

# Review on Challenges, Opportunities and Genetic Improvement of Indigenous Breed of Cow and its Productivity

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## ABSTRACT

Cows are considered to have been one of the first animals domesticated by man for agricultural purposes. They were tamed to provide milk, meat and hides and for draft purposes. Where and when exactly this domestication started is not clearly documented historically, but it is thought cow were probably first domesticated in Europe and Asia about 8500 years ago. Domesticated cow belong to the family Bovidae, which includes ruminants with paired, hollow, unbranched horns that do not shed and an even number of toes. Species belonging to the family Bovidae that are so closely related to true cow that they can interbreed include the bison, buffalo, and yak. Although Indian cow and their germplasm are not officially being exported presently, on account the prevalence of a number of diseases in the country, there is still a demand for the germplasm to upgrade foreign stocks. Purely on the basis of development of cow of Indian origin, especially the heavy breeds, Brazil has become one of the largest exporters of meat to the external world. The National Commission on Cow is concerned with the issue of slaughter of cow and feels that indiscriminate or clandestine export of live cow or germplasm, ostensibly for breeding purposes should be stopped. Even if the cow / germplasm is going for breeding, one should bear in mind that the breeding is only for the purposes of meat or beef production. In view of our feelings against cow slaughter in general, whether such slaughter occurs within the country or on foreign shores, we should not be instrumental in furthering such activities. It is not as if the country is losing millions of dollars in foreign exchange if the exports are stopped as the potential earnings are quite insignificant. On the other hand, a ban on exports would help to conserve our germplasm for further propagation and upgradation of our own genetic resources, which are fast depleting.

**KEYWORDS:** cow, challenges, opportunities, genetic improvement, indigenous, breed, productivity, Asia, India

## INTRODUCTION

There is general concern (the world over) that the genetic variation within the few domestic animal species is disappearing through breed substitution and crossbreeding. Any reduction in the diversity of genetic resources narrows the scope to respond to changes in the environment, disease challenges, or demand patterns. In the tropics, however, the most serious concern is the imminent loss of locally adapted breeds. India has a very rich reservoir of genetic diversity and possesses some of the best breeds of cow and buffaloes in the world. [1,2]The

country's population of 218.8 cow accounts for 17% of the total world population of cow. The best indigenous germ plasm of Milch, Draught and Dual purpose animals account for 22-25% of the Indian cow population, while 7-10% of the Cow population is cross-bred. Most of the indigenous breeds of cow excel in draught capacity. The native livestock breeds exhibit a distinct superiority in utilizing poor quality feed and are adapted to withstand heat and show better resistance to tropical diseases.

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### Name of breed Breeding Tract Characteristics and important features

1. Gir Saurashtra region of Gujarat Gir cows are high milk yielders, milk yield ranging from 2000 kg to 6000 kg per lactation with fat percentage ranging from 4.5% to 5%. Bullocks are heavy and powerful draught animals.
2. Sahiwal Herds established in Punjab, Uttar Pradesh, and Haryana. Sahiwal cows are well-known for their milking capacity. Milk yield varies from 2000 to 4000 kg per lactation, with fat content varying from 4% to 4.5 %.[3,4]
3. Red Sindhi Number of Red Sindhi herds have been established in India. The milk yield varies from 2000 kg to 4000 kg per lactation, with fat content varying from 4% to 4.5 %.
4. Rathi Bikaner and Ganga-nagar Districts of Rajasthan, Sirsa Distt. of Haryana and part of Ferozepore district of Punjab. Good potential for milk production. Resistance to adverse climatic conditions of the desert area. Milk yielded ranges from 1800 kg to 3500 kg per lactation.
5. Tharparkar Tharparkar District of Sind (Pakistan) and Kutch, Jodhpur and Jaisalmer desert area of India. Bullocks are slow workers. Cows are good milkers, with average milk yields varying from 1800 to 3500 kg per lactation. Name of breed Breeding Tract Characteristics and important features
6. Deoni Marathwada region of Maharashtra This is dual-purpose breed.
7. Haryana or Haryana Home tract is in Haryana State but the breed is found in U.P., Bihar and parts of Rajasthan. Bullocks are useful for ploughing and transport. Cows are good milkers. Milk yield is 1000 to 2000 kg per lactation.[5,6]
8. Kankrej Bani tract of Bhuj District, North Gujarat and part of Rajasthan adjoining to Gujarat. Milk yield is 1500-4000 kg per lactation. Bullocks are strong and hard-working.
9. Ongole Guntur and Ongole Districts of Andhra Pradesh. Bullocks are useful for ploughing and cart-work / transport. Cows are fair milkers.
10. Red Kandhari Breeding tracts are in Marathwada region of Maharashtra Dual purpose and hardy in nature. Bullocks are good draught animals. Cows are good milkers.
11. Nimari Khandwa District of Madhya Pradesh. This is a dual purpose milk and draught breed.
12. Malvi Parts of Madhya Pradesh and Rajasthan. A dual purpose breed.
13. Gaolao Found in Vidarbha Region of Maharashtra. Bullocks are useful for ploughing. Cows are average milkers.
14. Dangi Found in Western Maharashtra. Especially good for heavy rainfall areas for draught purpose.
15. Khillar Found in southern part of Maharashtra Bullocks are hardy and well-known for being fast in work.
16. Amritmahal Found in Karnataka Bullocks are well-known for draught power and endurance. Average milk yield is 1000 to 1200 kg per lactation.
17. Hallikar Found in Hassan, Mysore and Tunkur districts of Karnataka. Draught breed both used for road and field agricultural operations.
18. Kangayam It is found in Coimbatore District of Tamil Nadu. Bullocks are strong draught animals. Their skin is very strong and tight.[7,8]
19. Nagore Nagore District of Rajasthan. It is an excellent draught breed. Bullocks are good for draught purposes.
20. Bargur Coimbatore District of Tamil Nadu Bullocks are good work animals.
21. Kenkatha Found along the Ken river of Banda District of U.P. and M.P. Bullocks are small but fairly sturdy animals and good for cultivation in rocky areas.
22. Siri Hill tracts around Darjeeling and in Sikkim. Bhutan is the real home of this breed. This breed can stand the rugged conditions of the mountains very well. Bullocks are eagerly sought after for draught purposes (ploughing and transport) due to their reputed great strength.
23. Bachaur Sitamarhi District of Bihar. Bullocks are used for draught purpose. Cows are poor milkers.
24. Kherigarh Kheri District of U.P. The cow of this breed are very active and thrive on grazing only. Bullocks are good for light draught and quick light transport. The cows are poor milkers. Name of breed Breeding Tract Characteristics and important features[9,10]
25. Mewati West Alwar and Bharatpur districts of Rajasthan. The breed is mainly found in Mewat region but is also known as Kosi. Mewati cow are in general sturdy, powerful and docile and are useful for heavy ploughing, carting and drawing water from deep wells. Cows are said to be good milkers.

26. Umblachery Thanjavur District of Tamil Nadu. It is a draught breed of the Zebu type, similar to Kangayam but smaller. They are gray with white spots.
27. Krishna Valley Southern border of Maharashtra and Andhra Pradesh. Bullocks are powerful and good for heavy ploughing and slower draught purpose. Cows are fair milkers.
28. Ponwar Pilibhit and North West part of Lakhimpur Kheri District of UP. Draught purpose. Cows are poor milkers.
29. Vechoor Kerala Small animal. Bullocks are mainly used for draught purpose. Cows are poor milkers.[11]

### Discussion

It is necessary to see how the issues relating to Cow Breeding have been dealt with in the successive Plan periods starting from the First Five Year Plan. It is seen that, while the issue of surplus cow has been handled in different ways in the various Plan documents, some discussing this issue at great length and other remaining completely silent on the subject, other issues such as cow development, genetic improvement and breeding etc., have also received varying degrees of emphasis in the different Plans. The First Plan document speaks of the fact that the available feed could not adequately sustain the then existing bovine population and noted that, while there was a deficiency of good milch cows and working bullocks, there existed a surplus of useless or inefficient animals, and that this surplus was pressing upon the scanty fodder and feed resources. It was suggested that a programme for improvement of cow should be launched, involving arrangements for production and use of adequate numbers of superior bulls of known parentage and productivity and elimination of inferior and unapproved bulls. It was envisaged that, under the Key Village Scheme, 600 centres would be set up in the Plan period, each centre with three or four villages having about 500 cows of over three years of age where maintenance of records of pedigree and milk production, feeding and disease control would receive full attention and techniques of artificial insemination would be utilised by setting up one AI centre for four key villages centres. Improvement of common grazing grounds, growing of fodder crops in suitable rotations, preservation of surplus monsoon grass, and use of untapped fodder resources were some of the key components of the Scheme.[12,13]

The document for the Second Five Year Plan notes that the object of animal husbandry programmes is, inter alia, to increase the supply of milk, meat and

eggs and to provide efficient bullock power for agricultural operations in every part of the country, which meant that the quality of the cow was of critical importance to the rural economy. The Plan paper documents the fact that there are as many as 25 well-defined breeds of cow and six well-defined breeds of buffaloes in India, which are distributed in different parts of the country. High class specimens in each breed are limited in number and are found in the interior of its particular breeding tract, around which there are animals of the same type but of poorer quality. A few of these breeds are of the dairy type while a large majority of the breeds are of the draught type. In between there are "dual-purpose" breeds, whose females yield more, than an average quantity of milk, while the males are good working bullocks. It was found that the while the well-defined breeds are largely found in the dry parts of the country, over large parts of the country in the east and the south of India where rainfall is very heavy, the cow are non-descript and do not belong to any definite breed.

The breeding policy was generally designed to increase the production of milk in the country, without affecting the position in regard to the supply of bullocks required for cultivation. In every draught breed there is always a small number which give more than an average quantity of milk and by selecting bulls from this group, the milk production of the population could be progressively increased by further selection and breeding. When this is done in the interior of the breeding tracts, the bulls produced can be used in the outer areas in order that general improvement may be brought about in the entire population. For the implementation of this policy, each State was divided into zones according to the breeds used in them. Thus, in the districts of Ahmedabad, Kaira, Broach and Surat. the breed to be used was 'Kankrej'. In the western tracts of U.P. like Saharanpur, Muzaffamagar, Aligarh, Mathura, etc., the breed proposed to be used was 'Hariana'. In the hilly tracts such as Dehra Dun, Garhwal, Almora and parts of Nainital, where the cow are non-descript, Sindhi bulls were to be used.[14,15]

It was envisaged that, mainly through the key village scheme, the programme of livestock improvement would be pursued by State Governments. This scheme provides for concentrated work in selected areas. It envisages castration of scrub bulls, breeding operations controlled by artificial insemination centres (each of which is intended to serve about 5,000 cows of breeding age), rearing of calves on a subsidised basis, development of fodder resources and the marketing of animal husbandry products organised on co-operative lines. During the first five

year plan, 600 key villages and 150 artificial insemination centres had been established. During the second plan 1258 key villages, 245 artificial insemination centres and 254 extension centres were to be set up. The programme was intended to produce about 22,000 improved stud bulls, 950,000 improved bullocks and a million improved cows. The scheme made encouraging progress, but in respect of fodder development and the marketing of animal husbandry products not much headway was made. On the other hand, controlled breeding had found a large measure of acceptance and States had enacted the necessary legislation for implementing the scheme. In the early stages, work in many key villages and artificial insemination centres was delayed for want of equipment and shortage of staff, but everywhere the local people were willing to provide rent-free buildings and contribute in other ways to make the scheme a success. During the second plan, a great deal of attention was to be given to the fodder programme as this was an essential basis for the programme of cow development. In each area efforts were to be made to develop the limited pasture lands which were available. With the large programme envisaged in the second plan, a high degree of urgency was attached to the provision of adequate staff, to better administrative planning of supplies and to public education in matters affecting animal husbandry development.

The Third Five Year Plan document took note of the seriousness of the problem of surplus and uneconomic cow and arrived at the conclusion that weeding of inferior stock was a necessary complement to a programme of cow improvement and systematic breeding. The Plan states that having regard to the size of the problem of surplus cow and its special features, with a view to elimination of scrub male stock, it was proposed to undertake a large-scale programme of castration during the Third Plan. The programme envisaged that mass castration work would be initiated first, in areas in which intensive livestock development programmes have been taken up and would be later extended to other areas[16,17]

Fourth Plan has not specifically discussed the problem of surplus cow but has talked about the cow development programmes launched in the previous Plan period. It was proposed that the schemes of the Third Plan including those relating to cow breeding farms, bull rearing farms, Goshala development, control of wild and stray cow and organisation of mass castration would continue and three central cow breeding farms and eight bull rearing farms would be set up during the Fourth Plan period. It was also

indicated that Sire-evaluation cells would be established in each State.

## Results

The document for the Fifth Five Year Plan has not mentioned the animal husbandry sector, and while discussing the perspectives on agriculture has singularly concentrated on food-grain production and related issues. Only in the Chapter on Plan Outlays and Programmes of Development, a small paragraph on Animal Husbandry and Dairy Farming find its place. Here it has been acknowledged that there had been some delay in giving a start to the special livestock development programmes through small and marginal farmers and agricultural labourers. By and large, the targets under production oriented projects such as the intensive cow development (ICD) projects were expected to be fully achieved. There were 85 subsidised projects for calf-rearing. It was envisaged that the emphasis would continue to be laid on cross-breeding of cow through establishment of exotic cow breeding farms and intensive artificial insemination measures. While reviewing the position with regard to animal husbandry and dairying, the Sixth Plan document notes that the increase in productivity of cow and buffalo received continuing emphasis since the advent of the Planning process and progressive introduction of artificial insemination technique using superior breeding bulls was the main plank for cow development under the Key Village Scheme and the Intensive Cow Development programmes.[18,19]

The sixth Plan document noted that several special livestock production projects through small and marginal farmers and agricultural labourers were formulated based on the recommendations of the National Commission on Agriculture. Under this programme, 99 projects for subsidised rearing of cross-bred heifer calves were taken up in different States. The document speaks of the need to increase the productivity of cow by making concerted efforts to contain the increase in the population of cows and she buffaloes and to change the structure of these populations by replacing non-descript local stock by high-producing cows of indigenous breeds, cross bred cows and improved buffaloes. To achieve this, States were required to frame their breeding policies. The seventh Plan document for the Seventh Plan period speaks of the efforts to increase productivity of milch cow in the previous Plan, through the establishment of 500 Key Villages and 122 Intensive Cow Development projects. Cross-breeding with exotic dairy breeds was accelerated through the establishment of frozen semen stations in different States.

For increasing milk production and to improve draught power of bullocks, programmes for improvement of various breeds would continue, with emphasis on inputs like high merited breeding bulls, adequate and scientific feeding, modern management practices, provision of health facilities would continue and efforts would be made to bring at least 25 million cows under the cross-breeding programme. In the eighth Plan for the Eighth Five Year Plan, the need for paying special attention to technologies being developed to make activities in the livestock and dairy development sector economically more remunerative for the farmers. Emphasis was sought to be given to research in frontier areas such as genetic engineering which would provide for rapid upgradation of cow through the use of Embryo Transfer Technology, development of more effective vaccines to control livestock diseases and so on. The Ninth Plan paper documents a considerable improvement in production of milk during the previous Plan, which is attributed to the intensified activities particularly, in improvement of genetic stocks, through cross-breeding, effective control of diseases and the Operation Flood Programmes. The Ninth Plan sought to achieve the goals of doubling of food production and alleviation of hunger by adopting, for the first time a Regionally Differentiated Strategy based on the agro-economic and climatic conditions of different regions.

Animal Husbandry and Dairying, contributing about 26% of the total agricultural output was recognised as an important tool for generating employment and supplementing incomes of small and marginal farmers and agricultural labourers. The specific areas identified for intervention and support included, scientific management of genetic stock resources and upgradation, breeding, producing quality feed and fodder and so on.[20]

- A new programme focused exclusively on draught breeds of livestock may be initiated during Xth Plan.
- The National Project for Cow and Buffalo breeding may be continued and the stipulations made for its implementation may be followed in letter and spirit to realize the envisaged targets. It is necessary that adequate budgetary support be provided to this scheme to enable sequential development of the breeding networks in a given time frame.
- A well-defined livestock breeding policy is in place which states that pure indigenous well developed breeds should be improved through selection, while non-descript low producing populations should be improved by grading up

with other superior indigenous breeds or crossbreeding with exotic males. It was observed that crossbreeding with exotic breeds is practiced even in home tract of elite important indigenous breeds. This is threatening the very existence of these breeds in their home tracts. It is recommended that the government should initiate steps to create incentives for breeding indigenous elite breeds and improve them through selection.

- An aggressive strategy is to be adopted to remove the hurdles in sourcing and use of quality bulls for breeding. Military dairy farms could be used as a major source of crossbred bulls. They can give 5,000-7,000 crossbred bulls every year for the national bull production programme.
- Monitoring cell for certification of sperm stations and A.I. bulls should be established in each state. Only certified semen should be used for A.I; where certification of semen is not possible, bulls may be used for breeding.
- Institutional arrangements for production and delivery of breeding inputs may be reviewed and restructuring as required may be adopted on priority basis. Government may withdraw gradually from the production and delivery of breeding inputs and create a congenial environment and play a supportive role for private operators to grow. Government should recover the delivery and input cost of A.I service on commercial basis. However, improved bulls for natural breeding could be distributed free of cost by the government for the benefit of poor farmers. Rearing of such bulls will be the responsibility of Panchayat / cooperative societies / NGO's.
- Field AI network (A.I. outlets), sperm stations, breeding farms and breeding programmes (Performance Recording, Progeny Testing, ONBs etc.) should constitute focal points for monitoring efficiency and progress.
- Rapid computerization of the breeding network needs to be done in order to build up a reliable database and effective monitoring through a Management Information System (MIS) both at State and national Level.
- Under the prevalent conditions in the country, the conventional method of producing progeny tested bulls has failed to achieve the desired results. Advance technologies like ETT and OPU-IVF should be used to support this programme.[19,20]

### Conclusions

For rearing bull mothers of different breeds, seven Central Cow Breeding Farms (CCBF) were

established at Suratgarh (Tharparker and its crosses with Holstein Friesian), Chiplima (Red Sindhi and its crosses with Jersey), Sunabeda (Jersey), Andeshnagar (Holstein Friesian X Tharparker), Hesserghatta (Holstein Friesian), Dhamrod (Surti) and Alamadhi (Murrah) and more farms are developing. Central Frozen Semen Production and Training Institute established in 1969 at Hesserghatta is a premier Institute producing above 9 lakh doses of semen per year and imparting training to the field officers and veterinarians. According to the Working Group on Animal Husbandry for the Tenth Plan, the broad frame-work of cow and buffalo breeding policy recommended for the country since the mid-sixties envisaged selective breeding of indigenous breeds in their breeding tracts and use of such improved breeds for upgrading of the non-descript stock. While the framework was accepted by the States, appropriate operationalisation of the same through field level programmes could not be done because of various reasons. Lack of interest in promoting Breed Organization / Societies and related farmers' bodies contributed to gradual deterioration of indigenous breeds. Majority of owners having indigenous breeds were not willing to accept AI, which was the major Government intervention for breed improvement. Eventually, the availability of good quality bulls needed for natural mating in the breeding tracts became scarce, leading to further deterioration of indigenous breeds in these tracts.

The Working Group further observes that large deviation from the laid breeding policy has occurred, which is quite obvious from the fact that crossbreeding which was to be taken up in a restricted manner and in areas of low producing cow has now spread indiscriminately all over the country including in the breeding tracts of some of the established indigenous cow breeds. Keeping In view current concerns for sustainability, maintaining environment and bio-diversity and conservation of energy, there is a rethinking on the development and use of indigenous breeds for milk and draught. The country since then has advanced in the area of newer reproductive technologies, which can be of tremendous advantage for rapid multiplication of elite germplasm. Therefore, a fresh look at the breeding policy is needed. The policy needs to be dynamic and consider, inter-alia, the demand for milk, requirement of draught animal power for agricultural and transportation purposes, need to conserve breeds in their breeding tracts, farming systems, production environments and availability of inputs as well as marketing channels. If such a policy does not exist, the same has to be evolved and followed consistently for a reasonable period, say twenty years, after which

the policy may be reviewed. As regards Breeding Strategies, the Working Group felt that programmes for genetic improvement undertaken in the past were not successful, particularly those relying on up-gradation of indigenous breed through continuous crossbreeding for lack of backup support in the feed and fodder resources. However, in States like Punjab, where average milk production of 2500 litre per lactation in crossbred cows can be achieved under field conditions, substantial progress been made. Since most of the female stock is needed for herd replacement, accurate selection of sires assumes greater importance. But a feasible cost effective and proven method for general adoption in the country is yet to emerge. Any programme for genetic improvement needs an organization/set-up that goes beyond the individual/herd. Absence of breeders' organizations and field recording network are serious handicaps in the emergence of viable and effective Breeding Service Organizations. Genetic measures undertaken to improve livestock will not be successful unless the livestock production system as a whole is considered. Availability of inputs and support services, marketing channels and economic viability will have to be considered as an important component of the whole system. Rapid genetic changes in livestock population for efficient commercial production will have to be brought about by a carefully planned and monitored process. Conditions congenial to private initiatives to aid the process for faster improvement in productivity will assume paramount importance because the central and state governments may not be in a position to provide financial support for programmes in the long run.[17,18]

The Working Group further states that the efforts would need greater attention because breeding is a cost intensive, long-term exercise with a time horizon of 15 years in India. Unless those who undertake such breeding programmes do not have a full control over various facets involved for this period, they run the risk of wasting time, effort and resources. If livestock development sector is to be successful, in terms of generating income to farmers, returns to government expenditures, and in value addition in international prices, the focus of policy will have to shift from the "best" technology to the most productive technology that is appropriate for different regions and is in tune with their natural endowment and labour and capital resources. Further, the adoption of appropriate breeding programmes and technology will result in accumulation of comprehensive field data on farmers' preferences, productivity of animals, cost of feed and other inputs, animal responses to nutrition, and other similar biological factors. A major systematic effort

in this direction is required if an all-round sustainable genetic improvement of cow and buffalo is to be effected in the country.[20]

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