

Continuing Education Article

Genetic Resources and Diversity in Pakistani Sheep

MUHAMMAD SAJJAD KHAN¹, MUQARRAB ALI KHAN[†], SOHAIL AHMAD AND SULTAN MAHMOOD[‡]

Department of Animal Breeding and Genetics, University of Agriculture, Faisalabad 38040 Pakistan

[†]*Department of Livestock and Dairy Development, NWFP, Peshawar, Pakistan*

[‡]*Livestock and Dairy Development Department, Government of Punjab, Pakistan*

¹Corresponding author's e-mail: drsajjad2@yahoo.com

ABSTRACT

Rich genetic diversity of Pakistani sheep genetic resources is unexploited. There are at least 25 sheep breeds available in the country apart from the wild relatives such as Urial, Bharal, Argali and Blue sheep. Sheep population is estimated at 26.5 millions and trend is almost static. Documentation of these genetic resources has been very sporadic and many breeds need to be described and performance recorded. Although, mutton and carpet wool are the major products, some breeds have wool as the main utility. Adult weight may vary between 18 and 70 kg and variation in size, shape orientation of horns, fleece color and other attributes is great. Failed attempts to develop new breeds in the past should provide a lesson to focus on development and improved utilization of indigenous resources. Capacity building of farmers can help achieve this goal. Breeds are taken as granted and there is need to improve realization to at least keep these resources in the present status, if not improved for the next generations. This paper describes the sheep genetic resources available in Pakistan and diversity among them.

Key Words: Pakistani sheep; Genetic diversity; Conservation

INTRODUCTION

Pakistan is rich in sheep genetic resources. Population estimates for sheep are 26.5 millions (GOP, 2006). There are at least two dozen breeds of sheep in the country with positive population growth. Different reports do not agree on the number of breeds. Hasnain (1985), for example, reported 25 breeds, while Isani and Baloch (1996) have presented basic information on 31 breeds. Disagreement may be in the nomenclature as well as in the phenotypic similarities. Distribution of sheep breeds across provinces and agro-ecological zones is however, quite heterogeneous (Fig 1). Provincial shares do not follow the human population trends. About 48% of about 27 million sheep reside in Balochistan. Punjab, Sindh and NWFP share 24, 15 and 13% population, respectively.

Sheep breeds. Sheep breeds can be grouped into thin-tailed (Baltistani, Buchi, Cholistani, Damani, Hissardale, Kaghani, Kail, Kajli, Kali, Kooka, Lohi, Pahari, Poonchi, Sipli & Thalli) or fat-tailed (Balkhi, Balochi, Bibrik, Dumbi, Gojal, Harnai, Hashtnagri, Khijloo, Kohai Ghizar, Latti, Michni, Rakhshani, Tirahi & Waziri). Synthetics developed in the last 40 years include thin-tailed Baghdale (Hissardale x Damani x Rambouillet) and Ramghani (Kaghani x Rambouillet) and fat-tailed Pak-Awassi (Kachhi x Awassi) and Pak-Karakul (Kachhi & Karakul) breeds. Some public institutions still keep some of these synthetic breeds. Crossbreeding between Afghani (brought by Afghan refugees) and Salt Range has also been reported. Rambouillet crossbreds continue to breed and rebreed in Northern Punjab and Eastern part of NWFP but population

estimates are not available. Also, a flock of Hissardale, received as a share at the partition in 1947 is being maintained at Livestock Experiment Station Jahangirabad. There may still be other breeds/strains available in the country but many needs to be documented. Just in NWFP, examples can be Kari, Madakhlash, Kuthha and Gujri breeds, which await documentation.

Breeds at government farms. About 1/3rd of the breeds in the country (Balkhi, Balochi, Bivarikh, Buchi, Harnai, Kachhi, Kaghani, Kajli, Karakul, Lohi, Salt Range, Sipli & Thalli) are found on government owned livestock farms, while others are not. Among the exotic breeds having been reported on Government stations are Afghani, Awassi, Karakul and Rambouillet. There is no breed improvement program for any specific sheep breed except up-gradation of Kaghani with Rambouillet in NWFP. Breed associations/societies do not exist.

Utilization of sheep. Almost all sheep breeds produce coarse type wool and are used for mutton. They are generally raised in mixed flocks with goats. Separate sheep flocks are also raised. Milk is important in breeds such as Damani and Kachhi with about 1 litre daily for a lactation period of 4-6 months (Wahid, 1982). Wool from breeds such as Kaghani and Kari is finer than the others but still not fine enough to meet the domestic needs of fine wool and long fibre. Wool imports therefore may be to the tune of few million rupees. Sheep population has not shown growth rate similar to that of goats, the species with highest growth rate. Droughts in sheep raising areas such as those in Balochistan along with the preference for goat meat may be the two major factors but shift from wool to synthetic fibre may be

even more important for a slow growth of sheep population. Nevertheless sheep is an important sacrificial animal and very important to many communities as it fits better to environmental and socio-economic circumstances.

Diversity. Diversity among sheep breeds for various economic traits is quite amazing. About half of the sheep breeds are thin tailed and other half fat-tailed as indicated above (Table I). Type of thin and fat-tails also has a very wide variation. Sipli breed is for example, is thin tailed but tail length may be a foot long. In breeds like Lohi animals may not have any tail. Fat tail of Michni may reach fetlock joint but it is tucked up in SaltRange breed. Although, polledness is sex influenced trait, breeds such as Kajli are generally polled, while in most breeds females are polled, while males are horned. Horns structure in males also presents a wide variation and is quite fascinating. Horns may be spiral upward, downward and backward etc. with wide variation in size, shape and orientation. Number may even be four or six in rare cases. Color of wool is generally white with black or tan head and or legs but animals may be all brown like in Balkhi, all white (except eyes & tips of ears) like in Kajli or even black or black and white like in Mangli. Adult body weight may vary widely. It may be as low as 18 kg in Kari to as high as 70 kg in Balkhi and other breeds. Well fattened animals of Kajli, for example, can easily surpass these figures.

Although, most breeds fall in the coarse wool type, fibre diameter may be as fine as 23 micron in Kari (Ahmad, 2007) to as coarse as 51 microns in Kooka breed (Shah, 1993) breed. True wool fibre percentage and fibre diameter of some breeds have been drawn in Fig 2.

Level of inbreeding. Homozygosity within breeds is another measure to judge if a breed is at a greater risk of losing diversity. The inbreeding studies in sheep are restricted to data from institutional flocks, where although trends for drastic affects of inbreeding on economic traits are similar to international studies. Level of inbreeding is quite underestimated due to incomplete pedigrees and poor data quality. At farmer level, use of sires from own flock is common and is expected to reduce variability among members of the flock.

Genetic diversity for specific traits. Studies on genetic diversity at gene level in Pakistani sheep are very limited. Babar *et al.* (2006) have recently reported genetic variability in prion protein gene in some native (Buchi, Kachi, Kajli, Lohi, Sipli, Thalli), synthetics (Hissardale, Pak-Karakul) and imported (Awassi) sheep breeds available in Pakistan. V136 allele, which is generally associated with the highest susceptibility to scrapie, was not present in any of the breeds sampled. Low frequency of the highly resistant R171 allele suggested that the native breeds were at a moderate but comparatively higher risk of infection to typical scrapie agents. It may however, be remembered that most common production system in Pakistan is low-input extensive transhumant, where post-harvest forage residues and naturally grown shrubs and grasses are the main source of

Fig. 1. Distribution of sheep breeds

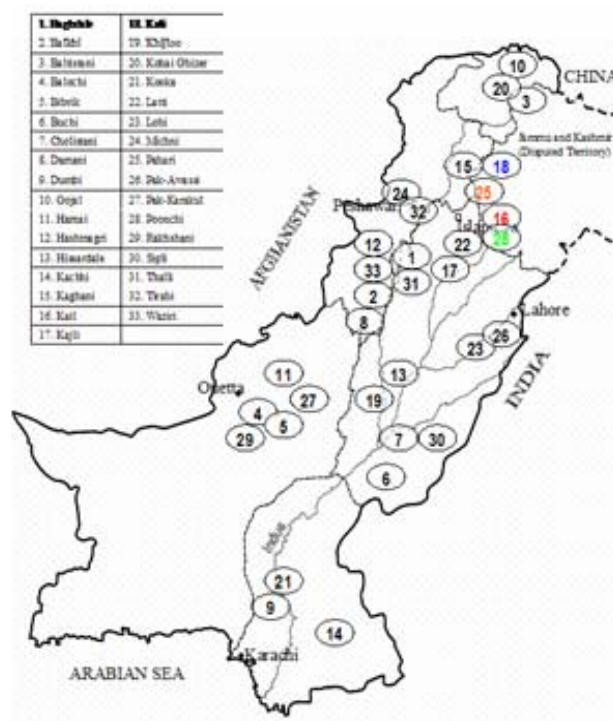
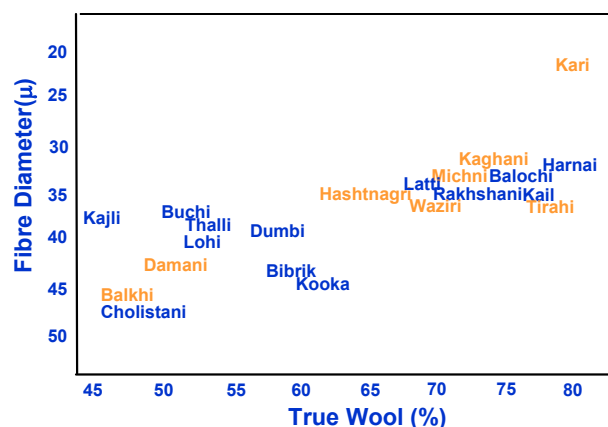


Fig. 2. Variation in fibre diameter and true wool fibre (%) in some sheep breeds of Pakistan (adapted from Hasnain, 1985)



feeding. Feeds of animal origin (bone, meat & blood meals etc.) are rarely offered to sheep and therefore risk of such diseases is much less as compared to sheep in intensive production systems of advanced countries yet, importation of sheep (if any) should be restricted to animals that possess natural resistance to scrapie to avoid any outbreak in this country.

Wild relatives of sheep. Wild relatives of sheep are also available in Pakistan. The Argali (*Ovis ammon*), Bharal (*Pseudois nayaur*), the blue sheep and Urial (*O. vignei*) are the wild relatives of domestic sheep (*O. aries*) found in Pakistan. Their direct contribution to food and agriculture is

Table I. Sheep breeds of Pakistan

S. No.	Breed	Synonym	Utility	Geographic distribution	Population. Size (000)*	Population. trend
1.	Baghdale		Mutton, wool	Punjab	<1	NA
2.	Balkhi		Mutton, wool, fat	NWFP	444	+ve
3.	Baltistani		Mutton, wool	Northern Areas	235**	NA
4.	Balochi		Mutton, wool, fat	Balochistan	4130	+ve
5.	Bibrik	Bugti	Mutton, wool, fat	Balochistan	1687	-ve
6.	Buchi	Bahawalpuri	Mutton, wool	Punjab	466	-ve
7.	Cholistani	Bekaneri	Mutton, wool	Punjab	39	+ve
8.	Damani		Mutton, wool, milk	NWFP	624	+ve
9.	Dumbi		Mutton, wool, fat	Sindh	38**	NA
10.	Gojal		Mutton, wool, fat	Northern Areas	93**	NA
11.	Harnai	Dumari	Mutton, wool, fat	Balochistan	572	+ve
12.	Hashtnagri		Mutton, wool, fat	NWFP	156	+ve
13.	Hissardale		Mutton, wool	Punjab	<2	NA
14.	Kachhi	Kutchhi	Mutton, wool, milk	Sindh	708	+ve
15.	Kaghani		Mutton, wool	NWFP	183	-ve
16.	Kail		Mutton, wool	AJK	40	+ve
17.	Kajli		Mutton, wool	Punjab	1379	-ve
18.	Kali		Mutton, wool	AJK	6**	NA
19.	Khijloo	Haleenjoo	Mutton, wool, fat	Punjab	NA	NA
20.	Kohai Ghizer		Mutton, wool, fat	Northern Areas	139**	NA
21.	Kooka		Mutton, wool	Sindh	1096	+ve
22.	Latti	Salt Range	Mutton, wool, fat	Punjab	125**	NA
23.	Lohi	Parkanni, Lamochar	Mutton, wool	Punjab	969	-ve
24.	Michni		Mutton, wool, fat	NWFP	36**	NA
25.	Pahari		Mutton, wool	AJK	15**	NA
26.	Pak-Awassi		Mutton, wool, fat	Punjab, Sindh	<1	NA
27.	Pak-Karakul		Mutton, wool	Punjab, Balochistan	<1	NA
28.	Poonchi		Mutton, wool	AJK	57**	NA
29.	Rakhshani		Mutton, wool, fat	Balochistan	475	+ve
30.	Sipli		Mutton, wool	Punjab	52**	NA
31.	Thalli		Mutton, wool	Punjab	818	+ve
32.	Tirahi	Afridi	Mutton, wool, fat	NWFP	40**	NA
33.	Waziri		Mutton, wool, fat	NWFP	575	+ve

*Numbers as in 2006 livestock census but if not available, estimates are given, ** 1986 estimates from www.fao.org/DAD-IS/

difficult to quantify, because none of them crossbred or in use for crossbreeding with domestic sheep. Exception may be a picture, where an animal has been shown to be hybrid between domestic sheep and Punjab Urial (*O. vignei*) (www.callisto.si.usher.ca:8080/caprinae/photos.htm). It is difficult to justify these claims. However, attempts to have it happen do exist.

It may be worth mentioning that Bharal is called blue sheep, because its head and upper parts of body are brownish grey with tinge of slaty blue (underside & inside legs whitish). It has been categorized as *O. naysaur* (<http://www.nmnh.si.edu/gopher-text/vert/mammals.txt>) but now it is considered more closer to goat than sheep. Roberts (1997) described the similarities to and differences from sheep and goats. Animals resemble true sheep with horns sweeping out and back, but do not have a beard nor a potent body odor as in goats. They have goat-like characteristics as well, with a broad flat tail, black and white markings on their forelegs and have some skull features typical of the goat. True sheep have preorbital and interdigital glands on all feet, whereas goats lack preorbital glands and have interdigital glands only on their forefeet, if they have them at all. Blue sheep either have rudimentary preorbital and interdigital glands or none at all (Grizimek, 1972).

The Marco Polo sheep is restricted to Hunza valley

and is endemic to the country. Estimates vary between 45 and 300 heads. Khunjerab National Park in the Northern Areas has these animals. Margalla hills national park, near Islamabad has about 100 animals of Goral sheep. NWFP also inhabits some population. Bharal is found in the Baltistan area of Northern Areas and is also found in the Khunjerab National Park. Population estimates are few hundreds. Pakistan inhabit three kinds of Urial. Afghan Urial is found in Balochistan and NWFP. Punjab Urial is found in Salt Range area of Punjab province (and is endemic to the country), while Ladakh Urial is the third kind and is found in Northern Areas. Total Urial population in Pakistan is estimated at 10-12 thousands.

Urial in Pakistan are protected for hunting or for trade. Trophy hunting is the exception. They are widespread from around Skardu in the north, southwards to the west of Jehlum river, throughout Balochistan and southwestern Sindh and the Salt Range area of Punjab. The status of species in Pakistan is, however endangered (IUCN, 2002), which may be more true for Ladakh and Punjab Urial. Urial sheep generally likes gentle slopes at lower elevations in open areas of arid habitats often close to human habitations, which exposes it to many threats like poaching and competition with domestic livestock, especially sheep and goats. Ladakh urial is confined to northern Pakistan and

Ladakh area in Indian-held Kashmir. Total population is estimated between 500 and 750 animals. Roberts (1997) estimated 500-600 Urial for Baltistan and 700-800 Urial for Gilgit region. In Chitral District it inhabits the west bank of Kunar river. Some locations of east bank have also been reported to have Ladakh Urial. Attempts to protect Ladakh urial include Bunji Community Conservation Area (BCCA), which is situated in District Diamer about 70 km in the southeast of cold desert mountainous region Gilgit on the left side of Karakorum Highway across the Indus, on the Astore road. The altitude is 1372 m asl. The summer is quite harsh as compared to other places of Northern areas. There is ban on hunting wild animals in the area but occasional poaching is still reported. Also, heavy grazing pressure from domestic livestock that directly compete with Urial is another threat for the species.

CONCLUSION

Biological diversity is now recognized as common concern of mankind and genetic diversity is the major driver of variation within and across breeds, which helps populations to adapt to environmental changes. In Pakistan however, realization that the country is very rich in sheep genetic resources, is not very great. Breeds are taken as granted. Realization to at least keep them at the present status, if not improved for the next generations, is also not great. Every now and then breeds are being haunted for crossing to some other imported breed without attempting to see if such efforts will be sustainable. Attempts to develop new sheep breeds in the 60's should have given planners the lesson that under developing circumstances, resources and long term commitments are difficult and that breeding objectives can not be short term or static.

For any breed development efforts thus, available genetic resources need to be characterized both at phenotypic and genetic levels. Equally important would however, be that these resources meet our needs of the present without compromising the ability of future generations to meet their own needs from them.

REFERENCES

- Ahmad, S., 2007. Performance and phylogenetic position of Kari sheep in Pakistan. (un-published) *Ph.D. Thesis*, Department of Animal Breeding and Genetics, University of Agriculture, Faisalabad (Pakistan)
- Babar, M.E., F. Hossain, B. Benkel, Q. Khan, J. Ahmad and A. Nadeem, 2006. Genetic variability at eight codons of the PrP gene in 9 sheep breeds of Pakistan. *Proc. 8th World Congress on Genetics Applied to Livestock Production*. Vol. 22, pp: 664-956.pdf. Belo Horizonte, MG, Brazil (August 13-18, 2006)
- GOP (Government of Pakistan), 2006. *Livestock Census 2006*. Agricultural Census Organization, Statistics Division, Government of Pakistan, Lahore
- Grizimek, B., 1972. *Grizimek Animal Life Encyclopedia*, pp: 458-514. Van Nostrand Reinhold, Co., New York
- Hasnain, H.U., 1985. *Sheep and Goats in Pakistan*. FAO Animal Production and Health Paper 56. FAO, Rome
- Isani, G.B. and M.N. Baloch, 1996. *Sheep and Goat Breeds of Pakistan*. Press Corporation of Pakistan, Karachi
- IUCN, 2002. <http://www.IUCN.org/> [accessed June, 2007]
- Roberts, T.J., 1997. *The Mammals of Pakistan*. Oxford University Press, Oxford
- Shah, S.K., 1993. Technique for genetic improvement. In: Mackintosh, J.B. (ed.), *Sheep Production in Pakistan*. Pakistan Agricultural Research Council, Islamabad
- Wahid, A., 1982. General pattern of production, breeds, management, disease, nutrition performance and problems. In: *Proc. International Seminar on Sheep and Wool*. Pp: 14-38. Pakistan Agricultural Research Council, Islamabad

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