



Review Article

Transforming Animal Breeding in India: Breed Conservation to Breed Prioritization

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Abstract

India is the hub of low producing non-descript cattle and buffalo population with 43 well recognized cattle and 15 buffalo breeds. The present manuscript deals with the identification of priority breeds of cattle and buffalo which are mostly addressed for breed improvement programs in the country, preferred in around 44 semen stations, research institutes and farmers preference for these priority breeds. In almost every states livestock breeding policies, it was observed that for upgradation of non-discipt population preferred breeds of choice are Gir, Sahiwal, Hariana, Red Sindhi and Tharparkar. While in buffaloes, Murrah and Surti were preferred. In general, if the focus was on between breed diversity, the Gir cattle breed and Murrah buffalo breeds classified as top priority. The increased milk production in India has resulted in the increase in per capita availability of milk from 176 grams per day in 1990-91 to 322 grams per day by 2014-15. It is more than the world average of 294 grams per day during 2013 (The Economic Survey, India, 2015-16). However, after reviewing the lacunas in implementation of present breeding policies and farmers preference for a specific breeds, author through this manuscript proposes that these aforesaid cattle and buffalo breeds needs to be prioritized in the future to meet demand of per capita milk requirement for Indian population without harming present breed conservation programs for conserving unique featured genes in diversified livestock population of India.

Key words: Buffalo, Cattle, Conservation, Milk, Prioritization

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Introduction

India is rich in livestock diversity with 169 indigenous breeds in the country which comprises 43 for cattle, 15 for buffalo, 34 for goat, 43 for sheep, 7 for horses and ponies, 9 for camel, 8 for pig, 1 for donkey and 19 for chicken (NBAGR, 2016). The indigenous cattle breeds are generally classified on the basis of their utility like milch breeds (Sahiwal, Red Sindhi, Gir) with an average milk production 1500 kg/lactation, dual



purpose breeds (Tharparkar, Hariana, Kankrej, Deoni, Ongole, Dangi, Kenkatha, Rathi etc.) with an average milk yield of 1000-1500 kg/lactation and draught breeds (Hallikar, Khillar, Nagauri, Kangayam, Red Kandhari, etc.) with an average milk yield below 500 kg/lactation. The need for conservation of animal genetic resources for food and agriculture is widely recognized but the existence of conservation and breed improvement programs differs considerably for different livestock breeds. These vast diversified domestic livestock and poultry have supported the agrarian economy of the country by contributing milk, meat, egg, draught power, fibre, manure, etc. as well as generating rural employment. Recently, the Indian government has initiated various programmes to conserve and enhance productivity of India's indigenous cattle breed in mission mode with objectives as development and conservation of indigenous breeds, upgradation of vast non-descript cattle population using elite indigenous breeds like Gir, Sahiwal, Rathi, Deoni, Tharparkar and Red Sindhi. Out of the total cattle population in India, around 69.70 per cent are non-descript cattle which yield about 300 litres of milk in 250 days and remain dry for another 6-8 months (Hegde, 2016) and 56.10 percent are non-descript buffaloes (Figs.1 & 2).

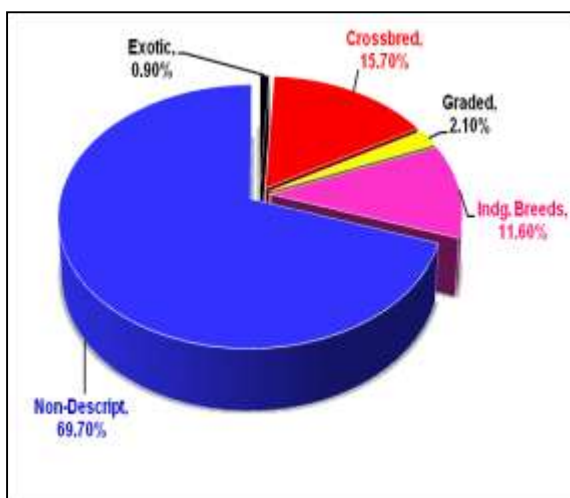


Fig. 1: Non-descript cattle population

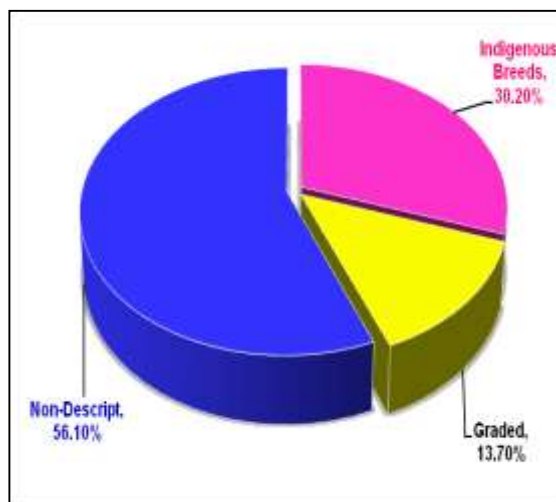


Fig. 2: Non-Descript buffalo population

India ranks first in milk production, accounting for 18.5 percent of world production, achieving an annual a growth of 6.26 percent. The Food and Agriculture Organization (FAO) has reported 3.1 percent increase in world milk production (Economic Survey, 2014). Various efforts are being made for enhancing milk productivity of indigenous cattle. Bovines were preferably reared for milk production by the farmers and draught breeds of the cattle have been replaced by mechanization in agriculture. It is therefore, now-a-days only preference is being given for cattle breeds like Gir, Sahiwal, Tharparkar, Hariana and buffalo breeds like Murrah, Jaffarabadi and Mehsana which are predominantly reared for milk production throughout India. The present manuscript have taken a review of the current breed improvement programs and their

implementation, lacunas and farmers preference for various breeds which needs to be prioritize in India without harming breed conservation programs of unique featured genes in diversified livestock population of India. However, in Karnataka, major causes perceived by veterinarians for decreasing indigenous cattle population are mechanization of agriculture, shrinking grazing land, ignorance about the quality traits of indigenous cattle, high cost of feeding and lack of interest in rearing indigenous cattle (Lingaraju *et al.*, 2017). Despite of all efforts by Indian Government for Indigenous breed conservation, still their population is declining (Table 1).

Table 1: Livestock and poultry population in India

S. No.	Species	Livestock Census 2003 (in millions)	Livestock Census 2007 (in millions)	Livestock Census 2012 (in millions)	Growth Rate (%) 2007-12
1	Cattle	185.2	199.1	190.9	-4.1
2	Buffalo	97.9	105.3	108.7	3.19
3	Yaks	0.06	0.08	0.08	-7.64
4	Mithuns	0.28	0.26	0.3	12.88
5	Sheep	61.5	71.6	65.07	-9.07
6	Goat	124.4	140.5	135.2	-3.82
7	Pigs	13.5	11.1	10.3	-7.54
8	Other animals	2.2	1.7	1.48	-12.94
9	Poultry	489	648.8	729.2	12.39

(Source: Annual Report 2014-15, DAHD, GOI)

Implementations of Livestock Breeding Policies in India

Breeding policy is the state matter, most of the states have more or less well defined breeding policy, with the main features being in consonance with the central policy, advocating cross breeding in certain areas only with the exotic inheritance being limited to 50 percent in most cases and going up to 62.5 percent in a few cases. Goa does not have a breeding policy and Jharkhand is yet to evolve its policy. Mizoram does not have a policy as such, but does have a breeding programme. It reveals from different state livestock breeding policies that, for upgradation of non-discipt population of cattle and buffaloes, preferred breeds of choice are Gir, Sahiwal, Hariana, Red Sindhi and Tharparkar for cattle while Murrah and Surti for buffalo breeds (Table 2). Apart from all the effort made by each states towards conservation and multiplication of their native breeds, indigenous breed population is declining in numbers in several states of India. For example, in Andhra Pradesh, Ongole pure-bred population is decreasing and the Punganur breed has almost vanished. Similarly, in Haryana, the Sahiwal population has dwindled and Amritmahal in Karnataka is also reported to be declining in numbers. In Kerala, the Vechur cow was almost on the verge of extinction and a programme for its conservation had to be launched by the Kerala Veterinary and Animal Sciences University (KVASU). The reasons behind the decline vary from indiscriminate cross breeding, lack of grazing facilities, poor economics of maintaining some of the breeds and so on.

Table 2: Preferred breeds of choice for upgradation of non-descript cattle and buffalo population in different states of India

S. No.	States	Contribution in total milk production (%)	Species	Preferred Breeds for upgradation
1	Uttar Pradesh	17.6	Cattle	Sahiwal and Haryana
			Buffalo	Murrah and Bhadawari
2	Rajasthan	10.5	Cattle	Gir, Haryana, Malvi, Rathi, Kankrej, Nagauri and Tharparkar
			Buffalo	Murrah and Surti
3	Andhra Pradesh	9.6	Cattle	Ongole and Deoni
			Buffalo	Murrah
4	Gujarat	7.7	Cattle	Gir and Kankrej
			Buffalo	Jaffarabadi, Surti, Mehsana & Banni
5	Punjab	7.3	Cattle	Sahiwal and HF
			Buffalo	Murrah and Nili Ravi
6	Madhya Pradesh	6.6	Cattle	Haryana, Tharparkar and Sahiwal
			Buffalo	Murrah, Jaffarabadi and Bhadawari
7	Maharashtra	6.5	Cattle	Gir, Tharparkar, Kankrej, Sahiwal
			Buffalo	Pandharpuri, Marathwadi, Nagpuri & Surti
8	Haryana	5.3	Cattle	Haryana, Sahiwal and HF
			Buffalo	Murrah
9	Tamil Nadu	5.2	Cattle	Red Sindhi, Sahiwal and Tharparkar
			Buffalo	Murrah
10	Bihar	5.1	Cattle	Red Sindhi, Gir, Sahiwal and Tharparkar
			Buffalo	Murrah
11	Karnataka		Cattle	HF and Jersey
			Buffalo	Surti and Murrah
12	Kerala		Cattle	HF and Jersey
			Buffalo	Murrah
13	Odisha		Cattle	Haryana and Red Sindhi
			Buffalo	Murrah
14	Uttarakhand		Cattle	Red Sindhi, Sahiwal and Haryana
			Buffalo	Murrah
15	West Bengal		Cattle	Sahiwal and Gir
			Buffalo	Murrah

The availability of genetically superior breeding bulls with high breeding values is lacking for almost all indigenous cattle breeds of India except Gir, Sahiwal and Tharparkar and Murrah, Mehsana and Jaffarabadi buffalo breeds. As sufficient number of semen doses are not available for all breeds, these preferred breed are being used excessively throughout the country on non-descript populations. Moreover, breeding policy implementing workers have less knowledge of phenotypic characters of various breeds, they may perform faulty artificial inseminations. Almost all state livestock development boards in India have their own database for performance recording of state populations. However, the sharing of the database across the states is very limited because of which, the superior male animals could not get identified through data

analysis. The major guidelines of the national breeding policy, drawn up by the Indian Council of Agricultural Research and accepted by the central and state governments were-

- a) In the case of well-defined milch breeds the milking capacity should be developed to the maximum by selective breeding and the male progeny should be used for the upgradation of the nondescript cattle to well defined breeds.
- b) In the case of well-defined draught breeds, the objective is to put as much milk-producing capability in them as possible, without materially impairing their quality for work.
- c) For the implementation of breeding policy, each state is divided into zones according to the breeds used in them. For example in the districts like Ahmedabad, Kaira, Broach and Surat of Gujarat, the breed to be used is Kankrej breed. In the western tracts of Uttar Pradesh like Saharanpur, Muzaffamagar, Aligarh, Mathura, etc., the breed to be used is Haryana. In the hilly tracts such as Dehra Dun, Garhwal, Almora and parts of Nainital in Himachal Pradesh and Uttarakhand, where the cattle are non-descript, Sindhi is proposed. Similarly, in Maharashtra Gir, Tharparkar, Kankrej, Sahiwal should be utilized suitably and non-descript buffaloes should be bred with germplasm of anyone of the identified breeds like Murrah, Jaffrabadi, Pandharpuri, Marathwadi, Nagpuri and Surti.

Amongst all states in India, Uttar Pradesh is the leader in milk production in the country with an annual production of more than 20 million tonnes. Top ten milk producing states account for more than 80 percent of the total milk production in India.

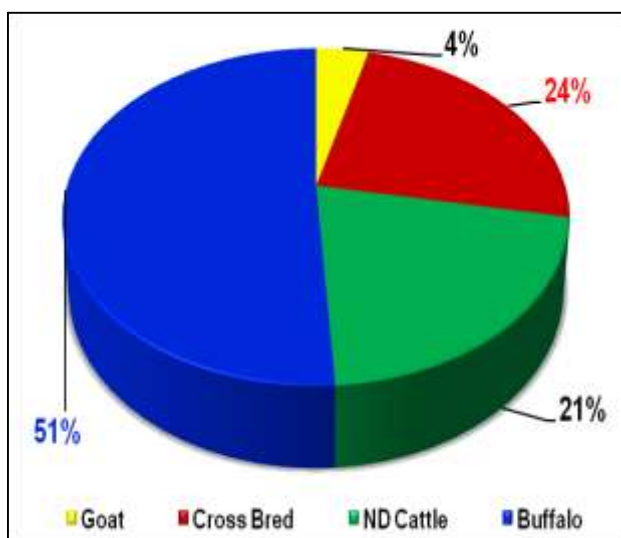


Fig. 3: Contribution of milk from different animals to the total milk production (DAHD, 2015)

Table 3: Share of indigenous cattle and buffalo breeds in the total population

S. No.	Name of the Breed	Percentage share with respect to total cattle/buffalo population
Cattle Breeds		
1	Hariana	4.15
2	Gir	3.38
3	Sahiwal	3.23
4	Kankrej	2
5	Kosali	1.61
6	Khillar	1.33
7	Hallikar	1.2
8	Malvi	1.13
9	Bachaur	1.02
10	Rathi	0.82
Buffalo Breeds		
1	Murrah	44.39
2	Surti	3.58
3	Mehsana	3.33
4	Jaffarabadi	1.63

(Source: Breed based survey, 2012)

Preference of Semen Stations towards Specific Breeds

There are presently 44 A and B graded semen stations in India producing around 85 million frozen semen doses to cater the need of artificial insemination in the country. It is planned that these Semen Stations together produce around 140 million frozen semen doses by the end of 2021- 22 (NDDDB, 2017). Amongst cattle breeds, Sahiwal, Gir, Hariana, Tharparkar and Red Sindhi are most preferred breeds for semen stations in India and amongst buffalo, Murrah followed by Surti, Mehsana and Jaffarabadi are given more priority with Murrah breeds being maintained at 30 semen stations all over the country. However, no semen station in India which produces semen doses of cattle breeds mainly reared for draught purpose like Kosali, Bachaur, Dangi, Kenkatha, Kherigarh, Mewati, Ponwar, Punganur, Siri, Vechur, Motu, Ghumusari, Binjharपुरi, Khariar, Pulikulam, Malnad Gidda, Belahi, Gangatiri, Badri and Buffalo breeds producing slightly low milk yield like Marathwadi, Nagpuri, Toda, Chilika and Kalahandi. It indicates that the semen stations only provide semen doses of few demanded breeds of cattle and buffaloes (Table 4). It results in non-availability of semen doses of these breeds in their native breeding tract and farmers have to go either for natural service or rely on whatever semen dose available with the nearest veterinary dispensary for insemination, this is the major reason for breed dilution and vanishing the draught purpose breeds like Vachur, Amritmahal, Punganur, etc. Further, the non-availability of sufficient semen doses of indigenous breeds in the respective breeding tract is also the major reason for voracious use of preferred breed semen as it available in almost every artificial insemination centres.

Table 4: Breed-wise semen stations in India

S. No.	Cattle Breeds	Semen Stations	S. No.	Buffalo Breeds	Semen Stations
1	Hariana	SAG, Bidaj (Gujarat)	1	Murrah	Nandyal (Andhra Pradesh)
		Cuttack (Odisha)			Banavasi (Andhra Pradesh)
		Bassi (Rajasthan)			Vizag (Andhra Pradesh)
		ABC, Salon (Uttar Pradesh)			Karimnagar (Telangana)
		FSBS, Babugarh (Uttar Pradesh)			Anjora, Durg (Chhattisgarh)
					SAG, Bidaj (Gujarat)
					Amul (Gujarat)
					Hissar (Haryana)
					Jagadhari (Haryana)
					Gurgaon (Haryana)
					Rohtak (Haryana)
					Nandini (Karnataka)
					CFSP&TI, Hessarghata (Karnataka)
					SLBTC, Hessarghata (Karnataka)
					CSCC, Dharwad (Karnataka)
					Dhoni (Kerala)
					Bhadbhada, Bhopal (Madhya Pradesh)
					BAIF (Maharashtra)
					Chitale (Maharashtra)
					Kirkee, Pune (Maharashtra)
					Nagpur (Maharashtra)
					Bhattian (Punjab)
					Nabha (Punjab)
					Bassi (Rajasthan)
					Eachenkottai (Tamil Nadu)
					ABC, Salon (Uttar Pradesh)
					FSBS, Babugarh (Uttar Pradesh)
					Rishikesh (Uttarakhand)
2	Gir	Patan (Gujarat)			Haringhata (West Bengal)
		Anjora, Durg (Chhattisgarh)			Salboni (West Bengal)
		SAG, Bidaj (Gujarat)			
		Patan (Gujarat)			
		Amul (Gujarat)			
		Kulathupuzha (Kerala)			
		Bhadbhada, Bhopal (Madhya Pradesh)			
		Bassi (Rajasthan)			

		Haringhata (West Bengal)			
		Salboni (West Bengal)			
		Beldanga (West Bengal)			
3	Sahiwal	Anjora, Durg (Chhattisgarh)			
		SAG, Bidaj (Gujarat)			
		Hissar (Haryana)			
		Jagadhari (Haryana)			
		Bhadbhada, Bhopal (Madhya Pradesh)			
		BAIF(Maharashtra)			
		Nagpur (Maharashtra)			
		Bhattian (Punjab)			
		Nabha (Punjab)			
		Ropar (Punjab)			
		Bassi (Rajasthan)			
		ABC, Salon (Uttar Pradesh)			
		Rishikesh (Uttarakhand)			
		Haringhata (West Bengal)			
		Beldanga (West Bengal)			
4	Tharparkar	Anjora, Durg (Chhattisgarh)	2	Surti	Patan (Gujarat)
		CFSP&TI, Hessarghata (Karnataka)			SLBTC, Hessarghata (Karnataka)
		Bhadbhada, Bhopal (Madhya Pradesh)			CSCC, Dharwad (Karnataka)
		BAIF(Maharashtra)			BAIF(Maharashtra)
		Bassi (Rajasthan)			Kirkee, Pune (Maharashtra)
		ABC, Salon (Uttar Pradesh)			Bassi (Rajasthan)
5	Kankrej	SAG, Bidaj (Gujarat)	3	Mehsana	SAG, Bidaj (Gujarat)
		Banas, Dama (Gujarat)			Mehsana, Jagudan (Gujarat)
		Dhoni (Kerala)			Banas, Dama (Gujarat)
		Bassi (Rajasthan)			Patan (Gujarat)
6	Red Sindhi	Anjora, Durg (Chhattisgarh)	4	Jaffarabadi	SAG, Bidaj (Gujarat)
		SAG, Bidaj (Gujarat)			Patan (Gujarat)
		Cuttack (Odisha)			Bhadbhada, Bhopal (Madhya Pradesh)
		DLF, Hosur (Tamil Nadu)			BAIF(Maharashtra)
		ABC, Salon (Uttar Pradesh)			
		Rishikesh (Uttarakhand)			
7	Rathi	Bassi (Rajasthan)	5	Pandharpuri	SAG, Bidaj (Gujarat)
		ABC, Salon (Uttar Pradesh)			Kirkee, Pune (Maharashtra)
8	Khillar	SAG, Bidaj (Gujarat)	6	Banni	Patan (Gujarat)
		CSCC, Dharwad (Karnataka)			BAIF(Maharashtra)

		BAIF(Maharashtra)			
		Kirkee, Pune (Maharashtra)			
9	Hallikar	SSCC, Hessarghata (Karnataka)	7	Bhadawari	Bhadbhada, Bhopal (Madhya Pradesh)
		BAIF(Maharashtra)			BAIF(Maharashtra)
					ABC, Salon (Uttar Pradesh)
10	Malvi	Bhadbhada, Bhopal (Madhya Pradesh)	8	Nili Ravi	Nabha (Punjab)
11	Ongole	Nandyal (Andhra Pradesh)			
		Vizag (Andhra Pradesh)			
		Anjora, Durg (Chhattisgarh)			
12	Deoni	Aurangabad (Maharashtra)			
		CSCC, Dharwad (Karnataka)			
13	Amritmahal	SSCC,Hessarghata(Karnataka)			
		BAIF(Maharashtra)			
14	Nimari	Bhadbhada, Bhopal (Madhya Pradesh)			
		BAIF(Maharashtra)			
15	Red Kandhari	BAIF(Maharashtra)			
16	Krishna Valley	BAIF(Maharashtra)			
17	Gaolao	Nagpur (Maharashtra)			
18	Nagori	Nagpur (Maharashtra)			
		Bassi (Rajasthan)			
19	Umblacherry	Eachenkottai (Tamil Nadu)			
20	Kangayam	DLF, Hosur (Tamil Nadu)			

Distribution of Priority Breeds in India

There are 15 different agro-climatic zones are present in India and 43 indigenous cattle and 15 buffalo breeds are distributed in these regions. There is a global consensus on the conservation of animal genetic resources for sustainable development. The concern today is the declining population of indigenous cattle. The best indigenous germplasm of milch, draught and dual purpose animals account for 22-25 percent of the Indian cattle population, while 7-10 percent of the cattle population is cross-bred. Most of the indigenous breeds of cattle excel in draught capacity. Cattle breeds like Gir, Sahiwal, Haryana and Tharparkar and buffalo breeds like Murrah and Jaffarabadi are distributed in almost all parts of the country. It is important to notice that out of the total milk production (146.7 million tones) from the country, around 51 percent milk production was contributed by buffaloes and Murrah is the only buffalo breed which has a spread throughout the country except Gujarat and North Eastern states. It indicates that, Murrah buffalo breed contributes significantly to the total milk production of India as compare to other buffalo breeds. In the recent years, farmers in India are more demanding for Gir cattle as a result, various research institutes like National Dairy Research Institute, Karnal (Haryana) have started rearing this breed for research.



Fig. 4: Distribution of Sahiwal breed



Fig. 5: Distribution of Gir breed



Fig. 6: Distribution of Hariana breed



Fig. 7: Distribution of Tharparkar breed



Fig. 8: Distribution of Murrah breed



Fig. 9: Distribution of Jaffarabadi breed



Fig. 10: Distribution of Mehsana breed



Fig. 11: Distribution of Surti breed

Breed Oriented Research from Institutes and Government Schemes

In India, bovines are being predominantly maintained for milk purpose as a result, research and related activities are mostly being targeted on the milch breeds as a result draught and dual purpose breeds are being neglected. In a report Birthal *et al.* (2002), it was found that in cattle around 78 percent and in buffalo around 93 percent research was targeted for milk production. However, breeds which are important for draught power, only 17 percent and 3 percent research is being done for cattle and buffaloes respectively. Most of the research institute in India related to animal sciences targets their research on milch breeds of cattle and buffaloes. Further, various government schemes and breed development programs mostly favor milch breeds of the country (Table 5).

Table 5: Important government schemes for cattle & buffalo development

S. No.	Govt. Scheme/Program	Breeds Targeted
1	National Dairy Plan	Cattle : Rathi, Gir, Sahiwal, Tharparkar, Hariana
		Buffalo: Murrah, Mehsana, Jaffarabadi, Banni, Pandharpuri and Nili-ravi
2	Central Cattle Breeding Farms	Cattle: Tharparkar, Red Sindhi
		Buffalo: Surti and Murrah
3	Central Herd Registration Scheme	Cattle: Gir, Kankrej, Haryana and Ongole
		Buffalo: Murrah, Jaffarabadi, Surti & Mehsana
4	National Project for Cattle and Buffalo Breeding	Cattle: Sahiwal, Gir, Deoni, Kankrej, Hariana, Hallikar, Khillar
5	Rashtriya Gokul Mission	Cattle: Gir, Sahiwal, Rathi, Deoni, Tharparkar, Red Sindhi

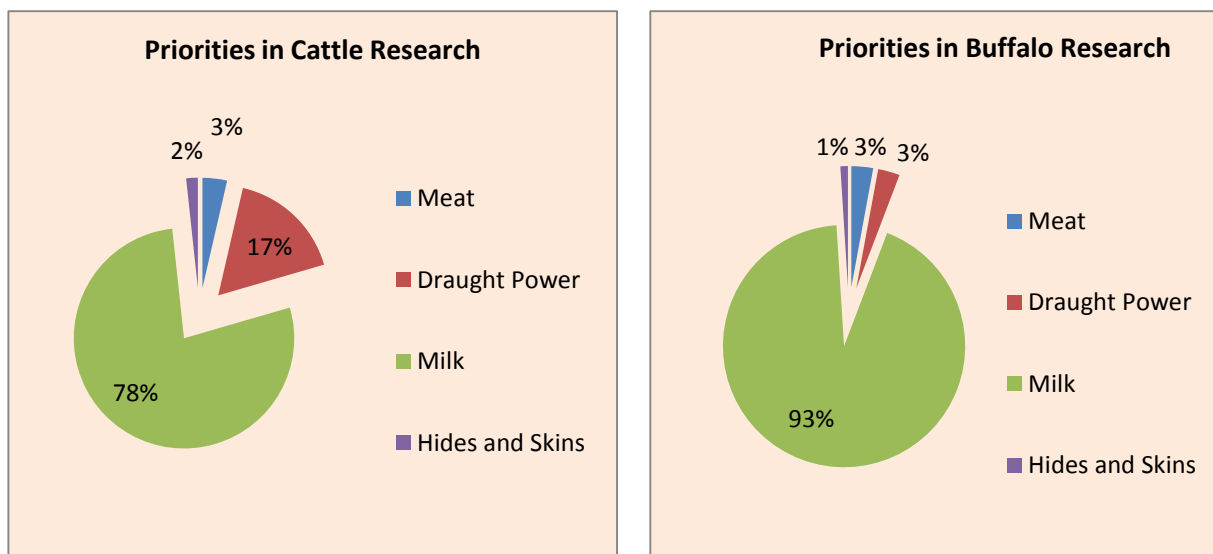


Fig. 122: Research priorities in cattle and buffaloes (Source: Birthal *et al.*, 2002)



Conclusion

Reviews on the breed preference by state livestock breeding policies, semen stations, researchers, farmers and policy makers reveals that amongst cattle breeds, Gir, Hariana, Sahiwal and to some extent Red Sindhi and Tharparkar were given more priority. However, in buffalo, Murrah and to some extent Surti and Jaffarabadi show widespread distribution and retain considerable levels of priority in India. In general, if the focus was on between breed diversity, the Gir cattle breed and Murrah buffalo breeds classified as top priority. This manuscript proposes these aforesaid cattle and buffalo breeds need to be prioritized in the future. Looking to the future demand of per capita requirement of India, the demand for these cattle and buffaloes will be more in near future. However, the other indigenous cattle and buffalo breeds should be conserved in their native breeding tract with existing breeding policies.

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