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Current human population (in 2017) in India is estimated to be 1.34 billion, of which nearly 70% lives in rural areas. When we talk about the rural prosperity, it not only means economic growth of people living in rural areas but also includes freedom from hunger, under-nutrition and ill-health. In spite of intensive efforts, the problem of poverty, malnutrition, lack of sanitation and diseases continue to exist in significant proportion of population with higher magnitude in rural areas as compared to urban areas. Reports indicate that around 48% children of the country, under the age of five years, have stunted growth indicating that almost every second child is chronically malnourished in India. Similarly, the prevalence of wasting is 19.8% and underweight is 42.5% — these are the highest in the world. Anaemia is found more prevalent in rural areas than urban areas. Since about 80% of rural population is dependent on agriculture for their livelihood, development in agriculture and its allied activities thus becomes vital for rural prosperity.

Dairy animals are an important source of food, particularly of high quality protein, minerals, vitamins and micronutrients; they supply huge amount of essential nutrients to the human population. Eating even a small amount of animal product corrects amino acid deficiencies in cereal-based human diets. It permits more of the total protein to be utilized because animal proteins are more digestible and are metabolized more efficiently than plant proteins. Milk provides proteins with a wide range of amino acids that match human needs. Thus increasing dairy production is expected to have significant impact on food supply to people since many rural poor small holders will have direct access to more food of dairy origin. Increased production will keep milk and milk product prices down and allow low income group's access to such food. Increased domestic production will also reduce imports and save foreign exchange which can then be diverted to productive investment and indirectly contribute to food security of rural poor.

Milk production: World Vs India

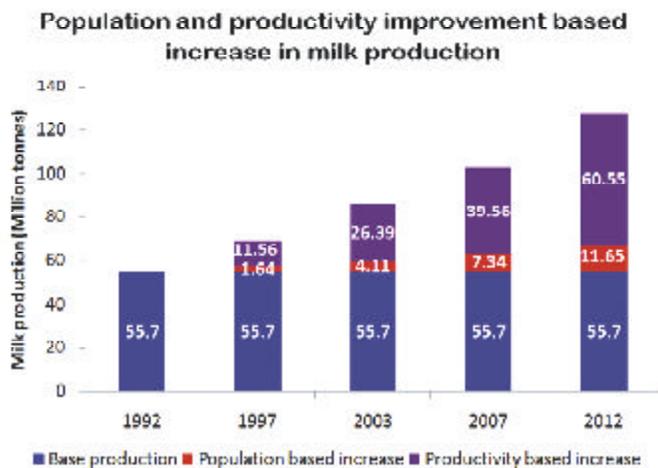
World milk production is forecast to reach 816 million tonnes in 2016. The current growth rate in milk production is about 1.6% and with this the milk production is likely to grow to 827 million tons in 2020. Except for very limited growth elsewhere most of the increase can be assigned to Asia, Latin America and the Caribbean and among these Asia is expected to account for most of the increase in milk production in the coming years. Expansions in herd size, as well as improved productivity are an important engine in the expansion. Within Asia, India is the world's largest milk producing country contributing around 18.5% of the world's milk production. China is next producing 47.6 million tonnes and is followed by Pakistan with a production of 39.12 million tonnes in 2013. In India, as compared to other food sectors, the growth in dairy sector has been commendable. The milk production increased from a mere 17 million tonnes



during 1950-51 to 160.35 million tonnes in 2015-16. The annual growth rate in milk production in India stood at 6.27% during 2014-15 as compared to the global average of 2.2%. Increase in milk production boosted the per capita availability of milk to the population of the country. In 1950-51, the per capita milk availability was only 130 gram per day while today the national average (<320 g) is above the ICMR recommended level of 280 gram per day.

Animal population vs Milk production

It is a matter of joy that India ranks first in the world regarding milk production and buffalo population, and ranks second in terms of cattle and goat population. However in terms of per-cow milk productivity the country is at 59th position in the world. From 18.7% of world's bovine population, the country produces 18.5% of world's



total milk production. Although population of dairy animal is one of the reasons for high milk production in the country, technology based increase in milk production is also significant. Recent developments in science and

technology improved our understanding on reproductive biology, endocrinology, lactation physiology, genetics/genomics, nutrition, health/disease resistance, behavior and animal comfort and management needs of the high producing dairy animals, which in turn facilitated interventions to improve productivity and production. The figure indicates the population based and productivity improvement based increase in milk production in the country. However, it is also true that we need to look again at several issues of dairy animal production and management in a holistic way.

Need to improve the individual animal productivity

There has been a substantial increment in the individual cow milk productivity in India. The individual cow milk productivity was 423.53 kg/year in 1961, which hereafter increased to reach 1191.54 kg/year in 2011. Similarly the average milk productivity of individual buffaloes also showed a significant increase during the period (from 889.59 kg/year in 1961 to 1700.78 kg/year in 2011). The individual animal milk productivity in goats increased over the period to reach 150.16 kg/year in 2011 from 100 kg/year in 1961. However, when the average milk productivity of individual cows in the country is compared with Israel, the average milk productivity of individual cows in the country is around 10% of Israel's productivity.

While improving the production potential of recognized breeds through selective breeding, it is recommended that side-by-side the production potential of huge masses of nondescript cattle and buffaloes need to be improved using identified improver breeds, preferably indigenous high producing breeds. Since the adaptability, survivability and the ability to produce moderate quantities of milk under the smallholder system

The major factors affecting the growth of Indian dairy sector includes, but is not limited to:

- ✗ Poor Productivity of native animals and inadequate availability of superior germplasm
- ✗ Inadequate feed and fodder supply
- ✗ Problems in diffusion of new technologies
- ✗ Mind set of people to manage animals under low/negligible input system
- ✗ Indiscriminate breeding of animals at field conditions
- ✗ Reduced availability of vaccines and other health measures
- ✗ Unorganized marketing

are high in indigenous breeds compared to exotic breeds, the use of these breeds as improver breed is expected to improve over all milk production without much production and reproduction problems. Further some of indigenous breeds like Sahiwal, Gir and Red Sindhi have been shown to perform well under intensive system also making them a perfect choice as improver breeds in both smallholder and commercial dairy production systems. The emerging concept of A1/A2 hypothesis in milk claiming that A2 milk has benefits over normal milk is also an opportunity for India since initial studies on indigenous cow (Zebu type), buffalo and exotic cows (taurine type) have revealed that A1 allele is more frequent in exotic cattle while Indian native dairy cow and buffalo have only A2 allele, and hence are a source for safe milk.

Wherever resources for intensive dairying is adequate/plenty, crossbreeding with exotic breeds can also be practiced. However, proper monitoring should be done so that the metabolic, infectious and reproductive problems that are more commonly encountered in crossbreds compared to Zebu cattle are kept under control. For the purpose of crossbreeding with exotic breeds, use of already identified and in-use breeds can be continued.

Facilitating Favorable utilization of Feed and Fodder

It has been a tradition in India to have community pasture land in each village — an important source of feed for cattle particularly of weaker sections like landless/small/marginal farmers. Each family has equal access to these resources in the village. In the past, group of villagers were taking care of such lands and maintaining them, but after abolition of this system, they remain in a denuded condition.

One of the major constraints in dairy farming is inadequacy of feed (quantity and quality) to sustain milk production, particularly during the dry season. A majority of the cattle and buffaloes under smallholder production system are reared under traditional feeding practices. Farmers choose their own ingredients and prepare their own formulations, believing that by this practice they are able to pay more individual attention to their cattle. Since considerable proportion of cattle and buffaloes produce less milk due to their genetic make-up, the farmers feel high-quality compound feed (industry feed) may not necessarily generate a significant improvement in productivity. However when we are aiming to improve

the productivity through genetic improvement, the genotype must be matched with proper environment including feeding to harness maximum potential of the genetics.

The area under fodder crops in India has stagnated at about 8.5-9.0 million hectares during the past decade and accounts for only about 4.6% of the total cultivated area. The projected green fodder and dry fodder demand for 2020 is 1134, 630 million tones whereas the availability is expected to stand at 406 and 473 million tones leaving a shortage of 64 and 25%, respectively. The concentrate requirement at 2020 has been estimated to be 81 million tones on dry matter basis while the estimated availability is around 45 million tones leaving a gap of 45%. Although significant quantities of crop residues are produced their quality cannot meet the nutritional requirements of dairy cows.

Disease control

In India, the control of dairy animal diseases is encouraging. India has the eradicated Rinderpest, the most dreaded disease that vanished herds of cattle. But there are several other diseases like FMD, IBR, HS, BQ, Anthrax and Brucellosis and parasitic diseases that are prevailing in the country leading to huge loss to dairy industry. Although the country has vast and effective network for animal health management across the country, the outreach of veterinary health care services to the dairy farmers especially in some areas is also low. Lack of awareness and non-availability of inputs for preventive measures at appropriate time leads to very high incidence of diseases and epidemics in the country. It has been estimated that losses due to brucellosis cost India at least ` 350 million every year and also loss of man-days. The annual economic losses incurred by dairy industry on account of udder infections have been estimated about ` 6053.21 crore. Out of this, loss of ` 4365.32 crore (70-80 %) has been attributed to sub-clinical version of udder infections. A well-planned and operational mastitis control programme is urgently needed to ward off huge economic losses to dairy industry. For success of the programme, close monitoring during its implementation along with good husbandry practices is essentially required. There is a strong need for health education for all personnel and farmers engaged in control programme. The direct economic loss due to FMD in India is estimated at ` 20,000 crore a year. Small, marginal and unorganized dairy sector of the poor farmers suffer the most due to this disease. If FMD alone is controlled, the milk production



can be increased by at least 5% in the country.

Value addition and milk processing

India has a unique pattern of production, processing and marketing/consumption of milk, which is not comparable with any large milk producing country. About 35% of milk produced in India is processed. The organized sector (large scale dairy plants) processes about 13 million tonnes annually, while the unorganized sector (halwais and vendors) processes about 22 million tonnes per annum.

Meeting the stringent quality standards of dairy chains is the biggest challenge for smallholders as their production system, at least partly, does not follow the “Clean Milk Production” practices. Strong emphasis on food safety and quality results in introduction of standards and control mechanisms — demands are put on reliability of supply, an efficient collection system with chilling equipment etc. The successful AMUL model needs to be replicated in the state for effective participation of smallholders in the dairy supply chains. For increasing the production of value added dairy products, the infrastructure will need to be further developed at the public, cooperative as well as at private sector level. The Institutes and Universities engaged in dairy education and research need to enhance their efforts to provide research support and human resources for large scale, diversified and quality production of value-added products. The traditional unorganized marketing of milk in smallholder system needs to be gradually shifted towards organized marketing for better and sustainable remuneration to the producers. Research input will also need to be provided for formulation of macro, meso and micro level policies and programmes to control cost of milk production and processing, facilitate flow of milk to the organized sector and strengthen the legitimate interests of various stakeholders in dairy sector. The main areas need to be given due attention areas follows.

- Improvement in raw milk quality.
- Increased processing efficiencies.

- Value addition.
- Development of functional foods that promote health and well being.

Epilogue

In India, dairying offers a viable livelihood option for rural population. Milk plays a major role in reducing poverty and is a source of nutritious food in rural and urban population. For the small-scale producer, milk is a key element for household income and food security and is a regular source of income for rural families and their survival. FAO estimates that for every 100 litres of milk produced locally, up to five off farm jobs are created in related industries like collecting, processing and distribution. To boost dairying in rural areas — as a means for livelihood security and employment generation — the productivity of the dairy animal needs to be increased. However matching the environment with the genotype is a must for exploiting the full production potential. Limited availability of management resources including feeding, breeding and health care necessitates development of newer technologies or adoption of proven technologies to utilize the available resources in an effective manner. Now it is well understood that dairying must be reoriented towards “Technology driven mode” to meet the rising demand for milk and milk products. Since dairying is socially and culturally intermingled with farming community and offers livelihood and nutritional security to a major part of the population, this transformation in dairying cannot be made overnight. The yield gap needs to be bridged through an integrated package of technology and policies to reap the untapped production potential, particularly, in rain-fed and other low productivity areas. Since a single daily glass of milk to the children in the country can contribute tremendously to improving the nutritional levels, focused attention on dairy development would not only improve milk production but also enhance the livelihood and food security of rural population.

Development in dairy sector can be boosted through...

- Production system oriented planning
- Agro-ecological region based prioritization of dairy animal breeds and optimizing productivity
- Germ plasm improvement using cutting edge breeding and reproduction technologies
- Improvement of feed and fodder availability by strategic planning
- Development of efficient and innovative methods for diagnosis of livestock diseases and early warning system
- Eliminating middle men between producers to consumers and enhancing processing and value addition