



Genetic Resources of Livestock and Poultry in Uttarakhand State of India: A Comprehensive Review

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Authors' contributions

This work was carried out in collaboration between both authors. Author RSB did managed the literature searches, corrected and approved the final manuscript and Author OS wrote the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

Uttarakhand, a northwestern Himalayan state in India, is home to diverse livestock and poultry breeds adapted to its unique agro-climatic conditions. With its rugged terrain and varied ecosystems, the state offers a rich repository of indigenous animal genetic resources. Among these are native cattle like the Badri, goats such as Pantja and Chaugarkha, sheep like Muzzafarnagri, and poultry breeds including Uttara fowl. These animals, well-suited to the challenges of high-altitude living, play a vital role in sustaining rural livelihoods through dairy, meat, wool, egg and manure production. Despite a decline in indigenous livestock populations, grading-up and crossbreeding programmes have instrumental in increasing the production potential of the existing livestock. Notably, while the cattle and buffalo populations have declined, the goat and poultry

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populations have increased significantly, driven by growing market demands. The review also highlights the critical conservation efforts in the region, including breeding programmes aimed at preserving the genetic diversity of these local breeds. Significant initiatives such as those by the Uttarakhand Livestock Development Board, the Himmotthan Society, and the Department of Animal Genetics & Breeding at Govind Ballabh Pant University of Agriculture and Technology, Pantnagar focus on improving livestock productivity through selective breeding, artificial insemination and advanced reproductive technologies. Furthermore, these efforts aim to integrate modern agricultural practices with the preservation of traditional livestock systems. Genetic characterization of breeds like the Badri cattle, Uttara fowl, and Pantja and Chaugarkha goat breeds has been instrumental in their registration and conservation. The review underscores the importance of maintaining these indigenous genetic resources to ensure the sustainability of the region's agriculture, provide economic stability to farmers, and contribute to India's broader agricultural biodiversity. Continued research and robust policy support are imperative to safeguard these valuable genetic assets for future generations and to harness their full potential in strengthening the nation's livestock sector.

Keywords: Conservation; livestock; poultry; market; populations.

1. INTRODUCTION

India is rich repository of livestock species viz. cattle, buffalo, sheep, goat, pig and various domesticated poultry species. The Indian subcontinent has been a cradle for the earliest domestication of several farm species. During the Indus Civilization, cattle husbandry was a primary occupation, playing a crucial role in both the nutritional and economic aspects of their society (Mishra & Niranjana, 2022). Uttarakhand, a northwestern Himalayan state of India, is known for its rich biodiversity and diverse agro-climatic conditions, which support a variety of indigenous animal genetic resources. The state, characterized by its mountainous terrains, rivers, and forested landscapes, is home to several native livestock and poultry breeds that have adapted to the challenging environmental conditions over centuries.

India is home to approximately 536.82 million livestock and 851.12 million poultry (Department of Animal Husbandry & Dairying, 2019). According to the 20th Livestock Census (2019), the total livestock population in the Uttarakhand state, including poultry, stands at 96.78 lakhs. Uttarakhand's livestock population, in comparison to the national figures, comprises 0.96% cattle, 0.79% buffaloes, 0.38% sheep, 0.92% goats, 0.20% pigs, and 0.59% poultry. Notably, while the overall cattle population has declined, there has been a marked rise in crossbred cattle, accompanied by a decrease in indigenous cattle numbers. This shift indicates the direct impact of ongoing Breed Improvement Programmes leading to increase production potential existing livestock resource. Additionally, both buffalo and sheep populations have

witnessed a decline, whereas goat numbers have increased significantly. A particularly notable trend is the sharp rise in poultry population, most likely driven by the growing demand for poultry meat and eggs (Department of Animal Husbandry, Government of Uttarakhand, 2019).

As of now, India has a total of 230 registered indigenous breeds of livestock and poultry. This includes 53 indigenous cattle breeds plus on synthetic cattle breed (Frieswal), 21 buffalo breeds, 41 goat breeds, 46 sheep breeds, 8 horse and pony breeds, 9 camel breeds, 15 pig breeds, 4 donkey breeds, 5 dog breeds and 2 yak breeds in the livestock category. In the poultry category, there are 20 chicken breeds, 1 geese breed, and 4 duck breeds (ICAR-NBAGR, 2025). Among the 230 recognized breeds in India, Uttarakhand is home to one registered breed each of cattle, sheep, and chicken, along with two recognized goat breeds (ICAR-NBAGR, 2025).

Therefore, this review explores the genetic resources of Uttarakhand, focusing on their importance, conservation efforts and potential role in advancing modern agriculture and livestock enhancement programs.

2. GENETIC RESOURCE OF CATTLE

Uttarakhand, a Himalayan state in northern India, is home to diverse cattle genetic resources uniquely adapted to its varied agro-climatic conditions. The indigenous Badri cattle, the only registered breed from the region, thrive in the hilly terrain due to their resilience, disease resistance, and ability to sustain on forest-based fodder. Additionally, crossbreeding programmes

have introduced high-yielding dairy breeds such as Jersey and Holstein Friesian in the hilly terrains and plains, respectively, to enhance milk production. These genetic resources play a vital role in the livelihoods of rural farmers, contributing to dairy farming, draught power, and sustainable agriculture in the region. Conservation and selective breeding efforts continue to improve productivity while maintaining the adaptability of local breeds.

2.1 Badri

The breeding tract of Badri cattle in Uttarakhand state is Chamoli, Uttarkashi, Rudrapur, Tehri Garhwal, Pauri Garhwal, Champawat, Pithoragarh, Bageshwar, Almora and Nainital. The Badri cattle, also known locally as *Pahadi*, is an indigenous breed found in the hilly regions of Uttarakhand. These cattle are primarily reared for milk production, draught power, and manure, making them an integral part of the traditional farming system in the region. They thrive at altitudes ranging from 1,200 to 2,200 meters above sea level, with daily sunshine exposure varying between 6 to 10 hours. The major crops cultivated in their breeding tract include wheat, maize, rice, bajra, barley etc. Badri cattle are well adapted to the challenging hilly terrain and climatic conditions of Uttarakhand. Their balanced gait enables efficient movement on steep slopes, making them ideal for agricultural activities in mountainous areas. The management system for these cattle follows a semi-intensive approach. Adult animals primarily rely on grazing and fodder, with feeding practices involving stall-feeding in the morning and evening, while grazing occurs from late morning until early evening. They are typically housed

under the dwelling-house or in separate cowsheds during the night. Fodder mainly consists of crop residues/by-product and grasses collected from hillsides, often carried by women, reflecting the deep integration of Badri cattle in the rural agrarian lifestyle. Their resilience and adaptability make them an invaluable genetic resource for sustainable livestock farming in Uttarakhand.

Badri cattle exhibit a diverse coat colour, predominantly black, red, or grey. Their horns are curved upward and inward, measuring approximately 10–22 cm in males and 15–25 cm in females (ICAR-NBAGR, 2016). These cattle are small-sized, active, and sure-footed, making them well-suited for the rugged terrain of Uttarakhand. They possess a straight forehead with a prominent poll, a medium to large hump, and a small udder that is neatly tucked-up with the body. In terms of body measurements, the average height is 110.5 cm in males and 108.0 cm in females, while the average body length is 115.2 cm in males and 116.3 cm in females (ICAR-NBAGR, 2016). The heart girth is 145.2 cm in males and 140.5 cm in females, reflecting their compact and well-proportioned build. The average body weight of Badri cattle is 257.00 kg for males and 231.00 kg for females, with an average birth weight of 17.20 kg for males and 16.20 kg for females. These physical characteristics highlight the breed's adaptability to the hilly terrain and climatic conditions, making them an essential livestock resource for the region. The average litter size born, age at first parturition, parturition interval, milk yield per lactation and milk fat are 1.00, 49.00 months, 13.40 months, 632.00 kg and 4%, respectively (ICAR-NBAGR, 2016).



Fig.1. Badri cattle (male)



Fig. 2. Badri cattle (female)

(Source: ICAR-NBAGR, Karnal)

3. GENETIC RESOURCE OF GOAT

The state hosts around 13,71,000 goats (Department of Animal Husbandry & Dairying, 2019). The state's goat genetic resources primarily consist of non-descript lesser-known indigenous goats, well adapted to harsh climatic conditions, rugged terrains and limited fodder availability. These goats are reared mainly for meat, milk and fibre, contributing significantly to food security and income generation for landless, small and marginal farmers. Efforts are being made to improve their productivity through selective breeding, scientific management practices and conservation programmes, ensuring sustainable goat farming in the region.

3.1 Pantja

Pantja is a registered goat breed native to the Tarai region of Uttarakhand, primarily reared for meat production by local farmers. These goats are known for their morphological resemblance to deer and are well adapted to the hot and humid climate of the Tarai region in Uttarakhand and the neighbouring districts of Uttar Pradesh (Khadda et al., 2019). The Pantja goat is a dual-purpose breed valued for both chevon and milk production. Farmers particularly appreciate the quality of Pantja chevon, leading to the practice of castrating bucklings at an early age of 7 to 10 days. The management system followed for Pantja goats is primarily extensive, with the animals being stationary rather than migratory. Adult goats rely on grazing and fodder for their nutritional needs. These goats are predominantly

reared by landless, small, and marginal farmers, with an average flock size of 7.2 animals.

The Pantja goat exhibits a fawn to brown coat colour, which gradually lightens on the ventral side. It possesses small horns, typically less than 15 cm in length, with a triangular shape that is twisted, slightly directed upwards and backwards, and ends in a pointed tip. A distinctive white streak is present on either side of the face, and the head has a slightly convex profile. The breed is also characterized by its pendulous ears. In terms of body measurements, the average height is 63.57 cm in males and 59.63 cm in females, while the average body length is 56.24 cm and 54.21 cm, respectively (ICAR-NBAGR, 2014). The heart girth averages 65.81 cm in males and 63.65 cm in females (ICAR-NBAGR, 2014). The adult body weight is approximately 22.91 kg for males and 18.81 kg for females, with an average birth weight of 1.96 kg in males and 1.85 kg in females (ICAR-NBAGR, 2014). The Pantja goat is an early-maturing and highly prolific breed, with a twinning rate exceeding 65%. It is favoured by farmers for its meat, milk, and reproductive efficiency. The breed has an average litter size of 2.0 kids per kidding. The age at first parturition is approximately 14.17 months, with a parturition interval of around 9.35 months (ICAR-NBAGR, 2014). In terms of milk production, the average milk yield per lactation is 127.0 kg, with a milk fat percentage of 3.87%. Additionally, the breed exhibits a dressing percentage of 56.0%, further enhancing its economic value for meat production (ICAR-NBAGR, 2014).



Fig. 3. Pantja goat (male)



Fig. 4. Pantja goat (female)

(Source: ICAR-NBAGR, Karnal)

3.2 Chaugarkha

The Chaugarkha, also known as the Kumaoni goat, is primarily found in the Almora, Pithoragarh, Nainital, Champawat and Bageshwar districts of Uttarakhand. This breed is mainly raised for mutton production. The average adult body weight is approximately 27 kg for males and 24 kg for females (ICAR-NBAGR, 2025).

Chaugarkha goats are small in size and reared for meat purpose. The coat colour of this breed varies from black, Fawn to white. The ear length,

height at withers, body length, heart girth, tail length, and horn length of Chaugarkha goats at full mouth age were 13.95 cm, 56.92 cm, 55.12 cm, 65.23, 10.81 cm, and 7.72 cm, respectively, in females and 14.91 cm, 62.95 cm, 57.12 cm, 70.21 cm, 12.73 and 13.27 cm, respectively, in males (Singh et al., 2025). The adult body weight of Chaugarkha goats at six teeth was 25.60 kg in males and 22.40 kg in females. They kid twice a year with one or two kids. Meat of this breed is coarse and devoid of fat. The udder is small with well set with small pointed teats. The she goats do not yield any appreciable quantity of milk except for nourishing the kids.



Fig. 5. Chaugarkha females

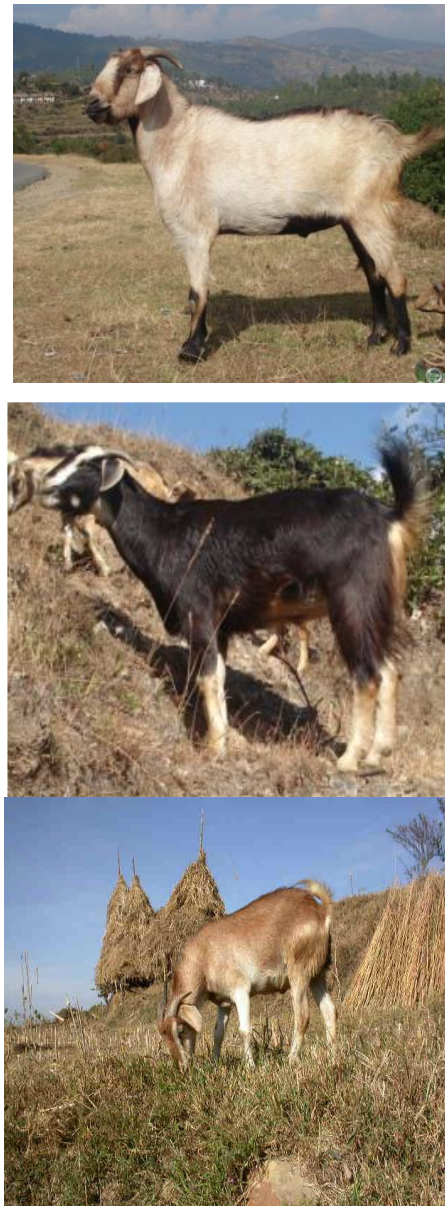


Fig. 6. Chaugarkha males

4. GENETIC RESOURCE OF SHEEP

The state's sheep population primarily includes Muzzafarnagri breed, which is well adapted to the local conditions and migratory grazing systems. These indigenous breeds are reared mainly for wool, meat, and manure, contributing significantly to the rural economy. The lesser-known black sheep of Garhwal, known for their medium-quality dense fleece, are also prevalent in the region. Conservation and genetic improvement efforts are being undertaken to enhance wool quality, productivity and overall sustainability of sheep farming in Uttarakhand.

4.1 Muzzafarnagri

The breeding tract of the Muzaffarnagri sheep is located in the Indian states of Uttarakhand (Dehradun) and Uttar Pradesh (Bijnor, Bulandshahr, Meerut, Muzaffarnagar, and Saharanpur). The breed is managed under an extensive system, with stationary mobility and a grazing-based feeding regimen. It is primarily white in colour, with occasional patches of brown or black, while the ears and face may also exhibit black markings. Both males and females are polled. Morphologically, the breed has a slightly convex face, long and drooping ears, and a coarse, open fleece that is predominantly white. The belly and legs are devoid of wool.

In terms of body measurements, the average height is 80.68 cm in males and 73.59 cm in females, while body length averages 80.32 cm and 73.53 cm, respectively (ICAR-NBAGR, 1995). The heart girth measures approximately 84.32 cm in males and 78.51 cm in females. The adult body weight is around 50.21 kg in males and 39.61 kg in females, with an average birth weight of 3.01 kg in males and 3.0 kg in females. Regarding reproductive performance, the breed typically produces a single lamb per birth. The age at first parturition ranges from 16 to 18



Fig. 7. Muzzafarnagri sheep (male)

(Source: ICAR-NBAGR, Karnal)

months, with a parturition interval of 6 to 8 months. The fleece yield varies between 0.6 and 1.0 kg per year, with an average staple length of 3.72 cm and a fibre diameter of 45.17 microns (ICAR-NBAGR, 1995). The breed exhibits a dressing percentage of 50.4%. Notably, it is recognized as one of the heaviest and largest sheep breeds in India (ICAR-NBAGR, 1995).

5. GENETIC RESOURCE OF POULTRY

The poultry population stands at approximately 50,18,000. Various species, including chickens, ducks, guinea fowl and quail, contribute significantly to the human food chain and family income. These species exhibit large genetic variation, which needs to be explored for improvement and conservation. Differences in body size, conformation, and colour patterns among these birds should be thoroughly described and evaluated using both phenotypic traits and DNA profiles. Additionally, these populations should be studied for unique traits related to disease resistance and their ability to survive under harsh climatic conditions.

5.1 Uttara Fowl

Uttara fowls are predominantly reared under the backyard system in the Kumaon division of Uttarakhand. This breed holds significant local importance, providing both nutritional and economic security to the farming communities (Jaiswal et al., 2017). Similarly, Uttara fowl is well adapted to the cold winter stress and thrives under challenging conditions, including poor housing, inadequate management, and limited feeding resources. The breed is characterized by its predominantly black plumage, a distinct crest or crown-like structure on the head, and feathery shanks. Uttara fowl is widely reared under traditional systems by marginal farmers, tribal communities, and other rural populations in the hilly regions of Uttarakhand (Jaiswal et al., 2017).



Fig. 8. Muzzafarnagri sheep (female)



Fig. 9. Uttara fowl (male)

The Uttara fowl is characterized by its compact body, alert nature, and strong adaptability. The breed exhibits normal plumage with a solid black coloration, a single comb, white skin, and yellow shanks. A distinct feature observed in approximately 18% of birds is the presence of feathered shanks and a bunch of feathers forming a crown-like structure on the head. In terms of growth, the average birth weight is 33.19 g in males and 33.04 g in females, with adult weights averaging 1.296 kg and 1.129 kg, respectively (Ansari et al., 2018). The breed reaches its first egg-laying stage at around 5.5 months, with a range of 5.4 to 5.8 months. The clutch size varies from 3 to 6 days, averaging 5 days. Annual egg production ranges from 125 to 160 eggs, with an average egg weight of 51.33 g (Ansari et al., 2018). The breed demonstrates a fertility rate between 71% and 86%, with an average of 81.36%, while the hatching percentage ranges from 59% to 71%, averaging 60.12% (Ansari et al., 2018). The dressing percentage varies between 70% and 78%, with an average of 76%. Uttara fowl is known for its unique traits such as high alertness, noisiness, strong fighting ability, and attractive plumage. The breed's lighter body structure and strong wings enhance its ability to escape predators by running swiftly or flying to safety. Notably, Uttara fowl produces more noise compared to commercial poultry breeds, making it a distinctive choice for backyard farming. Additionally, its meat is well regarded for its taste, further contributing to its popularity among rural and marginal farmers (ICAR-NBAGR, 2018).

6. CONSERVATION AND GENETIC ENHANCEMENT INITIATIVES

6.1 Badri Cattle Conservation and Genetic Enhancement

Recognizing the importance of preserving and enhancing its indigenous animal genetic



Fig. 10. Uttara fowl (female)

resources, Uttarakhand has undertaken several initiatives. The Animal Breeding Farm in Nariyalgaon, Champawat, established in 2012, focuses on the conservation and propagation of the Badri cow. Starting with 50 cows, the farm has expanded its population to over 300, emphasizing the significance of this breed in the state's livestock diversity (ULDB, n.d.).

To further boost the productivity of the Badri cow, the state government has proposed the use of advanced reproductive technologies, such as Multiple Ovulation Embryo Transfer (MOET) and in vitro fertilization (IVF). These methods aim to enhance milk yield and ensure the proliferation of high-genetic-stock cattle. The project, with an estimated cost of ₹50 crore, reflects the state's commitment to improving the livelihoods of mountain farmers through sustainable livestock development (The Hindu, n.d.).

6.2 Breed Improvement Initiatives by Himmotthan Society

The Himmotthan Society has been actively involved in enhancing livestock productivity in Uttarakhand's mid and higher Himalayan regions. Their initiatives include:

Large Ruminants (Cattle and Buffaloes): To address low milk yields, Himmotthan, in partnership with the Uttarakhand Livestock Development Board (ULDB) and the International Livestock Research Institute (ILRI), has performed approximately 28,500 artificial inseminations, resulting in 12,929 improved progenies as of December 2020. Preferred breeds among the community include Red Sindhi and Jersey for cattle, and Murrah for buffaloes.

Small Ruminants (Goats): Recognizing the non-descript nature and low productivity of local goats, Himmotthan promotes semi-stall feeding practices, construction of goat sheds,

introduction of improved feed, and selective breeding to avoid inbreeding. These efforts aim to make goat rearing economically viable for rural communities.

Backyard Poultry: To boost local poultry production, Himmotthan has established hatchery units in project clusters to reduce the cost of day-old chicks and promote the production of local birds (Himmotthan Society, n.d.).

6.3 Academic and Research Contributions

The Department of Animal Genetics & Breeding at Govind Ballabh Pant University, Pantnagar

has been instrumental in characterizing and conserving Uttarakhand's livestock genetic resources. Their achievements include:

Characterization of Badri Cattle and Tarai Buffaloes: The department has conducted studies to understand the unique traits of these indigenous breeds, aiding in their conservation and improvement efforts.

Characterization and Registration of Uttara Fowl: In collaboration with the Department of Livestock Production Management, the university has worked on identifying and registering this local poultry breed, ensuring its preservation and recognition.

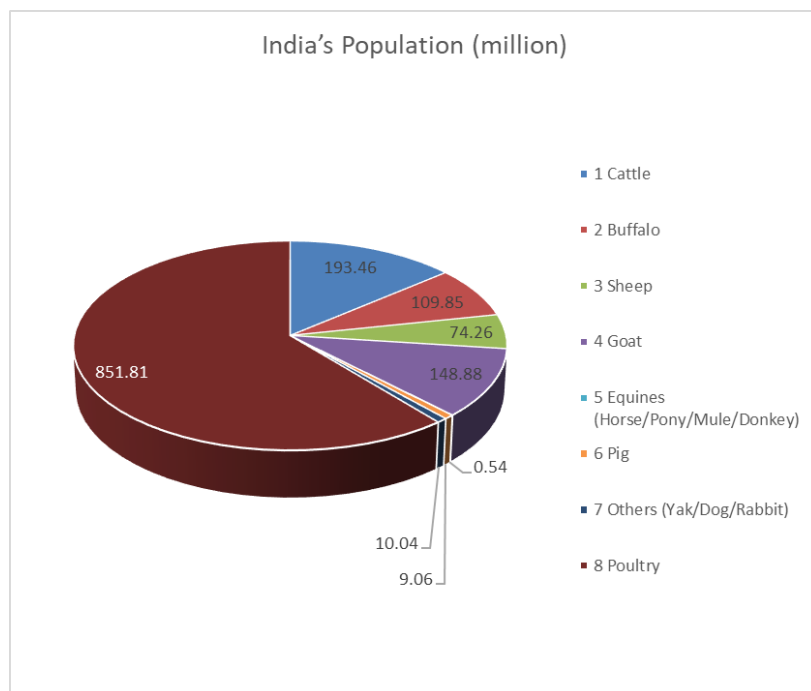


Fig. 11. Livestock and poultry population in india as per 20th livestock census

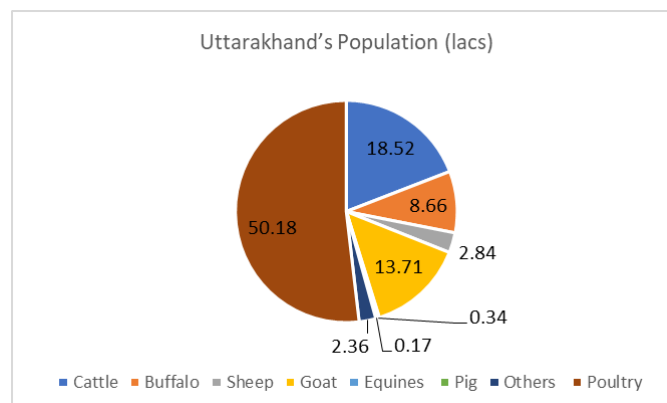


Fig.12. Livestock and poultry population in uttarakhand as per 20th livestock census

Table 1. Specieswise livestock population (2019)

S.NO.	Category	India's Population (million)	Uttarakhand's Population (lacs)
1	Cattle	193.46	18.52
2	Buffalo	109.85	8.66
3	Sheep	74.26	2.84
4	Goat	148.88	13.71
5	Equines (Horse/Pony/Mule/Donkey)	0.54	0.34
6	Pig	9.06	0.17
7	Others (Yak/Dog/Rabbit)	10.04	2.36
8	Poultry	851.81	50.18

(Source: 20th Livestock Census of Uttarakhand)

Table 2. Registration number of livestock and poultry breeds of Uttarakhand

Sr.No.	Breed	Home Tract	Utility	Accession Number
1	Badri	Uttarakhand	Milk and Draught	INDIA_CATTLE_2400_BADRI_03040
2	Pantja	Uttarakhand	Milk and Meat	INDIA_GOAT_2420_PANTJA_06024
3	Chaugarkha	Uttarakhand	Meat	INDIA_GOAT_2400_CHAUGARKHA_06040
4	Muzzafarnagri	Uttar Pradesh & Uttarakhand	Meat	INDIA_SHEEP_2024_MUZZAFARNAGRI_14014
5	Uttara	Uttarakhand	Egg and Meat	INDIA_CHICKEN_2400_UTTARA_12019

The above breeds of livestock and poultry have been registered by National Bureau of Animal Genetics and Breeding (NBAGR), Karnal, India

Characterization and Registration of Pantja and Chaugarkha Goats: The department of Livestock Production and Management of Govind Ballabh Pant University of Agriculture and Technology, Pantnagar has got registered Pantja goat in the year 2014 as a distinct goat breed of the country. Similarly, the department of Animal Genetics and Breeding along with other institutions got registered Chaugarkha goat breed in the year 2025.

Establishment of Elite Guinea Fowl Flocks: The department has developed elite flocks of guinea fowls suitable for semi-intensive systems, aiming to provide economic upliftment opportunities for rural women in Uttarakhand (Himmotthan Society, n.d.).

These concerted efforts by various organizations and institutions underscore Uttarakhand's commitment to conserving and enhancing the genetic resources of its livestock and poultry, thereby supporting sustainable livelihoods and preserving biodiversity in the region (Govind Ballabh Pant University of Agriculture and Technology, n.d.).

7. CONCLUSION

Uttarakhand's indigenous livestock and poultry breeds are important genetic resource for

sustaining rural economies and agricultural systems. Conservation and genetic enhancement efforts are crucial in preserving these genetic resources, improving productivity and ensuring food security. The state's focus on breed improvement, including the use of modern technologies, promises a bright future for these breeds. Continued collaboration between government bodies, research institutions and local communities is vital for the success of these initiatives.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that they have no known competing financial interests or non-financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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