging world scenario presents exciting opportunities for orchestrating further growth.

Appropriate R&D interventions and newer developments in dairy processing area will focus on novel aspects of emerging technologies, which could be utilised for upgrading processes for the production of traditional milk products.

Transformation of the unorganised sector of dairy industry engaged in processing more than 54 percent of the milk produced in the country, provides a formidable challenge. Development of appropriate dairy equipment to permit commercial production and packaging systems call for intensive financial and scientific inputs. Promising success has been achieved in the development of certain popular Indian dairy products, such as gulabjamun, shrikhand, paneer, mishti doi etc. Considerable potential exists for further developmental work in this area. Intensive R&D efforts are needed to develop suitable technologies for large scale manufacture and packaging of traditional milk products. The growth is to be achieved through integration with newly emerging, energy efficient unit operations developed in advanced countries.

A pre-requisite to this developmental activity would be scientific documentation of the desirable physico-chemical and shelf-life characteristics of regions’ specific traditional milk products. The food industry in Japan is the success story of such an approach and could serve as a model for planning suitable strategies for further developmental work. Noteworthy success have been achieved for the production / packaging of gulabjamun, shrikhand, burfi etc. at Sugam Dairy, Baroda. Dairying during the new millennium is optimistic about repeating the experience gained thus far to achieve phenomenal expansion of technological development. Considerable input of financial resources will be necessary to achieve growth targets (Aneja, 1996). Scope exists for the introduction of at least 25-30 traditional milk products through the organised sector of the dairy industry.

ENERGY CONSERVATION

Energy cost is the key factor in determining the production costs of milk and milk products would require adoption of energy efficient processes for processing of milk and milk products. The unorganised sector of the dairy industry consumes considerable amount of energy derived from non-renewable energy sources. Intensive R&D efforts are required so that the technologies like membrane separation, UHT methods, multistage drying are used. There is also a need to assess non-thermic processing like micro filtration, ultra-high pressure pulsed high voltage electrical fields, for future applications (Patel, 1997). In order to have an eco-friendly approach and to keep the processing cost to the minimum, the dairy industry must to adopt energy conservation systems such as utilisation of non-conventional energy sources, heat pumps, condensate recovery system and regeneration. The industry is yet to adopt the latest technological developments such as ultra filtration and reverse osmosis processes for the manufacture of various dairy products.
STRENGTHENING OF THE PROCESS INDUSTRY

Growing awareness of the beneficial role of milk and milk products in maintaining human health will demand the development of a range of functional foods. It is widely recognised that unique bioprotective factors present in milk such as immunoglobulin, lactoperoxidase, lactoferrin, lysozyme, vitamin binding proteins, etc. play an important extra-nutritional role. Technologically advanced countries have successfully developed foods with special health attributes and food ingredients derived through fractionation of milk by employing emerging technologies. Gross domestic product per capita and economic growth are important determinant of the market potential. The upper middle-income group in India represents the largest consumer market next to China. Life styles are changing quickly. Working couples in the urban areas are searching for convenience foods. Thus new markets are expected to emerge.

In the coming years, an agenda for Environmental policy would have to be developed. Adoption of biodegradable packaging material is required to replace the presently used flexible films and laminates.

HUMAN RESOURCE DEVELOPMENT

At a time when quantum changes are anticipated in globalisation of trade in dairy commodities, an appraisal of the current and future needs of HRD becomes necessary. The rate of growth of dairy education and research institutions has been commensurate with the development of the Indian dairy industry. The education network comprises 11 Dairy Science Colleges, 31 Veterinary Colleges and over 80 Agricultural Colleges and Research Institutions affiliated to 25 State Agricultural Universities, one university each of Horticulture and Forestry, Veterinary and Animal Sciences and Veterinary, Fishery and Animal Sciences. Besides these, many general universities also offer Dairy Education as a vocation course at the B.Sc. level. Dairying is also included as a vocational course for ten plus two level education (Mathur, 2000). In view of the increasing demand for middle level floor shop management personnel in the Dairy Industry, a two year National Diploma in Dairying is also offered by the National Dairy Research Institute, Deemed University, Karnal. In addition, over half a dozen major research Institutes under the Indian Council of Agricultural Research (ICAR), New Delhi, work in the field of Animal Sciences. These institutions provide facilities for certificates, diplomas and degrees, the latter also at Masters and Doctoral level, in Animal and Dairy Science, with specialisation in animal health, production and processing technology.

There is a strong trend towards the application of new science as well as management sciences in resource management. Further, attempts are being made in the dairy industry for cost reduction through labour saving mechanisation, process automation and application of computers in systems management. The industrial requirement for quality and risk management of export products, conforming to the SPS standards envisaged by WTO, would demand newer knowledge and skilled and competence of future scientists and managers. Thus the dairy education program needs to be reoriented.

The expanding dairy industry, privatisation of enterprise and the globalisation of the economy, will result in an increased demand for people trained in specific areas of dairying. Production experts conversant with modern biotechniques will be required to deliver results at field level and make dairying a profitable enterprise. Future demands will be in the area of food engineering, food packaging, quality assessment, and increasing the shelf life of dairy products considering the volume of financial turn-over in dairy industry in the coming years, management expertise in dairy business will be required with specialised training in business management. A close interaction between the dairy industry and educational institutions is necessary to contribute to the further development of dairying in India. The active participation of industry in providing necessary feedback about the training needs of dairy graduates and the educational institutions to come up to the industry's expectation, will be necessary to achieve this goal.

CONCLUSIONS

For further growth of dairy industry in the liberalised global economies, India has to face the challenges on several fronts. These include the production of good quality milk, adoption of cost effective, energy efficiency eco-friendly technologies for collection and processing of milk and milk products, diversification of the product range, up-grading and improvement in the shelf-life of Indian dairy products, development of appropriate systems for packaging, infrastructure for storage, transportation and marketing of dairy products, quality systems, certification, food safety, government legislation, effective management of resources and energy, proper disposal of industrial waste and customer services.

REFERENCES

Mahadevan, A. P. 1997 Opportunities in Marketing Dairy India Year Book published by Mr. P. R. Gupta, Delhi, India. 53-54.
Aneja, R. P. and Puri, B.P.S. 1997. India’s dairy riddle unrevealed. Dairy India Year Book. Published by Mr. P.R. Gupta, Delhi, India-p. 3-26.


Email: bnm@ndri.hry.nic.in