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Exploitation of unconventional indigenous livestock genetic resources and their conservation strategy

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Abstract
Indigenous livestock species have coexisted with humans for many generations, providing important food, financial resources, a sense of social standing, and cultural value. The livestock situation of today is dictated by demand, not resources, which were previously set by regional conditions and ecosystems. Because of this, specific traits of native animal breeds with low production are ignored in modern, high-input agricultural techniques. Because of this, old multipurpose breeds have gradually been replaced by high-yielding ones, and farming has changed to become more profit-driven. It makes sense to focus on native livestock's unique traits for the purposes of conservation and as a source of revenue, as they cannot out produce industrial livestock systems. Fortunately, many indigenous breeds and species have a great potential to produce items that customers demand and value, but this potential is often underutilized. Many native breeds are characterized by unique qualities like colourful wool, disease resistance, patterned hides, ultra-fine fiber, very flavourful meat, or milk with health advantages. Local producers of unique commodities have the ability to generate significant demand and prevent the extinction of endangered breeds.

Keywords: Indigenous livestock species, coexistence with humans, food, financial resources

Introduction
Raising native livestock breeds is usually less profitable in the current economy than keeping high-yielding commercial varieties. Characterizing local germplasm; specifically, attributes related to product quality needs immediate attention because it has the potential to elevate native breeds in the contemporary consumer landscape. In certain wealthy countries, it is common knowledge that local breeds are important for creating fine dining experiences. In Europe, a range of specialized cheeses and meats are associated with particular breeds. Customary procedures are often used in the processing of items bred locally. The need to preserve milk or meat without refrigeration has led to the creation of unique-tasting cheese and sausages. Local identities have been reinforced, native breeds have been preserved, and rural economies have grown as a result of the promotion of cheeses, sausages, wool, and other specialty commodities. Nonetheless, poor countries do not have many examples of this approach. Tradition cattle, their products, and their methods of processing must be identified and documented. For breeding and sustainable conservation, it is also essential to assess these breeds genetically so that biomarkers linked to certain traits can be used. More research is needed to determine the particular qualities of the products in terms of their therapeutic advantages, nutritional worth, and sensory elements. A strategy such as this will result in: A list of the traditional goods that are now produced and methods of processing the selected breeds can aid in comprehending the technological requirements for producing goods that are tailored to the preferences of urban consumers and awareness among collectives. The potential and promise of regional breeds, the necessity of a unique product label or brand, and the economic benefits these breeds offer are discussed with policy authorities and professionals in the business sector. The list of current scientific studies that attest to the superior qualities of Indian cattle and which can be employed to boost their worth and promote sustainable use is provided below.

Potential worth of Unconventional Livestock Species and Their By products
The usage of milk from non-traditional animal species, such as camels and donkeys, has grown recently, primarily due to the belief that these species may meet the demands of

particular demographic groups, such as the elderly and new-borns. Over the past few years, there has been a significant increase in research on their milk to understand their special functional qualities, such as immunomodulation, hypoallergenicity and antimicrobial activity. This research has focused on the effects of these properties on human health and the potential applications of their nutritional, medicinal, and cosmetic qualities.

Milk from Donkey

In many developing nations, the donkey (*Equus asinus*) is one of the most valued domestic animals in terms of economic value. While donkey milk is more suited for infants than the milk of other mammals and has a composition similar to that of human milk, donkey meat is a nutritious diet with a high protein content but low fat and cholesterol content. Either fresh or powdered, it is consumed. For customers who have dairy allergies, such as a cow's milk protein allergy, it is regarded as a good substitute. Due to its low casein content which is quite similar to that of human milk it has a low allergenicity. Specifically, several phosphorylated versions of αs1- and β-caseins are seen.

Milk from Camel

The ecosystem of the desert and dry plain areas depends heavily on the dromedary camel. It provides milk for communities that raise camels in addition to being a crucial mode of transportation. Because of its abundance of nutrients and ability to strengthen immunity, camel milk is regarded as the "white gold" and a powerful force for health. It has anti-infectious, anti-cancer, and anti-diabetic properties. Due to the rich vitamin C, several minerals, and immunoglobulin content of camel milk, COVID-19 has raised interest in and focuses on immunity-boosting supplements. In the current era of declining draught value, it might serve as the primary criterion for the survival of native camels. The inclusion of these components in camel milk could serve as the primary criterion for the survival of native camel breeds in this era of diminishing draught value. It has been stated that camel milk is used to treat a number of illnesses, including tuberculosis. In the Middle East, camel milk production has flourished as a trade. India is gradually coming around to the idea of producing and consuming camel milk since camel milk has become more and more popular throughout the world. Camel milk from Gujarat's Kutch region is already on the shop shelves of the nation's largest metropolises. Due to the additional revenue generated by selling camel milk, camel herders are more inclined to maintain a larger number of animals. The herders' livelihoods and the steadily diminishing population of native camels may benefit from this. Numerous researches have recently examined the purported medicinal benefits of milk.

Milk from sheep

Sheep milk is regarded as a superior food source for people. About twice as much fat, calories, and important vitamins and minerals are present as in cow's milk. It's an ideal food for senior citizens because it contains enough calcium and magnesium. When compared to other ruminant milk, it also has the largest concentration of casein and whey protein. In sheep milk, there are plenty of unsaturated fatty acids including conjugated linoleic acid. Consequently, sheep milk is used in skincare cosmetics such as lotions, soaps, and creams. European and Mediterranean sheep breeds are important dairy breeds, but Indian sheep are poor producers and their milk has never been a key player in the dairy business in India. Several well-known breeds of dairy sheep include the Middle Eastern Awassi, the French Lacaune, and the German Eastern Friesian. Among the well-known traditional cheeses produced from sheep milk are Pecorino, Roquefort, Feta, and Manchego. With an average daily milk supply of 800g and a 90-day lactation period, the Patanwadi sheep is thought to be a higher milk yielder among Indian sheep, suggesting that it has potential as a dairy breed (Mohapatra *et al.*, 2020) [6].

Cheese from Yak

A traditional cottage cheese from India's hill country of Sikkim, Darjeeling, and Ladakh, churpi is prepared from the milk of yaks. The main microorganisms involved in Ladakhi churpi are yeast, mold, lactic acid bacteria, and *Bifidobacterium* sp. Milk becomes more nutrient-dense throughout the fermentation process due to microbial contact. It has higher levels of vitamin C, thiamine, and riboflavin. Additionally, it has a low level of fat (7-8%) and extremely good amounts of protein (60-63%) and carbs (23-24%) (Panda *et al.*, 2016) [8]. The Himalayan region's native yak and cattle (Siri) populations are in decline, but commercialization based on utilizing the special qualities of Churpi can increase their commercial worth.

Conservation Strategy

In India, the situation with the animal population is not critical enough to require large-scale ex situ conservation efforts. It is vital to examine and perfect these technologies in specified institutions so that they can be employed whenever and wherever needed. The most important tasks in conservation are to monitor the number of breeds over time, identify breeds at risk, and prioritize breeds for conservation, preferably through an in situ technique. A national and state livestock census of breeds is required, as well as information on the ecologies in which they function. A comprehensive database should be created on the number of various breeds, as well as the reasons threatening breed extinction. After identifying the at-risk breeds, breeds for conservation can be prioritized based on financial resources and existing infrastructure, which limit the number of breeds for conservation at any point in time.

Three major strategies are normally followed for conservation of farm animal breeds. The first two i.e.in situ conservation as well as ex situ *in vivo* involves conservation of living population. The third ex situ *in vitro* (cryopreservation) encompasses conservation of living embryo, ova, semen, somatic cell or other animal tissue, DNA etc. stored cryogenically. In situ conservation of breeds is the most preferred method of conservation, by involving livestock keepers in the production system. The maintenance of a breed in its tract also satisfies the requirements of article 8 of the Convention of Biological Diversity, which gives first priority to in situ conservation (Niranjan *et al.*, 2018) [7]. Village-based breed improvement programs must be complementary to in situ livestock conservation objectives with the concept conservation through sustainable utilization (Alemayehu, 2013) [1]. Ex situ *in vitro* should complement in situ conservation. One of the most useful aspects of cryopreservation is its supportive role in genetic up-gradation of breeds. Realizing that no clear-cut guidelines are available within present .system of management of indigenous breeds in India, the strategy should be to combine genetic improvement and conservation. It is always recommended to preserve around 2000 doses of frozen semen each from 15-30 sires in order to maintain genetic diversity of a breed. About 300 embryos with equal number of male and females may be preserved per breed. Genomic DNA, tissues, stem cells and whole blood may also be preserved for posterity (Sharma et al., 2014) [11]. Ex situ *in vivo* conservation strategy should be adopted, when in situ conservation is not at all possible. It is suggested that research institutions of ICAR, Agricultural/Veterinary Universities and other laboratories should initiate the programmes to study and identify valuable adaptive traits of indigenous livestock at all levels (phenotypic, genotypic, DNA/RNA levels) and locate structural genes /QTLs responsible for these traits. Factors responsible for their sustainability and adaptation in their native tract should be explored. The viability of a livestock genetic resource programme is essential when it focuses on traits that increase the economic value of the breed specifically to the communities involved.

Several approaches have been proposed and used to prevent or reduce the decline of livestock genetic resources, and these models can be supportive mutually for short as well as long term conservation. It is necessary that identification, characterization, evaluation and documentation of the genetic resources are completed in next 5-10 years. A complete set of description of every breed should be generated on the basis of various profiles, including their distribution, habitat, body conformation, adaptation, production, reproductive ability and socio-economic aspects. In next 20 years, there is possibility to identify at least 30-50 new breeds of livestock. About 10 new breeds may be identified for each five year (Sharma and Niranjana, 2016) [10]. NBAGR, as a Nodal agency, should develop a time bound action plan for breeds to be surveyed, characterized and determining conservation needs and strategies. The basic strategy will be conservation through sustainable improvement and management. This will includes election for important economic traits. A district level improvement plan, with village as a unit will have to be devised. A village level committee needs to be established that should function as Breeder's Association Unit, and be responsible for bull selection. The association / society should maintain: listing of all animals of each farmer; birth and death registers; health cover register; breeding register and monthly milk record register. All males not used inbreeding, needs to be castrated and for each castration the farmer should receive a reasonable compensation. A district level monitoring committee to provide technical guidance, involving District Animal Husbandry Officer and all veterinarians in the district, should be established. There may be situations where there is need for up-gradation of non-descript animals to be done. However a well-defined breeding plan should be developed in concurrence of futuristic need, availability of resources in different regions with avoiding problems of future degeneration of Indigenous livestock. Sincere efforts should be made to ensure that the livestock farming should be a financially viable livestock enterprise than subsistence farming.

Most creative and productive activities of individuals or groups in every society take place in communities; hence community-based conservation is receiving increasing attention from the stakeholders (Tesfa *et al.*, 2017) [12]. Farmers should get access to finance on low interest rate from Financial Institutions and Breeder's Association should made arrangements should to provide services and goods as required as well as suitable and sustainable market for the animal products. If a breed is identified as vulnerable or endangered, the farmers who maintain the animals of this breed should get appropriate compensation at the rate of profit earned through the crossbreds. The village association/ society should also arrange to take up the marketing of animal products. Value addition of the product of indigenous cattle is new possibility for improving our conservation efforts. Efforts like identifying unique biomolecules, producing high quality products with value addition, better marketing and branding could be more important to conserve our indigenous germplasm for longer time. Most importantly, Belew *et al.* (2016) [2] suggested that conservation of indigenous cattle resources should be designed with a long term perspective, using a planning horizon of at least 50 years as the required genetic management to maintain diversity over a given time horizon. For more effective conservation measures, proper coordination among various agencies (ICAR, SAHD, SAUs, SVUs, and Research Institutes) is highly needed. "National Consortium of Partners" comprising different stakeholders should be formulated for conservation of indigenous breed resources with a holistic approach (Gandhi, 2016) [5].

Conclusion

The state government agencies can assist farmers with labelling and packing their products, provide market support and incentives to communities for the sale of value-added material, and conducting skill enhancement training on an as-needed basis to manufacture value-added processed livestock products. It is possible to find a match between the demands of a particular market, the qualities of a particular product, and the traits of the native breeds with focused efforts. Completing this match will create job possibilities for those in the value chain and assist efforts to conserve breeds. With this conservation technique, local breeds might find a new use in modern agriculture.

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