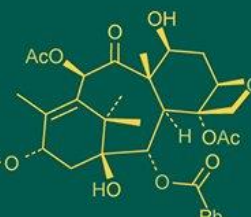
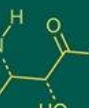
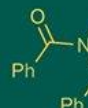


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Population trends of indigenous cattle in Karnataka: Integrating secondary data with perceptions of field veterinarians

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Abstract

Indigenous cattle form a significant component of India's livestock biodiversity because of their adaptability, heat tolerance, disease resistance, and ability to function in low-input production systems. Recent shifts in Agriculture like mechanization of agriculture, the growth of crossbreeding programs, the growing use of artificial insemination, and shifting farmer preferences appear to influence change in their demography. The current study sought to evaluate such population trends of native cattle in Karnataka. The study adopted a field survey coupled with secondary data from the 19th and 20th Livestock Census reports, Basic Animal Husbandry Statistics, published literature. Census data were analyzed for population changes over time, and veterinarians' observations at their work place about trends in native bullocks, bulls, and cows were documented and analyzed using frequencies and percentages. Indigenous cattle numbers were found to be significantly declining, while crossbred cattle—especially females—showed an increasing trend. With 69.26%, 71.98%, and 66.93% of veterinarians reporting dwindling populations of native bullocks, bulls, and cows, respectively, the field observations strongly corroborated the secondary data patterns. The impact of mechanization and decreased reliance on natural service bulls were showed to be contributing to greater decline among indigenous males. The study shows that combining official population data with expert opinions from the field offers a thorough and quicker method for comprehending the dynamics of livestock genetic resources. The findings emphasize the need for strengthening conservation programmes, maintaining indigenous breeding populations, promoting sustainable utilization, and developing evidence-based strategies for conservation of indigenous cattle genetic resources in Karnataka.

Keywords: Indigenous cattle, Karnataka, livestock census, population trends, veterinarian perception, conservation, cattle biodiversity

Introduction

Indigenous cattle constitute an essential part of India's livestock biodiversity and contribute to sustainable livestock production, because of their adaptation to a variety of agroclimatic settings, heat tolerance, disease resistance, longevity, and capacity to flourish under low-input management methods. Particularly in light of climate change and sustainable livestock production, these special adaptive characteristics make them attractive genetic resources (FAO, 2015; Hoffmann, 2010) [8, 12]. India has a wide variety of native cattle breeds that are suited to various ecological zones; ICAR, the National Bureau of Animal Genetic Resources (NBAGR), has registered a number of these varieties. With recognized breeds including Hallikar, Amrit Mahal, Malnad Gidda, Krishna Valley, and Deoni, Karnataka is one of the major hubs of indigenous cattle diversity. These breeds have made substantial contributions to agricultural and rural subsistence systems.

However, over the past few decades, India's cattle production systems have undergone a significant transformation due to the various factors like expansion of crossbreeding programs, widespread adoption of artificial insemination, agricultural mechanization, reduction in grazing resources, and shifting farmer preferences. As a result, indigenous cattle populations, especially those of breeding bulls and draught animals, have gradually declined, while the number of crossbred dairy cattle has increased (DAHD, 2012; DAHD, 2019) [4, 5].

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While crossbreeding has increased milk production, the ongoing decline of indigenous cattle may result in the loss of important adaptive genetic traits necessary for future livestock improvement and climate resilience (FAO, 2007; Gandini and Oldenbroek, 2007) [6, 9].

Although official livestock census reports offer useful information on population trends, they don't fully explain changes at the field level or the factors affecting native cattle populations. Veterinarians working at the field level might have firsthand knowledge of changes taking place at the grassroots level because of their ongoing interactions with farmers, breeding programs, and livestock production systems. A better understanding of the dynamics of livestock genetic resources can be obtained by combining such expert opinions with secondary population data.

Thus, the current study was conducted to analyse the population trends of indigenous cattle in Karnataka using secondary data from official livestock reports and to gauge the perceptions of field veterinarians on changes in indigenous cows, bulls, and bullocks. The study also sought to compare census-derived trends with field observations and identify implications for conservation and sustainable management of indigenous cattle genetic resources in Karnataka.

Materials and Methods

The study was carried out in Karnataka by combining field-level perceptions of veterinarians with secondary population data. Field veterinarians were selected as key informants due to their direct involvement with livestock health, breeding services, and farmer advisory activities (FAO, 2012) [7]. The 19th (2012) and 20th (2019) Livestock Census reports, Basic Animal Husbandry Statistics, and pertinent published literature were the sources of secondary data on indigenous and crossbred cattle populations (DAHD, 2012; DAHD, 2019; FAO, 2015) [4, 5, 8]. The percentage variation of cattle population changes between census periods was computed.

Primary data were collected from 257 field veterinarians working in different regions of Karnataka through a structured questionnaire. The respondents were asked to assess trends in indigenous bullocks, bulls, and cows in their respective service areas under four categories: almost nil, decreasing, increasing, and stagnant.

The collected data were analysed using descriptive statistics, and frequencies and percentages were calculated for veterinarian responses. The trends obtained from secondary data were compared with field observations to assess the consistency between official population statistics and expert perceptions. The integration of quantitative secondary data with expert opinion-based information followed a mixed-method framework recommended for livestock genetic resource assessment (Creswell and Plano Clark, 2018) [3].

3. Results

3.1 Population trends of indigenous and crossbred cattle in Karnataka

According to an analysis of data from the 19th (2012) and 20th (2019) Livestock Censuses (Table 1), cattle population structure of Karnataka changed significantly over the course of seven years. Total indigenous/non-descript cattle population declined from 6.60 million in 2012 to 4.56 million in 2019, representing an overall decline of 30.94%. Conversely, the total exotic/crossbred cattle population

increased from 2.91 million to 3.91 million, registering an increase of 34.19%.

Among indigenous cattle, males experienced a greater drop (−36.80%) than females (−26.70%). Crossbred males showed a comparable decline (−38.76%), whereas crossbred females showed a significant rise (39.71%), indicating a continued shift towards dairy-oriented production systems.

The contrasting population trends suggest that while farmers increasingly prefer crossbred females for milk production, the population of indigenous cattle has continued to decline, particularly of breeding bulls and draught animals.

Table 1: Population trends of indigenous and crossbred cattle in Karnataka between 2012 and 2019

Category	2012	2019	Percentage change (%)
Indigenous/non-descript males	2,771,874	1,751,771	-36.80
Indigenous/non-descript females	3,832,093	2,809,071	-26.70
Total indigenous/non-descript cattle	6,603,967	4,560,842	-30.94
Crossbred/exotic males	205,182	125,646	-38.76
Crossbred/exotic females	2,707,335	3,782,516	+ 39.71
Total crossbred/exotic cattle	2,912,517	3,908,162	+ 34.19

Source: 19th and 20th Livestock Census reports, DAHD, GOI.

3.2 Perceptions of field veterinarians regarding indigenous cattle population trends

The perceptions of 257 field veterinarians regarding changes in indigenous cattle populations was recorded through structured questionnaire. The data are presented in Table 2.

A majority of veterinarians perceived that indigenous cattle populations had declined in their respective working areas. 69.26% of respondents perceived declining populations of bullocks, while it was 71.98% for breeding bulls, and 66.93% for cows.

The highest proportion of respondents reporting a decline was observed for indigenous bulls, followed by bullocks and cows. Only 6.61% of respondents perceived an increase in indigenous bulls, whereas 8.56% reported increasing bullock populations.

Interestingly, relatively more veterinarians (17.12%) perceived an increase in indigenous cows compared with bulls and bullocks, suggesting that although indigenous male animals continue to decline, some regions may still be maintaining indigenous cows through conservation initiatives, agro-ecological considerations or niche dairy production systems.

Only a small proportion of respondents perceived that indigenous cattle populations were almost absent in their working areas, accounting for 8.17% for bullocks, 10.12% for bulls, and 1.95% for cows.

Approximately 11-14% of veterinarians reported stagnant populations across the three categories.

Table 2: Perceptions of field veterinarians regarding trends in indigenous cattle populations (N = 257)

Category	Almost Nil	Decreasing	Increasing	Stagnant
Bullocks	21 (8.17)	178 (69.26)	22 (8.56)	36 (14.01)
Bulls	26 (10.12)	185 (71.98)	17 (6.61)	29 (11.28)
Cows	5 (1.95)	172 (66.93)	44 (17.12)	36 (14.01)

3.3 Comparative analysis of secondary data and veterinarians' perceptions

A comparison between official Livestock Census data and veterinarians' perceptions is presented in Table 3.

Between 2012 and 2019, Karnataka's native cattle population significantly decreased (30.94%), according to the official Livestock Census. Remarkably comparable findings were obtained from the field study, with almost two-thirds to three-fourths of vets reporting dwindling numbers of indigenous bulls, cows, and bullocks.

The strongest agreement was observed for indigenous breeding bulls. Veterinarians' perceptions, of which 71.98% observed declining indigenous bull populations, closely matched the significant drop in indigenous male cattle, despite census data reporting sex-wise indigenous cattle populations rather than breeding bulls separately.

Similarly, the decrease in indigenous bullocks as reported by 69.26% of veterinarians is in accordance with the decreased reliance on draught animals that has been caused by growing agricultural mechanization.

Although the Livestock Census does not separately classify indigenous cows, the decline in indigenous female cattle population was also reflected in veterinarians' observations, with 66.93% reporting declining indigenous cow numbers.

The close agreement between objective census statistics and field-level observations indicates that veterinarians possess reliable knowledge regarding long-term changes in indigenous cattle populations within their service areas.

Table 3: Comparison of official Livestock Census trends and veterinarians' perceptions

Observation	Official Livestock Census	Veterinarians' perception
Indigenous cattle	Declined by 30.94%	Majority perceived decline
Indigenous males	Declined by 36.80%	71.98% reported declining bulls; 69.26% reported declining bullocks
Indigenous females	Declined by 26.70%	66.93% reported declining cows
Crossbred females	Increased by 39.71%	Indicates continued preference for dairy-oriented cattle systems

3.4 Major observations emerging from the study

The present investigation generated several important observations regarding indigenous cattle population dynamics in Karnataka.

First, official secondary data clearly demonstrated a continued decline in indigenous cattle populations over the study period, accompanied by a substantial increase in crossbred female cattle.

Second, field veterinarians consistently perceived declining populations of indigenous bullocks, bulls, and cows across their working jurisdictions, corroborating the trends observed in the Livestock Census.

Third, indigenous breeding bulls emerged as the category perceived to be under the greatest decline, suggesting reduced availability of natural service bulls following expansion of artificial insemination programmes.

Fourth, indigenous bullocks also showed marked decline, reflecting reduced dependence on animal draught power owing to increasing mechanization of agriculture.

Finally, although the majority of field veterinarians reported declining indigenous cow populations, a notable proportion observed increasing populations in certain areas, possibly indicating localized conservation programmes, increased awareness regarding indigenous cattle, or growing demand for products derived from native breeds.

Overall, the findings demonstrate a high level of concordance between official data on Livestock population statistics and field veterinarians' observations, supporting the use of expert perceptions as a complementary tool for monitoring livestock population dynamics and informing conservation planning.

4. Discussion

The present study provides an integrated assessment of indigenous cattle population trends in Karnataka by combining official Livestock Census data with field veterinarians' perceptions. The observed decline in indigenous cattle populations and increase in crossbred cattle, particularly females, indicate a transition from traditional multipurpose cattle-based farming systems towards specialized dairy production systems. The agreement between census trends and veterinarians' observations highlights the usefulness of combining

secondary statistics with field-based expert knowledge for assessing livestock genetic resource dynamics.

The indigenous cattle population in Karnataka declined by 30.94% between 2012 and 2019, with a greater reduction among males (36.80%) compared with females (26.70%). Similar trends have been reported at the national level, where indigenous cattle populations have declined in several regions, while crossbred cattle populations have increased (DAHD, 2012; DAHD, 2019) ^[4, 5]. Birthal and Taneja (2006) ^[1] reported that increasing commercialization of dairying, market demand for higher milk production, and adoption of improved breeding technologies have influenced the changing composition of Indian cattle populations.

The decline was particularly evident among indigenous bulls and bullocks, which was also strongly reflected in veterinarians' perceptions, with 71.98% and 69.26% respondents reporting decreasing trends, respectively. The reduction of indigenous males is associated with reduced dependence on draught power due to agricultural mechanization and increased reliance on artificial insemination programmes. Although artificial insemination has contributed to genetic improvement and enhanced milk productivity, reduced maintenance of indigenous breeding males may affect the availability of locally adapted germplasm and increase the risk of genetic erosion (FAO, 2015; Gandini and Oldenbroek, 2007) ^[8, 9]. Similar concerns regarding loss of functionally important indigenous cattle populations have been highlighted in animal genetic resource conservation programmes (Groeneveld *et al.*, 2010) ^[11].

The increasing population of crossbred females (+ 39.71%) reflects farmer preference for improved milk yield and economic returns from dairy production. Crossbreeding has played an important role in increasing milk availability and supporting dairy development in India (Birthal and Taneja, 2006) ^[1]. However, excessive replacement of indigenous cattle with crossbreds may reduce genetic diversity and compromise traits such as heat tolerance, disease resistance, and adaptability, which are increasingly important under changing climatic conditions (Hoffmann, 2010; FAO, 2015) ^[12, 8]. Therefore, productivity enhancement and conservation of indigenous genetic resources should be pursued as complementary strategies.

Although 66.93% of veterinarians perceived a decline in indigenous cows, 17.12% reported increasing trends in their working areas. This indicates the presence of localized conservation efforts, increased awareness regarding indigenous breeds, and emerging interest in native cattle-based production systems. Government initiatives such as the Rashtriya Gokul Mission have further promoted conservation, development, and sustainable utilization of indigenous cattle breeds (DAHD, 2019) ^[5]. However, the overall declining trend observed in census data indicates the need for broader and sustained conservation interventions.

In this study of comparing census information and field veterinarians' perceptions, Livestock Census data provide large-scale quantitative estimates and veterinarians provide practical insights regarding local population changes, breeding practices, and farmer preferences. FAO (2012) ^[7] emphasized the importance of participatory and field-based approaches for characterization and management of animal genetic resources, particularly where continuous population monitoring is limited.

The results emphasize the need for conservation strategies that support community-based breeding initiatives, strengthen in-situ conservation programs, maintain viable indigenous cattle populations, particularly breeding males, and increase the economic value of indigenous cattle products. For Krishna Valley breed of cattle who are in few thousands, Gokhale and Bhagat (2012) ^[10] have proposed phenotypic purification of the mixed cattle population through genetic selection for conservation and improvement of this breed. Most of the cattle breeds, which used to be the pride of Karnataka, have suffered a decline in population and require similar efforts to arrest this decline (Rahul Behl *et al.*, 2023) ^[14]. Indigenous cattle conservation should be seen as an investment in preserving genetic resources necessary for future livestock production that is climate-resilient, rather than only as a way to preserve traditional breeds.

Conclusion

The present study revealed a declining trend in indigenous cattle populations in Karnataka, which was consistently reflected in both Livestock Census data and field veterinarians' perceptions. The higher decline observed among indigenous bulls and bullocks highlights the impact of artificial insemination programmes, agricultural mechanization, and changing livestock production systems. Integration of secondary population data with expert field observations provides a comprehensive approach for monitoring livestock genetic resource dynamics. Strengthening conservation programmes, maintaining indigenous breeding populations, promoting sustainable utilization, and supporting farmers rearing native cattle are essential for long-term conservation of indigenous cattle genetic resources in Karnataka.

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