

Review Article

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## An Overview of Diversified Animal Genetic Resources in the Indian State of Jammu and Kashmir

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### ABSTRACT

The state of Jammu and Kashmir, a north temperate region of Indian subcontinent, is a rich source of indigenous germplasm. Owing to the rich biodiversity in terms of sheep, goat, camel, yak and poultry, the livestock activity has a contribution of about 11percent in the Gross Domestic Product of the state. It offers promising employment opportunities and handsome economic returns especially in rural mountainous areas of the state. The indigenous livestock populations are very well adapted to various challenges posed due to certain topographic, demographic and other factors. The importance of these indigenous livestock in state economies and its role in improving the nutritional status and incomes of many small farmers and landless communities has been recognized by various scholars and rural development agencies in the last two decades. But the uncontrolled intermixing among the indigenous breeds and the infusion of exotic germplasm, has by far led to the dilution of pure native breeds. These native breeds of Jammu and Kashmir as understood from the present study exhibit high genetic variation and its rearing can emerge as an important component of rural development that can generate employment, augment rural economy, besides providing nutritional security at low inputs. Certain efforts, associated with the conservation and proper breeding strategies, need to be implemented in the form of ground level programmes and schemes to ensure better productivity, improvement and conservation of indigenous livestock resources.

#### Keywords

Biodiversity, Breeds, Germplasm, Jammu and Kashmir, Resources

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### Introduction

The state of Jammu and Kashmir (J&K), standing as the 'crown of the country',

occupies the northern most region of India. The vast mountainous territory of the state not only divides it into three zones (Kashmir Division, Jammu Division and Ladakh

Division) but adds a huge variety in the culture, tradition and heritage. These three major divisions of the state further consist of 22 Districts, where about 73 percent of the population lives in rural areas and are associated with agriculture and allied sectors including livestock rearing for their livelihood (Population census, 2011). The rearing of livestock is a very critical and core activity in the economic profile of the state. Although it is adopted as a subsidiary occupation by majority of the rural population, yet it constitutes a vital activity from the stand point of the economic welfare of the farmers.

The state of J&K owns a precious livestock wealth of 92,008,24 animals and 82,73,709 poultry birds in the form of Cattle, Buffaloes, Sheep, Goat, Equines, Yaks and Poultry. The state owns a rich biodiversity, contributing significantly to the country's production and population might. In terms of population heads, the state of Jammu and Kashmir occupies first position with respect to yak population, second in terms of horse and mule population, fifth in sheep population, sixth in donkey population and seventeenth with regard to poultry population, with percentage share of 71.30percent, 23.13percent, 18.59percent, 5.21percent, 5.41percent and 1.13percent respectively against the total respective population of the country (Livestock census, 2012). Being an important source of income and employment for the rural section of society, the livestock helps in alleviating poverty and smoothening of income distribution (BIRTHAL *et al.*, 2002). In the recent years, 2015-16 to 2016-17, the state has shown an increase of 4.5percent in milk production, 13percent in meat production and 5% in wool production (Basic Animal Husbandry Statistics, 2017). However the statistics have shown a decrease of 0.1percent in egg production, but the percentage of improved variety of birds in backyard sector has shown an increase from 5.31percent

in 2007 to 17.91percent in 2012 (Livestock Census, 2007; Livestock Census, 2012).

### **Diversified livestock sector of the state**

Jammu & Kashmir has varied agro-climatic conditions across various regions and based upon these diversified geographical locations, the state has been divided into three distinct regions, viz. Kashmir region (temperate), Ladakh region (cold arid), and Jammu region (sub-tropical) (Baba *et al.*, 2011; Mathur, 2015). Because of unique animal biodiversity and ecosystem integrity of this region it has been found that livestock contributes in income generation and poverty alleviation by means of multiple values which are associated with livestock. Direct value, for example livestock sales, meat, milk, employment, transport, knowledge and indirect values, such as inputs for agriculture, wildlife and tourism help in extensive utilization of the states' genetic resources. The native livestock breeds are multipurpose with unique genetic characteristics and exhibit a distinct superiority over other breeds of India which includes, adaptation to harsh extremely cold arid dry climatic conditions, utilization of poor quality feed and better resistance to tropical diseases. The latest reports of National Bureau of Animal Genetic Resources, Karnal, state that among the 183 newly registered indigenous breeds of the country, the state of Jammu and Kashmir contributes 5 registered breeds of sheep, 2 breeds of goat, 1 breed of cattle, 1 breed of horse, 1 breed of chicken and the only registered breed of geese. The following subheadings give a summarized view of the native genetic resources of the state.

### **Cattle and buffalo genetic resources**

Livestock production system in the sub-tropical Jammu region is extensive with buffaloes, crossbred cows (Jersey and

Holstein Friesian) and non-descript local cows as main species. In the temperate Kashmir valley livestock production is intensive mainly based on crossbred cattle, while in the cold-arid Ladakh region it is intensive for large ruminants (crossbred cows and yak) (Taneja, 2010; Wani *et al.*, 2011). As per the latest reports of National Bureau of Animal Genetic Resources, Karnal, the Ladakhi cattle from the Ladakh region of the state has been registered among the 43 breeds of cattle in the country. These small sized and short statured animals have highly developed over time to the hypoxic and extremely cold climatic conditions of the Ladakh region. Their compact body and short legs make them highly useful over the mountainous terrains where the adaptability of majority of the other animal fails and can be easily reared under low input extensive management system for milk, draught and manure purposes. Still the majority of the indigenous livestock remains non-descript and has not yet received enough attention regarding its characterization and recognition as distinct breeds. As per the latest Census, the State has 1.47 million crossbred cattle, mostly of cross-bred Holstein Friesian and cross-bred Jersey while the remaining 1.66 million are nondescript indigenous. In addition, there are 0.95 million buffaloes out of which 25percent have been upgraded (Animal and Sheep husbandry Department, Govt. of Jammu and Kashmir). Most of the buffalo population is migratory, with majority in Jammu region. Apart from Murrah and Nili-ravi, the local Buffalo, also known as Gujjari Buffalo, are reared by the traditional *Gujjar* community, as a domestic water buffalo for dairy production and draught purposes (Singh *et al.*, 2017). Around 70percent of the total cattle population in the state has been upgraded in to high yielding cross bred variety, which may have led to the increase in the production might of the state but the tolerance of such crossbred species towards the scarcity of fodder or harsh

climatic conditions is found quite low as compared to the locally adapted indigenous breeds.

### **Sheep genetic resources**

The state of J&K, in its varied agro climatic zones, inhabits a rich genetic resource of small ruminants, which not only supports the local community through the highly valuable livestock products but also maintains an ecological balance among the human-environment interactions. Among the 42 registered breeds of sheep in the country, the state constitutes five of them. The Bhakarwali, Changthangi, Gurez, Karnah and Poonchi constitute the local genetic resource of the area among the sheep breeds (National Bureau of Animal Genetic Resources, Karnal). Gurez and Karnah are the important sheep breeds in Kashmir, while as Bakerwal and Poonchi are the dominant sheep breeds in Jammu. In the cold arid region of Leh and Kargil, the production system is intensive with unique livestock including Changthangi sheep. Despite the harsh climatic conditions prevalent in these high altitude arid regions of Ladakh, the Changthangi breed thrives well and produces good quality coarse and long wool to be used by carpet industry. Owing to the small size with sturdy legs, the Gaddi breed is used as a means of transport in the high terrains. Besides Gaddi, the Bhakarwali breed is also hardy and sturdy, proving to be the best climber on the mountains despite of its bulky size (Directorate of Sheep Husbandry, Kashmir). The Gurez breed of sheep is the largest among the breeds of this region which show the better tendency of survival in the cold regions of the valley as compared to the exotic breeds. The rich native biodiversity of sheep in the state is continuously being manipulated in the hands of breeders since 1960s and Merino and Rambouillet, the fine Wool breeds, are used to upgrade local sheep (Wani, 2014). This

might have increased the demand of fine wool in the markets leading to a much higher population of cross breeds but the necessity to conserve the native breeds is also alarming. Many other native breeds of the state, like Malluk and Changluk, which produce better quality wool for cloth or carpet industry, require characterization (Shergojry *et al.*, 2017).

### **Goat genetic resources**

Goat Breeding is an integral part of the livelihood for most of the local population of the state. The Gujjar and Bakerwals tribes usually cherish rearing of goats, thereby augmenting the income of the poorest of poor community of the state through milk, meat, hair or other livestock products. Besides, the traits like prolificacy, the meat quality and resistance to parasitic diseases are also unique to these native sheep and goat breeds and play significant roles in their rearing patterns. Among these local breeds of goats Chagthangi, Gaddi, Cheguand Bhakarwali have shown highest adaptability to the varied climatic conditions of the state. The Changthangi breed survives in the sandy and mountainous regions of the Ladakh, situated at an altitude of 12000-18000 ft. above the sea level, where the temperatures in the winter might even reach below(-)40 degree Celsius. Despite this tough survival, the goat produces pashmina fibre which due to its non-medulation, has a unique position among animal fibres for its fineness, warmth, softness and ability to absorb dyes and moisture as compared to mohair and wool (Directorate of Sheep Husbandry, Kashmir). Gaddi, also known as the 'white Himalayan Goat' is very much adapted to the migratory rearing systems in the high altitude mountains of the state (Singh *et al.*, 2015). After Changthangi, among the native registered goat breeds of Jammu and Kashmir, Bhakarwali is the recently registered breed

(National Bureau of Animal Genetic Resources, Karnal). The Bhakarwali goat, immensely found in the Jammu region of the state, is reared on the similar patterns as those of Gaddi and shows productivity in terms of milk, meat and fibre under the low input system. The Chegu breed found in the regions of Kashmir and Ladakh are known to produce ample quantities of Pashmina. The unfavourable conditions in the state resulting in poor livestock management systems, lack of effective conservation and goat Development programmes in the state, and haphazard slaughter of goats to meet the ever increasing demand for meat are some of the causes of subdued native goat population in the state.

### **Yak genetic resources**

Yak (*Bos grunniens*), a hardiest and versatile bovine species, is rightly called the 'ship of snow' as it easily survives in the cold barren deserts of Ladakh, where the hypoxic conditions and limited agriculture make the survival of other livestock quite limiting. The animal thrives well on the mountains at an altitude of 2,500 to 6,000 m above mean sea level with temperature well below 50°C, requiring minimum care and management. Besides being of cultural importance, the yak serves as a financial asset providing source of livelihood for the highlanders living in difficult terrains. The animal not only proves to be an excellent pack and transport animal for the snow bound passes, but also provides economic security to the owners in terms of milk, meat, hide, fuel and manure (Gupta *et al.*, 2011). Yak-cattle hybrids (dzo and dzomo) in the recent times have found immense popularity due to their better survival in the hypoxic conditions. Dzo are preferred for ploughing because they are much harder than the local bulls or the cattle-jersey bulls and the female yak (Dzomo) are better milch animals, producing nutritionally

enriched milk (having 7 – 12 per cent fat and 5 -6 per cent protein) as compared to the local cow. Besides a good dressing percentage of 40-45 percent, the yaks also produce undercoat of fine diameter (400g/year) (Shergojry *et al.*, 2017).

### **Camel genetic resources**

Asiatic double-humped camel (*Camelus bactrian*) is a unique animal species of economic importance in high hill and snow bound areas of Nubra valley of Ladakh at a high-altitude of 18,300 ft (Ranjan *et al.*, 2015). These animals have incorporated unique traits over ages of adaptation that bestow them the endurance in these extreme harsh climatic conditions and make them a major source of livelihood for the highlanders living in difficult terrains. The range of products and services provided by camel include meat, milk, hide and hair which are ideally suitable for apparels, such as sweaters, coats and shawls, and various other domestic utility items (wall hangings and hand-tufted carpets). The fibre quality attributes, especially diameter and per cent pure fibres, support the use of camel fibres for woollen items (sweaters, coats and caps) in pure fibre form as well as in the form of blends with other animal fibres (wool and silk) and synthetic fibres (Sahani *et al.*, 2003). Bactrian camels move on an average at about 5 km/hr and produce 5 kg of hair, 600 lt of milk and 250 kg of dung a year (Shergojry *et al.*, 2017). These Bactrian camels have historic importance of Central Asian trade capable of carrying 1 quintal, working 6-8 hours daily (Angchok *et al.*, 2012). They can go days without water and months without food, enduring extreme harsh climatic conditions as ideal caravan animals of cold dry arid region. The animal shows tolerance to high levels of salt and sugar in the body, making it an appreciable animal model for Blood pressure and Diabetes (Ganai, 2016). But the animal has been declared critically endangered by

IUCN since 1998, yet the animal has not been explored in detail and none of the measures have been adopted to conserve this species (Makhdoomi *et al.*, 2013).

### **Horse genetic resources**

Zanskari, are among the registered breeds of horses found in Leh and Laddakh region of Jammu and Kashmir, India (Behl *et al.*, 2006). Since, their height at wither is between 125 and 127 cm, hence this breed was clubbed under the category of pony breeds (Gupta *et al.*, 2010). Zanskari horse is a symbol of wealth and used as a source of entertainment as well as transport along the upper Indus River. Being highly adapted to the extreme environmental conditions of the arid desert of the state, these ponies are known for their ability to work tirelessly and carry loads in high altitude regions. These animals are also used for riding, draught purposes (agricultural operations), sports (polo) and for logistic support by the Indian army in the Ladakh region (Behl *et al.*, 2013). Phenotypic characteristics of these horses overlap with Spiti probably due to common blood of Mongolian horse breeds. As a result, the thin population line of these ponies along with indiscriminate cross breeding with Spiti horses has led to tremendous decline in the pure indigenous breed of these horses. The breed is at the verge of extinction with due existence of only few hundred animals in the valley. Due to decreasing population of these horses, a Zanskari breeding farm has recently been established at Leh by Animal Husbandry Department of Jammu and Kashmir for improvement and conservation of the breed with selective breeding (Singh and Yadav, 2005).

### **Poultry genetic resources**

Kashmir Faverolla is an important indigenous Kashmiri poultry breed well adapted to local extremes of temperature and primarily reared



for meat and egg production in the traditional free range scavenging or backyard system. These indigenous birds thrive on leftover human foods, kitchen wastes, broken rice or paddy, insects or worms and do not enjoy compound feeds or defined housing. The indigenous chicken, evolved through thousands of years of natural selection, are well adapted to the local climatic conditions, feed and management stresses, with better resistance to diseases (Iqbal and Pampori, 2008). Besides having deleterious effect on the rural economy and employment generation, the hybrid poultry farming is cost-consuming and seems to be far away from villages (Bikramjit, 2000). Moreover, Farooq *et al.*, (2004) reported that even mixed rearing of exotic birds with local chicken adversely affected the hatching performance of indigenous breeds due to non-broodiness.

Among the poultry breeds, Kashmir Anz is the only breed of geese being registered by the National Bureau of Animal Genetic resources, Karnal. These cinnamon or white colored birds are reared for meat, eggs, feathers, or as a hobby in areas located around the water bodies. Kashmir Anz geese are hardy, disease resistant and good foragers, requiring minimum inputs for rearing and management.

### **Recommendations**

In the developing and bio-diverse state like Jammu and Kashmir, the major threat to genetic diversity is intensification of agriculture and indiscriminate/vicious cross breeding of local breeds with less adapted exotic germplasm to evolve highly productive breeds. We are foolishly squandering animal-capital for short-term gains, distorting the importance of local breeds adapted to local conditions and hampering the conservation of the local ecology. Henceforth, the authors recommend the following strategies for the

evaluation of biodiversity and conservation of genetic resources:

The breed improvement policies can be framed properly if information on the status of breed is available. Hence the National Survey Programmes should be conducted on breed basis such that the population of certain breeds showing declining trends can be monitored and suitable in-situ and ex-situ conservation methods can be adopted.

Changes in the agriculture mixed farming systems, introduction of modern techniques and limited knowledge about traditional livestock husbandry practices have all lead to the replacement of animal draught and transport by machinery, ultimately accounting a decline in economic viability of the indigenous breeds. The farmers and pastoralists, who already own the indigenous breeds, must be supported with monetary or non-monetary incentives to ensure that they do not switch to crossbred varieties.

Periodic publications about the status of indigenous breeds and their performance should be brought out which can be of utmost help in popularizing the breeds.

The characterization of the indigenous genetic resources of the state must be prioritized in order to help in the recognition of these local breeds as well defined ones.

The non-descript local livestock can be improvised into pure breeds by grading-up with superior germplasm of elite indigenous bulls. Eliminating the extensive introgression of indigenous germplasm with the exotic ones by restricting the indiscriminate cross breeding, may help in the conservation of the genetic resources. The crossbred animals need to be improved by way of *inter-se* mating only with stabilized exotic inheritance levels.

Increasing exotic inheritance levels to unnecessarily higher levels yields nothing significant and in turn deteriorates the adaptability of the animal. Hence, the exotic inheritance levels must be appreciated to certain scientifically efficient proven levels (i.e. 52-62.5% for semi-intensive and 62-75% for intensive production systems).

Many native breeds of the state like Zanskari horse, Bactrian camel etc., are facing the inevitable status of critically endangered species since long. Breeding farms incorporating live animals in the form of organized herd, cryo-conservation of wide variety of living cells (sperms, oocytes, embryos and DNA etc.) or the establishment of live animal gene banks are some of the suitable conservation methods that can be successfully implemented to overcome the erosion and ensure better and sustainable use of these resources in the future.

Currently there is a major global thrust on genetic preservation and biodiversity because continued cross-breeding programmes in the local livestock resources, which do not consider gene preservation aspects, would lead to erosion of the indigenous germplasm. The taxonomically distinct breeds have unique gene combination associated to unique adaptability and producing capacity under the adverse climate and inadequate feed resources. Although there are apparent inadequacies associated with the indigenous livestock resource base, but one cannot ignore the limitations possessed by the productively potential exotic species.

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