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Crossbreeding experiments in India – Lessons to learn and voyage to future

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Abstract

Crossbreeding in India was started during colonial era by East India Company and European missionaries. Military Farms were the first to start systematic crossbreeding work in India. After independence, ICAR has launched several crossbreeding programmes in cattle, sheep and goats with the aim to meet out ever growing demand of livestock products. Every state has its own cross breeding policy which is agro climatic and breed specific. Crossbreeding of non-descript animals with exotic germplasm has although resulted in increase in production and reproduction potential, but, indiscriminate crossbreeding resulted in breed dilution of valuable indigenous livestock in their native breeding tract. Along with these, crossbreds are poor to adapt harsh climate, susceptible to tropical diseases and require constant input of good managerial conditions compared to our indigenous livestock genetic resources which are far superior in these aspects. So, even though crossbreeding had initial success but it is necessary to evaluate crossbred animals on large scale basis.

Keywords: Cattle, crossbreeding, exotic breeds, goat, sheep

Introduction

Animal breeding

Animal breeding is an age old practice started parallel with human civilization. Different forms of breeding practices were experimented to meet the need of the human beings. India was not lagging behind and its ancient civilization paid proper attention to livestock breeding practices.

Crossbreeding in cattle

Perhaps the first crossbreeding of cattle in India was started in 1875 while 'Taylor' (Shorthorn bulls x Native cows) breed was created near Patna ^[1]. Crossbreeding in the Nilgiri area of Madras State and hilly regions of Assam and Bengal with Ayrshire, Holstein and Jersey bulls also initiated during the same time ^[2]. In 1891, Military Farms started using exotic breeds like Friesian, Jersey, Guernsey, Ayrshire and Shorthorn for crossbreeding ^[3]. In 1910, Imperial Dairy Research Institute, Bangalore started crossbreeding; first with Ayrshire and Haryana, later with Ayrshire and Red Sindhi breed. In Hosur Livestock Research Station of Tamil Nadu crossbreeding of Ayrshire with Red Sindhi was started in 1919. Indian Agricultural Research Institute, Pusa (Bihar) started crossbreeding with Sahiwal cows in 1920. Board of Agriculture and Animal Husbandry recommended grading up of non-descript cattle with superior indigenous breeds in 1940. In 1961, Central Council of Samvardhana and Animal Husbandry Wing suggested crossing of non-descript cattle with exotic dairy breeds like Holstein Friesian, Brown Swiss and Jersey for bringing faster increase in milk production. Scientific Panel of Animal Husbandry Department set up by the Union Ministry of Food and Agriculture in 1965 suggested grading up of non-descript cattle with established defined breeds and crossbreeding with exotic dairy breeds (Mostly Jersey breed and to a limited extent with Brown Swiss and Holstein). Fourth Five-Year Plan further laid more stress on crossbreeding of cattle with exotic dairy breed. ICAR sanctioned a large crossbreeding scheme in 1955 for hilly and heavy rainfall areas for determining the optimum proportion of exotic (Jersey) inheritance in crossbreds. In 1963, crossbreeding of Sahiwal and Red Sindhi with Brown Swiss were initiated to evolve a new dairy breed, Brown Swiss, famous for its high milk yield, better heat tolerance and draught capacity ^[4].

Crossbreeding experiments in different states of India

A group of synthetic cattle breeds were developed due to various crossbreeding experiments (Table1) during post independent period ^[5]. Some breeds like Taylor, Jersind, Brownsind and Jerthar developed from crossbred foundation, though had higher milk production as compared

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to the indigenous cows but could not be sustained for long periods because of limited population size and lack of systematic selection programme [6]. Due to crossbreeding, there is tremendous increase in crossbred cattle population in the country i.e. 22.8% (24.686 million) during inter censal period 1997-2003. The total crossbred population in the country is about 13.3 % of total cattle population [7]. If we

consider the state-wise crossbred cattle population (Figure-1), Tamil Nadu had the highest crossbred population (5.14 million) followed by Maharashtra (2.776 million), Kerala (1.735 million), Uttar Pradesh (1.634million) and Karnataka (1.602million). Crossbred cattle contributed 39% to the total cattle milk production and 16 % to total milk production of the country [8].

Table 1: Crossbred cattle developed in India

Crossbred	Exotic breed	Indigenous breed	Remarks
Taylor	Shorthorn	Non-descript	
Jalsindhi	Jersey	Red Sindhi	Exotic inheritance-62.5%, Lactational yield- 2079kg, Lactational length-301.79 days
Jerthar	Jersey	Tharparkar	Exotic inheritance-50%, Lactational yield- 1351 kg
Sunandini	Brown Swiss	Non-descript	Exotic inheritance-62.5%, Lactational yield- 1351 kg
Frieswal	Holstein Friesian	Sahiwal	Exotic inheritance-50%, Age at first calving-30 months Lactational yield- 2729.9 kg, Lactational length-326 days
Karan Fries	Holstein Friesian	Tharparkar	Exotic inheritance-50%, Age at first calving-30-32 months Lactational yield-3700 kg, Intercalving period-400-430 days
Karan Swiss	Brown Swiss	Sahiwal and Red Sindhi	Exotic inheritance-50%, Age at first calving-32 months Lactational yield- 3257.3kg, Intercalving period- 395.5 days

Jersey is being used for the genetic improvement of local cattle in Assam, Arunachal Pradesh, Bihar, Goa, Himachal Pradesh, Jammu and Kashmir, Madhya Pradesh, Maharashtra, Manipur, Odisha, Rajasthan, Tamil Nadu, Tripura and West Bengal. Holstein Friesian is being used in Delhi and Punjab. Both Holstein Friesian and Jersey are being used in Gujarat, Haryana and Uttar Pradesh in crossbreeding program currently. The State Animal Husbandry Department, Maharashtra carried out the cattle development programs through Key Village Centers, Intensive Cattle Development Programs, Operation Flood Schemes, Cooperative Federations and Bhartiya Agro Industries Foundation, Uruli-Kanchan. As, there is no descript breed of cattle in Punjab and most of the local cattle are of Hariana type, The State Government of Punjab had decided to take up crossbreeding with Jersey in sub mountainous areas and with Holstein in the central districts. Crossbreeding with Brown Swiss was done

in Patiala, Bhatinda and Faridkot districts under Indo-Swiss Project [8]. However the project was discontinued in 1977 due to lower performance of its crossbreds and Holstein was started in use. In Karnataka crossbreeding of non-descript cattle with Jersey, Red Dane and Holstein Friesian is being practiced. Largest concentration of crossbred animals is around Bangalore. In Kerala using exotic Brown Swiss semen on local nondescript cattle Sunandini breed was developed in 1963 [9]. Several on-farm bilateral crossbreeding projects in collaboration with external agencies like UNDP Project in Haringhatta West Bengal, Indo-Swiss Project in Mattupetty, Kerala and Punjab using Brown Swiss bulls on local cows, Indo-Danish Project in Karnataka using Red Dane bulls on Red Sindhi cows and Indo-German project in Mandi, Himachal Pradesh were established for performance recording under field conditions [10].

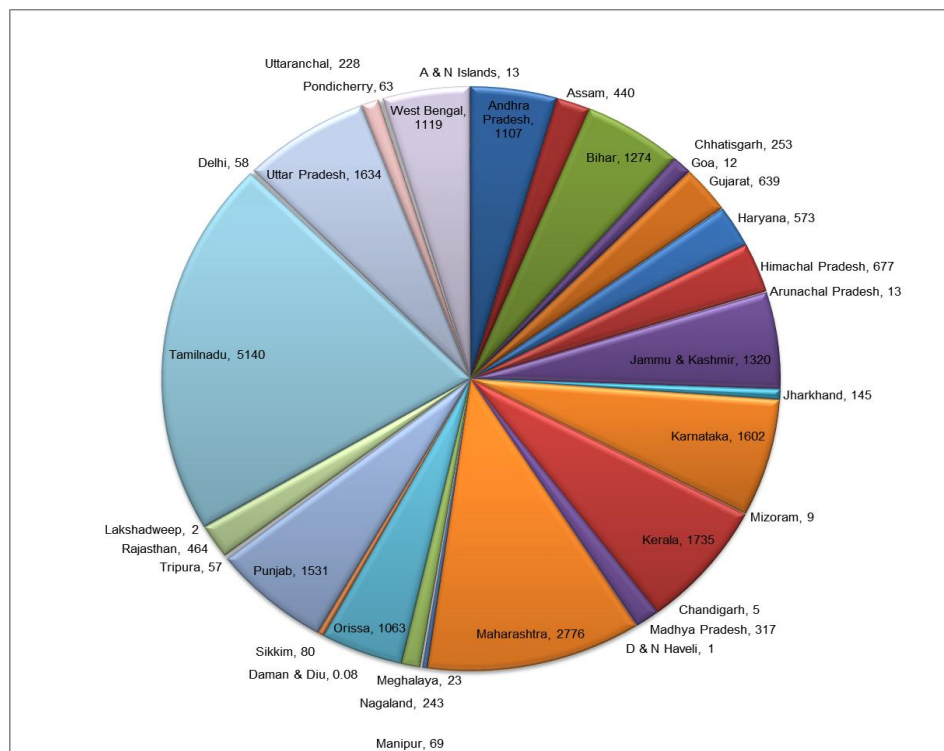
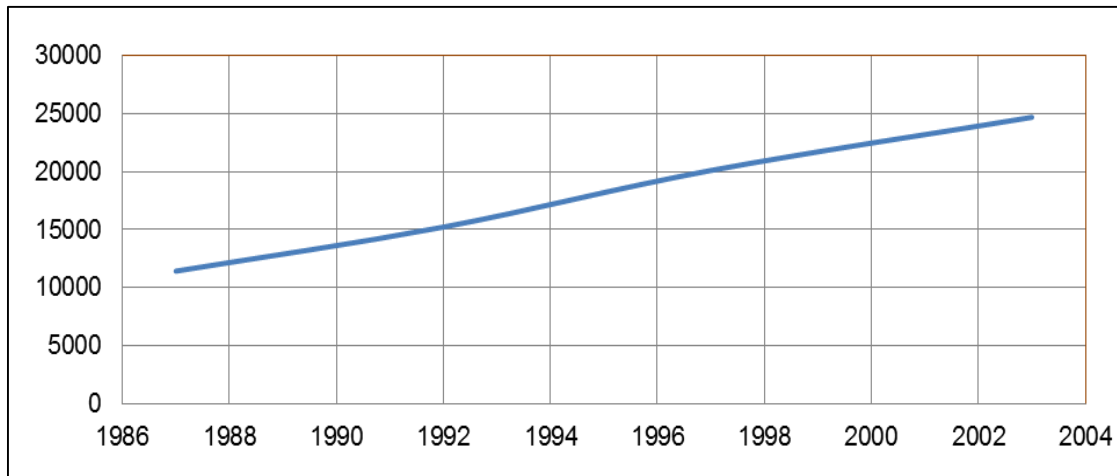


Fig 1: State wise Cross breed Cattle Population

Based on the initial results of these bilateral projects, a crossbreeding program entitled “Behavior pattern of Zebu crossbreds” was initiated during the 4th Plan by the ICAR which came into operation from 1.4.1968 at IVRI, Izatnagar and at Hisar centre of Punjab Agricultural University, Ludhiana (presently CCS HAU, Hisar). At these units Haryana was to be crossed with Friesian, Brown Swiss and Jersey frozen semen of high merit bulls under a planned mating program. Later this project was renamed as All India Coordinated Research Project (AICRP) on Cattle and started

functioning from 1.4.1969. The coordinating unit of the project was established at IVRI, Izatnagar. In 1970, three more units namely Andhra Pradesh Agricultural University, Lam, Mahatma Phule Agricultural University, Rahuri and Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur with Ongole as the foundation breed at Lam, and Gir at the two remaining centers were added to the project. In 1972 the UNDP/PL-480 international crossbreeding project at Haringhata with Haryana breed was also merged in the AICRP on cattle.

Table 2: No. of Crossbred-cattle in different Year (in thousand)



The results from these and other similar projects indicated that Holstein crosses irrespective of any indigenous breed and the agro-ecologies involved produced the highest quantity of milk followed by Brown Swiss and Jersey crosses given the necessary feed, health and management inputs. The results also indicated that in areas with good feed resources specially irrigated cultivated fodder, crossbreeding of indigenous non-descript and low producing cattle with Holstein and stabilization of exotic inheritance at 50 % through interbreeding and further improvement through selection may be adopted.

Crossbreeding in sheep

Crossbreeding in sheep for improving wool production was started in 19th century by the East India Company using Cape Merino breed around Poona which produced more wool of superior quality [11]. In the first decade of 20th century, crossbreeding of indigenous sheep with Romeny Marsh was undertaken both in plains and hilly areas. With the establishment of Indian Council of Agricultural Research (ICAR), research programmes were taken up on sheep development on regional basis, covering almost all the important sheep rearing states. During the Fourth Plan, Indo-Australian (now Central) Sheep Breeding Farm was set up at Hisar with Corriedale breed for production and distribution of Corriedale stud rams to different states for cross breeding to improve wool and mutton production [10]. Corriedale did not perform well especially with respect to reproduction and

survival and was later replaced by Rambouillet. The crossbreeding of Bikaneri ewes with Australian Merino rams at GLF Hissar resulted in development of a new breed ‘Hissardale’. Similarly, ‘Kasmiri Merino’ breed was developed by crossing Gaddi, Bhakrawal and Poonchi ewes with Merino and Rambouillet rams (Table 3). In CSWRI Avikanagar, two new synthetics (Chokla and Nali synthetics) breeds were developed by crossbreeding with Merino and Rambouillet. Three different native breeds (Malpura, Chokla and Jaisalmeri) were also crossed with Rambouillet at CSWRI Avikanagar which brought to a conclusion that exotic breeds can be used for crossbreeding with 50-75% inheritance depending on managemental conditions. As indigenous carpet wool breeds (Chokla, Nali, Bikaneri, Marwari, Jaisalmeri, Malpura, Sonadi, Deccani, Patanwadi and Bellary) have been crossed with exotic fine wool breeds improvement in wool quality and quantity was observed. Three new synthetic mutton strains were developed by crossing of Malpura and Sonadi with Dorset and Suffolk at CSWRI Avikanagar and crossing of Nellore and Mandya breed with Dorset and Suffolk. These were named as Avimaans, Mandya synthetic and Nelore synthetic, respectively. The native breeds of India (Chokla, Nali, Malpura and Sonadi) were crossed with Karakul at Avikanagar for improving pelt production in India. From those crossbreed experiments it was revealed that crossing of coarse carpet Indian breeds with Karakul had good potential for pelt production.

Table 3: Crossbred Sheep developed in India

Crossbred sheep	Utility	Exotic Breed	Indian Breed	Exotic Inheritance (%)
Avikalin	Carpet wool	Rambouillet	Malpura	50
Avivastra	Fine wool	Rambouillet	Chokla	50
Avimaan	Mutton	Dorset and Suffolk	Malpura and Sonadi	50
Hissardale	Apparel wool	Australian Merino	Bikaneri	75
Kashmiri Merino	Fine wool	Merino and Rambouillet	Gaddi, Bhakrawal and Poonchi	50-75
Chokla Synthetic	Carpet wool	Merino and Rambouillet	Chokla	50
Nali Synthetic	Carpet wool	Merino and Rambouillet	Nali	50
Nilgiri Synthetic	Apparel wool	Merino	Nilgiri	62.5-75
Patanwadi Synthetic	Carpet wool	Merino and Rambouillet	Patanwadi	50
Bharat Merino	Fine wool	Merino and Rambouillet	Chokla, Nali, Malpura and Jaiselmeri	75
Nelore Synthetic	Mutton	Dorset and Suffolk	Nelore	-
Mandya Synthetic	Mutton	Dorset and Suffolk	Mandya	-
Indian Karakul	Pelt	Karakul	Marwari and Malpura	75

Crossbreeding of goats

For crossbreeding of goats both native breeds as well as exotic breeds were used in past. The bucks of Jamunapari and Beetal breeds were used to mate the Bengal does which showed improvement in the milk production, but the reciprocal crosses did not show significant result. Similarly, the crossing of Sirohi with Beetal showed very slight improvement^[10]. The crossbreeding of Indian breeds of goats with exotic breeds was done to improve the production potential for milk (Alpine and Anglo Nubian), for meat (Boer and Toggenburg) and for fibre (Angora). However, these

programmes were discontinued after short term experiment for certain reasons of high mortality and morbidity. In 1971, during fourth plan two separate projects were started i.e. AICRP on goats for milk and AICRP on goats for fibre (Pashmina and Mohair) production. In 1974 the third component of meat was included in AICRP on goats and all the three AICRP on goats were merged to form a single AICRP on goats. The summary of AICRP on goats is given in Table 4. AICRP on goats by ICAR which was initiated for genetic improvement of goat breeds at CSWRI Avikanagar was later shifted to CIRG Makhdoom, Mathura.

Table 4: AICRP on goats

Purpose	Exotic breeds	Native breeds
Milk		Beetal
	Alpine and Sannen	Malbari
		Jamnepari and Beetal X Black Bengal and Jhakrana
Meat		Sirohi X Beetal
		Black Bengal X Jamnepari and Beetal
Pashmina	Angora	Chegu
	Angora	Changthangi
	Angora	Deccani

Conclusion

The use of crossbreeding can be an efficient tool for replacing non-descript animals. However, crossbreeding should be used with caution basing on the availability of superior quality bulls or semen, good quality fodder, proper infrastructure and socio-economic status of the farmer. Proper monitoring or evaluation system along with planned breeding policy and awareness development can lead to success of crossbreeding in India.

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