Biodiversity of Indigenous Cattle and Its Utility

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Biological diversity is the variability of life on earth. The most obvious aspect of biodiversity is genetic in the form of different breeds and forms within species. This genetic diversity or variability is due to molecular diversity in the process of molecular or biochemical metabolic reactions. The diversity in the gene provides the basis of molecular variability and the phenotypic variations between breeds and species. The genetic diversity has resulted due to the process of evolution over thousands of years during wild and domesticated stages and for the efforts made by man to meet the market demand, in present day context. This leads to domestication of some species of animals having desirable characteristics for mankind. However, man has domesticated about 40 species for his own use like milk, meat, eggs, fibre, hide/skin, fuel, manure and drought power etc. Biodiversity is a valuable asset for every country. Nearly 15 per cent of Earth’s species will be threatened over the next 25 years, if we neglect them. There is already less genetic variation in farm animals as compared to the plant species. Further erosion of animal diversity may invite disaster for long term productivity and loss of sustainability. Therefore, genetic improvement in farm animals adapted to different stress conditions like, food, fodder and climate must be based on the utilization of locally adapted genetic resources. It is widely recognized that preservation of biodiversity is a matter of insurance and investment necessary to sustain and improve agriculture, animal husbandry, forestry, fisheries and honey production and to keep open future options as a buffer against harmful environmental change and as a raw material for scientific and industrial innovation and a matter of moral principle.

India is the most significant source of the cattle diversity in the world and India’s cattle breeds are being used in Australia, South Africa, Latin America and USA for developing major livestock economies. While India’s gift of its animal wealth to the world’s economy has not undermined our own sovereignty to his wealth, the emergence of the animal patenting and cattle biopiracy creates a major threat to the sovereignty of animal biodiversity.

The FAO had estimated 61 breeds of cattle in India but there are 26-30 well defined breeds according to Indian literature. These diverse and rich breeds are being used worldwide to enhance the genetic wealth of cattle. However, in India our cattle biodiversity is under severe threats through cross breeding programme which are replacing our unique breeds with crossbred Jersey and Holstein cows. On the one hand, this is displacing our indigenous diversity; on the other hand, it is leading to the severe erosion of draught cattle and the replacement of renewable animal energy with imported fossil fuel.

Cattle biodiversity

The Indian cattle belong to kingdom Animalia, phylum Chordata, sub phylum Vertebrata, class Mammalia, sub class Eutheria, order Ungulata, family Bovidae, genus Bos, species indicus. In 1992 India with 204.58 million cattle, had 15.97% of the world cattle population. India stands first with respect to the bovine population having 1/5th of the world bovine population. About 80% of the total cattle population in India is non-descript. Further the large majority of descript cattle belongs to draught and dual purpose breeds. The distribution of different classes of cattle (millions) in 1992 has been shown in Table 1.
Between 1987 and 1992 cattle population grows at an annual growth rate of 0.48%. Out of the 204.58 million cattle, 15.21 million were crossbred cattle, which is 7.43% of the total cattle population. Between 1987 and 1992, crossbred cattle grows at the rate of 5.92%. The changes within the cattle population over the last two decades indicate a radical shift in the priority of the farming community from production of work animals to milk production. The proportion of the female in the population increased steadily with 1972 as turning point. Between 1972 and 82, the number of working male in cattle population declined sharply (by 12 million) and among females the proportion of adult females increased (63% in desi and 61% in crossbred) gradually. However the proportion of desi cows steadily declined and a marked phenomenal growth in the number of crossbred. Total crossbred number grew from 8.80 million in 1982 to 11.59 million in 87 (31.70%), and 15.21 million (31.32%) in 1992. In the northern region, desi cow population has declined substantially and the region now accounts for 40% of all crossbreds in the country. The South has the second largest population of crossbred cattle –34% followed by west – some 15% of the crossbred. Eastern region has the highest proportion of desi cows and lowest percent of cross breeds (11%). Among all the States, Uttar Pradesh, TamilNadu, Maharashtra, Kerala and Punjab have the largest number of crossbred cattle and together they account for nearly 65% (9.50 million) of all the cross bred cattle population in the country in 1992 (Table 2).
Cattle breeds of India

Details of Important recognized breeds of cattle of India with their breeding tracts, are given below:

Table 3. Important recognized breeds of cattle of India with their breeding tracts

<table>
<thead>
<tr>
<th>Breed</th>
<th>Breeding tracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gir</td>
<td>Saurashtra region of Gujarat</td>
</tr>
<tr>
<td>2. Sahiwal</td>
<td>Herds established in Punjab, Uttar Pradesh, and Haryana.</td>
</tr>
<tr>
<td>3. Red Sindhi</td>
<td>Number of Red Sindhi herds have been established in India.</td>
</tr>
<tr>
<td>5. Tharparkar</td>
<td>Tharparkar District of Sind (Pakistan) and Kutch, Jodhpur and Jaisalmer desert area of India.</td>
</tr>
<tr>
<td>6. Deoni</td>
<td>Marathwada region of Maharashtra</td>
</tr>
<tr>
<td>7. Haryana</td>
<td>Hariana Home tract is in Haryana State but the breed is found in U.P., Bihar and parts of Rajasthan.</td>
</tr>
<tr>
<td>8. Kankrej</td>
<td>Bani tract of Bhuj District, North Gujarat and part of Rajasthan adjoining to Gujarat.</td>
</tr>
<tr>
<td>10. Red Kandhari</td>
<td>Breeding tracts are in Marathwada region of Maharashtra</td>
</tr>
<tr>
<td>Malvi</td>
<td>Parts of Madhya Pradesh and Rajasthan. A dual purpose breed.</td>
</tr>
<tr>
<td>13. Dangi</td>
<td>Found in Western Maharashtra.</td>
</tr>
<tr>
<td>15. Amritmahal</td>
<td>Found in Karnataka</td>
</tr>
<tr>
<td>17. Kangayam</td>
<td>It is found in Coimbatore District of Tamil Nadu.</td>
</tr>
<tr>
<td>19. Bargur</td>
<td>Coimbatore District of Tamil Nadu</td>
</tr>
<tr>
<td>20. Kenkatha</td>
<td>Found along the Ken river of Banda District of UP and MP.</td>
</tr>
<tr>
<td>21. Siri</td>
<td>Hill tracts around Darjeeling and in Sikkim. Bhutan is the real home of this breed.</td>
</tr>
</tbody>
</table>
22. Bachaur 
Samarhi District of Bihar.

23. Kherigarh 
Kheri District of UP.

24. Mewati 
West Alwar and Bharatpur districts of Rajasthan. The breed is mainly found in Mewat region but is also known as Kosi.

25. Umblachery 
Thanjavur District of Tamil Nadu.

26. Krishna Valley 
Southern border of Maharashtra and Andhra Pradesh.

27. Ponwar 
Pilibhit and North West part of Lakhimpur Kheri District of UP.

28. Vechoor 
Kerala Small animal.

29. Pungannur 
Dwarf cattle, Andhra Pradesh.

The population statistics of different breeds of cattle revealed that Malvi had the maximum estimated population (0.75 million) followed by Gir (0.54 million), Kankrej 90.46m), Ongole (0.38m) and Hariana (0.33m) whereas Red Sindhi and Sahiwal had very low estimates of 2400 and 3400 respectively. This may be due to the fact that a large part of the home tract of these two breeds is now in Pakistan. The maximum decline in the population of different breeds from 1977 to 1982 was observed in Bargur (-49%) followed by Kangayam (-18.2%). The population of Mewati (-14.10%), Hariana (-8.65%), Ponwar (-8.0%), Siri (-5.60%) and Nagori (-2.4%) also exhibited during this period. This decline in the population of these breeds has been attributed to the fast changing socio-economic condition of the farmers, change in the nature of farming, shrinkage of grazing area, emphasis on crossbreeding as a tool to increase milk production also preference of buffalo over cow for milk production.

The population size in thousands for consideration of endangered status of a breed under India condition for cattle have been suggested by NBAGR which shown below:

<table>
<thead>
<tr>
<th>Species</th>
<th>&gt;10000</th>
<th>5000-10000</th>
<th>1000-5000</th>
<th>100-1000</th>
<th>&lt;100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>Normal (Intermediate)</td>
<td>Insecure</td>
<td>Vulnerable</td>
<td>Endangered</td>
<td>Critical (Rate)</td>
</tr>
</tbody>
</table>

The endangered Indian cattle breeds which need attention for their conservation are as under:


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Proximate Causes affecting cattle biodiversity are
1. Lack of awareness
2. Economic benefits
3. Overall policy of breed improvement

The Indian Cow April-June, 2006
4. Shrinkage of grazing land
5. Over population of livestock-high density
6. To improve yield and economic benefits
7. Replacement of local non-descript breeds to productive cattle
8. Over mechanization of agriculture & transport
9. Inadequate attention on identification of germplasm and performance recording
10. Indiscriminate cross breeding with exotics for other purposes

Consequences of loss of cattle genetic biodiversity are
1. Stagnation and even deterioration of production performance of indigenous breeds
2. Loss of indigenous genetic resources
3. Disappearance of native varieties and breeds
4. Threat to native draught breeds
5. Loss of indigenous biodiversity
6. Shrinkage and even disappearance of grass-lands lead to loss of biodiversity
7. Grassland ecosystem is disturbed

Cattle Biopiracy
A recent controversy has erupted in Kerala over the extinction and piracy of the unique Indian breed called “Vechur” or “Vechoor”. The Vechur is short draught cattle, the smallest cattle variety in the world. The most important genetic quality of the Vechur breed is the high fat content in milk - from 6.02 per cent to 7.86 percent. A patent search by Research Foundation for Science, Technology and Ecology in collaboration with Public Interest groups in Europe has confirmed that the Roslin Institute and the PPL Therapeutics (Scotland) Ltd. has 14 patent applications with the European Patent Office (EPO) and one of these clearly refers to an Indian Cattle Breed. The Roslin patent for the Gene Construct of Bovine Alpha - Lactalbumin has no scientific reference cited for the claim. Since this is based on an Indian breed. There is every possibility that the basic research was done in India and ‘pirated by the Roslin Institute’ since all Indian cattle breeds in spite of their diversity are called Bos indicus, the patent claim itself confirms that an Indian breed was used. Which of the many Indian cattle breed has been used by the Roslin Institute for its patent application no? EP 0765390 needs to be investigated by the Government of India or whether this was the Vechur? Whether the breed was the famous and nearly extinct the “Vechur” breed of Kerala can only be confirmed by investigating the research of the Kerala Agriculture University?

Since India is on the process of drafting its biodiversity law which will regulate and govern access to our biodiversity, the case of the Roslin patents and the status of the Vechur are important examples of the piracy that needs to be prevented through the Indian Biodiversity Act. The status of India’s animal biodiversity wealth and the biopiracy of the wealth is too important to the survival of the Indian agriculture and the small and marginal farmers to be left unattended. The Government of India should immediately investigate the full scope of cattle biopiracy for India.

Utility of Indian cattle
Dairying is closely interwoven with the socio-economic fabric of rural people in India. Traditionally, dairy animals have performed multiple functions of producing milk for household consumption, males as a source of draught power in agricultural operations, and dung as manure...
and fuel. Besides, dairy animals have often performed important functions of banking and insurance. Dairy production system in India mainly consists of smallholders. Around 100 million milch animals are spread over 5 lakh villages among 70 million farmers. There are about 100,000 village milk cooperatives with 11 million farmers as members. Landless, small and marginal farmers own 68% of milch animals and contribute nearly 62% of total milk produced. Around 63% of the available animal protein in Indian diet (10 g per caput per day against a world average of 25 g) comes from milk. Apparently milk would continue to be a major source of animal protein in India. Livestock account for about one forth of the GDP in agricultural sector output in India, in which dairy account for the Lion’s share. In 1998/2000 milk accounted for 69.3% of the livestock sector output. In fact, milk with a share of 18% in gross value of agricultural sector has emerged as the largest agricultural commodity produced in the country. This shows rising importance of dairying in India. The per capita availability of milk, which has been growing over the years, is projected to reach 232 gm/day in 2004-05. An extensive nation wide study carried out by the NCAER in 1990 found that revenue from milk sale alone amounted for 33% of the family income (National average).

Cattle breeds with their utility

Olivery (1938) was the first to survey the important breeds of cattle in India. Details of important characteristics and other features of some of the important recognized breeds of cattle are given below:

A. MILCH BREEDS

1. Gir: Gir cows are high milk yielder, 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. Heat and drought tolerant.

2. Sahiwal: Best India dairy breed and most economic milk producer. 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%. Heat and drought tolerant.

3. Red Sindhi: The milk yield varies from 2000 kg to 4000 kg per lactation, with fat content varying from 4% to 4.5%. Heat and drought tolerant. Exported to Malaysia, Brazil and Cuba etc.

4. Tharparkar: Bullocks are slow workers. Cows are good milkers, with average milk yields varying from 1800 to 3500 kg per lactation. Heat and drought tolerant.

B. DUAL PURPOSE BREEDS

5. Rathi: Good potential for milk production. Resistance to adverse climatic conditions of the desert area. Milk yield ranges from 1800 kg to 3500 kg per lactation.
6. Deoni: Dual purpose breed.

7. Hariana: Bullocks are useful for ploughing and transport. Cows are good milkers. Milk yield is 1000 to 2000 kg per lactation.

8. Kankrej: Milk yield is 1500-4000 kg per lactation. Bullocks are strong and hard-working. Heaviest cattle breed of India. Impoted by central/south USA for beef production.

9. Ongole: Bullocks are useful for ploughing and cart-work/transport. Cows are fair milkers.

10. Gaolao: Bullocks are useful for ploughing. Cows are average milkers.

11. Krishna Valley: Bullocks are powerful and good for heavy ploughing and slower draught purpose. Cows are fair milkers.

12. Dangi: Especially good for heavy rainfall areas for draught purpose.

13. Mewati: Mewati cattle 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.

C. DRAUGHT BREEDS

14. Red Kandhari: Draught purpose and hardy in nature. Bullocks are good draught animals. Cows are good milkers.

15. Nimari: Draught breed.


17. Khillari: Bullocks are hardy and well-known for being fast in work. Most popular draft breed of N-Western India.

18. Amritmahal: Bullocks are well-known for draught power and endurance. Average milk yield is 1000 to 1200 kg per lactation. Best draft breed of India.

19. Hallikar: Draught breed both used for road and field agricultural operations.

20. Kangayam: Bullocks are strong draught animals. Their skin is very strong and tight.

21. Nagore: It is an excellent draught breed for hot climate.

22. Bargur: Bullocks are good work animals.

23. Kenkatha: Bullocks are small but fairly sturdy animals and good for cultivation in rocky areas.
24. Siri: This breed can stand the rugged conditions of the mountains (high altitude breed) very well. Bullocks are eagerly sought after for draught purposes (ploughing and transport) due to their reputed great strength.

25. Bachaur: Bullocks are used for draught purpose. Cows are poor milkers. Best draft breed of Bihar.

26. Kharigarh: The cattle 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.

27. Umblachery: It is a draught breed of the Zebu type, similar to Kangayam but smaller. Excellent for wet ploughing.

28. Ponwar: Draught purpose. Cows are poor milkers.

29. Vechoor: Bullocks are mainly used for draught purpose. Cows are poor milkers. Miniature cattle. The most important genetic quality of the Vechur breed is the high fat content in milk from 6.02% to 7.86%.


The various breeds and distinct animals types developed through selection and breeding practices and quest for development of need based animal types in different agro climatic zones have required specific morphological and physiological characteristics grouped as adaptation. That led into development of different kind of breeds suitable in different part of country and serving Indian through various ways which will be discussed below.

For centuries, the use of cattle for milk and draught purpose has been universal. Indigenous cattle contributed 24% and crossbred cattle 16% to the total milk pool. Most of the cattle breeds are suited for draught power but produce little milk. India has about 70 million draught animals. The value of energy produced by draught animals has been estimated to be over Rs. 100 billion annually and it saves foreign exchange outgo of Rs. 40 billion. One adult worker plus a pair of oxen would provide for about 3-4 hectares of land 0.4 KW/hectare. Which is satisfactory for most of Indian farmer. It produced draught animal power of about 195 million MW energy. Cattle manure is used as fertilizer for crops. It is also used for bio-gas production. The Indian cow is gaining importance not only for the quantity and quality of milk that it yields but also for the medicinal and nutritional importance of its products beside traditional use of dung and urine for agriculture. The high profile Panchgavya is five materials obtained from cows that includes milk, curd, ghee, cow urine and dung possess the medicinal value. Indigenous animals are sturdy, are endowed with quality of heat tolerance, resistance to diseases and ability to thrive under extreme nutritional stress. Some of these breeds have enormous potential to become high producing commercial milch animals, and there is a need for the development of these breeds. Pre-requisite for the
development of a breed are large enough population size, a wide selection differential for economic traits. The indigenous dairy breeds of cattle with potential for development as commercially viable milch animals in a comparatively few generation are: Sahiwal in Punjab, Rathi and Tharparkar in Rajasthan and Gir and Kankrej in Gujarat. If these breeds are selectively mated with genetically selected bulls (through sib lea and progeny testing) individuals of these breeds would be commercially viable in just one generation and the breeds as a whole in few generations. The genetic potential of milk animals are not optimally expressed has been proven through nutritional studies that milk production can be increased by 20 to 30% by improved feeding alone. There is acute shortage of nutrients for our livestock and presently gap is about 40 to 50%. During 1992, 57.79 million is the milch cattle population and contributing 26.57 million tones of milk i.e. 41.64% of the total milk production in the country. Hence cow-biodiversity sector of the country is to be conserved and a national and state-level implementation of breeding policy of the country as well as the State may be drawn as early as possible. Selective breeding in their home tract of pure indigenous draught breeds must be undertaken and preserved very carefully and sincerely. Upgradation of local non-descript cattle by known indigenous breeds like, Hariana, Gir, Tharparkar, Sahiwal, etc. in selected pockets be started. The conservation of domestic cattle biodiversity is a complex and multi-dimensional activity in which number of agencies can play significant role. Different measures of conservation should be implemented through national and state-level strategies, plans and programme developed, keeping in view the social and cultural diversity, ecology, farming practices, present level use, sustainability and economic use. Thus all these issues should be carefully harmonized.

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