International Journal of Social Science and Economic Research

ISSN: 2455-8834

Volume: 04, Issue: 04 "April 2019"

PERSPECTIVES OF CHANGING NATURE OF LIVESTOCK RESOURCES IN INDIA

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ABSTRACT

India is largely an agrarian country with mixed farming where livestock plays vital economic roles. The nature of farming is synchronized in accordance to livestock rearing. Vast landscape with pastureland and rural habitations which are spread over in abundance, makes the livestock rearing as inevitable mode of livelihood. Therefore, India is bestowed with largest number of livestock population and milk production in the world.

With the introduction of mechanization in farm sector, intensification of agriculture and expansion of transport infrastructure with the mobility of goods and humans since independence, the nature and objectives of livestock rearing have changed in India. Indigenous breeds of cattle are decreasing and exotic/crossbreed (cows) is increasing. Simultaneously, male cattle and male buffalo population have decreasing rapidly.

The study deals the geographical perspectives of rapidly changing nature of livestock in India like the bovine population is decreasing but the milk production is increasing. Simultaneously, the share of per capita milk intake as calorie in food has also increased from 178 gm./day in 1991-1992 to 375 gm./day in 2017-18. The study correlates the composition of livestock with relief, climate, droughts, crop intensification and natural adversaries. The population of indigenous breeds of cattle (cows), sheep, goat, donkey and camel is decreasing rapidly and established the logical justification in accordance to changing technology, infrastructure and human needs.

Since independence in India, the livestock population has increased from 293.9 million in 1951 to 512.1 million in 2012 and the bovine (cattle and buffalo) population increased from 198.7 million to 299.6 million in the same time period. While human population has increased from 361.09 million in 1951 to 1210.19 million in 2011 with continuously decreasing share of rural population from 82.71% (1951) to 68.84% (2011). Cattle population is higher in continental states where intensive subsistence food grain farming is predominant while sheep and goat

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population is higher in states with adverse climatic conditions, rough terrains, arid, semi – arid and water stressed regions with extensive dry land farming. North eastern hilly states have least dependency on bovines and more on piggeries.

Keywords:

1. **Exotic breeds**: The breed of cattle/livestock/animal or plant of foreign origin or character but not fully naturalized or acclimatized to the newly introduced geographical conditions.
2. **Bovines:** Bovine comes from the latin word for cow, though the biological family called the bovidae actually includes not only Cows and Oxen but also Goat, Sheep, Bison, Yak, Mithun, and Buffalo.
3. **Carrying capacity**: The carrying capacity of a region or biological species in an environment the maximum size of the species that the environment can sustain indefinitely, supplying the food, habitat, water and other necessities available in the environment.
4. **Habitat:** In ecology, a habitat of natural environment in which a particular breed or specie of organism lives. It is characterized by both physical and biological features.
5. **Indigenous Breeds**: It means the breed of a particular animal/livestock which is native to the particular region. Naturally, a breed that is indigenous to one area will be exotic to another. Indigenous breeds evolve in response to given climate, geomorphic and human condition of a defined region.
6. **Dry land farming**: It's the method of farming and raising crops generally in semi-arid areas without the aid of irrigation, using drought resistant crops and conserving moisture. Such crops are prone to failure as they are completely depended on rain and when rain fails it resulted in to crop failure.

INTRODUCTION

The extensive geographical extent of India, leads to peculiar monsoonal climate, multiplicity of drainage, intricate vegetation, heterogeneous pedology and unique relief features. Subsequently, the large base of rural population spread over in various types of compact to dispersed habitations. The vast agrarian landscape with assured irrigation to dry land farming supports the economic dependency of farmers on domesticated livestock population. Almost two-third of cultivated area of India is dependent on dry land farming where crop-failure is the regular phenomenon and force the agrarian society to shift on alternate modes of occupation for survival. Resulting which domestication of livestock for various economic activities offers the safety-valve for survival for poor farming society particularly in drought-prone regions.

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The availability of green fodder in abundance throughout the country from the multiplicity of crop lands (some time crops residual/waste or its by-products as green leaves of sugar cane etc.), the availability of vast traditional pasturelands, village common land, extensive rangeland, degraded wasteland and large non-classified and protected forested area supported the rearing of domesticated animals. Apart from the cheap availability of green fodder and crude-fibre (dry fodder) the large urban inhabited population (377 million In 2011 census) in India, which offers extensive and remunerative market of livestock byproducts as milk, meat, hides and wool etc. also supported the livestock rearing.

Table 1: Trends of Population Size, Habitat and Nature of Farming in India: 1951-2011.

Year	Total Population (in Million)	Rural Share %	Urban share %	Net Irritated Area. (Million Hactare)	Net Dry land Farming Area (Million Hactare).
1951	361.09	82.71	17.29%	20.85	97.9
1971	548.16	80.09	19.91	31.10	109.76
1991	846.42	74.30	25.70	48.02	94.85
2011	1210.19	68.84	31.16	63.66	110.40

Source: Khullar, D.R. (2018), Geography of India, Kalyani Publications, Ludhiana.

The domesticated animals or livestock includes Cattle (cow and bull), Buffalo, Mithun, Yaks, Sheep, Goats, Horses and Ponies, Mules, Donkey, Camel and Pigs. All the livestock have different geographical habitat in response to varied climate, water availability and relief feature based adaptability in India. During 1951, total livestock population was 292.9 million which became 369.6 million in 1977 and 529.7 million in 2007 and in 2012 livestock census it become 512.1 million. The variety of livestock, its breeds and regional density also changes over space and time in polymorphous geographical and human conditions in India.

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Table 2: Trends of Livestock Population in India (1951-2012).

Census Year	Total livestock Population (million)	Bovines (million) (Cow +Buffalo)	Sheep (million)	Goat (million)
1951	292.9	198.7	39.1	47.2
1961	336.5	226.8	40.2	60.9
1977	369.4	242.0	41.0	75.6
1987	445.2	275.7	45.7	110.2
1997	485.4	288.8	57.5	122.7
2007	529.7	304.4	71.6	140.5
2012	512.1	299.6	65.1	135.2

Source: Livestock Census, Department of Animal Husbandary, Ministry of Agriculture and Farmers Welfare, Govt. of India, 2015.

SIGNIFICANCE OF LIVESTOCK

The large size of rural population in India is engaged in heterogeneous farming activities and performing mixed farming where livestock rearing is considerably significant for the livelihood of farmers. The availability of green fodder in larger part of the year due to multiple cropping seasons and growth of substantial amount of weeds in moist and tropical climate make livestock rearing as cheaper mode and cost effective. The feudalistic character of Indian society, where land less communities for economic livelihood rear and domesticate the livestock rearing as significant alternate for survival. The availability of sufficient labour force particularly women folk for rearing the livestock enhanced its dependency. The farmland owning communities are rearing the livestock by default as their rearing cost is minimal due to availability of fodder with negligible cost from their farmlands.

The increasing demand of byproducts of livestock further enhanced their economic dependency. The increased urban population size surged the demand of perishable milk and its byproducts, meat and wool etc. In varied climatic conditions, even in the situation of crop- failure, the livestock byproduct yields are assured and sustained the farmers from crop-distress. The nature of livestock also changed with cropping intensity and distance decay from urban centres. Near the urban centres, farmers prefer to rear the buffalo as they yield high fat milk (12 to 18% fat) and adaptable to stall-feeding as intensive farming altered all kind of pasturelands in to crop

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lands. While, in areas of extensive farming where pasturelands are available cattle/cows are reared. The recent trends are showing the indigenous breeds of cow as Sahiwal, Tharparkar, Kankrej, Rathi, Hariana and Gir etc. are decreasing rapidly while the number of exotic or cross-breed cow are increasing with equally faster rate. The indigenous breed of cows (cattle) in India decreased by -8.94 % from 160.01 million in 2007 to 151.17 million in 2012.

LIVESTOCK AND SOCIETY

Livestock rearing is meant for different direct and indirect objectives in agrarian society. Milk and its byproducts is one of the significant economic purposes in rural habitat. Large size of continental inhabited rural population in India is vegetarian and milk is the important constituent of their calorie-intake as source of protein and calcium. Therefore, cattle (cow) and buffalo, both the bovines constitutes 58.50% share i.e. 299.6 million from total 512.1 million livestock population in India in 2012 livestock census.

Table 3: Trends of Bovine Population in India; 2007-2012.

Cattle (Cows & Bulls)	2007 (Million)	2012 (Million)	% change
• Total exotic breed/ crossbreeds	33.06	39.73	+20.18%
• Male	6.84	5.97	-12.75%
• Female	26.21	33.76	+28.78
• Total Indigenous	166.01	151.17	-8.94
• Male	76.77	61.94	-19.32
• Female	89.23	89.22	-0.01
• Total Cattle	199.07	190.90	-4.10
• Total Buffalo	105.34	108.70	+3.19
• Male	19.59	16.10	-17.83
• Female	85.74	92.59	+7.99
Total	304.41	299.60	-1.58

The intensive subsistence food grain dominant nature of Indian farming system is largely dependent on bio-manures to maintain the soil fertility. Bio-manure is the byproduct of livestock whereas cow-dung is also converted into cow-dung cakes after drying up and since generation in rural India these cakes as used as fuel woods for daily domestic consumption. With depleting

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pasturelands the cattle (cows) and buffalo, both the bovines are adapted to stall-feeding. Simultaneously, rural society in India is skilled in rearing the livestock with minimal investment as they are getting training since generations.

Table 4: Milk Production and Per Capita Availability in India: 1991-92 to 2017-18.

Year	Milk Production (million tonne)	Per Capital Availability of Milk (gm./ Day)
1991-92	55.60	178
1996-97	69.10	200
2001-02	84.40	222
2006-07	102.53	260
2011-12	127.90	290
2017-18	176.34	375

Source: Basic Animal Husbandry Statistics, DAHD&F, Govt. of India, 2018.

India is bestowed with largest livestock population (around 17%) in the world and so in the milk production. Rural folks rear the milch livestock for three different purposes as:

(a) Exclusive economic purpose for selling the milk.
(b) Exclusive domestic consumption of milk.
(c) Both economic purpose and domestic consumption of milk.

With increasing demand of milk the number of exotic/crossbreed female cattle population (cows) increased tremendously by +28.78% from 26.21 million in 2007 to 33.76 million in 2012. In India, cattle population constitute the largest share among all the livestock with 37.28% share in 2012 while buffalo population share in 21.23%, goat population share in 26.4% followed by sheep population with its 12.71% share. The continental states with irrigational farming and higher rural population share are the largest producer of milk in India. Following table 5 shows the leading milk producing states with their respective bovine population.

Table 5: Leading Milk Producing States and their Bovine Population Share: 2012.

S. No. & State	Production of Milk MT (Million Tonne)	Share of Milk (Percent)	Bovine Population (million)	Share of Bovine Population (%).
1. U.P	29.05 MT	16.47 %	50.18 Mn.	16.72 %
2. Raj.	22.42 MT	12.71 %	26.30 Mn.	8.76 %
3. M.P	14.71 MT	8.34 %	27.79 Mn.	9.26 %
4. Andhra Pradesh	13.72 MT	7.78 %	20.79 Mn.	6.73 %
5. Gujarat	13.56 MT	7.68 %	20.36 Mn.	6.78 %
6. Punjab	11.85 MT	6.71 %	7.58 Mn.	2.52 %

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7.Maharatra	11.10 MT	6.29 %	21.07 Mn.	7.02 %
Total India	176.34 MT	100 %	299.98 Mn.	58.51 %

During the last two censuses of livestock from 2007 to 2012, the number of indigenous breed female cattle (cows) remained almost constant. It was 89.23 million in 2007 and 89.22 million in 2012 which declined by -0.01%. While the exotic breed or cross breed female cattle (cows) population increased tremendously from 26.21 million in 2007 to 33.76 million in 2012 and registered +28.78% increase in size. The higher yield of milk, geographical adaptability and institutional support to the farmers in villages are the main factors behind the rapid increase in the number of exotic/crossbreed female cattle (cows).

Table 6: List of States with Highest Per Capita Consumption of Milk in India (gm./day), 2012.

S.No	State	Per Capita Milk Consumption (gm./day)
1	Punjab	1120
2	Haryana	1005
3	Rajasthan	834
4	Gujarat	592
5	Andhra Pradesh	874
6	Himachal Pradesh	542
7	Madhya Pradesh	505
8	India (Average)	375

Table 7. List of States with Lowest Per Capita Consumption of Milk in India: 2012.

S. No	State/UT's.	Per Capita Consumption (gm./day)
1	Delhi	35
2	Mizoram	63
3	Goa	70
4	Assam	71
5	Manipur	77
6	Meghalaya	83
7	Nagaland	84
8	Chandigarh	86

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	India (Average)	375

In India, the daily average milk production of exotic/crossbreed cow is 7.10 kg./day while the indigenous breed cow yields merely 2.54 kg./day during 2014-15. The average daily milk yield for crossbreed cattle is significantly lesser than the best of global standards – UK, USA and Israel are at 25.6, 32.8 and 38.6 kg./day respectively. The major causes of low productivity of milk in India are intrinsic (low genetic potential) and extrinsic as poor nutrition/feed management, inferior farm management practices, ineffective veterinary and extension services and inefficient implementation of breed improvement programmes. India has the world's largest livestock population with 58% of buffaloes and 15% of cow stock. Owing to this huge bovine stock, though India has managed to attain numero uno position (about 17%) in milk production and less on the back of yield improvement.

The introduction of mechanization in farm sector particularly tractors and electric pumps have replaced the animate power up to great extent. Subsequently, the number of male cattle (bulls and male calves) reduced tremendously from 83.66 million in 2007 to 67.91 million in 2012 by -18.82%. On the other hand during 2012 livestock census, the share of exotic/cross breed male cattle was merely 15.02% to the total population of exotic or cross breed population. On the same pattern, the male buffalo population decreased from 19.59 million in 2007 to 16.10 million in 2012 by -17.83 % in 5 year span. Though, total bovine population (cattle and buffalo) also decreased marginally by -1.58% from 304.41 million in 2007 to 299.60 million in 2012.

Cattle population is widely spread over India across the relief and climate heterogeneity. The maximum density of cattle (cows) found in North Indians plains because of low rearing cost and high economic value of its byproducts. Cattle have high climatic endurance and require least financial investment and it can sustain on both green and dry fodder in limited quantity. On the basis of regional climatic adaptability indigenous breeds of cattle are divided in two broad categories:

A: Drought breeds and their respective habitat:

a. Hallikar – South Karnataka around Mysore, Mandya and Hasan.
b. Amritmahal – South Karnataka around Mysore and Chitradurga.
c. Kherigarh – Eastern U.P along Nepal Border in Lakhimpur and Kheri.
d. Malvi – Western Madhya Pradesh in Malwa region.
e. Nagauri – Semi arid to arid western Rajasthan around Nagaur.
f. Bargur – Interior Tamil Nadu around Erode Region.

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g. Kangayam – Interior Tamil Nadu around Coimbatore.
h. Bachaur – North to East Bihar i.e. Champaran to Bhagalpur.
i. Kenkatha – Along the Ken River valley in U.P. and M.P.(Bundelkhand).
j. Siri – Lesser Himalayas around Darjeeling and Kalimpong.
k. Ponwar – Terai Region of U.P. and U.K. around Pilibhit.
l. Khillari – In Marathwada region around Solapur and Satara.

B: General utility breeds and their respective habitat :

a. Kankrej – Plain of Gujarat and arid region of Rann of Kutch.
b. Hariana – Yamuna Plains of Haryana, UP and Rajasthan.
c. Sahiwal – Sutlej plains of Punjab (Malwa, Majha and Doaba plains).
d. Tharparkar – Western margin of (arid) Rajasthan in Barmer, Bikaner and Jaisalmer.
e. Mewati – Southern Haryana and Rajasthan.
f. Rath/Rathi – Alwar, Bharatpur region of Rajasthan.
g. Gir – Saurastra plateau of Gujarat.
h. Nimari – Narmada valley region of Madhya Pradesh.
i. Dangi – Northern Maharastra from Ahmednagar to Nasik region.
j. Gaolao – Southern Madhya Pradesh from Chhindwara to Nagpur (Maharastra).
k. Ongole – South of Krishna river in Andhra Pradesh in Prakasham and Nellore region.

In the recent past, the utility of cattle have decreased due to substitutes offered by technology in farm sector. Therefore, its total population also decreased from 199.07 million in 2007 to 190.90 million in 2012 by -4.10% in five year span. On the other hand pasturelands/village common lands for grazing have shrunk rapidly and the number of buffaloes with high fat content milk has increased. Though, the total buffalo population increased from 105.43 million in 2007 to 108.70 million in 2012 by +3.19% in five year. While during the same time period female buffalo population has increased by +7.99% from 85.74 million to 92.59 million.

LANDSCAPE AND LIVESTOCK

The large base of rural population (around 833 million in 2011) which is spread over in more than 6.4 lakh remotely inhabited villages in India mainly rear livestock for economic support in heterogeneous composition. The number and variety of livestock population in India keep changes with time and space on the basis of availability of fodder and nature of farming. Therefore, on different landscapes, variety of livestock developed their adaptability for survival. Domesticated livestock cannot survive in isolation or in natural condition therefore, they found in human association in accordance to their demand and regional adaptability.

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Sheep is the fourth largest livestock with its 65.06 million stock population in India after cattle (190.9 million), Goat (135.73 million) and Buffalo (108.70 million) in 2012. Sheep has the great range of climatic adaptability and terrain assimilation. It can survive with least availability of fodder in adverse climate and most rugged terrains. Therefore, it requires vast rangeland or pastureland for survival as they can survive in least carrying capacity region. The main habitat of sheep in India is:

a. Temperate climate and highly rugged terrains of western Himalayas.
b. Arid and water stressed western Rajasthan.
c. Semi-Arid rain shadow region of Western Ghats (Shayadris) in Maharastra and Karnataka.
d. Drought prone Kathiawad and Kutch region of Gujarat.

Sheep is reared in herds generally in the region with natural adversaries. Though, it is reared by poorest of the poor (nomads and semi-nomads) but its byproducts have high market value. It is reared for mutton, wool, hides, skin/leather and have great demand in global market after industrial processing of its byproducts. The value addition of its finished product is exorbitantly high. Sheep rearing is associated with low-population density regions and water stressed extensive and dry land farming regions.

Table 8: Concentration of Sheep Stock in Descending Order and its Natural Condition: 2012.

S. No.	State	No. of Sheep (million)	Natural Conditions
1	Andhra Pradesh	26.39	Drought prone and rain shadow Rayalsema.
2	Karnataka	9.58	Rain shadow, semi-arid with dry land farming.
3	Rajasthan	9.08	Arid and semi-arid hot desert.
4	Tamil Nadu	4.78	Leeward side of Nilgiri and Annamalai hills.
5	Jammu and Kashmir	3.38	Temperate Himalayan highland with rough terrains.
6	Maharashtra	2.58	Rain shadow, dry land farming.
7	Gujarat	1.70	Drought prone, semi-arid region.
	India (Total)	65.06 million	

Goat is a unique livestock with great climate adaptability to given natural conditions. It can survive with least possible fodder with great range and can survive in isolation to gregarious conditions. Therefore, goat habitation found in rugged Himalayan terrains to Gangetic plains and further in Deccan plateau and arid deserts of western Rajasthan. The rearing cost of goat is minimal with assured output even in all sorts of natural adversaries where as it required a little

ISSN: 2455-8834

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space to survive. In different geographical region it is reared for different economic purpose as milk, mutton, wool and skin etc. Apart from rural habitat it can be reared in urban areas where its economic value is very high. In terms of the total livestock population, goat constitutes the second rank in India with 135.17 million in 2012 out of the total livestock population of 512.05 million. Its population declined from 140.53 million in 2007 to 135.17 million by -3.82% in 2012.

Table 9: Descending Order of States with Goat Population and its Breeds in India: 2012.

S. No.	State	No. of Goats (million)	Breeds
1	Rajasthan	21.66	Barbari, Beetal, Sirohi.
2	Uttar Pradesh	15.58	Jamnapari, Barbari, Pantja, Ruhelkhandi.
3	Bihar	12.15	Black-Bengal, Saanen, Kota.
4	West Bengal	11.50	Black Bengal, Ganjam, Assam Hill.
5	Andhra Pradesh	9.07	Tellicherry, Osmanabadi, Jamnapari.
6	Maharashtra	8.43	Osmanabadi, Surti, Konkan, Kanyal.
7	Tamil Nadu	8.14	Salem-Black, Malabari, Toggenburg.
8	Madhya Pradesh	8.01	Sojat, Kamori, Kamrab, Malwa.
	India	135.17 million	

In the high altitudes of Himalayan region with dispersed settlement, rugged terrain and poor road connectivity, the role of horses, ponies and mules is inevitable for their economic survival. Horses and Mules are the only mode of transportation in all the hilly and mountainous states of India. Therefore, the total population of horses and ponies increased from 6.12 lakh in 2007 to 6.25 lakh in 2012 by +2.12%. While, the mule population increased from 1.37 lakh to 1.96 lakh during the same period. With increased mechanization, development of road network and agricultural intensification the number of donkey stock has decreased drastically from 4.38 lakh in 2007 to 3.19 lakh in 2012 by -27.17%.

In the arid and semi-arid region of western and central India, the demand of camel has decreased rapidly. The expansion of road transport network, supply of piped water and introduction of tractors replaced the utility of camel. Therefore, the number of camel in India was 5.17 lakh in 2007 and which reduced to 4.00 lakh in 2012 by -22.63%. The number of pigs also reduced from 11.13 million to 10.29 million by -7.54% during the same time period.

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CONCLUSION

With increasing population of India from 361 million in 1951 to 1210 million in 2011, the demand of livestock generated food-intake has increased rapidly. The livestock is domesticated and reared since time immemorial for their economic support. The livestock rearing in rural agrarian society is inter-linked with the modus-oprandi of farming methodology and selection of crops. Cattle, buffalo, goat, sheep, horses, pig and camel etc. support the economic livelihood of the both rural and urban population. Since 1951, livestock population increased from 292.9 million to 512.1 million in 2012 i.e. +74.83.

Cattle (Cows and Bulls) constitute the largest share of livestock population in India. During last livestock census (19th livestock census) in 2012, it was observed that the number and share of indigenous cattle (cows) is decreasing while the exotic/crossbreed cattle population is increasing rapidly. Apart from that the number of male cattle (bulls and calves) and male buffaloes is also decreasing rapidly as animate power in farm sector is replaced by mechanization and electrification.

With the increasing number exotic/crossbreed female cattle (cows) and female buffaloes, the milk production of India increased from 55.60 million tonne (MT) in 1991-92 to 176.34 MT in 2017-18. UP, Rajasthan, Madhya Pradesh, Andhra Pradesh and Gujarat are the leading producer of milk. Subsequently, the per capita milk availability and consumption also increased from 178 gm./day in 1991-92 to 375 gm./day in 2017-18. Though, there is great range of milk consumption among different states as Punjab and Haryana have the highest consumption 1120 and 1005 gm./day respectively. While north eastern state have the lowest milk consumption as Mizoram have 63 gm./day, Nagaland have 84 gm./day and Goa have 70 gm./day.

In the recent past, the absolute number of most of the livestock except buffalo has declined especially of indigenous breeds. The total number of livestock declined from 529.69 million in 2007 to 512.05 million in 2012 by -3.33% in five year period.

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