



## Major Cross Breeds of Cattle and their Impact on India's Dairy Productivity

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### Abstract

India's dairy business has seen tremendous change as a result of the introduction of exotic and crossbred cattle, which has improved milk output and provided farmers with economic security. This study investigates the genetic benefits, historical evolution, and economic effects of crossbreeding initiatives started in India. By marrying animals from many recognized breeds, a process known as crossbreeding, new strains of cattle with higher milk outputs and greater climate adaptation have been produced. With a significant rise in milk availability per capita, crossbreeding initiatives—most notably including breeds like Holstein Friesian, Jersey, and Brown Swiss—have catapulted India to the forefront of the world milk production scene.

**Key words:** Crossbreeding, Exotic cattle, Dairy industry, Milk production, Genetic improvement, India, Agricultural advancements

### Introduction

To improve milk production in India, new breeds of crossbred cattle were developed, offering a more cost-effective and productive alternative to native cows. These crossbred cattle not only increased milk yield but also generated higher incomes for farmers and dairy farmers, providing them with year-round employment opportunities. To further enhance the profitability of farmers and the dairy sector, it is recommended to simultaneously increase the population of crossbred cows and implement the Artificial Insemination Programme.

In India, crossbreeding involves mating animals from different established breeds, resulting in crossbred progeny. According to the 20th Livestock Census (2019), India has a vast cattle population of 192.49 million, including 50.42 million crossbred cattle, which shows a significant increase of 26.9% from 39.73 million in previous years. The crossbreeding program of dairy cattle has played a crucial role in establishing India as the world's leading milk producer, with production rising from 17 million tonnes in 1950-51 to

230.6 million tonnes in 2022-23. The per capita milk availability in India is approximately 559 grams per day, exceeding the global average of 322 grams per day (Economic Survey 2022-23). This achievement is attributed to the combination of alien dairy breeds like Holstein Friesian, Jersey, and Brown Swiss with Indian descriptor and non-descriptor cattle. Despite having the largest population of cattle and buffalo, India's average milk production per animal is relatively low due to factors like low genetic potential, inadequate nutrition, poor farm management, unfavorable climate conditions, and limited veterinary and extension services (Dhara *et al.*, 2006).

India's crossbred cattle have an average daily milk yield of 7.1 kg, which is significantly lower than the United Kingdom (25.6 kg), United States (32.8 kg), and Israel (38.6 kg) (Kapoor, 2014). To enhance milk production, cross-breeding programs were initiated in India in the 1950s, focusing on combining native cattle with exotic breeds like Holstein Friesian (HF) and Jersey. These efforts led to the development of new crossbred strains, including Taylor, Jersind, Jerthar, Karan Swiss, Karan Fries, Sunandini, Frieswal, Phule-Triveni, and Vrindavani, which have shown improved milk production capabilities compared to native breeds.

### Cross Breeding in India

The first crossbreeding initiative in India dates back to 1875, with the creation of the 'Taylor' breed, resulting from the cross between Shorthorn bulls and native cows, near Patna (Sinha 1951). Around the same time, crossbreeding programs were also introduced in the Nilgiri area of Madras State and the hilly regions of Assam and Bengal, using Ayrshire, Holstein, and Jersey bulls (Arora *et al.* 1993). In 1891, Military Farms began utilizing exotic breeds like Friesian, Jersey, Guernsey, Ayrshire, and Shorthorn for crossbreeding purposes (Acharya 1970).

Between 1910 and 1932, systematic crossbreeding programs were initiated at prominent research institutions, including the Imperial Dairy Research Institute in Bangalore, the Agricultural Institute in Pusa, the Livestock Research Station in Hosur, and the Military Dairy Farms in Allahabad. At the Allahabad Agricultural Institute, crossbreeding between native breeds (Sahiwal, Gir, Haryana, Kankrej, and Red Sindhi cows) and foreign breeds (Holstein Friesian, Jersey, and Brown Swiss sires) took place from 1924 to 1934. This led to the development of the "Jersindh" breed, resulting from crossbreeding Red Sindhi and Jersey cows with a 3/8 to 5/8 Jersey inheritance, starting in 1934. Additionally, the "Jerthar" breed was created in Bangalore by crossing Jersey bulls with Tharparkar cows.

Following the selection of the Brown Swiss breed, renowned for its exceptional milk yield, heat tolerance, and draught capacity, various crossbred groups were established, but they failed to demonstrate significant heterosis in milk yield. Consequently, selective breeding was undertaken after consolidating the diverse crossbred groups. The second-most promising crossbred group consisted of a combination of Brown Swiss (ranging from 50 to 75%) and Sahiwal cattle, as reported by Thiagarajan (2014).

### Major Cross Breed and Exotic Cattle Breed in India

#### Major Exotic Breeds

NAME	ORIGEN	LACTATION YIELD	REMARKS
Holstein Friesian	Holland	7200-9000 kg	Large, stylish animals with color patterns of black and white or red and white. Far the best diary breed among exotic cattle regarding milk yield.
Jersey	Jersey Island, U.K	5000-8000 kg	In India this breed has acclimatized well especially in the hot and humid areas

Brown Swiss	Switzerland	5000 kg	Breeds are rugged in nature and good milk production.
Red Dane	Denmark	3000 to 4000 kg.	Body colour is red, reddish brown or even dark brown.
Ayrshire	Scotland	6,876 kg	Considered as most beautiful dairy breed.
Guernsey	France	6000 kg	The milk has a golden colour due to an exceptionally high content of beta-carotene

### Major Cross Breeds

Name	Crossing	Development Center	Yield	Remark
Taylor	crossing zebu with the Jersey breed	1875, Patna	5-6 liters/day	black, grey or red in colour
Karan Swiss	Sahiwal cow and Brown Swiss Bull.	NDRI Karnal, Haryana	3500kg/lactation	Body is large, Legs are proportionate in size and well set apart
Karan Fries	Holstein Friesian and Tharparkar.	NDRI Karnal, Haryana	3000 to 3400 litters a year	Black and white spots on the body, forehead, and tail of the cows
Frieswal	5/8 Holstein Friesian and 3/8 Sahiwal	ICAR-CIRC Meerut collaboration with Ministry of Defence	4,000 kg of milk with 4% butter fat	Project Frieswal was started in 1987
Sunandini	nondescript cattle with Brown Swiss, Jersey cattle and Holstein Friesian cattle	1963, the bilateral project Indo-Swiss Project Kerala (ISPK) - now named (KLDB)	3200 kg and 4 % milk fat	Sunandini is a composite breed of cattle
Phule Triveni	consists of Holestian friesean, Jersey and Gir combinations	Mahatma Phule Krishi vidyapeeth, Rahuri, Dist-Ahmednagar, Maharashtra	3000 to 3500 litre per lactation	3.8 to 4.2 % fat in milk.
Jersind	crossing Jersey and Red Sindhi and the crossbreds were backcrossed to Red Sindhi	Allahabad Agricultural Institute	-	-
Jerthar	Jersey bulls with Tharparkar cows	In 1958 at the NDRI, Bangalore	-	-

### Advantages of crossbreeding

The benefits of heterosis, or hybrid vigor, in crossbred cattle include increased population expansion, milk yield, and per capita milk availability, as well as improved lactation length,

growth rate, and reproductive efficiency (Tomar, 2009). Additionally, crossbred cattle exhibit reduced puberty age, first calving age, and inter-calving gap, along with increased birth weight and growth rates. They also demonstrate improved reproductive performance, breed complementarity, and non-additive effects like dominance and epistasis. Heterosis is particularly significant for traits with low heritability, such as survival and fertility. Consequently, crossbred animals surpass both parent breeds in productivity and are known for their calm and gentle nature, making them more suitable for machine milking. Furthermore, artificial insemination and heat detection are easier to perform in crossbred cattle, and their milk is more affordable than that of native breeds.

### **Disadvantages of Crossbreeding**

Crossbreeding programs involve high initial investment and maintenance costs. Additionally, crossbred animals are more susceptible to infectious diseases like foot and mouth disease, babesiosis, theileriosis, mastitis, milk fever, and ketosis due to limited access to high-quality feed and fodder (Sethi, 1989). They also exhibit increased vulnerability to heat stress and shock. Moreover, male crossbreds have a high culling rate (40-70%) due to low libido, poor semen quality, and poor freezability. To sustain a crossbreeding program, it is necessary to maintain two or more pure breeds, which can be challenging. Furthermore, surplus crossbred males have limited value as disposal items, making their management a significant concern.

### **Conclusion**

In addition to increasing milk output, crossbreeding has given dairy farmers more cash and greater job prospects. The effectiveness of crossbreeding initiatives emphasises the value of ongoing funding for techniques used in animal husbandry, such as selective breeding and artificial insemination. As India develops, the productivity of the dairy industry will need to be sustained and further increased by keeping up the momentum in crossbreeding projects and tackling issues like nutrition, farm management, and veterinary services.

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