



Sheep Farming in Assam: Harnessing Indigenous Potential for Sustainable Development and Needed Policy Interventions

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ABSTRACT

This paper emphasized the need for targeted scientific research, development of comprehensive management practices, and the adoption of improved strategies to boost productivity and income. Sheep farming played a vital role in supporting the livelihoods of small and marginal farmers, as well as landless labourers, by providing meat, wool, and skin as reliable sources of income. In India, sheep were mainly reared for meat and wool and were valued for their adaptability, lower feed requirements, and higher production efficiency compared to large ruminants. Despite these benefits, sheep rearing in Assam remained underdeveloped and largely traditional, with farmers practicing extensive grazing methods with minimal scientific interventions. The total sheep population in Assam has fluctuated, declining from 5.11 lakhs in 2012 to 3.32 lakhs in 2019, while the sector continued to face challenges such as lack of husbandry and veterinary care, improper breeding programs, and absence of structured farming packages. Moreover, most sheep were indigenous and unregistered, which limited their genetic improvement and productivity. Data from Assam highlighted issues such as lack of awareness, parasitic infestations, and inadequate infrastructure but at the same time there were signs of growth in sheep meat production. It goes without saying that state's agro-climatic conditions offered significant opportunities for large scale sheep rearing. With proper planning, genetic improvement, and efficient feed management, sheep farming in Assam could become a sustainable and economically viable livelihood option, helping to reduce poverty and uplift rural communities.

KEYWORDS: Sheep rearing, challenges, opportunities, sustainable livelihood, Assam

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1. INTRODUCTION

Globally, small ruminant husbandry significantly contributes to food security, gender equity, and poverty reduction among marginal communities (Islam et al., 2021). In India, sheep farming plays a vital role in ensuring livelihood security and supplementary income for millions of smallholders and landless labourers (Islam et al., 2019) providing meat, wool, skin, and manure and requiring relatively low inputs compared to larger ruminants. Their adaptability to diverse climatic and feeding conditions makes them integral to mixed farming systems, especially in dry as well as low-lying areas, where they effectively utilize scarce vegetation through grazing (Adegbeye et al., 2020). The economic significance of sheep rearing has been reported across various developing regions (Inal et al., 2021; Rebello-Morales et al., 2021; Gogaev et al., 2021; Merrouchi et al., 2021). In recent decades, the focus of India's sheep husbandry has shifted from wool to mutton production due to changing consumer preferences, rising meat demand, and better market returns (Bhateshwar et al., 2022). The country ranks among the world's top sheep producers, significantly contributing to meat supply, employment, and rural income (Balasubramaniam, 2024). India is also the leading exporter of sheep and goat meat, exporting 10,828.99 mt during 2023–24 valued at ₹ 643.55 crores (Anonymous, 2023a), mainly to the United Arab Emirates (75.16%), Qatar (10.62%), Kuwait (5.54%), Saudi Arabia (2.91%), and Oman (2.69%) (Anonymous, 2021a). Rearing systems influence performance, with ewes under intensive management reaching puberty and first service earlier than those in semi-intensive or extensive systems (Rangamma et al., 2022). Intensive systems yield higher gross and net income per animal due to greater weight gain (Karthik et al., 2021). Despite this, sheep rearing in north-eastern India, particularly Assam, remains underdeveloped. Farmers largely depend on indigenous, non-descript flocks maintained under extensive/ free-range conditions with minimal scientific inputs. Such systems, though low-cost, are vulnerable to parasitic infestations such as coccidiosis (Singh et al., 2025) and gastrointestinal nematodes (Das et al., 2025), which are of global concern (Miller et al., 2012). Proper housing under intensive management ensuring ventilation, hygiene, and efficient handling enhances welfare, health, and productivity (Popescu et al., 2014; Hossain 2021; Waiz and Gautam, 2024). Indigenous sheep of Assam, though well adapted to resource-scarce conditions, remain scientifically neglected, limiting opportunities for genetic and management improvements. At the national level, the Indian Council of Agricultural Research (ICAR) and its institutes, including the Central Sheep and Wool Research Institute (ICAR-CSWRI) and the National Bureau of Animal Genetic Resources (ICAR-NBAGR)

have developed several synthetic and composite breeds with improved meat and wool yields across diverse agro-climatic zones (Anonymous, 2011–12; Mishra et al., 2017). Crosses between indigenous and exotic breeds produced various strains (Singh et al., 2005). However, region-specific studies on feeding, health, and genetic potential are lacking for Assam. Transforming traditional extensive systems into semi-intensive or intensive models emphasizing improved breeding, nutrition, and healthcare is essential for sustainable growth (Pangamma et al., 2025). Rising meat preference, expanding markets, and favourable agro-climatic conditions indicate vast potential for a profitable sheep industry in Assam. Scientific recognition and characterization of indigenous sheep, coupled with supportive policies, could significantly enhance rural livelihoods. Prioritizing selection and pure breeding of native breeds can improve body weight and mutton traits (Bhateshwar et al., 2022). Strengthening extension delivery systems is equally important for effective technology dissemination for enhancing farm income and improving rural livelihoods (Anonymous, 2010) for the benefit of the end users (Dhaliwal et al., 2022). This paper emphasized the need for targeted scientific research, development of comprehensive management practices, and the adoption of improved strategies to boost productivity and income.

2. SIGNIFICANCE OF SHEEP FARMING

Sheep farming plays a crucial role in supporting the livelihoods of small and marginal farmers, as well as landless labourers, by providing meat, wool, and skin as dependable sources of income. In India, sheep are primarily raised for meat and wool and are valued for their adaptability, lower feed requirements, and higher production efficiency compared to larger ruminants. Despite these benefits, sheep rearing in Assam remains underdeveloped and mostly traditional, with farmers practicing extensive grazing methods with minimal scientific intervention. The total sheep population in Assam has fluctuated, decreasing from 5.11 lakhs in 2012 to 3.32 lakhs in 2019 (Anonymous, 2019a), while the sector continues to face challenges such as a lack of husbandry and veterinary care, poor breeding programs, and the absence of structured farming packages. Moreover, most sheep are indigenous and unregistered, which limits their genetic improvement and productivity. Data from Assam highlight issues such as lack of awareness, parasitic infestations, and inadequate infrastructure, but simultaneously, there are signs of growth in sheep meat production. It is evident that the state's agro-climatic conditions offer significant opportunities for large-scale sheep rearing. This paper emphasizes the importance of targeted scientific research, the development of comprehensive management practices, and the adoption of improved strategies to increase productivity and income. With proper planning, genetic enhancement, and efficient

feed management, sheep farming in Assam can become a sustainable and economically viable livelihood, helping to alleviate poverty and uplift rural communities. A commercially farmed animal is primarily raised for meat, skin, and wool production. A large section of farmers with small fam holding are dependent on sheep rearing for livelihood generation and maintenance of their families. Most of the sheep reared in India are basically raised for both meat and wool. Although sheep were traditionally reared for wool and much emphasis was placed on wool production in the past, farmers' interest has now shifted towards meat, as mutton presently yields a higher income compared to wool (Bhateshwar et al., 2022).

Islam et al. (2019) reported on the involvement of 12.50% people in animal husbandry activities from Dhubri district of Assam. As sheep possesses good grazing ability they require less inputs for remunerative production. They also have better production efficiency than large ruminants and have easy marketability, better adoptability to climatic variations. Sheep rearing in many developing countries helps in empowering women and reducing poverty (Islam et al., 2021). However, sheep rearing is not so popular in India as in Australia and New Zealand (Islam et al., 2019).

3. SPIRITUAL AND CULTURAL SIGNIFICANCE OF SHEEP ACROSS RELIGIONS

Sheep have played an important role in many religions and cultures throughout history. In Christianity, the lamb stands for being innocent and pure. In Christianity, Jesus is called the "Lamb of God" because his sacrifice is believed to forgive people's sins. In Judaism, a lamb is offered during Passover (a Jewish holiday) and was first sacrificed on the night of the Exodus from Egypt. The sacrificed lamb should be young male without blemish and its blood is sprinkled on the altar to protect families from danger (Anonymous, 2025a). In the Islamic religion, there is a story about Abraham (Ibrahim in Arabic) being asked by God to sacrifice his son- Ismael. Before it happened, a ram was given instead, showing Abraham's faith and obedience. The Khnum, one of the earliest Egyptian deities, who had a ram's head, was believed to be associated with fertility, rebirth, regeneration, and resurrection (Anonymous, 2025b). In Hinduism, the ram/sheep is connected with deities. In RV 1.51 and 1.52, the word mesa is used as a title for Indra, the God of thunderstorms and war, calling him a famous and praised ram who brings blessings (Anonymous, 2025c). In astrology, the sheep as a symbol of Aries, which is also known as Mesha Rashi, is the first sign of the zodiac, symbolizing new beginnings, energy and initiatives (Anonymous, 2024). Aries in Western astrology and the sheep sign in Chinese astrology represent creativity,

courage, and kindness. In Tibet, sheep are used in special rituals to remove bad luck. Many cultures, such as Persian, Sumerian, and Hebrew, view sheep as symbols of protection, strength, and spiritual guidance. These beliefs show how sheep have been important to people's lives for thousands of years (Anonymous, 2025d).

4. DOMESTICATION AND EVOLUTION OF SHEEP

Zoo-archaeological evidence suggests that sheep were first domesticated in south west Asia (Kaptan et al., 2024). Most acceptable hypothesis states that present day's *Ovis aries* descended from Asiatic Mouflon (*O. gmelini*), a wild native to Cyprus and Caspian, from which European mouflon (*Ovis aries musimon*) descended (Anonymous, 2025e). Domestication of sheep falls way back between 11,000 to 8,000 BCE in Mesopotamia; however, archaeological evidence suggest that woolly sheep developed around 6,000 BCE (Anonymous, 2025f). Present day *Ovis aeries* is a purely domestic animal which survives only on human's assistance for its health and welfare. The exact path from wild ancestors to domestic sheep is not clearly known (Hiendleder et al., 2002). Archaeological evidence suggest that sheep were domesticated in the Indus Valley Civilisation around 3300 to 1300 BC. During the time of Mughal (1526–1857), sheep rearing in India got more importance and they established sheep farm in various parts of India (Ali, 2023).

5. POPULATION OF SHEEP – INDIA VERSUS ASSAM

The total sheep population in India is 74.3 million as per the 20th Livestock census. Several wild varieties of Sheep (*Ovis orientalis vignai*) found in the mountains from Afghanistan to Armenia are considered probable ancestors of Indian Sheep, and the inhabitants of Mohenjo-Daro and Harappa had already domesticated them (Anonymous, 2025g). The indigenous sheep breeds of India display wide variations in adaptability, productivity, feed efficiency, and resistance to diseases (Jeyakumar, 2024). The National Bureau of Animal Genetic Resources (ICAR-NBAGR) registered 46 indigenous breeds of sheep as of January 2025 (Anonymous, 2025g). In 2022, the International Wool Textile Organization listed India as having the second-largest population of sheep in the world (Balasubramaniam, 2024), with 5.7% (75.3 M) of the global share of 1320 M, next to China with 194 M sheep (Anonymous, 2025h), and Australia ranks third. Due to their resilience and ability to thrive in arid environments, sheep are predominantly concentrated in the north-western and southern India of the country. Based on their distribution in India, they are broadly classified into four regions: the Northern Temperate Region, the North-Western Region, the Southern

Peninsular Region, and the Eastern Region (Yadav et al., 2017). As per the 2019 census, with nearly 25.72% of the total, Telangana ranks first in sheep population, while Andhra Pradesh and Karnataka hold second and third position with 23.70 and 14.95%, respectively. From the 19th and the 20th Livestock censuses, it has been found that more than 94% of the total sheep of India are indigenous, and the rest are exotic/crossbred (Anonymous, 2019a). According to the 20th Livestock Census, the sheep population of Assam has decreased to 3.32 Lakhs in 2019 from 5.11 Lakhs during 2012, and more than 98% are indigenous (Anonymous, 2019a) scattered over the entire length and breadth of the state, but more concentrated in lower and Middle Assam. As per the 20th livestock census (Anonymous, 2025i), the Barpeta district accounted for the highest share of sheep population (15.6%), followed by Darang (10.6%), Dhubri (9.7%), Cachar (8.2%), Karimganj (7.1%), Goalpara (7.0%), Nagaon (5.6%), Kamrup (5.3%), Nalbari (4.8%), and South Salmara (4.5%), ranking among the top 10 districts. Between 2012 and 2019, the sheep population in Barpeta, Darang, Dhubri, Goalpara, and Kamrup districts declined substantially, ranging from 15% to 73%. The birth weight and adult body weight of indigenous sheep of Assam are 900 g and 17.8 kg, with age at puberty and age at first lambing being 7 and 13 months, respectively, under a free-range system (Zaman and Akhtar, 2019). The local sheep of Assam, predominantly brown in colour and smaller in size, produce low-fat mutton, rough wool, and good-quality skin (Islam et al., 2019).

6. SHEEP REARING PRACTICES – ASSAM VERSUS INDIA

The agro-climatic conditions of Assam are suitable for farming of sheep, which is primarily maintained for meat production. Sheep rearing in Assam is mostly confined to economically weaker section of the society. Only a few farmers are engaged in this sector, and these farmers are mainly rearing local sheep (non-descript sheep) in a free-range/ extensive system. However, these farmers are mainly rearing it in a complementary manner along with the rearing of other livestock like goat and cattle. In Assam, to date, no comprehensive information on the scientific method of sheep rearing for increasing production potential is available. This species is neither incorporated in the Package of Practice (PoP) nor is it being registered. Therefore, for the betterment of the farming community, this valuable species needs upliftment, and a concrete PoP on non-descript sheep of Assam should be developed. There are four Government Sheep and Goat Breeding Farms (Anonymous, 2019b), where sheep are rarely found or are virtually absent. Accounting for around 8.5% of total livestock output, sheep rearing plays a vital role in arid, semi-arid, and mountainous areas where farming and dairy production are not feasible,

and in India, sheep are mainly raised on grass and fodder naturally available in grazing lands, wastelands and fallow areas. They are also commonly fed with stubbles and residues of cultivated crops (Wodeyar and Kadam, 2018). Islam et al. (2019) reported on sheep rearing practices in Dhubri district of Assam, highlighting that the system remains predominantly traditional, with most resource-poor rural farmers relying entirely on natural pasture grazing to manage their flocks. Comparable conditions are observed in several other sheep-rearing pockets across the state. In some parts of the state farmers also feed their sheep with home-grown grains and a small amount of concentrate feed. Sheep were not kept in separate housing; instead, they were released into the fields during the day when no crops were grown and brought back to the night shelter before evening. Leaves of commonly available trees like jackfruit, mango, guava, banana, neem etc. are the only source of food for the animals during natural calamities like flood when they often temporarily shifted to safer elevated lands. Sheep have the ability to acquire their daily food even from marshy land, particularly during the rainy season when the grazing lands are inundated by flood water. In such conditions they commonly suffer from parasitic infestations like liver fluke, which may lead to death of a section of sheep when the condition is aggravated due to non-availability of food. Most farmers of Assam indicated that sheep generally have two breeding seasons, occurring during June–August and January–March. Vaccination of sheep is rarely practiced by the farmers of the state (Islam et al., 2019). Therefore, to utilize the production potential of the local sheep population it is essential to adopt scientific management practices, through which there is enough scope of enhancing the income of the rural farmers. However, because of the market demand of meat and meat products and acute shortage of grazing land (0.77 ha available/ACU against 3 ha/ACU as per CSWRI, Avikanagar), the intensive production system by rearing and feeding in the stalls with minimal inputs is one of such promising options (Rangamma et al., 2025) to improve meat supply and carcass quality. Earlier study indicated that rearing system has immense impact on higher and quality meat production in sheep (Rangamma et al., 2025).

7. SCIENTIFIC WORK AND DATA – ASSAM VERSUS INDIA

Research in India has significantly contributed to the development of the sheep sector through genetic improvement, crossbreeding, and conservation programs. The Indian Council of Agricultural Research (ICAR) and its institutes, like Central Sheep and Wool Research Institute (CSWRI) and National Bureau of Animal Genetic Resources (NBAGR), have played key roles in developing synthetic breeds such as Bharat Merino, Kashmir Merino,

and Hisardale for fine wool, as well as prolific crosses like Garole×Malpura for enhancing mutton production (Mishra et al., 2007; Anonymous, 2011–12; Mishra et al., 2017). Molecular characterization and breed surveys by NBAGR have further helped to conserve indigenous sheep diversity while guiding breeding policies for sustainable improvement (Sodhi et al., 2003; Arora and Bhatia, 2004). In the last couple of decades, many synthetic breeds of sheep have been developed with the aim of enhancing wool and meat production. These synthetic breeds or strains created by crossing indigenous sheep with exotic breeds (like Merino, Rambouillet, Suffolk, Dorset, and Karakul) showed promising results at research stations and government farms, but when introduced to farmers' fields, they did not perform well because of limited inputs, poor healthcare, weak management, and lack of expertise under real farming conditions (Bhatia and Arora, 2005). However, because of their good adaptability, indigenous breeds are best suited to Indian conditions, and with farmers showing more interest in meat than wool production, the sheep industry has taken a promising path marked by enhanced growth in sheep meat over the last two decades.

Conversely, the information on sheep husbandry practices in Assam is insufficient, which hinders the extension workers as well as policymakers from formulating effective production strategies. No comprehensive information on the scientific method of sheep rearing (non-descript Sheep) for increasing production potential is available, except for some scattered information. The study from Dhubri district of Assam revealed that the majority (56.67%) of the sheep farmers were illiterate, similar to the findings of Telangana, where Rajanna et al. (2012) reported 74.65% illiterate people in sheep rearing. Very few studies have been conducted on indigenous sheep of Assam, including a study on rearing practices (Islam et al., 2019), some blood enzymatic (SGPT, SGOT, LDH, ALP, GGT, and Amylase) profile (Das et al., 2017), blood plasma macro-mineral (Ca, P, Mg, Na, K, and Cl) profile (Ali et al., 2017), and carcass quality. Although there are four Government Sheep and Goat Breeding Farms (Anonymous, 2019b), the farms are either devoid of sheep or receive minimal efforts for their multiplication. This unattended species is also not included in the Package of Practices (PoP); therefore, for the betterment of the farming community, it is essential to promote this valuable species and develop a comprehensive PoP for the non-descript sheep of Assam.

8. GROWTH OF SHEEP POPULATION AND SHEEP MEAT PRODUCTION IN ASSAM VERSUS INDIA

The Sheep population in India and Assam, as per the report of livestock census, is shown in Table 1.

Table 1: Sheep population in Assam versus India during 1997–2019

Parameters	1997	2003	2007	2012	2019
India (in Million)	57.5	61.5	71.6	65.1	74.3
Assam (Lakhs)	0.84	1.7	3.54	5.11	3.32

In India, the average year-to-year (YoY) growth rate of the Sheep population was 7.08% and it grew by 14.1% in 2019 over 2012. From 1997 to 2019, the average YoY growth of 54.99% was observed in Assam, although growth was highly negative in 2019 over 2012. An aligned Average Annual Growth Rate (AAGR) and Compound Annual Growth Rate (CAGR) of 1.33% and 1.17% represent a stable growth of the sheep population in India. In Assam, AAGR and CAGR were recorded as 13.42 and 6.45%, respectively, showing high potential but unstable growth due to volatility.

In terms of meat production in India, sheep meat accounted for 11.08% of India's total meat production of 10.3 mt derived from the slaughter of 80.70 M sheep during 2023–24. The YoY growth rate for sheep meat was 8.93% (ranging from -2.1% to 14.82%) between 2007–08 and 2023–24 (Anonymous, 2013, 2014, 2015 and 2017; Anonymous, 2019c; Anonymous, 2021b; Anonymous, 2023b and Anonymous, 2024b), with an aligned AAGR of 9.22% and CAGR of 9.47%. Such a steady growth rate signifies a strong and sustainable expansion of sheep meat production, reflecting its rising demand, economic potential, and increasing contribution to food security and rural livelihoods. Despite this trend, it is seen that sheep farming in India lacks proper marketing facilities like meat processing, storage, and refrigerated transport, as well as public-private partnerships, but with good veterinary support and rising demand, there is a big opportunity for exports and value-added products (Bhateshwar et al., 2022).

In Assam, sheep meat constituted 3.51% of the total 68.68 thousand tons of meat produced in 2023–24, with 4 lakh sheep slaughtered. During the period from 2007–08 to 2023–24, the YoY growth rate was found as 21.06%, with an AAGR of 26.45%, and a CAGR of 16.87%. The remarkable growth rate of sheep meat production from 2007–08 to 2023–24 reflects more expansion of the sector, highlighting its growing demand, economic potential, and vital role in supporting livelihoods. Considering the higher growth of the sheep population and meat production in Assam, greater focus should be directed towards sheep rearing and strengthening the sheep meat production system in the region.

In India, about 77–80% of the population identifies as non-vegetarian, as per NFHS-5 estimates, while in Assam, the preference is even more pronounced, with surveys showing nearly 79–80% of people consuming non-vegetarian

food. This aligns with the 2022–23 expenditure survey, where Assam ranked second only to Kerala in the share of household food budgets spent (17% of their food budget on non-vegetarian food) on eggs, fish, and meat (Mittal, 2024).

The average sheep meat production per animal in Assam was 6.68 kg, which is nearly 50% lower than the national average of 13.04 kg, based on data from 2007–08 to 2023–24. This might be due to the smaller size of the Sheep species of Assam. One earlier study revealed that the carcass weight of indigenous sheep of Assam varied from 4.14 kg to 6.33 kg animal⁻¹. Sheep breed improvement in Assam can be accomplished through pure line breeding within the same high-merit Indigenous breed (example Deccani sheep for higher meat per animal), crossbreeding lesser or non-descript breeds with superior ones, or using exotic germplasm to enhance traits like meat and wool production, as proposed by Bhateshwar et al. (2022).

8.1. Policy interventions tailored for Assam's context

With the growing demand for meat in Assam, where meat is more preferred than other animal proteins, and encouraging trends in both sheep population and sheep meat production growth, the following interventions are suggested

8.1.1. Inclusion in state breeding policy

Sheep should be formally incorporated into the State Livestock Breeding Policy of Assam, with clear strategies for conserving indigenous breeds, introducing selective and crossbreeding programs, and ensuring genetic improvement for higher meat productivity.

8.1.2. Establishment of breeding and multiplication farms

Dedicated sheep breeding and multiplication farms must be set up in key districts to supply superior germplasm, strengthen breed conservation, and provide quality breeding stock to farmers.

8.1.3. Scientific management and market support

There is a need to develop and implement a comprehensive Package of Practices (PoP) for sheep rearing, training of farmers through frontline extension agencies like KVKs, extension and veterinary establishments/ institutes, and creating value-chain infrastructure, including processing, storage, and cooperative-based marketing to enhance farmer income.

8.1.4. Recognition of the indigenous sheep variety of the state as a separate breed

Phenotypic and genetic characterization of the local population of sheep needs to be done to establish it as a separate indigenous breed through ICAR-NBAGR recognition.

8.1.5. Strengthening research on increasing productivity

Emphasis must be given to the identification of research gaps and mobilizing funding towards research on scientific

interventions needed for enhancing the productivity of the indigenous sheep population.

9. CONCLUSION

Although most of the sheep reared in Assam were indigenous and/ or nondescript, a significant number of people depend on this sector for their livelihood. However, this valuable and largely neglected resource has received very limited attention in terms of scientific research and development. With proper planning and focused efforts on genetic improvement, feed availability, and scientific management practices, sheep rearing in Assam could become a viable livelihood option by increasing meat production and thereby promoting sustainable growth for the farming community.

10. FUTURE COURSE OF RESEARCH/ ACTION

Emphasis should be given to systematic research on genetic improvement, nutrition, health management, and disease resistance of Assam's indigenous sheep, while documenting their productive traits. Strengthening farmer-oriented field trials, multiplying superior germplasm, and promoting adaptive research on intensive and semi-intensive rearing systems will be crucial for enhancing productivity and ensuring sustainable growth of the sheep sector in Assam.

11. ACKNOWLEDGEMENT

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