

Trends in the Growth of Crossbred Cattle Population in Indian Climatic Conditions

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Abstract: *The study focuses on the growth of milk producing animals, specially crossbred cows and buffalos in India. As per the 20th Livestock Census, the total livestock population is 535.78 million in India in the year 2019 and it shows an increase of 4.6% over Livestock Census of 2012. Cattle population of India is 192.49 million while the population of buffaloes is 109.85 million in the year 2019. About 36% of the total livestock is contributed by cattle & buffalos. Compared to previous census, the cattle population has increased by 0.83% while buffalo population has increased by 1.06% showing an increasing trend of buffalo population. Further, there is a consistent increase of buffalos over the last three livestock census. On the other hand population of the total exotic/crossbred cattle has increased by 26.9 % in 2019 as compared to previous census. Among this, it is striking to note that female crossbred cattle population has increased by 39% while male crossbred population decreased by 42% indicating that the adaption of crossbred cows for milk production is on the rise in India. Further, the higher fertility rate of crossbred cows over indigenous cows states that the crossbred cows are well adapted to Indian climatic conditions.*

Keywords: Crossbred cows, buffalos, livestock, climatic conditions

1. Introduction

Animal husbandry has been an integral part of Indian agriculture providing livelihood and nutritional security to about 70% of rural masses. Livestock rearing has been a vital component of small holder's production system comprising marginal, small and semi-medium farmers. Majority of these dairy farmers are of below poverty line and livestock rearing provides food security as well as social security to these livestock keepers against natural calamities (Gandhi, RS, 2014). Thus, livestock rearing is a key livelihood source as well as risk mitigation strategy for small and marginal farmers, particularly across the rain-fed regions of India. This is because they face increasingly uncertain and erratic weather conditions which negatively impact crop productivity and wage labor in the agriculture sector. Further, it is emphasized that livestock wealth is much more equitably distributed than wealth associated with land (Patel, 1993). Thus, when we think of the goal of inclusive growth, we should not forget that from equity and livelihood perspectives, livestock rearing must be at the center of the stage in poverty alleviation programs. Among all the activities of livestock rearing, dairy farming or milk production activity is very important livelihood source for millions of farmers in the rural India.

Contrary to many developed countries, dairying in India is more than a business activity. It has broader social and economic dimensions. Over 71 million of 147 million households in the country depend on dairy for their livelihood. Out of these households, nearly 75% belong to small, marginal and landless farmers with an average herd size of 2-8 animals (Saxena, 2019). Livestock sector contributes nearly 26% of rural income in case of poorest households and about 12% in case of overall rural income. Dairying provides a remunerative opportunity for family labor, so farm families are willing to take up dairying as an occupation subsidiary to agriculture (Saxena, 2019).

Further, India is endowed with world's largest and most diverse asset of livestock in terms of species and breeds within the species. India possesses one of the world's best dairy buffaloes, draught cattle, carpet wool sheep and highly prolific goat breeds. Further, India has a share of 2.4% of the world's area with 15% of world's livestock and 17.5% of human population. The number of livestock per hectare is 1.58 and there is one livestock per 2.1 human beings in the country (Sonali Prusty et al, 2014). Emerging trends indicate that the demand for milk is growing faster than the production of milk especially in view of faster growth in GDP (Singh, and Neelam 2012). To enhance the milk production in India, the crossbreeding of Indian cattle with European breeds has been launched during the seventies and this has contributed significantly to the enhancement of milk production in India. Further, the crossbreeding of indigenous cattle with exotic breeds resulted in the evolution of new dairy cattle breeds such as Karan Swiss, Karan Fries, Frieswal and Sunandini at organized dairy farms in India. The impact of crossbreeding is more pronounced under field conditions in most of the states of our country. However, it is reported that crossbreds have not acclimatized fully to widely varying agro-climatic conditions of the country leading to many health and adaptation problems attributed to the existence of genotype-environment interaction (Steane, 1999). Therefore, crossbred animals need to be replaced frequently in order to sustain the level of performance which is potentially available in crossbreds (Alderman, 1987). Now the question is whether the crossbred cow population is well adapted to the Indian climatic conditions or not. The increase in the crossbred cow population will be the answer for this question. Thus, it is necessary to analyze the changes that have taken place in the structure and size of livestock population, especially bovine population, of the country in order to know whether present livestock growth is sufficient to meet the growing demand for milk and milk products in India.

2. Materials and Methods

The study focuses on the changes in the livestock population over the years, change in milk production over the years – species wise and feed supply to the bovines in order to achieve higher milk yields from dairy animals. To achieve this objective livestock census data related to 20th livestock census and previous census is collected from statistical data published by Government of India and other relevant agencies. Further, milk production data from the publications of National Dairy Development Board is also collected and analyzed. This data is analyzed for the changes in the structure and size of cattle and buffalo population to elucidate whether the changes are towards dairy development or not. Further, the data related to the supply and demand of feeds and fodders required for cattle and buffaloes is also collected and processed to know the feed supply position in the country.

3. Results and Discussion

(a) Demand for Milk and milk products in India

The milk production in India is on the increasing trend from 55.6 million tons in 1991-92 to 176.3 million tons in 2017-18 at an average growth rate of 4.5% per annum. While the per capita availability of milk is 375 grams per day at all India level and it varies between 71 grams per day in Assam to 1120 grams per day in Punjab. On the other hand, demand for dairy products is increasing with higher population growth and increased income. At present demand for milk is growing faster than the production of milk especially in view of faster growth in GDP (Vijaya and Reddy, 2010; Singh and Neelam 2012). The government of India has asked the National Dairy Development Board (NDDB) to conduct a study to assess the true scale of demand for milk in India as part of National Plan. According to the national plan, the milk sector must grow annually by an average 4.2 per cent. But in the last two years, the growth registered has been much more. India also plans to take its milk production to 240 million metric tons (MMT) by 2025. Despite the surplus growth of the last two years, this target looks hard to achieve. India's milk production increased from 165.40 MMT in 2016-17 to 176.35 MMT in 2017-18, a growth rate of 6.62 per cent. Thus, emerging trends indicate that the demand for milk is growing faster than the production of milk specially in view of faster growth in GDP (Singh and Neelam 2012). The country ranks first in global milk production. However, the demand for milk and milk products in India is likely to grow significantly in the coming years, driven by more consumers, higher incomes and greater interest in nutrition. Consumption of processed and packaged dairy products is increasing in urban areas. In these circumstances it is imperative to examine the changes in livestock, particularly bovine population, in order to know whether the growth of bovine population is towards catering to the increasing demand for milk and milk products or not.

(b) Trends in the livestock population of India

As per the 20th Livestock Census, the total Livestock population is 535.78 million in India in the year 2019 and it shows an increase of 4.6% over Livestock Census of 2012. Total Bovine population (Cattle, Buffalo, Mithun and Yak) is 302.79 million in 2019 and this shows an increase of 1.0%

over the previous census (Table-1). Among total bovines, cattle and buffaloes are more important in terms of commercial milk production. Cattle population of India is 192.49 million while the population of buffaloes is 109.85 million in the year 2019. About 36% of the total livestock is contributed by cattle and it indicates that cow is the predominant livestock species in India. Compared to previous census of 2012, the cattle population has increased by 0.83% while buffalo population has increased by 1.06% showing an increasing trend of buffalo population. Further, the cattle population of 2019 is decreased when compared to the livestock census of 2007. On the other hand, there is a consistent increase of buffaloes over the last three livestock census. This clearly shows that the buffaloes are gaining importance as milk producing animals in India over cows. With regards to sheep and goat, their population has shown tremendous increase compared to cattle and buffaloes and this could be due to higher demand for their meat rather than milk. Since, cow and buffaloes are the chief milk producing animals the focus will be made only on these two species in the forthcoming analysis.

Table 1: Livestock population of India (in millions)

	2007	2012	2019	Percent growth over 2012
Cattle	199.08	190.9	192.49	0.83
Buffaloes	105.34	108.7	109.85	1.06
Sheep	71.56	65.07	74.26	14.13
Goats	140.54	135.17	148.88	10.14
Pigs	11.13	10.29	9.06	-12.03
Mithun	0.26	0.30	0.38	26.66
Yaks	0.08	0.08	0.06	-25.00
Horses & ponies	0.61	0.63	0.34	-45.58
Mules	0.14	0.20	0.08	-57.09
Donkeys	0.44	0.32	0.12	-51.23
Camels	0.52	0.40	0.25	-37.05
Total livestock	529.70	512.06	535.78	4.63

Data Source: Livestock Census of India, 2019.

(c) Trends in the growth of cattle population in India

From time immemorial cattle are used for agricultural operations, cart pulling, milk production and for manure in India. Cow or bull is part of human life in India particularly in the rural areas. However, the changes in the growth of livestock population over the years emphasizes that cattle population is declining with the concomitant increase in buffalo population. The total cattle population in the country is 192.49 million during 2019 and total cattle is increased by 0.8% over previous livestock census (2012). Within cattle, female cattle population increased by 18.0% whereas the size of male cattle is reduced by 30.2% over previous census (Table-2). This trend clearly establishes one fact that the use of bulls or bullocks for agriculture is being drastically reduced in the country.

In India, cattle are generally maintained for dual purpose i.e., for milk production as well as for draft or agriculture purpose. With the introduction of tractors and pump sets, the use of bullocks in agriculture has been declined drastically. On the other hand, crossbreeding of cows with exotic cattle like Jersey, Holstein Friesian, Brown Swiss etc., was introduced long ago for improving the milk production in India (Acharya, 1987). Buffaloes are purely meant for milk production. Therefore, there is lesser demand for the male

progeny of buffalo or cow, either indigenous or exotic or crossbred for agriculture purpose and thus, there is reduction in the male population of cattle and buffaloes which is

evident from the recent livestock census presented in Table-2 (cattle) and Table-3 (buffaloes).

Table 2: Exotic/Crossbred and Indigenous / Non-descript Cattle Population in India

S.No.	Category	Cattle Population 2012 (millions)	Cattle Population 2019 (millions)	Percent change
1	Total cattle	190.90	192.49	0.83
2	Male	67.82	47.40	-30.20
3	Female	122.98	145.12	18.00
4	Total Exotic/crossbred	39.73	50.42	26.9
5	Male	5.87	3.46	-42.0
6	Female	33.76	46.95	39.1
7	Total Indigenous/ Non-descript	151.17	142.11	-6.0
8	Male	61.95	43.94	-29.1
9	Female	89.22	98.17	10.0

Data Source: Livestock Census of India, 2019 and 2012.

The female cattle (cows population) constitutes about 75% of the total cattle i.e., 145.12 million in 2019 and it increased by 18.0% over the previous census (2012). The exotic/crossbred cattle population in the country is 39.73 million and 50.42 million respectively in the years 2012 and 2019 (Table-2). Thus, the population of the total exotic/crossbred cattle has increased by 26.9 % in 2019 as compared to previous census. Among this, it is striking to note that female crossbred cattle population has increased by 39% while male crossbred population decreased by 42% indicating that the adaption of crossbred cows for milk production is on the rise in India. Further, the indigenous/non-descript female cattle population is also increased by 10% in 2019 as compared to previous census. There is a decline of 6 % in the total indigenous (both descript and non-descript) cattle population over the previous census and this could be attributed to the successful implementation of crossbreeding program. The above analysis reveals that the cows, either indigenous or exotic, are also gaining importance as milk producing animal in India.

(d) Trends in the growth of buffalo population in India

Changes in the growth of buffalo population is similar to that of cattle. Total buffalo population in the country is 109.85 million during 2019. It indicates that about 20.5% of the total livestock is contributed by buffaloes. Total buffalo population has increased by 1.1% over previous livestock census (2012) (Table-3). Female buffalo population increased by 8.61% whereas male buffalo is declined by 42.35% over previous census. It is apparent that milch buffalo population has increased marginally by 0.2% over previous census in which in-milk animal population has increased by 4.3% whereas dry category has declined by 10.2% (Table-3). Decline in the dry animal population with concomitant increase in in-milk animal population elaborates the efficiency of these animals as good milk producing animals with high fertility. The high fertility rate of buffaloes could be corroborated with the details of in-milk and dry animal population given in Table-3. Out of total 51.05 million milch buffaloes in 2012, in-milk animal proportion constitutes 71.64% and dry animal population constitutes only 28.36%. In the year 2019, the proportion of in-milk animals accounts for 74.57% where as dry animals accounts for 25.43% of total milch animals. The in-milk animal population is about three-fourth where as dry animals are only one-fourth in the year 2019. This clearly shows the

higher fertility rate of buffaloes and this could be attributed to the interest of farmers in rearing buffaloes and also could be due to more demand for buffalo milk in India over cow milk.

Table 3: Trends in the buffalo population of India – Male, female and milch animals

Category	Population (in millions) 2012	Population (in millions) 2019	Percent change
Total buffaloes	108.70	109.85	1.06
Total male	16.10	9.28	-42.35
Total female	92.60	100.57	8.61
In-milk	36.57 (71.64)	38.16 (74.57)	4.34
Dry	14.48 (28.36)	13.01 (25.43)	-10.19
Milch animals (in-milk & dry)	51.05 (100)	51.17 (100)	0.22

Note: Figures in the parenthesis indicates the percentage to the total milch animals.

(e) Productivity of dairy animal population in India

In any herd or cow population if the number of in-milk animals or current milk producing animals is higher then that herd or cow population can be treated as good dairy herd with more productive animals. Female cattle could be divided as in-milk animals and dry animals depending upon their status of lactation or milk production and both the categories are generally called as “Milch Animals”. Table-4 depicts the number of productive cows in India in 2019 and the change in their number over the previous livestock census. The milch animal population of crossbred cows in India was 19.42 million in the year 2012 and it grew up to 25.67 million in the year 2019 registering a 32.2% growth. The growth of indigenous cows during the same period is only 0.81%. It indicates that the exotic or crossbred cows are preferred as dairy animals over indigenous animals in India during the past seven years. However, the indigenous cows are also being maintained by the farmers as milch animals as indicated by the positive growth rate of 0.81% over the previous census (Table-4). Further, the decline in the dry animal population and increase in in-milk animal population in the case of indigenous cows emphasizes the increasing preference of indigenous cows in India. This may be due to higher disease resistance power with moderate milk yielding capacity of desi cows.

Within the total milch animal population, the proportion of in-milk crossbred cows accounts for 73.64% and dry animal

population accounts for 26.36% of total milch animal population of 19.42 million in the year 2012. By the year 2019 the proportion of in-milk crossbred cows increased while dry crossbred cow population declined indicating the increased fertility rate of crossbred cows over the years. In the case of indigenous cows, the proportion of in-milk animal population (61.60%) is less than crossbred cows in the year 2012 and similar trend is observed in the year 2019. However, it could be noted that the fertility rate of indigenous cows has increased over the years as evident by the reduction in dry animal population in 2019 over the previous livestock census. It shows that the fertility rate of crossbred cows is higher than indigenous cows.

Table 4: Dynamics of Cattle population – in milk, dry and milch cattle : Crossbred and Indigenous cattle in India

Breed group	Category	Population 2012 (million)	Population 2019 (million)	Percent change
Exotic/ crossbred	In-milk	14.30 (73.64)	20.00 (77.91)	39.8
	Dry	5.12 (26.36)	5.67 (22.09)	10.8
	Milch	19.42 (100)	25.67 (100)	32.2
Indigenous/ Non-descript cattle	In-milk	29.65 (61.60)	31.98 (65.92)	7.87
	Dry	18.48 (38.40)	16.53 (34.08)	-10.53
	Milch	48.13 (100)	48.51 (100)	0.81

Note: Figures in the parenthesis indicates the percentage to the total milch animals.

Further, the higher fertility rate of crossbred cows over indigenous cows states that the crossbred cows are well adapted to Indian climatic conditions. Many livestock experts maintained that crossbred cows having the exotic cattle blood will have low disease resistance power and low heat tolerance compared to indigenous cows and thus are not suitable to Indian climatic conditions (McDowell, 1985). But the reality through livestock census clearly supports the suitability of crossbred cows to Indian climate. It was reported that crossbred cows are performing well compared to buffalos in India (Acharya, 1987; Reddy, 2001; Reddy and Subramanyam, 2002). In India, earlier it was observed that indigenous cows are reared for dual purpose i.e., primarily for draught purpose and milk production is secondary. It has been well established that single purpose breeding goal as practiced in the developed countries should not be applied to livestock breeding in difficult environment of developing countries, but multi-purpose breeding objectives must be kept in view while formulating breeding programs. The breeding objectives under Indian conditions should be optimum output per animal and crossbreds should be bred for productive and adaptive traits (FAO, 2019; Franklin, 1986). But the present study emphasizes that there is decline in the male progeny stating that cows are primarily maintained for milk production and not for draught purpose.

4. Summary and Conclusions

The livestock population of India is on the rise according to the demand for meat, milk and milk products. The total dairy animal population, i.e., cattle and buffalo population, has increased over the past livestock census with remarkable changes in their size and composition. The changes in the size and composition of cow and buffalo population shows a structural adjustment in the herd. The female animal

population has registered a higher positive growth rate while male animal population registered a negative growth over the years. The apparently remarkable situation which could be noted from the analysis of livestock census is that there is a positive growth in the milk producing animals of all species such as buffalos, crossbred cows and indigenous cows. Further, the proportion of in-milk animals is about two-thirds while the proportion of dry animals is about one-third indicating the higher productive and reproductive ability of Indian dairy animals. Increase in the crossbred cow population emphasizes its suitability to Indian climatic conditions. Further, buffalo is growing fast as milk producing animal compared to cow in India.

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