ECONOMIC PROSPECTS OF DAIRY DEVELOPMENT

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The stake holders are the backbone of dairy development in the country. Dairy sector is an important source of providing livelihood support to the rural population particularly landless and marginal farmers. Of late, it has been realized globally that dairy sector is less vulnerable due to less uncertainty and less impact of climate on livestock in comparison to agriculture, and thereby contributing more to the economy.

India is predominantly considered as agricultural and particularly a milk consumption country. Till now, about 58 % population of the country depends on their livelihood from agriculture and allied sectors. The dietary habits related to milk and milk products, diverse culture and festivals of multi-religion country endowing second largest population in the world. India has accepted the cattle and dairy related products since mythological ages. The scientific revelation and data generation and monitoring since independence showed that the country is unique repository of genetic resources.

Cattle Population Scenario:

According to 19th Livestock Census (2012), Govt. of India, 190.90 million cattle are contributing about 37.28 % of total livestock population in the country. Among bovine population (299.98 million), the cattle shares about 63.72 % and, of the total cattle population, 151.17 million are indigenous cattle and 39.73 million are crossbred cattle.

Till 2017, 43 indigenous cattle breeds whose breed characteristics are well defined have been listed as descript cattle in the country. These descriptive breeds of cattle constitute about 25.06 % (37.92 million) of total cattle population. During 1997-2012, crossbred cattle population increased by about 20.18 % where as the indigenous cattle population decreased by about 8.94 %, though the indigenous cattle are found more sustainable in comparison to crossbred cattle. Indigenous dairy cattle are also known for being more heat tolerant, comparatively resistant to many diseases; need low maintenance cost and higher feed conversion efficiency. Of late, the indigenous cattle in the country are also slowly getting importance due to scientific revelation of functional quality of milk.

Milk Production Scenario:

During 2014-15 to 2016-17, the Economic Survey recorded the average annual growth rate of milk production around 5.94 %, and as a result, the milk production increased to 163.7 million tons in 2016 – 2017. The per capita availability of milk in the country was also increased to about 352 g/day, though the per capita availability of milk varies dynamically from state to state mainly due to diverse food habits of human population. Analysis of trend of milk production over six decades (1950-51 to 2016-17) shows that the growth of milk production in the country has jumped more than nine times during the period from 17 million tonnes to 163.7 million tonnes and the country remained as the largest producer of milk (19 %) in the world.

Milk Production from Cattle:

During last five years (2012-13 to 2016-17) as given in Table 1, about 31.26 million tonnes of milk increased in

the country, of which more than 50 % milk (17.61 million tons) was contributed from cattle. The amount of milk production increased from cattle is due to 11.20 million tonnes of milk produced from exotic and crossbred cows and 6.41 million tonnes of milk produced from indigenous cows.

The increase of milk production and productivity of cow has to be looked in two ways i.e how much average milk productivity and production per lactation of cow was increased in our commercial organized herds as well as in the country when we compared the same with developed countries or some developing countries where cattle is the main source of milk production and managed intensively.

In general, it has been observed that milk yield per lactating dairy animal has been more than doubled due to rapid improvement in genetics and management of dairy animals in many countries including commercial herds and organized herds in India. However, in India, about 113.25 million (74.92%) indigenous cattle, still defined as non-descript cattle, are distributed mainly in small herds of 2-3 animals and reared by small and marginal farmers of different socio-economic conditions under diverse 20 agro-climatic zones of the country. Thus though the milk production from cattle has increased in the country, yet the average milk productivity of exotic, crossbred, indigenous and non-descriptive cattle in 2016-17 has been found to be very low as compared to the productivity of the cattle from developed countries.

Dairy Development Scenario in India:

The dairies in India were developed based on cattle and buffalo as even today, different states and union territories are dominated by either cattle or buffaloes. According to BAHFS (2017),

23 states and 5 union territories have more cattle population where as only five states and two union territories having more buffalo population. Therefore, other than large dairies which prefer milk from crossbred cows because of higher milk productivity and buffalo milk for handling huge amount of milk and processing milk for various milk products, many dairies developed in the country are focussing on cow milk. Further, among the cattle dominating states in the country, three states even surpassed the national average (5.3 %) for significant growth in milk production during 2016-17.

The dairy development in India was the organized effort of the Govt. of India, State Animal Husbandry Departments / Dairy Development Boards, ICAR Institutes, NDDB, BAIF, Private Organizations, NGOs, NABARD and State Agricultural / Veterinary Universities. The massive scientific dairy development was mostly emerged in 1960 when the country realized the shortage of milk and milk products. During this period, the country initiated the All India Coordinated Research Project on Cattle and also started crossbreeding programme through crossing of exotic dairy breeds primarily Holstein Friesian, Jersey and Brown Swiss with indigenous descript /

Table 1: The contribution of milk from Cattle in India

Year	Milk production (MT)		Total milk from cattle	India's milk production (MT)	% share of cattle
	CB cattle	Indigenous cattle			
2012-13	32.38	27.42	59.80	132.43	45.15
2013-14	33.88	28.13	62.01	137.68	45.03
2014-15	36.93	29.48	66.41	146.31	45.38
2015-16	41.93	31.71	73.64	155.49	47.35
2016-17	43.58	33.83	77.41	163.69*	47.29

* Including 5.62 million tonnes of Goat milk.

non-descript cattle to increase the milk production for dairy development.

The National Dairy Development Board (NDDB) was founded in 1965, with the motto to transform dairying into an instrument for the development of rural India. The major programme for dairy development initiated by NDDB in three phases was Operation Flood Programme during 1970- 1996 with the main objectives of increasing milk production, augment rural income and reasonable prices for consumers. In the Phase-I (1970- 1980), 18 milk sheds in country were linked to 4 metropolitan cities. During 1981-1985 in second Phase, the milk sheds were increased to 136 and 43,000 village cooperatives formed with 4.25 million milk producers. In third Phase (1985-1996), milk production increased from 22,000 tonnes to 144000 tonnes in 1989 by establishing 30,000 new dairy cooperatives and increasing milk sheds to 173. Till 2014-15, total number of dairy cooperatives under NDDB was 1, 65,835.

Cattle and Dairy Development in India: Challenges and Strategies

Looking into the low productivity of animals, rapid increase in human population and the demand of 191 million tonnes milk by 2020 and 230 million tonnes milk by 2035, the dairy development in the country based on cattle genetic resources only is encountering the following challenges:

1. Prioritization of breed:

Cattle are widely maintained among different species of livestock because of social acceptability and have the genetic potentiality for generating substantial income from milk. There is a need to prioritize based on availability of cattle breeds as per their economic importance which will be helpful for selecting economically important breeds in order to develop the dairies and at least double their income through sale of milk and milk products.

2. Sustainability of breed:

To sustain the improved productivity of crossbreds and to minimize the decline in reproductive performance, there is a need to develop the sustainable breeding strategy. Animal Genetics and Breeding Division of NDRI, Karnal has developed the sustainable breeding strategy for HF crossbred cattle and recommended that 61%, 9 % and 30 % weightage to be given to milk yield per day of first lactation length, calving to first A.I and longevity and 57% & 43% to be given to first lactation 305 days milk yield and pregnancy rate for selection of Holstein Frisian crossbred cattle for sustainable performance. Research for developing the weightage to production, reproduction and longevity of indigenous cattle is under progress at ICAR-NDRI.

3. Shortage of Male Germplasm/Breeding Bulls:

The dairy stakeholders are not able to select the breeds which are adaptable in a particular region due to non-availability of male germplasm of climate resilient breeds. There is a huge deficit of frozen semen doses of different breeds to cover the breedable population in the country. According to 19th Livestock Census (2012), the adult female cattle and buffalo population is around 133 million. The country has targeted to cover 50 % (66.5 million) population through artificial insemination by 2021-22. Assuming average two services per conception, the demand of quality semen production are 133 million doses as compared to the availability of 96 million doses at present in the country.

There is a need to identify more high genetic merit bulls and to establish more 'Bull Mother Farms' of various breeds to ensure availability of superior quality male germplasm by 2022 in the country. Production of large number of bulls/bull calves selected on the basis of performance of elite pedigreed dams and progeny performance is an uphill task in the absence of structured programme.

The Department of Animal Husbandry & Dairying, Ministry of Agriculture & Farmers' Welfare, Govt. of India has reoriented/launched

the schemes like National Programme for Bovine Breeding, National Project for Dairy Development, Rashtriya Gokul Mission, National Mission on Bovine Productivity and Central Cattle Development Organization, the outcome of all the schemes are contributing in dairy development in the country.

National Dairy Devolvement Board, Anand, Gujarat has also initiated National Dairy Plan Phase-I and II programme related to different breeds using institutional farms and large farmer's herds for producing a large number of elite bulls through pedigree selection and progeny testing programme in 18 states. The major objectives of all the programmes were to meet the demand of germplasm of high genetic merit bulls of different breeds for frozen semen stations across the country, the supply of semen at the doorsteps of the farmers and to promote the conservation and genetic improvement of indigenous breeds of cattle and buffalo.

4. Assisted reproductive Techniques (ARTs):

The DADF, MoAFW, GoI has initiated the massive programme on assisted reproductive techniques (ARTs) like adoption of Multiple Ovulation and Embryo Transfer (MOET) technology which will not only help to increase the annual genetic gain for the milk yield by increasing selection differential and intensity of selection and reducing the generation interval for the breed, but also will be able to produce high pedigreed bulls required for dairy development in the country.

5. Sex semen Technology:

The adoption of sex semen technology in cattle will bring the significant change in dairy development in the country. The dairy stakeholders who are the backbone of dairy development may be able to reduce the economic input substantially by eliminating the burden of unproductive male animals. The DADF, MoAFW, GoI has initiated the sex semen scheme which will not only help to increase the annual genetic gain for the traits by increasing selection differential, intensity of selection and reducing the generation interval for different breeds for faster dairy development, but also reduce the huge burden of non-productive males in the country. The adoption of sex semen technology may also help to produce the desired number of elite bulls in the country.

5. Genomic selection of indigenous breeds of cattle:

The emerging developments in the areas of molecular genetics have opened the new possibility of identifying and using the significant genetic markers related to reproduction and production performance for genetic improvement of indigenous cattle in India. The marker-assisted selection (MAS) is one of the molecular approaches to be developed under Indian dairy scenario and to be incorporated initially in breeding programme for enhancing the rate of genetic progress of milk yield and milk composition of indigenous cattle.

Genomic selection is a molecular approach which is revolutionizing the concept of selection in animal breeding. Genomic selection refers to selection of elite animals based on genomic breeding values (GEBV). The ICAR with the support of DADF, MoAFW, GoI has initiated to fulfill the far reaching target of developing HD DNA based chips for genomic selection of Sahiwal and Gir cattle, the two important indigenous breeds with large population in the country. The selection of animals through genomic approach will increase the genetic gain for milk yield which is the prime requirement for growth of dairy development. The development and adoption of indigenous genomic selection tools for indigenous cattle breeds will contribute immensely for strengthening the dairy development in the country.

6. Acute shortage of feeds and fodders:

The feeds and fodder are the essential inputs for milk production of cattle. Crossbred cattle though have the potentiality to produce more milk in comparison to indigenous cattle however they demand more feed and fodder due to large body size and more milk production. At present,there is an acute shortage of feeds and fodders in the country. The DADF, MoAFW, GoI has launched National Livestock Mission (NLM) to cover all the activities required to ensure quantitative and qualitative improvement in livestock production systems and capacity building of all stakeholders. NLM is comprised of 4 sub missions and development of feed and fodder is one of them. Recently Haryana Government has taken the initiative to distribute quality fodder seed mini kits of Berseem and Oat during Rabi season (2017-18) under NLM.

7. Reproductive problems:

High producing cows suffer more reproductive problems including fertility as milk production is antagonistically related to fertility. About 20 to 30 % cows observed repeat breeding due to anestrous, cystic ovary, endometritis and pyometra, resulting in a huge loss of milk in the country. The effort should be made in mission mode to reduce the problem of infertility in cattle for strengthening the dairy development in the country.

8. Metabolic diseases and Udder Disorders:

Metabolic disorders like milk fever, ketosis, downer cow syndrome etc affect high producing dairy cattle immediately after parturition. Besides various udder disorders, most common expensive metabolic diseases in lactating animals are causing huge economic losses in terms of production loss and treatment cost , that needs to be taken care of.

9. Implementation of Central and Centrally Sponsored Schemes on health coverage of cattle:

The centre and state governments have initiated many schemes for prevention of various diseases of cattle that could be effectively implemented so that economic losses in terms of production loss could be reduced substantially. The Livestock Health and Disease Control, the centrally sponsored scheme is implemented since 10th Five year plan in order to control emerging and exotic diseases under four components viz., a) Assistance to States for Control of Animal Diseases (ASCAD), b) National Project on Rinderpest Surveillance and Monitoring, c) Professional Efficiency Development (PED) and d) Foot and Mouth Disease Control Programme (FMD-CP). Later on, the scheme was expanded and new components such as PPR Control Programme, Brucellosis Control Programme, National Animal Disease Reporting System, Establishment / strengthening of existing Veterinary Hospitals and Dispensaries were initiated. These schemes assists to collect, compile and distribute monthly animal disease status and helps the states to control spread of diseases. Vaccination and awareness component under this scheme plays a vital role for animal health improvement and Food Safety and Traceability component is also strengthening the dairy development.

10. Insurance Coverage of Dairy animals:

The insurance of the animal asset has significant bearing on income from dairy animals. Livestock Insurance Scheme has been formulated with the objective of providing security to farmers against any eventual loss of their animals due to death, to demonstrate the benefit of insurance of livestock to people, to conquer qualitative improvement in livestock and their products and finally to demonstrate the benefit of insurance of livestock to the dairy development.

11. Skilled Human Resource Development:

The dairy development in any country demands the service of skilled human resources. Therefore, it is of utmost importance to develop well trained, competent and dedicated human resources in order to increase the adoption of artificial insemination, in-vitro fertilization and embryo transfer for productivity enhancement of cattle and buffaloes. Besides, dairy stakeholders should be skilled through training on proper heat detection, clean and quality milk production, balancing of rations and milk processing for increasing the profitability through dairying.

12. Development of Dairy Entrepreneurs:

More initiatives are needed to motivate the dairy stakeholders to become start-up / dairy entrepreneurs in India. The DADF, MoAFW, GoI has initiated Dairy Entrepreneurship Development Scheme for strengthening the dairy development and creating more opportunity for the up-coming dairy stakeholders.

13. Strengthening Dairy Development Extension Programmes:

The dairy development in India demands a networking of various extension activities as the milk procurement is based on different milk shed areas where, the dairy stakeholders are the custodian of different breeds of indigenous and crossbred cattle. The role of extension workers are to be considered as pivotal as they are involved in enhancing the awareness of various dairy development technologies including the impact of climate on milk production.

Cattle and Dairy Development in India: Economic Prospects

Dairy development in India is gaining more attention as livestock sector alone, a major

component of agriculture, contributed about 4.5 % of total GDP and 25.8 % value (Rs. 812352 cr) of total output in agriculture sector at current prices during 2015-16. Among the livestock products, milk alone contributed about 67.72 % (Rs. 550171 cr) of the value of output from livestock sector at current prices during 2015-16 in the country (BAHFS 2017). The roadmaps for increasing the economic prospects through dairy development will be as follows:

1. Remunerative Price of Cow Milk:

Though the price of milk procurement is a state subject and varies from state to state, region to region and even one location to other location, however, the government should take the initiative to develop the compensatory model for leveling the prices of cow milk as most of the times the fat per cent of cow milk found below 4%. The logic is to obtain the equal amount of cow and buffalo milk the input expenditure does not differ much, though disposing buffalo milk earns more money due to higher per cent of fat in milk.

2. Dairying with High Producing Cattle

More efforts should be made to make aware the dairy stakeholders to keep less number of animals with higher productivity (milk per day per animal) to make the dairy more profitable. The dairying with high producing cattle along with the knowledge of technology will directly transform the growth and economic prospects of dairy development in the country.

3. Promoting Dairy based Precision Organic Farming:

The concept of organic milk is gaining importance in the country. Looking in to the demand and consumers, preference, the centre and state governments should develop the key scheme for encouraging the dairy stakeholders for dairy based precision organic farming and produce more organic milk to fetch better prices from organic milk disposal.

4. Dairy Development based on A2 brand milk:

The acceptance of indigenous cow milk as A2 milk is of late gaining popularity as it is available now in the domestic market. In many states, the indigenous cattle breed associations / start up have formed to promote the indigenous cow milk highlighting the importance of A2 allele and consumers are paying more price per liter of milk due to the health reasons. The economic prospects from dairying may come by developing many dairies in the country based on A2 brand milk in future.

5. Dairy Development based on Milk as Functional Dairy Food:

The economic prospects of dairy development in future may grow by considering milk as functional dairy food. The availability and consumption of such types of products may improve the bone, heart or gastrointestinal health and thus, will be contributing in the reduction of life-style associated diseases of consumers in India.

Conclusion:

India is predominantly considered as an agricultural and particularly a milk consumption country. The dietary habits related to milk and milk products, diverse culture and festivals of multi religions country are endowing the second largest population in the world. India has accepted the cattle and dairy related products since mythological ages. The idea of dairy development in India emerged from the demand of milk and milk products as early as in 1875. The dairies in India were developed based on cattle and buffalo as even today, different states and union territories are dominating by either cattle or buffaloes. During 2017, 23 states and 5 union territories have more cattle population where as only five states and two union territories having more buffalo population. Other than large dairies which prefer milk from crossbred cows because of higher milk productivity and buffalo milk for handling huge amount of milk and processing milk for various milk products, many dairies developed in the country emphasize on cow milk. The stake holders are the backbone of dairy development in the country. Dairy sector is an important source of providing livelihood support to the rural population particularly landless and marginal farmers. Of late, it has been realized globally that dairy sector is less vulnerable due to less uncertainty and less impact of climate on livestock in comparison to agriculture, and thereby contributing more to the economy.

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