



Global trends in cattle breeding

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Introduction

Many species of domestic animals are used for milk production in different areas of the world. But dairy cattle remains the major contributor of milk. Of the 400 odd dairy breeds of cattle, only a few had attained the global acceptance. Among these Holstein Friesian undoubtedly occupies the top position. The term Holsteinisation has become more and more meaningful with the acceptance of the breed as the best dairy animal.

The efforts for genetic improvement has attained more attention due to the global demand for milk. The conventional breeding techniques earlier used paved way for incorporation of molecular genetic tools and advancements in the sector. All these resulted in exponential improvements in dairy cattle production and performance. This in turn has resulted in attainment of self sufficiency for many constraints in milk production.

In the era of globalisation, the trade in dairy cattle germplasm semen, embryo / animals has become lucrative. Now progenies of

outstanding bulls are present in different countries and in millions. This article is an attempt to understand the trend in dairy cattle breeding of USA, where most of advancements have commenced, Israel, which boasts to have the best dairy animals, and India, which is the top producer of milk in the world.

Breeding trends

Developed countries are working at the increasing efficiency of dairy cattle. So the cattle population in these countries is in declining trend. This is completely reverse with India. Today, India is the top producer of milk, at the same time its cattle population is showing increasing trend.

In USA, modern dairy cattle breeding methods have been developed and applied to effective advantage through large-scale performance testing and young sire sampling programs under National Cooperative Dairy Herd Improvement program. Computers with large storage and data handling capacity are being used for analysis of millions of records and results are made available in every state. The US Department of agriculture has played a significant role in making accurate and useful sire evaluation available through AI associations and Breed associations. Service to top sires becomes available through AI. 25 million milking cows in the USA in 1945 had decreased to 9.2 million in 1998. Those 9.2 million US cows produced more total milk by over 30% than did the 1945 US dairy population.

Another country that has done rapid progress in genetic improvement of dairy cattle is Israel. Israel has very harsh climatic conditions, limited water facilities and scarce fodder resources. With all these constraints, Israel, tropical country like India has achieved more than any other country in the world. Israel Dairy Breeding was developed by upgrading indigenous cattle with European - Friesian and Holstein-Friesian Sires. Milk, Fat and Protein Yields, conformation traits, mastitis traits, calving ease and calf survival, fertility and meat production traits were given special importance in national breeding

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programme. The FAO study conducted in Poland for comparing the genetic level of young sires from 10 Holstein breed strains indicated that Israel strain was among the top for milk, fat and protein production and growth traits. When elite sires from the US, Canada, New Zealand, Sweden and Israel were compared in Israel, daughters of the Israeli sires were highest for milk and fat production and survival rate under Israeli management and environment conditions.

In USA, methods for pricing milk have undergone substantial changes over the last 20 years. Multiple component pricing has been implemented. It has become necessary to change the selection goals accordingly. Dairy producers should not be expected to produce a product for which they will not be compensated so milk pricing and selection goals should be coordinated. The present trend across the world is to breed the animals as per the needs of the market. The market is mainly dairy products and hence emphasis is on milk constituents rather than quantity of milk production.

Indian Scenario:

In our country, about 70 per cent of the population is engaged in agriculture, and rearing of livestock (mainly cattle and buffaloes) is subsidiary to agriculture. Livestock production in India is of backyard type. Small holder dairy production system exists in India. Animals maintained by landless produce 23%, small and marginal 42% and medium and large farmers 35% of milk respectively. Today India is the top producer of milk in the world.

Following points indicate different phases of genetic improvement of cattle and dairy development in India.

Traditionally, cows have been primarily reared to produce bullocks, while buffaloes are largely bred for milk production. Purebred bulls were maintained in veterinary hospitals for service.

India is blessed with 30 recognized cattle breeds with unique characters like disease resistance, adaptability to harsh environments and efficient utilization of low quality roughage, but are late maturing and poor milk producers.

British tea planters in hilly areas of North, North East and South India introduced temperate breeds (Ayrshire, Shorthorn, Jersey)

- Crossing of Sindhi and Sahiwal with HF and Ayrshire in military dairy farms.

- Key village scheme in 1955, Bulls for natural service, AI was introduced, centralized semen collection centers started.

- In 1956, ICAR tried crossbreeding under field conditions.

- The proposed breeding policy was selective breeding of recognized breeds in their home tract and crossbreeding the non descript cattle which forms the 75% of our Indian cattle Population.

- Intensive cattle Development Project started in 1964. Jersey and HF used for breeding. Crossbreeding was popularized all over and emerged as National program for milk production.

- Indo German, Indo Danish, Indo Australian, Indo Swiss and Indo New Zealand Projects started in Himachal Pradesh, Karnataka, Assam & Haryana, Kerala and Tamil Nadu respectively. Progeny testing programs were undertaken.

- Operation Flood in 1970, 1st phase (1970), 2nd phase (April 1981 to March 1985), 3rd phase (April 1985 to 1994) Co-operative unions established all over India.

- Project Directorate on Cattle (PDC) started at Meerut with progeny testing of bulls as one of its objective. Three field progeny-testing units of PDC are Pune, Punjab and Kerala.

- Two synthetic Dairy breeds Karan Swiss and Karan Fries were developed.

- Today India has largest bovine population in the world (20.2%). Zebu Cattle, Crossbred cows and constitute 35% each and buffaloes 51% of the milking animals. The average milk production/lactation (300 days) of Zebu cattle, crossbred cows and Buffaloes is only 732 lit, 1600 lit and 1340 lt. respectively

These developments have resulted in -

- Increased milk production from 17MT in 1950 to 74 MT in 2000 AD.

- Decreased age at first calving Decreased disease resistance.

- Increased rural employment

- Deterioration of indigenous cattle genetic resources due to indiscriminate cross breeding.





■ Crosses with exotic inheritance more than 50% did not show their performance as per theoretical expectations. Decline in milk production from F1 to F2 and subsequent generations were observed. As the proportion of *Bos taurus* inheritance increases further, an increased calving interval due to infertility problem, poor disease resistance, lack of adaptability to hot and humid climate were observed under field conditions.

The following points may act as solution to these problems: -

■ The most vital aspect of present day cross breeding programmes is the inconsistent production of progenies. Use of proven crossbred bulls is the only accurate solution. Alternatively young F1 bulls can also be used but with reduced accuracy of prediction.

■ Identification of superior strains, superior animals within the breeds, their utilization in genetic improvement of the stock and conservation of superior germplasm is essential.

■ The semen production and sire evaluation should be done by different agencies.

■ Survey & characterization of different breeds, creation of livestock gene bank (maintaining live animals, cryopreservation of semen, embryos, Oocytes and cell lines or as genomic libraries and transgenic forms). Application of latest techniques like molecular markers, DNA finger printing, PCR technology for livestock gene identification.

■ Increasing infrastructure like Bull mother farms, AI facilities, Frozen semen production centers.

■ Herd registration to form breeders' society.

■ Adoption of modern breeding technologies like MOET, ONBS, Transgenesis etc.

■ Inclusion of somatic cell score in genetic evaluations in near future to make India self sufficient to face the onslaught of international competition.

Migration of Genes:

The twentieth century had contributed much technical development in cattle reproduction. And many have dramatically enhanced the possibilities of exchanging genetic material across the borders. Wide spread use of frozen semen and transfer of frozen embryos are some of them. As a result many dairy cattle populations have rapidly incorporated genes

from other population. For example, in 1998, 41% of the US dairy semen sold was exported. Individual bulls have been documented to have as many as million daughters and grand daughters across countries. Countries that import semen according to their own breeding goals and needs should select the most suitable breeding bulls from worldwide gene pool. But this may not always become easy. An across country evaluation technique become essential when breeders want to make comparisons between a domestically marketed bull and a bull available through imported semen. Today, the driving force in recognition and promotion of the best genetics is the genetic evaluations produced by the International Bull Evaluation Service (INTERBULL). The INTERBULL grew out of Co-operative efforts in 1983 between European Association for Animal Production (EAAP) and International Dairy Federation (IDF) with its center in Uppsala, Sweden. The main task of INTERBULL is to coordinate genetic evaluations of cattle in the member countries. The international genetic evaluations done by INTERBULL are across country measures of genetic merit for individual traits. It uses a scientifically advanced method known as Multiple Across Country Evaluation (MACE) to estimate international genetic merit. So far, progeny testing has been done in 22 countries with the total of around 90,000 bulls from 6 breeds of dairy cattle. Till 2001, Interbull had 41 member countries.

Economic Traits under International Evaluation:

The traits under evaluation by INTERBULL are mainly Fat, Protein and Milk Yield. In 1996 evaluations, six countries provided some kind of evaluation for herd life and stability. An international proven sire producing progenies all over the world in different countries has some undesirable outcomes like the exhaustion of genetic variation. This can be controlled to a great extent through the international evaluations for all economically important traits, which have sufficient economic worth and reasonable opportunity for improvement. The move can also cater to the different breeding goals of each country and thus maintain some of the global diversity.

