GEF-UNDP Project 2715-03-4709

TECHNICAL REPORT ON THE STATUS, TRENDS, UTILIZATION AND PERFORMANCE OF FAnGR AND THEIR WILD RELATIVES IN PAKISTAN

M. S. Khan

June, 2004

Department of Animal Breeding and Genetics
University of Agriculture Faisalabad, PAKISTAN

TABLE OF CONTENTS

LIST OF TABLES

Page

LIST OF FIGURES

EXECUTIVE SUMMARY

Pakistan is rich in Farm Animal Genetic Resources (FAnGR). The FAnGR inventory of Pakistan includes (in millions) cattle (23), dairy buffaloes (25), sheep (25), goats (53), chicken (346), equines (5) and camels (1). There is a small population of yaks, too in Northern Areas of Pakistan. Animals are generally raised for subsistence in small sized mixed farming system. About 100 breeds of these FAnGR have been identified but most of the population is still described as non-descript. These genetic resources are very important for food and agriculture in the country. Livestock sector being an important sub-sector of Agriculture contributes 39% to GDP in agricultural value added but more importantly 30-35 million rural population is engaged in livestock raising.

Buffalo is the preferred dairy animal with Nili-Ravi and Kundhi being the main breeds. Nili-Ravi from Punjab is also raised in buffalo colonies around the country. Nili, Ravi and Azi-Kheli are the other buffalo breeds with negative population trend. Cattle have traditionally been raised for producing bulls for draught purpose and population of many breeds is reducing due mainly to mechanization. Of the fifteen cattle breeds, the two famous dairy breeds (Sahiwal and Red Sindhi) are under a pressure of crossbreeding for dairy purpose. Holstein is the most commonly used exotic breed for producing dairy crossbreds. There are limited attempts to produce beef crossbreds/synthetics because present beef prices do not support these strategies. Production system is smallholder subsistence with the exception of crossbreds, which are used for commercial purpose to fill the fluctuating seasonal demand of milk. Milk and meat availability per capita is 160 litres and 12 kg, per annum, respectively.

Sheep are raised for mutton and wool. Population growth is very slow due to preference of goat meat over sheep and reduction in demand of wool due to availability of artificial fibre. Of the 33 breeds documented, population trend of most sheep breeds is not available. However, generally it is believed that purebreds are decreasing due to non-existence of any breed society/association promoting or developing any of the sheep breeds. Attempts to produce synthetics in the past did not succeed. Goats are mainly raised for meat. Goat meat is the most preferred meat and so the population trend of the species is very high. There are 36 documented breeds of goat.

Camel is animal of people of deserts, coastal areas and mountains. Population is almost static (may be slightly negative trend). With the exception of few animals of Bactrian type, all the other population (20 breeds) belong to Dromedary category. Camel milk and meat is eaten in the country but general acceptance is low. Horses have traditionally been symbol of pride and main utility is sport (trend pegging, racing, dance etc). Horse driven tongas are reducing in number and so the population of the species. Population estimates on the strains are not available. Both mules and donkeys are used for draught. Donkeys need characterization. Population has a positive trend.

Indigenous chicken have Aseel, Naked Neck and Desi as the known breeds along with a synthetic Lyallpur Silver Balck. Aseel is mainly used for cockfighting while others are used for eggs and meat. Commercial chicken industry has flourished at a very fast pace but still 40% of eggs and 25% of chicken meat is produced by scavenging chicken under subsistence system of production.

Among the wild relatives of FAnGR**,** yak has a feral population in Northern Areas. There are no wild relatives of chicken. Pheasants, quails and peacocks are present under wild conditions**.** At least half a dozen varieties, each of sandgrouses, pigeons and doves have also been documented. For ducks, at least a dozen species migrate to Pakistan for spending milder winter. Urial (Afghan, Punjab and Ladakh) and Marco Polo sheep are the two wild relatives of domestic sheep while Markhor (Kashmir, Astor, Suleiman, Chitral and Kabul) and Ibex (Siberian and Sindh) are the two wild relatives of domestic goats. Two more species of family *Caprinae* present in Pakistan are the Blue Sheep (Bharal) and Goral, which are neither true sheep nor true goat and are found mainly in sanctuaries. Of these caprines, Punjab Urial, Sindh Ibex, Chiltan Markhor and Suleman Markhor are considered endemic to the country. There are 14 national Parks and 99 wildlife sanctuaries apart from other protected areas but population of wild relatives in many instances has not improved to expectations due some extant to Afghan war in the recent past and more extent to deterioration of ranges and habitats and also to poaching. Trophy hunting is being adopted successfully as a resource generation and capacity building strategy for conserving some of these wild relatives but many of them are still in the category of endangered or at least, vulnerable.

Breed characterization and economic valuation, almost in all the species is needed. Complete inventory of AnGR is needed to prioritize breeds for conservation. Cost-effective performance recording schemes involving farmers are required to help improve utilization. Farmers' demand for superior germplasm can only be met if recording and genetic evaluation infrastructure gets priority both at public and private level. This would also require capacity building to remodel the government livestock farms to include more breeds for conservation and development. International support is needed for higher education in molecular genetics & computational breeding. Poverty alleviation through livestock & poultry raising in rural areas needs attention in development programs. Development of disease free farms/zones will help improve sustainable utilization of indigenous AnGR for future.

1. CURRENT STATUS OF FAnGR

Farm animal genetic resources (FAnGR) of Pakistan are composed of eight main species i.e., cattle, buffalo, sheep, goats, camels, horses, donkeys (& mules) and chicken. Other species of poultry such as ducks/geese, pigeons, peacocks, partridges etc, although less well documents, are also used for food. A small population of yaks is also found in the Northern Areas. Wild relatives of sheep and goats are also present in the country. Population estimates from the last two census and recent estimates are presented in Table 1.

1.1 Buffalo

There are 24.8 million buffaloes in Pakistan. They belong to river type buffaloes. There are five established breeds (Table 2). Nili-Ravi and Kundhi are the two main breeds. Nili-Ravi being buffalo breed of riverine Punjab while Kundhi being the main breed of irrigated Sindh province (Figure 1). Nili and Ravi were distinguished as separate breeds until 1963 when their mixing was acknowledged officially. Nili and Ravi, however, still exist as separate breeds, also. The fifth breed is Azi-Kheli, which is mainly localized in the Swat valley in the North West Frontier Province (NWFP). Population estimates for this breed are based on the interviews with farmers and livestock professionals of the area. It may also be mentioned that a large segment of buffalo population (about 45%) in the country is described as non-descript because animals do not fulfil the precise phenotypic characters of any specific breed. These breeds are endemic to the country with the exception of Nili, which has been reported in India as well.

1.2 Cattle

Cattle population of Pakistan is estimated at 23.3 millions (Table 1). There are 15 breeds of cattle in the country (Table 3). Out of these breeds, Red Sindh and Sahiwal are well known internationally as tropical dairy cattle breeds. A small population of Sahiwal is also known to be present in Kenya, India, Bangladesh and Australia where it was exported for keeping as purebred and for the production of crossbreds/synthetics. Cholistani and Tharparkar are other two important breeds with dairy production potential. The Lohani, Achai and Gibrali are small sized breeds that can produce adequately under sub-hilly, subsistence production setups. Non-descripts are generally grouped as Desi. Draft cattle breeds include Bhagnari, Dajal, Dhanni, Kankraj and Rojhan (Table 3). Hissar and Hariana have a very limited population. They are sometimes grouped as Hissar-Hariana and are still used for Ox races. Gibrali shares hometract with Afghanistan (Figure 2).

1.3 Sheep

Population estimates for sheep in Pakistan are 24.6 millions. Thirty-three breeds of sheep are presented in Table 4. Different reports do not agree on the number of breeds. Hasnain (1985), for example, reported 25 breeds while Isani and Baloch (1996) have presented 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 quite heterogenous (Figure 3). Breeds can be grouped into thin-tailed (Baltistani, Buchi, Cholistani, Damani, Hissardale, Kaghani, Kail, Kajli, Kali, Kooka, Lohi, Pahari, Poonchi, Sipli and Thalli) or fat-tailed (Balkhi, Balochi, Bibrik, Dumbi, Gojal, Harnai, Hashtnagri, Khijloo, Kohai Ghizar, Latti, Michni, Rakhshani, Tirahi and Waziri).

Synthetics developed in the last 40 years include thin-tailed Baghdale and Ramghani and fat-tailed Pak-Awassi and Pak-Karakul breeds. Some public institutions still keep some of these breeds. 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 a Government farm. There may still be other breeds/strains available in the country but not yet documented. About 1/3rd of these breeds (Balkhi, Balochi, Bivarikh, Buchi, Hernai, Kachhi, Kaghani, Kajli, Karakul, Lohi, Salt Range, Sipli and 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.

1.4 Goats

There are 52.8 million goats in Pakistan (Table 1). Status of goat breeds is not different from that of sheep. Consensus on the number of goat breeds is yet to be reached. Table 5 enlists 36 breeds reported by different workers. Home-tracts are presented in Figure 4. Population estimates are not available for all the breeds. Estimates from the livestock census of 1996 are also presented along with the information from DAD-IS when such estimates were not available. Population trend is difficult to present but general believe is that number of purebreds is reducing due to lack of any pure-breeding program. Comparison of census from 1986 and 1996 could provide population trend for at least some of the breeds but such information is not available for all the breeds. There are no imported breeds of goats in Pakistan except Angora breed that is kept as a pet by rich people. Breeds developed by crossing with exotics are not many. Pak-Angora (Angora x Hairy) was developed in the 60's in Punjab and is limited to a research station in few hundreds. Major breeding objective for almost all breeds is goat-meat (locally categorized as mutton). Milk is secondary objective in breeds such as Beetal, Dera Din Panah and Nachi of Punjab and Kamori of Sindh province. Average milk production is 2-3 litres daily. Many of the goat breeds have long hair, especially those residing in milder habitats. Teddy and Barbari are most prolific with number of kids as high as six per kidding. Out of these breeds only Beetal, Dera Din Pannah, Hairy, Kamori, Nachi and Teddy have been reported to have a flock or two on Governmental research stations.

1.5 Camels

Camel population in Pakistan is 0.74 million with slightly negative trend in population number in the last decade (Table 1). With the exception of few heads in the Northern Areas where two humped camels have been reported, all the breeds and strains belong to one humped (dromedary) type (Table 6). Previously only four breeds (Bikanari/Mahra/Merecha, Sindhi, Bagri/Booja and Mountain camel) of dromedary camel were reported in Pakistan. However, in a recent report (Isani and Baloch, 2000), 20 breeds of dromedary camel have been reported. Seven breeds (Brahvi, Kachhi, Kharani, Lassi, Makrani, Pishin, and Rodbari) are found in Balochistan four (Gaddi, Ghulmani, Khader and Maya) in NWFP, five (Bagri, Brela/Thaloch, Cambelpuri, Kala-chitta and Marecha) in Punjab and four (Dhatti, Kharai, Larri/Sindhi and Sakrai) in Sindh province (Figure 5). Phenotypic characters of these breeds have been described but ambiguity still exists as if they were really breeds or variants of few breeds separated by areas/tribes.

1.6 Horses

Horse population is estimated as 0.32 million (Table 1) and has been decreasing over the years. Breeds such as Balochi, Heerzai, Makra, Pak-thoroughbred and Waziri have been reported. Yet, many other varieties such as Kakka, Kajlan, Morna and Shien, are raised by various families (Table 7). In many such cases relationship to a male or a female is kept close (linebreeding). Army stud farms raise draught horses such as Suffolk, Perchiran etc for the production of mules. Arab breeds are also raised here for producing racehorses. Most common horse, however, is Desi (local). Specimens of Anmol have also been reported but such claims need conformation. Near the Afghan border in NWFP and Balochistan, Afghan horses are also seen.

1.7 Donkeys and Mules

Estimated population of donkeys is 4.13 million (Table 1) with a positive trend. There are no defined breeds, but by stature, two may be easily distinguishable; the black large sized donkey and small light grey (the most common one). Mules also have a positive population trend. Their estimated population is 2.34 million.

1.8 Poultry

Commercial chicken have many strains of layers and broilers imported as parent and grandparent flocks. Indigenous chicken is predominantly Desi (local) mainly as a village scavenging bird. Aseel breed is locally available as fighting chicken while Ring-neck (naked neck) breed is also common Table 8). Breeds such as Fayoumi and Rhode Island Red are imported for crossing and raising as purebreds for semi-commercial setups or for raising under rural subsistence set up. The Lyallpur Silver Black breed developed few decades ago is confined to a research station only with very limited distribution.

Domestic ducks (Mallard and Pekin breeds) are found in every town of the country. They are raised for subsistence. The breed wise population estimates of ducks are not available. FAO (2002) reported that population of ducks is 4 millions in Pakistan. Similarly, guinea fowls (locally called ‘titri’) are common in villages and towns but population estimates are not available for the species. Peacocks (Indian blue peafowl) are found mainly in Sindh and AJK along with few spots in Punjab as wild birds. They are, however, kept as pet all over Pakistan. Quails (little bustard quail and yellow-legged button quail) are common especially in the rice growing areas of Punjab and Sindh. Five varieties of pheasants have also been documented (Roberts, 1991) in Pakistan. Nineteen wild ducks have been documented in Pakistan (Table 10). Many of them are migratory. Similarly, many of the pigeons, doves and snadgrouses (Roberts, 1991) are endemic to Pakistan (Table 11).

1.9 Yak

Yak (Bos grunniens or Poephagus grunniens) is mainly found in the Northern Areas of Pakistan at an altitude of 3000 to 7000 m asl. Official statistics (GOP, 1996) reported a population of 17,000 distributed in five districts of Northern Areas with Skardu being most populated (7045 animals). Kreutzmann (2003) summarized situation for year 2000 and presented higher estimates. Just for Baltistan, estimate were about 20,000 purebreds and 5500 hybrids. These reports indicate that probably a feral yak population is also available in the Northern Areas.

1.10 Wild Relatives of FAnGR

Among the wild relatives of FAnGR, two major kinds of relatives, apart from the Yak and some poultry species discussed above, are those of sheep and goat.

1.10.1 Wild Relatives of Sheep and Goat

Taxonomic classification puts these relatives under subfamily caprinae of bovidae family (Table 12 &13). The Argali (*Ovis ammon*) and Urial (*Ovis vignei*) are the two wild relatives of domestic sheep (*Ovis aries*) found in Pakistan while markhor (*Capra falconeri*) and Ibex (*Capra ibex*) are the two wild relatives of domestic goats (*Capra hircus*). Apart from these four wild relatives, Bharal (*Pseudois nayaur*), the blue sheep and Goral (*Naemorhedus goral*) are the fifth and sixth relatives (Figure 6, 7). For taxonomy of some species of wild sheep, Hiendleder et al. (2002) have provided evidence based on mitochondrial DNA analyses. Species in *Caprinae* subfamily are enlisted in Table 12. 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 and inside legs are whitish). It has previously been categorized as Ovis nayaur (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). Goral (*Naemorhedus goral*) is a goatelope. These relatives are listed in Table 13 along with their population estimates.

The Marco Polo sheep is restricted to Hunza valley and is endemic to the country (Figure 6). Estimates vary between 45 and 300 animals. 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 (Figure 6). 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.

There are five kinds of markhor named after the places they are found in Pakistan viz. Kashmir (or Pir Panjal markhor or Chitral markhor), Astor (or Gilgit), Suleiman, Kabul and Chiltan (Figure 7). Total population is estimated at 2500-3000. Kashmir markhor is found in Chitral and AJK with main concentration in the sanctuary called Chitral Gol National Park (CGNP). Astor subspecies is found in Gilgit region on both sides of Astor river up to south-western Baltistan. The Suleiman type is mainly restricted to mountain ranges immediately to the north and east of Quetta in Balochistan province and Toba Kakar

range, north of Hindu Bagh near Afghan border (Roberts, 1997). The Chiltan markhor is restricted to Balochistan while Kabul is near Afghan border in NWFP. The Siberian Ibex is restricted to colder climate of Northern Areas especially the northern Hunza and Khunjerab valleys. The Sindh Ibex on the other hand is found in mountain ranges of southern Balochistan from Makran coastal range at Pasni right across to Sindh Kohistan and Kirthar Range in the east. Kirthar National Park in Sindh province inhabits few hundreds of these (GOP, 1999). Of the five kinds of markhor, Suleman and Chiltan are considered endemic or near-endemic (http://www.wildlifeofpakistan.com/MammalsofPakistan/mammalsofPakistanmain.htm).

2. UTILIZATION AND CONSERVATION OF FAnGR

2.1 Buffaloes

Buffalo is the main dairy species of Pakistan. About 65% of milk produced in the country comes from buffaloes. Their estimated share in the red meat supply is 32% and in draught power about 2%. Distribution of buffaloes across provinces is not uniform. About 59% of them are found in Punjab while Sindh, NWFP and Balochistan share 34, 6 and 1% population, respectably. Milk and meat produced by buffaloes amount to 18,617 and 565 thousand tones, respectively (Table 14). General production system is small farming subsistence system. It is, however, changing gradually towards semi-commercial and commercial setup. Buffalo colonies have developed and expanded around big cities. Many have kept pace with the expanding human population. Colonies such as Landhi around Karachi inhabit quarter of a million buffaloes. Buffalo milk is preferred over cow milk due to its high fat contents. Per capita availability of milk is 160 liters (Table 15).

Most of the buffaloes in buffalo colonies around the country belong to Nili-Ravi breed (Nili and Ravi as separate breeds as well) with the exception of colonies in Sindh province where local Kundhi has about one third of the share. Kundhi is also raised in adjoining Balochistan but number of Kundhi buffaloes compared to Nili-Ravi in buffalo colonies is very small. Buffaloes (in their 2^{nd} to 5^{th} lactation) are purchased from central and southern Punjab and taken to the colonies around the country including AJK but are rarely bred for next lactation. This is because feeding for the dry period is uneconomical. Most of the buffaloes taken to Sindh get slaughtered after completion of lactation. However, local Kundhi buffaloes go back to interior of the province for recycling i.e. getting pregnant again to produce next lactation. Calves from the freshly calved buffaloes taken from Punjab are either left with the producers or get slaughtered in the first week of their age at the destinations. In the Punjab, situation is different in buffalo colonies. Only male calves get slaughtered after first few weeks of their age while female calves are retained as replacements. Similarly, dry buffaloes are slaughtered only if they were poor producer or if they had reproductive or other problems.

As farm size is very low (80% of buffaloes are raised in herd size of less than 10) and most common system is subsistence system of production (FAO, 1987), organized recording and genetic evaluation program are not in place. A limited progeny-testing program in Nili-Ravi buffaloes at field level was started in 1985 in the central Punjab. So far more than 300 bulls have been tested (Chaudhry, 2002a). Although accuracy of these evaluations has been low and evaluations have been delayed, however, such

institutionalized efforts can be initiated in other breeds if technical and other capacity building assistance is provided.

Government farms and experiment stations have few hundred breeding buffaloes (along with their calves and young stocks) intended for experimentation and production of males for Artificial Insemination. At present AI is available to about 5% of buffalo population in Punjab and to a lesser percentage in Sindh province. Semen production units of Qadirabad and Kalurkot collect Nili-Ravi semen and SPU at Karachi collects Kundhi buffalo semen. None of the Government farms, however, has Nili, Ravi or Azi-Kheli breeds. As such, there in no conservation program for any of the breeds. Although such efforts might be needed for Azi-Kheli, Ravi and Nili breeds in the given order of priority.

2.2 Cattle

Cattle have traditionally been bred to produce bullocks for ploughing and other on-farm operations. Fifteen breeds of cattle (generally) have specific hometracts with some overlapping in some cases. Males of all the breeds are used for draught purpose (including ploughing). Exception may be less-thrifty Sahiwal males. Dhanni is considered best of all the draught breeds as it is taken away from its hometract for raising as purebred and even for crossing. Role of cattle to produce bullocks for work has been decreasing over the years (Table 16). Cattle share 1/4th of the milk produced in the country and almost 28% of the red meat produced in the country. Total milk supplied by cattle is 8,511 thousand tones while estimated meat production is 495 thousand tones (Table 14).

Of the total cattle in Pakistan 42% are present in Punjab while Sindh, NWFP and Balochistan share 30, 22 and 6% of the population, respectively. Herd size in cattle is small as 76% of cattle are raised in herd size of less than 10; only 2.5% are raised in herd size of greater than 50. Most common production system is raising for subsistence in rural irrigated areas (FAO, 1987). Dairy cattle crossbreds of Friesian and Jersey have a significant population (15%) in the country. Breeding policy allows crossbreeding of non-descript cattle with Friesian in irrigated and with Jersey in rain-fed areas. Yet, mainly Sahiwal breed has been under pressure for the production of such crossbreds. Breeds other than Holstein and Jersey have been used but general preference is for Friesian. Productivity of these crossbreds is double than the local Sahiwal with reduced age at first calving and better calving interval but productivity is quite variable to managemental conditions such as feed/fodder availability and health cover. Their general role, however, has been to compensate seasonal fluctuation of milk availability in the buffaloes dairying under intensive production setups. Semen for the crossbreeding program has been both imported and locally produced in the Governmental farms of exotic cattle. Three of the four provinces (except Sindh province) have nucleus herds for exotic Friesian. Attempts have also been made to distribute purebred Friesian bulls to the farmers but mortality in such cases has been high due to poor adaptability.

Cattle crossbreeding for beef have also been attempted. Semen of Charolais and Simmental has been used for experimental purposes but to a very limited scale. The attempt to produce a local beef breed resulted in Narimaster (37.5% Bhagnari and 62.5% Australian Droughtmaster) but population of the new breed has not exceeded few

hundreds animals and its adoption by the farmers is yet to be tested. Growth rate in the synthetic has been reported to be much lower than the standards of beef breed (Khan and Khan, 1999). Recently, interest in producing beef crossbreds for special sacrificial occasions has risen. Semen of Charolais, Simmental, Angus and Brown Swiss breeds is being used for this purpose. Yet, low prices for beef in the local market discourages such adventures.

Government owned livestock farms inhabit Sahiwal, Red Sindhi, Bhagnari and Thari breeds. Few animals of Dhanni and Lohani breeds are available at one of the research facilities. Sahiwal is the most common among all the cattle breeds at the Government Farms but breedable cows are less than 5000 animals at these farms. Breed improvement programs for local cattle have almost been absent in the past few decades. Earlier attempts to record and improve cattle include a herdbook scheme in Dhanni cattle breed and later to a limited extent in Sahiwal breed. Institutional recording and genetic selection is attempted for Sahiwal breed and efforts are underway to expand such a program at farmer level. About 100 bulls have been tested so far on the basis of first lactation milk yield of their daughters (Chaudhry, 2002a). Semen availability at farmer level has been possible mainly for Sahiwal breed and to a very limited extent for Red Sindhi. All other breeds are bred naturally. AI has been available to about 10% of cattle population but mainly it is directed to crossbreeding instead of pure breeding. Technologies such as ET are at experimental level only.

There is no formal attempt to conserve any of the local cattle breeds. The importance of indigenous breeds for ploughing and load-carrying reducing due to mechanization (Table 16). Unless breed-wise statistics are collected and then monitored periodically, it might be too late to have any *in situ* conservation attempt. For Sahiwal breed, Punjab Government is initiating a conservation program in few districts of southern Punjab. Institutional herds do provide an opportunity for *in situ* conservation. Yet, more breeds needs to be included at these facilities with adequate population size. Farmers' preference for Friesian cattle crossbreds is generally recognized but any sustainable program for the production of desirable crossbreds (with respect to level of exotic inheritance) is lacking. Even supply of semen for artificial insemination from genetically superior bulls is very limited for breeds like Sahiwal as more than 90% of cows are bred naturally.

2.3 Sheep

About 43% of sheep reside in Balochistan. All sheep breeds produce coarse wool and are used for mutton. They are raised in mixed flocks with goats. Separate sheep flocks are also raised. Milk is important in breeds such as Damani and Kachhi yet, quantity is 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. Sheep population has not shown growth rate similar to that of goats. Droughts in sheep raising areas such as those in Balochistan along with the preference for goat meat may be two major reasons for a slow growth of sheep population. Attempts to improve wool quality towards fine include production of a Baghdale (Hissardale x Damani x Rambouillet) and Ramghani (Kaghani x Rambouillte). Kachhi and Awassi were crossed to produce Pak-Awassi and Kachhi and Karakul were crossed to produce Pak-

Karakul breeds but these synthetics could not gain importance with farmers and are now restricted to few research stations. Crossbreeding between Afghani (brought by Afghan refugees) and Salt Range has also been reported.

Experiment stations with the Government inhabit few breeds from where rams are distributed to interested farmers to a very limited extent. Experimental AI has been reported for few breeds such as Lohi only at research stations. Recording is also non-existing at farmer level. There is no breed improvement program for any sheep breed except upgradation of Kaghani with Rambouillet in NWFP. Breed associations/societies do not exist.

2.4 Goats

Goat population is more evenly distributed among provinces than other species. Punjab, Sindh, Balochistan and NWFP have 37, 24, 21 and 18% population, respectively. Goat meat is the most preferred meat in the country as it fetches the highest price. Goat hair is also used for preparing hand woven rugs by poor communities. Annual rate of increase in goat population is highest among all the ruminant species. Only fresh meat is sold. Hundred of thousand goats are sacrificed on religious occasions, especially on Eid. Breeds such as Beetal and Kamori are preferred for sacrificial purposes. Teddy, the most prolific and one of the smallest breeds is most common as well. Grazing alone and grazing with provision of some fodder is the most common system of feeding. Concentrate feeding does not exist. The only synthetic breed, Pak-Angora (Angora x Hairy) developed in the 60's did not get popularity at farmer level and is restricted to a research station. There is no conservation program for any of the goat breeds in any of the four provinces. Government farms inhabit breeds such as Beetal, Dera Din Pannah, Hairy, Kamori, Nachi and Teddy. Beauty competition in animal shows does include goat. Goat milk competitions are also included at these shows where Beetal is the usual winner. Breeding is natural. Semen is not produced for any of the goat breeds for AI or any other purpose. Farmers preference for superior germplasm varies across different agroecological zones. Government livestock farms are source of superior males but their contribution in the development of breeds is negligible.

2.5 Camels

Camel raising is part of socio-economic culture in coastal areas, arid deserts and mountainous regions. Most of the population (44%) reside in Balochistan. Camel meat and milk are not preferred products in general but communities raising them relish these products adequately. A wide variation exits in the productivity of camels (Khan and Nizamani, 2004). The nomads and people residing in remote desert areas consume fresh raw or soured camel milk. Camel meat is also consumed on religious ceremonies such as Eid. Camel is also used as a pack animal. It is used not only to carry loads but also water on its back. Wells in deserts are very deep and camels draw drinking water from these wells. Heavy loaded cart pulling by camel is commonly seen in cities. Agricultural commodities, fuel wood and other commodities are often carried to city markets by camel-driven carts. It is used for driving Persian wheels in irrigated areas and for ploughing. Edible oil extraction using camel power is also common. Hide is used for making special ornaments such as table lamps. Hair is used for making mats and clothes.

Camel racing and camel dancing is part of agricultural shows. Potential to export camel to gulf countries is great.

2.6 Horses

Tradition of raising and riding horses is much older than the history of Pakistan. The horse has always been a symbol of power, integrity and honour. While the tradition of Yakka (Tonga) or two-wheel carriage is on the decline, horse drawn carts are still seen all over. There are people who keep horses as a pastime or for renting them for marriage ceremonies, for religious processions, or riding them or playing polo or getting pleasure from their dance. Horses are used for individual or family ride in villages. Areas where transportation facilities are not adequate, people travel far-flung areas on the back of the horse or camel. Tent pegging or horse-dancing is an essential event in shows/Melas. Horsemeat is not eaten in Pakistan. Crossbreeding with exotic thoroughbreds is common in polo and racing horses. Horses used for tent pegging and for even for dance are mostly crossbred with imported thoroughbreds. Stud farms with armed forces have variety of horses (such as Percheron and Suffolk etc.) for the production of mules.

2.7 Donkeys and Mules

Donkeys are very important pack animals in Pakistan. They are often seen to carry concrete bricks from brick kilns to places of construction. Donkey carts are a common mean for transporting goods. Female ass, on the other hand, is used for ploughing (along with a bullock) in sub-hilly/barani areas. As livestock and agricultural farming go together, hauling (with female donkey), of fodder for the bullocks/cows/buffaloes, other agricultural produce or household articles is very common in villages. Their distribution across various agro ecological zones, however, varies widely. Donkeys have a very low status in the society. All the donkeys in the country are not the same but there is no characterization of donkeys in Pakistan for identification of breeds. Two major kinds may be large blackish donkey and small light grey variety, which is most common. A recent report has shed some light on the origin of the species and relationship among Asian and other populations of asses (Beja-Pereira et al., 2003). About 54% of mules are present in NWFP while Punjab ranks second (36%) in number. They are frequently used to drive carts that carry loads in almost all cities. They are rarely used for riding or ploughing. They are also used by the military as pack animals because they can endure more hardship as compared to horses.

2.8 Poultry

Although, poultry industry of Pakistan has developed at a reasonable pace in the last few decades, rural chicken still contribute 40% of eggs and 25% of poultry meat produced in the country. Under rural poultry improvement projects, Fayoumi and Rhode Island Red (RIR) breeds have been continuously imported. Crossbreeding of Fayoumi and RIR has also been conducted for small-scale commercial set-ups. The Lyallpur Silver Black breed of poultry, developed in the 60’s for rural set-ups is restricted to a research station (Poultry Research Centre, University of Agriculture, Faisalabad) even after 30 or so generations and does need conservation and development. Recent studies indicate that it has potential to produce good number of eggs (more than 70% production) and is more resistant to diseases as compared to RIR, (Ashraf et al., 2003). Aseel, a local breed, is

found in almost every village and town. Its main utility is production of cocks for cock-fighting competitions. Commercial farmers use modern breeds for egg and meat production. Parent and grandparent flocks are being raised for this purpose by at least a dozen enterprises.

There are no conservation efforts for any chicken breed in the country. It is generally agreed that population of naked-neck breed has decreased over the years mainly because eggs produced by commercial layers are more easily available and broiler meat is available in all major towns. Aseel cocks are high priced and breed is being raised by those who love their fight. For species other than chicken, authentic population estimates are not available.

Domestic ducks are used for egg and meat under subsistence production setup along with their utility as pets. Pekins are considered good for watch and ward. Generally, duck meat and eggs are not commercial products due to less acceptability at consumer level. Pigeons, partridges and quails are also found all over the country both for hobby and delicacy. Flight competitions in pigeons are common. Partridges are mainly kept as pets; singing competitions are also held occasionally. Quail farming is not common, however, these are kept as pets in villages and their meat is eaten as a specialty. This is especially true in the rice growing areas of Punjab and Sindh provinces where they can be hunted. Guinea fowls have more role as pet than their utility as meat or egg laying poultry. Eating peacocks is less common except for some areas in Sindh province where wild peacock is eaten as a specialty. Partridges are more used as pets and for sport and rarely. Wild pigeons and doves are also hunted. Few kinds are also kept for sport and eaten as medicinal meat.

2.9 Yak

Yak is a multi-purpose animal providing milk, meat, leather, hair and manure. It also adds to the aesthetic value of the Himalayas. Without it, survival of humans is difficult in this beautiful but hostile region. It is the main source of livelihood for people inhabiting this rugged region. The domestic yak is often white or piebald and much more docile than the wild yak. Animals are kept for subsistence. As a pack animal it can transport heavy load besides providing rich milk, meat and soft hair. Saddles, whips, boots and other articles are made from its hide. The daily production of milk by female yak is 2-5 kg per day. The lactation period is 90-120 days. Milk fat percentage is about 7.5%. Its meat has a red colour with good tenderness quality. Its hair are useful for making various things like carpets and ropes etc. Puberty starts around at the age of 3 years with most of the sexual activity occurring in mild season (July-August). Crossbreeding with cattle has been reported but information on the extent and direction is lacking. To appreciate the efficacy of traditional pastoral systems, role of yak needs attention.

2.10 Wild Relatives of FAnGR

Many of the migratory/wintering species of birds have been reported to visit Pakistan from central Asian states. Their population has, however, been reduced over the years due mainly to drought in the recent past and indiscriminate hunting due to weakly enforced legislations. An example in this regard would be decreased population of white-headed duck population, which may now be considered as threatened bird species (Chaudhry,

2002). Similarly, many of the pigeons, doves and snadgrouses (Roberts, 1991) are endemic to Pakistan (Table 11). Few positive conservation efforts include a pheasantry at Dhodial in NWFP (near Shinkiari). It has Peafowl, Kalij, Koklass, Cheer, and Western Tragopan pheasants for breeding and propagation. Other important wild relatives are those of sheep and goat.

There are 225 protected areas (wildlife sanctuaries, game reserves, national parks and other protected areas) that constitute 10.4% of the total land area (Table 17) of Pakistan (GOP, 2000). Many of these protected areas are located in the northern areas and serve as a protected habitat for wildlife of Pakistan. Yet, ungulates are still illegally hunted both for the 'fun' of hunting, for food and for decoration.

2.10.1 Wild Relatives of Sheep and Goat

Various relatives of sheep and goat do play important role in enhancing the tourism of the areas they are found in and do enhance the landscape beauty as well. Their direct contribution to food and agriculture is difficult to quantify because none of them crossbreed or are used for crossbreeding with domestic sheep or goat. Exception may me be a picture where an animal has been shown to be hybrid between domestic sheep and Punjab Urial [www.callisto.si.usherb.ca:8080/caprinae/_photos.htm]. It is difficult to justify these claims. However, attempts to have it happen do exist.

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 (1977) 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 has 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.

Most of the world's remaining population of Markhor is considered living in Pakistan, where two subspecies of this animal are recognized: flare-horned markhor (*Capra falconeri falconeri*) which includes the Kashmir and Astore forms and straight-horned markhor (*C. f. megaceros*) which includes the Kabul and Suleiman forms (Roberts, (1997). The species is currently listed as "endangered" on the 1996 IUCN Red List and on the Appendix-I of CITES. The species is associated with dry, steep slopes at lower elevations that provide adequate escape terrain and shallow snow cover in winter. The distribution of

this animal may range from an altitude as low as 700m to 1,000m in some of the hills bordering the Indus basin to as high as 4,000m during summer in Chitral and Gilgit regions where its distribution may seasonally overlap that of the Asiatic ibex. Flare-horned markhor is mainly confined to small, scattered populations along the Indus River and its tributaries in the North West Frontier Province (NWFP) and Northern Areas, as well as along the Kunar (Chitral) River and its tributaries in NWFP. Population estimates vary widely.

Ibex (wild goat) is an animal of higher elevations. It is believed to be the most abundant Caprinae in Pakistan in terms of its relative numbers. Ibex inhabits most of the higher mountain ranges of Chitral, Ghizar, Gilgit, Diamer, Skardu and Ghanche Districts. Total population size in northern Pakistan is believed to range between 2-5 thousand animals. The BCCA inhabits this species of ungulates alongwith the Urials. The Sindh Ibex are found in all the higher and more extensive mountain ranges of southern Baluchistan from the Mekran coastal range at Pasni right across Sindh Kohistan and the Kirthar Range in the east. They are also found in Kalat. There is a game reserve for ibex in the Hingol Range in central Mekran. The biggest population of this wild goat is in Kirthar National Park in southern Sind. There are many estimates but recent helicopter survey conducted in November 2000 by the Sindh Wildlife Department, Zoological Survey Department and the University of Melbourne yielded estimates of the total populations of the Sindh ibex at 13,155 ± 2,460, concentrated mainly in the Kirthar Range in the Sindh province of Pakistan [http://www.wildlifeofpakistan.com/mammals.html#wildsheepandgoats.htm].

3. TABLES

Table 1. Population of FAnGR in Pakistan (Millions).

Species	1986-Census	1996-Census	2002-03
Cattle	17.54	20.42	23.30
Buffalo	15.70	20.27	24.75
Sheep	23.29	23.54	24.57
Goat	29.94	41.17	52.76
Camels	0.96	0.82	0.75
Horses	0.38	0.33	0.32
Donkeys	2.97	3.56	4.05
Mules	0.07	0.13	0.22
Chicken	57.50	63.20	346.10

GOP (1996); GOP (2003)

Table 2. Buffalo Breeds of Pakistan.

S. No.	Breed	Synonym	Utility	Geographic distribution	Population size* (1996 census)	Population trend	Other countries
1.	Azi-Kheli	Albino	Milk, meat	Swat valley of NWFP	~25	Decreasing	Endemic
2.	Kundhi	Sindhi Murrah	Milk, meat	Mainly in Sindh, but also in Punjab & Balochistan provinces	6778	Increasing	Endemic
3.	Nili		Milk, meat	Mainly in Punjab but also in metro colonies of other provinces	124**	Decreasing	India
4.	Nili-Ravi		Milk, meat	Mainly in Punjab but also in metro colonies of other provinces	4282	Increasing	Endemic
5.	Ravi	Sandal Bar	Milk, meat	Mainly in Punjab but also in metro colonies of other provinces	171**	Decreasing	Endemic

*Thousand heads, if not available, estimates are given, ** 1986 estimates from DAD-IS

Table 3. Cattle Breeds of Pakistan.

S. No.	Breed	Synonym	Utility	Geographic distribution	Population size* (1996 census)	Population trend	Other countries
1.	Achai	-	Dairy & light draught	NWFP	~35	Decreasing	Endemic
2.	Bhagnari	Nari	Heavy draught	Balochistan	497	Decreasing	Endemic
3.	Cholistani	-	Dairy	Punjab	71**	Decreasing	Endemic
4.	Dajal	-	Medium draught	Punjab	72**	Decreasing	Endemic
5.	Desi	Non-descript	Draught, dairy	All over Pakistan	11752	Increasing	Endemic
6.	Dhanni	Pothwari	Medium draught	Punjab	1390	Decreasing	Endemic
7.	Gibrali	-	Dairy & light draught	NWFP	~30	Decreasing	Afghanistan
8.	Hariana	-	Draught	Punjab	<1	Decreasing	India
9.	Hissar	-	Draught	Punjab	<1	Decreasing	India
10.	Kankraj	-	Medium draught	Sindh & Punjab	54	Decreasing	Endemic
11.	Lohani	-	Light draught	NWFP & Punjab	232	Decreasing	Endemic
12.	Red Sindhi	Malir, Sindhi	Dairy	Sindh & Balochistan	1940	Decreasing	Endemic

S. No.	Breed	Synonym	Utility	Geographic distribution	Population size* (1996 census)	Population trend	Other countries
13.	Rojhan	-	Light draught	Punjab	213	Decreasing	Endemic
14.	Sahiwal	Lola, Montgomery	Dairy	Punjab	1392	Decreasing	India, Kenya
15.	Thari	Tharparkar, Grey Sindhi	Dairy & medium draught	Sindh	1413	Decreasing	India

*Thousand heads, if not available, estimates are given, ** 1986 estimates from DAD-IS

Table 4. Sheep Breeds of Pakistan.

S. No.	Breed	Synonym	Utility	Geographic distribution	Pop. size* (1996 census)	Population trend	Other countries
1.	Baghdale		Mutton, wool	Punjab	<1	NA	Endemic
2.	Balkhi		Mutton, wool, fat	NWFP	68**	NA	Endemic
3.	Baltistani		Mutton, wool	Northern Areas	235**	NA	Endemic
4.	Balochi		Mutton, wool, fat	Balochistan	2651	Negative	Iran, Afghanistan
5.	Bibrik	Bugti	Mutton, wool, fat	Balochistan	1757	NA	Endemic
6.	Buchi	Bahawalpuri	Mutton, wool	Punjab	668	Positive	Endemic
7.	Cholistani	Bekaneri	Mutton, wool	Punjab	33	Negative	Endemic
8.	Damani		Mutton, wool, milk	NWFP	311	Negative	Endemic
9.	Dumbi		Mutton, wool, fat	Sindh	38**	NA	Endemic
10.	Gojal		Mutton, wool, fat	Northern Areas	93**	NA	Endemic
11.	Harnai	Dumari	Mutton, wool, fat	Balochistan	358	Negative	Endemic
12.	Hashtnagri		Mutton, wool, fat	NWFP	133**	NA	Endemic
13.	Hissardale		Mutton, wool	Punjab	<2	NA	India
14.	Kachhi	Kutchhi	Mutton, wool, milk	Sindh	220	NA	Endemic
15.	Kaghani		Mutton, wool	NWFP	106	Negative	Endemic
16.	Kail		Mutton, wool	AJK	11	NA	Endemic
17.	Kajli		Mutton, wool	Punjab	939	Positive	Endemic
18.	Kali		Mutton, wool	AJK	6**	NA	Endemic
19.	Khijloo	Haleenjoo	Mutton, wool, fat	Punjab	NA	NA	Endemic
20.	Kohai Ghizer		Mutton, wool, fat	Northern Areas	139**	NA	Endemic
21.	Kooka		Mutton, wool	Sindh	948	NA	Endemic
22.	Latti	Salt Range	Mutton, wool, fat	Punjab	125**	NA	Endemic
23.	Lohi	Parkanni, Lamochar	Mutton, wool	Punjab	999	Negative	Endemic
24.	Michni		Mutton, wool, fat	NWFP	36**	NA	Endemic
25.	Pahari		Mutton, wool	AJK	15**	NA	Endemic
26.	Pak-Awassi		Mutton, wool, fat	Punjab, Sindh	<1	NA	Endemic
27.	Pak-Karakul		Mutton, wool	Punjab, Balochistan	<1	NA	Endemic
28.	Poonchi		Mutton, wool	AJK	57**	NA	Endemic
29.	Rakhshani		Mutton, wool, fat	Balochistan	326	NA	Endemic
30.	Sipli		Mutton, wool	Punjab	52**	NA	Endemic
31.	Thalli		Mutton, wool	Punjab	672	Positive	Endemic
32.	Tirahi	Afridi	Mutton, wool, fat	NWFP	40**	NA	Endemic
33.	Waziri		Mutton, wool, fat	NWFP	523	Negative	Endemic

*Thousand heads, if not available, estimates are given, ** 1986 estimates from DAD-IS

Table 5. Goat Breeds of Pakistan.

S. No.	Breed	Synonym	Utility	Geographic distribution	Population size* (1996 census)	Population trend	Other countries
1.	Baltistani		Meat, milk, hair	AJK	190	Negative	Endemic
2.	Barbari	Bari	Meat, milk	Sindh, Punjab	1539	Positive	Endemic
3.	Beetal		Meat, milk	Punjab	2245	Positive	India
4.	Beiari	Chamber	Meat, milk	AJK	39**	NA	Endemic
5.	Buchi		Meat, milk, hair	AJK	61**	NA	Endemic
6.	Bugi Toori	Sindh Desi	Meat, milk, hair	Sindh	NA	NA	Endemic
7.	Bujri		Meat, milk, hair	Sindh	NA	NA	Endemic
8.	Chappar	Kohistani, Jablu	Meat, milk, hair	Sindh, Balochistan	91	Negative	Endemic
9.	Damani		Meat, milk, hair	NWFP	271**	NA	Endemic
10.	Dera Din Panah	DDP	Meat, milk, hair	Punjab	96	Negative	Endemic
11.	Desi	Jattal	Meat, milk, hair	AJK	NA	NA	Endemic
12.	Gaddi		Meat, milk, hair	NWFP, AJK	416**	NA	Endemic
13.	Hairy		Meat, milk, hair	Punjab	NA	NA	Endemic
14.	Jarakheil		Meat, hair, milk	AJK	129**	NA	Endemic
15.	Jattan		Meat, milk	Sindh	168	NA	Endemic
16.	Kacchan		Meat, milk	Sindh		NA	Endemic
17.	Kaghani		Meat, milk, hair	Punjab, Northern areas	367	Negative	Endemic
18.	Kail		Meat, milk, hair	AJK	NA	NA	Endemic
19.	Kajli	Kajlee, Pahari	Meat, milk, hair	Punjab, Balochistan	404	NA	Endemic
20.	Kamori		Meat, milk	Sindh	3825	Positive	Endemic
21.	Khurassani	Baluchi	Meat, milk, hair	Balochistan	436**	NA	Endemic
22.	Kohai Ghizer		Meat, milk, hair	Northern Areas	238**	NA	Endemic
23.	Kooti		Meat, milk, hair	AJK	45**	NA	Endemic
24.	Kurri		Meat, milk	Sindh	NA	NA	Endemic
25.	Labri		Meat, milk, hair	AJK	118**	NA	Endemic
26.	Lehri		Meat, milk, hair	Balochistan	529	Positive	Endemic
27.	Lohri		Meat, milk, hair	Sindh	290**	NA	Endemic
28.	Nachi	Bikaneri	Meat, milk, hair	Punjab	81	Negative	Endemic
29.	Pak-Angora		Mohair	Punjab	<0.5	NA	Endemic
30.	Pateri		Meat, milk	Sindh	338**	NA	Endemic
31.	Piamiri		Meat, milk, hair	Northern Areas	79**	NA	Endemic
32.	Potohari	Salt Range	Meat, milk	AJK, Punjab	42**	NA	Endemic
33.	Shurri		Meat, milk,	AJK	94**	NA	Endemic

S. No.	Breed	Synonym	Utility	Geographic distribution	Population size* (1996 census)	Population trend	Other countries
			hair				
34.	Tapri	Lappi	Meat, milk	Sindh	NA	NA	Endemic
35.	Teddy		Meat, milk	Punjab, AJK	10182	Positive	Endemic
36.	Tharki	Tharri	Meat, milk	Sindh	NA	NA	Endemic

*Thousand heads, if not available, estimates are given, ** 1986 estimates from DAD-IS

Table 6. Camel Breeds in Pakistan*.

S. No.	Breed	Synonym	Utility	Geographic distribution	Population size (1996 census)	Population trend	Other countries
1.	Bagri	Booja	Meat, milk, draught	Punjab	NA	NA	Endemic
2.	Bikanari	Mahra, Marecha	Meat, milk, draught	Punjab	NA	NA	India
3.	Brahvi		Meat, milk, draught	Balochistan	NA	NA	Endemic
4.	Brela	Thalocha	Meat, milk, draught	Punjab	NA	NA	Endemic
5.	Campbelpuri		Meat, milk, draught	Punjab	NA	NA	Endemic
6.	Dhatti	Thari	Meat, milk, draught	Sindh	NA	NA	Endemic
7.	Gaddi		Meat, milk, draught	NWFP	NA	NA	Endemic
8.	Ghulmani		Meat, milk, draught	NWFP	NA	NA	Endemic
9.	Kachhi		Meat, milk, draught	Balochistan	NA	NA	India
10.	Kala-chitta		Meat, milk, draught	Punjab	NA	NA	Endemic
11.	Khader		Meat, milk, draught	NWFP	NA	NA	Endemic
12.	Kharai		Meat, milk, draught	Sindh	NA	NA	Endemic
13.	Kharani		Meat, milk, draught	Balochistan	NA	NA	Endemic
14.	Larri	Sindhi	Meat, milk, draught	Sindh	NA	NA	India
15.	Lassi		Meat, milk, draught	Balochistan	NA	NA	Endemic
16.	Makrani		Meat, milk, draught	Balochistan	NA	NA	Endemic
17.	Maya		Meat, milk, draught	NWFP	NA	NA	Endemic
18.	Pishin		Meat, milk, draught	Balochistan	NA	NA	Endemic
19.	Rodbari		Meat, milk, draught	Balochistan	NA	NA	Endemic
20.	Sakrai		Meat, milk, draught	Sindh	NA	NA	Endemic
21.	Pak Bactrian		Meat, milk, draught	Northern Areas	NA	NA	Endemic

*Isani and Baloch (2000)

Table 7. Horse Breeds/Strains in Pakistan*.

S. No.	Breed/Strain	Synonym	Utility	Geographic distribution	Pop. Estimates	Population trend	Other countries
1.	Anmol	-	Sport	Punjab	Few animals	NA	Endemic
2.	Balochi	-	Sport	Balochistan	NA	NA	Endemic
3.	Heerzai	-	Sport	Balochistan	NA	NA	Endemic
4.	Kajlan	-	Sport	Punjab	NA	NA	Endemic
5.	Kakka Biralanwala	-	Sport	Punjab	NA	NA	Endemic
6.	Morna	-	Sport	Punjab	NA	NA	Endemic
7.	Siaen	Shien	Sport	Punjab	NA	NA	Endemic
8.	Makra	Sindh Desi	Sport	Sindh	NA	NA	Endemic
9.	Pak Thoroughbred	-	Sport	All over Pakistan	NA	NA	Endemic
10.	Waziri	-	Sport	NWFP	NA	NA	Endemic

*Amir (1996); DAD-IS

Table 8. Breeds of Chicken in Pakistan.

S. No.	Breed	Synonym	Utility	Geographic distribution	Population size* (1996 census)	Population trend	Other countries
1.	Aseel		Sport	All over Pakistan	~50	Stable	India, Thailand
2.	Desi		Egg, meat	All over Pakistan	76000	Stable	-
3.	Lyallpur Silver Black	-	Egg, meat	Punjab	<1	Decreasing	-
4.	Naked Neck	Ring Neck, Ghoni	Egg, meat	All over Pakistan	~10	Decreasing	-

*Thousand heads, if not available, estimates are given

Table 9. Other Species of AnGR is Pakistan.

Species	Breeds	Utility	Geographic distribution	Pop. estimates	Other countries
Ducks	a. Domestic (Pak-Mallard, Pekin) b. Wild (at least a dozen varieties migrate to Pakistan for winter)	Meat, eggs Sport	All over Pakistan Punjab	4 millions* NA	India Central Russian States
Peacock	Indian blue peafowl (*Pavo cristatus*)	As Pet, feathers, meat	Tharparkar (Sindh), AJK, Punjab	NA	India Nepal
Quail	i. Indian little button or little bustard quail (*Turnix sylvatica*) ii. Button or yellow-legged button quail (*Turnix tanki*)	Sport, delicacy	All over Pakistan, especially peddy growing areas of Punjab and Sindh	NA	India
Pheasant	i. Cheer pheasant (*Catteus wallichi*) ii. Himalayan monal (*Lophophorus impeyanus*) iii. Koklas (*Pucrasia macrolopha*) iv. Western Horned Tragopan (*Tragopan melanocephalus*) v. White Crested Khalij (*Lophura leucomelana hamiltoni*)	Sport, pet	Northern Areas, Kaghan valley, AJK, NWFP	~1000	NA
Yak	*Bos grunniens* (breeds not yet identified)	Milk, meat, draught, hair, manure	Northern Areas	17000**	NA

* FAO (2002); **1996 census (GOP, 1996)

Table 10. Wild Ducks in Punjab*.

S. No.	Name	Technical name	Other names	Status	Distribution
1	Northern pintail	*Anas acuta*	-	Abundant	Sindh, Punjab & Balochistan
2	Shoveler	*Anas clypeata*	Chamcha chonch	Abundant	All over Pakistan
3	Common teal	*Anas crecca*	Teal	Very Abundant	Punjab, Sindh
4	Wigeon	*Anas penelope*	Peela Sar Murghabi	Abundant	Punjab, Sindh
5	Mallard	*Anas platyrhynchos*	Neil Sur	Abundant	Punjab, Sindh
6	Garganey	*Anas querquedula*	-	Abundant	Punjab, Sindh & NWFP
7	Gadwall	*Anas strepera*	-	Common	Punjab, Sindh & Balochistan
8	Greylag goose	*Anser anser*	Sona mugh, huns	Frequent	Punjab, Sindh & Balochistan
9	Bar headed goose	*Anser indicus*	Safaid mugh, huns	Frequent to rare	Punjab, Sindh
10	White-eyed pochard	*Anthya nyroca*	Ferruginous duck	Frequent	Punjab, Sindh, Balochistan
11	Common pochard	*Aythya ferina*	-	Abundant	Punjab, Sindh
12	Tufted duck	*Aythya fuligula*	-	Common	Punjab, Sindh, Balochistan
13	Lesser Whistling teal	*Dendrocygna javanica*	Lesser tree duck	Common	Sindh, Punjab
14	Marbled teal	*Marmaronetta angustirostris*	Thaddari murghabi	Rare	Sindh, Balochistan, Punjab
15	Red-crested pochard	*Netta rufina*	-	Scarce	Punjab, Sindh
16	Cotton teal	*Nettapus coromandelianus*	Cotton teal Quacky duck	Common	Sindh
17	White headed	*Oxyura leucocephala*	Sufaid sar wali murghabi	Scarce	Punjab, NWFP, Balochistan, Sindh
18	Ruddy Shelduck	*Tadorna ferruginea*	Surkhab, Chakwa	Frequent	Punjab, Sindh & Northern Areas
19	Common Shelduck	*Tadorna tadorna*	Surkhab	Scarce	Punjab, Sindh; occasionally in other provinces as well

*Anonymous (1996)

Table 11. Doves and Pigeons in Pakistan*.

S. No.	Name	Technical name	Other names	Status	Distribution/ Breeding tract
	Sandgrouse				
1	Close-barred	*Pterocles lichtensteinii*	-	Frequent	Southern Balochistan
2	Painted	*Pterocles indicus*	-	Frequent	NWFP
3	Crowned	*Pterocles coronatus*	-	Frequent to Common	Southern Balochistan
4	Spotted	*Pterocles senegallus*	-	Frequent to Common	Southern Balochistan & Sindh
5	Chestnut-bellied	*Pterocles exustus*	Indian sandgrouse Bhat teetar	Common to Abundant	Balochistan, Sindh, Punjab
6	Black-bellied	*Pterocles orientalis*	Imperial sandgrouse Kashmira	Common	Balochistan, Punjab, Sindh
7	Large pin-tailed	*Pterocles alchata*	-	Scarce	Balochistan
	Pigeons		-		

S. No.	Name	Technical name	Other names	Status	Distribution/ Breeding tract
1	Blue Rock	*Columba livia*	Rock Dove	Abundant	All over Pakistan
2	Hill	*Columba rupestris*	Eastern Rock Dove Turkestan Hill Pigeon	Scarce	Northern Areas
3	Snow	*Columba leuconota*		Scarce	Northern Areas
4	Pale backed Eastern stock	*Columba eversmanni*	Yellow eyed stock dove Eversmann's stock dove	Scarce	NWFP, Sindh
5	Wood	*Columba palumbus casiotis*	Eastern Ring dove Cushat	Scarce	Western NWFP & Balochistan
6	Speckled Wood	*Columba hodgsonii*	-	Rare	NWFP (eastern part below Northern Areas)
7	Common green	*Treron phoenicoptera*	Yellow-footed green pigeon	Common	Eastern Part of Punjab
8	Wedged-tailed green	*Treron sphenura*	Kokla green pigeon	Rare	Occasionally in Murree hills (Punjab)
	Doves				
1	Indian Ring	*Streptopelia decaocto*	Collard dove Collard turtle dove	Abundant	Mainly in Punjab & Sindh with summer breeding in NWFP & Balochistan
2	Red Turtle	*Streptopelia tranquebarica*	Red collard dove	Abundant	Southern Sindh
3	Western Turtle	*Streptopelia turtur*	-	Occasional	Northern areas & north-west Balochistan
4	Eastern Rufous Turtle	*Streptopelia orientalis*	Oriental turtle dove	Common	Northern Areas, Northern NWFP and Punjab
5	Little Brown	*Streptopelia senegalensis*	Laughing dove of Africa Palm dove of Africa	Abundant	Almost all over Pakistan
6	Spotted	*Streptopelia chinensis*	Chinese Dove	Common	Northern parts of NWFP and Punjab

*Roberts (1991)

Table 12. Species in Caprinae subfamily (of Bovidae family)*

Genus and Species	Found in
Genus *Ammotragus* (Barbary sheep)	
Species *Ammotragus lervia* (aoudad)	
Genus *Budorcas* (takin)	
Species *Budorcas taxicolor* (takin)	
Genus *Capra* (goats and ibexes)	
Species *Capra caucasica* (West Caucasian tur)	
Species *Capra cylindricornis* (East Caucasian tur)	
Species *Capra falconeri* (markhor) 2n=60	Pakistan
Species *Capra hircus* (domestic goat) 2n=60	Pakistan
Species *Capra ibex* (ibex) 2n=60	Pakistan
Species *Capra nubiana* (Nubian ibex)	
Species *Capra pyrenaica* (Spanish ibex)	
Species *Capra sibirica* (Siberian ibex)	
Species *Capra walie* (Walia ibex)	
Genus *Hemitragus* (tahrs)	

Genus and Species	Found in
Species *Hemitragus hylocrius* (Nilgiri tahr)	
Species *Hemitragus jayakari* (Arabian tahr)	
Species *Hemitragus jemlahicus* (Himalayan tahr)	
Genus *Naemorhedus* (serows)	
Species *Naemorhedus baileyi* (red goral)	
Species *Naemorhedus caudatus* (Chinese goral)	
Species *Naemorhedus crispus* (Japanese serow)	
Species *Naemorhedus goral* (goral) 2n=56	Pakistan
Species *Naemorhedus sumatraensis* (serow)	
Species *Naemorhedus swinhoei* (Taiwan serow)	
Genus *Oreamnos* (mountain goats)	
Species *Oreamnos americanus* (mountain goat)	
Genus *Ovibos* (muskoxen)	
Species *Ovibos moschatus* (muskox)	
Genus *Ovis* (sheep)	
Species *Ovis ammon* (argali) 2n=56	Pakistan
Species *Ovis aries* (mouflon, domestic sheep) 2n=54	Pakistan
Species *Ovis canadensis* (bighorn sheep)	
Species *Ovis dalli* (Dall's sheep)	
Species *Ovis nivicola* (snow sheep)	
Species *Ovis vignei* (urial) 2n=58	Pakistan
Genus *Pseudois* (bharals)	
Species *Pseudois nayaur* (bharal) 2n=56*	Pakistan
Species *Pseudois schaeferi* (dwarf bharal)	
Genus *Rupicapra* (chamois)	
Species *Rupicapra pyrenaica* (Pyrenean chamois)	
Species *Rupicapra rupicapra* (chamois)	

*Bunch et al. (2000); Hiendleder et al. (2002); Gregory (2001)

Table 13. Wild Relatives of Sheep and Goat in Pakistan**

S. No.	Breed	Synonym	Habitat/Parks	N*	Pop. trend⊥	Other countries
1.	Argali	Marco Polo sheep (*Ovis ammon polii*)	Hunza Khunjerab National park	45-300	VU	China Russia Kazakhstan Mongolia Nepal India
2.	Goral sheep	*Nemorhaedus goral*	Marghalla hills national park, NWFP	~100	LR/nt	Nepal China Korea
3.	Urial i. Afghan urial ii. Punjab urial iii. Ladakh urial	*Ovis vignei* i. *O.v.cycloceros* ii. *O.v.punjabiensis* iii. *O.v.vignei* Gad Shapu	 Sindh, Balochistan, NWFP, Salt Range area in Punjab Northern Areas Punjab	 ~10000 ~2000 ~500	Stable	Turkmenistan Uzbekistan Tajikistan Afgahnistan India Punjab kind is endemic
4.	Markhor i. Kashmir markhor ii. Astor markhor iii. Suleiman markhor iv. Chiltan markhor v. Kabul Markhor	*Capra falconeri* i.*C.f.Cashmirensis* ii.*C.f.falconeri* iii.*C.f. jerdoni* iv.*C.f.Chialtanensis* v. *C.f.megaceros*	 i. Chitral, AJK, CGNP ii. Gilgit, Hunza, KuNP iii. Balochistan iv. Balochistan v. NWFP	 1000 1000 400 400 Few	EN	Iran, Afghanistasn India Suleman and Chiltan kinds are endemic
5.	Ibex i. Siberian Ibex	 *Capra ibex sibirica* Himalayan ibex	 Baltistan, Hunza, KuNP	 3000	 VU	Russia China Aghanistan

S. No.	Breed	Synonym	Habitat/Parks	N*	Pop. trend⊥	Other countries
	ii. Sindh Ibex	Wild goat *Capra hircus aegagrus* Sindh wild goat Persian pasang Sarah (Sindhi)	Sindh & Balochistan, KiNP	13000	VU	
6.	Bharal	*Pseudois nayaur* Blue sheep	Baltistan Khunjerab National park	~300	LR/nt	China India Nepal

* 1991 estimates from DAD-IS; ** Estimates from various sources including http://www.ultimateungulate.com/Artiodactyla.html; http://www.wildlifeofpakistan.com/ungulates_gs.html
CGNP = Chitral Gol National Park; KuNP = Khunjrab National Park; KiNP = Kirthar National Park
LR/nt = Lower risk/near threatened; EN = Endangered; VU = Vulnerable
⊥ IUCN Red List 2002

Table 14. Animal Products in Pakistan*.

Product	1990-1991	2000-2001	2002-2003
Milk (000 tones)	12499	26284	27811
Cows	2922	8192	8511
Buffaloes	9005	17454	18617
Sheep	40	31	31
Goat	532	607	652
Meat (000 tones)	1581	2008	2332
Cows	326	476	495
Buffalo	439	533	565
Sheep	256	220	223
Goat	409	446	679
Poultry	151	333	370
Wool (000 tones)	48.1	39.2	40.7
Hair (000 tones)	7.9	18.2	19.9
Hides (million numbers)	5.8	7.8	8.2
Skins (million numbers)	32.7	38.2	40.3
Guts (million number)	21.3	36.8	39.9
Casings (million numbers)	4.1	7.7	8.3
Horns and hooves (000 tones)	21.6	29.4	31.83
Bones (000 tones)	258.8	331.4	347.6
Fats (000 tones)	101.8	123.5	129.7
Blood (000 tones)	40.1	41.8	44.0
Dung (million tones)	314.4	376.2	405.0
Urine (million tones)	151.0	184.9	199.4
Eggs (million number)	4490	7679	7860

GOP (2001); GOP (2003)

Table 15. Per Capita Availability of Milk, Meat and Eggs (Lit./kg).

Product	1990	1995	2000	2001
Milk	108.1	123.2	160.3	160.1
Meat (Total)	12.1	15.0	12.3	12.3
Buffalo and Cow meat	6.1	6.8	6.3	6.3
Sheep and Goat meat	4.4	5.5	3.6	3.6
Poultry meat	1.5	2.5	2.3	2.3
Eggs	1.8	1.9	2.0	2.0

FAO (2004)

Table 16. Population (thousands) of Work Animals in Pakistan.

Work Animal	1986	1996	% difference	2002-03
Bullocks (cattle)	5098	3389	-33.5	3867
Male buffaloes	118	163	38.7	199
Camels	671	627	-6.6	577
Horses	322	279	-13.2	265
Mules	52	110	112.3	182
Asses	2389	2810	18.1	3199

GOP (1986); GOP(1996); GOP(2003)

Table 17. Protected Areas in Pakistan*.

Region/ Province	National Parks	Wildlife Sanctuaries	Game Reserves	Un-classified	Total Protected Areas	Total Area conserved (ha)	% of Total Land Area Protected
Azad Jammu & Kashmir	1	0	8	0	9	51,998	3.91
Balochistan	2	15	7	7	31	1,837,704	5.29
Punjab	2	37	19	0	58	3,315,803	16.14
NWFP	3	6	38	5	52	470,675	6.30
Sindh	1	35	14	4	54	1,307,575	9.27
Federal Territory	1	1	1	0	3	94,186	100
Northern Areas	4	5	9	0	18	2,092,180	2.97
Total	**14**	**99**	**96**	**16**	**225**	**9,170,121**	**10.40**

(GOP, 2000)

4. FIGURES

Figure 1. Home-tracts of Buffaloes Breeds in Pakistan.

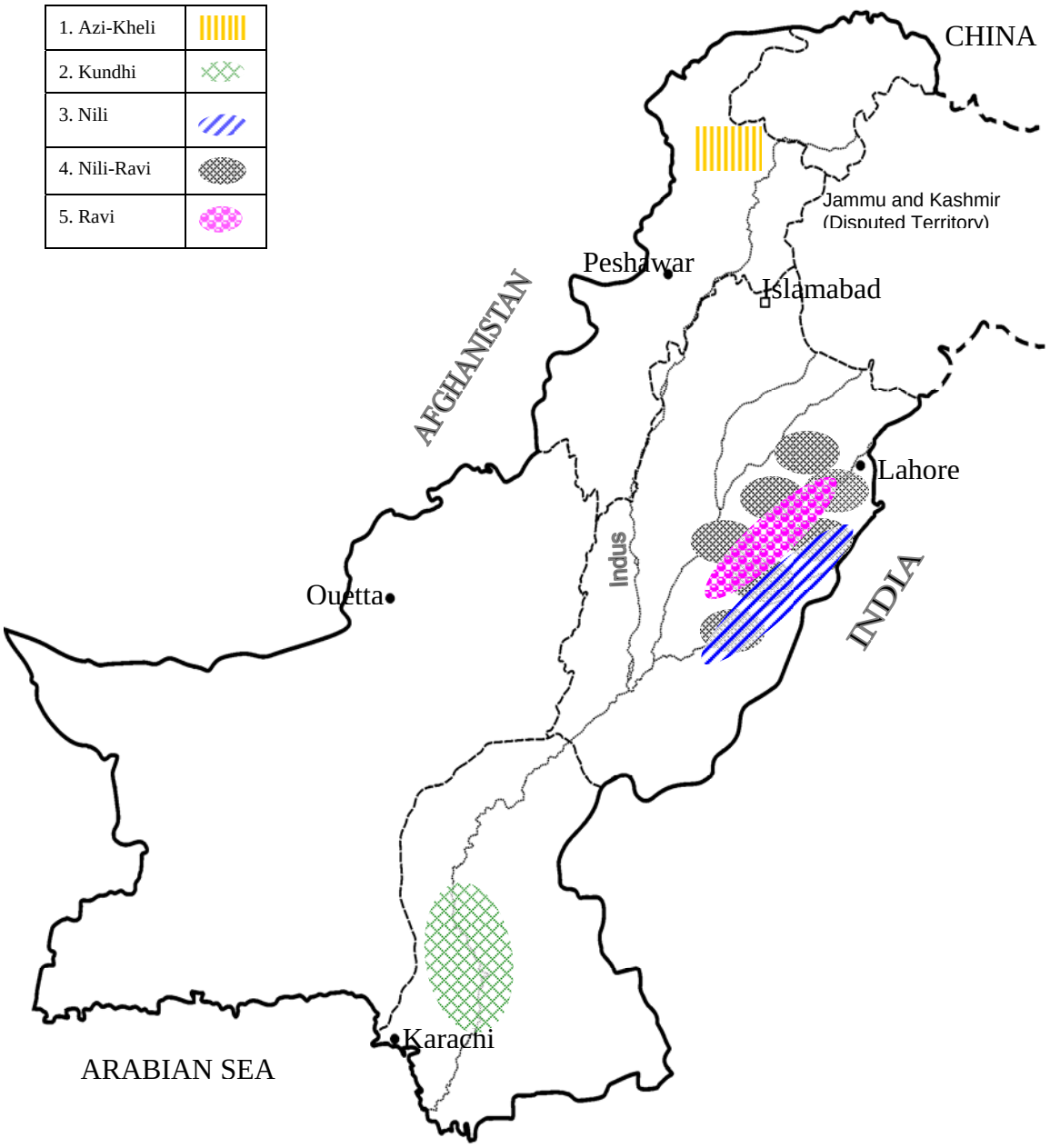


Figure 2. Home-tracts of Cattle Breeds in Pakistan.

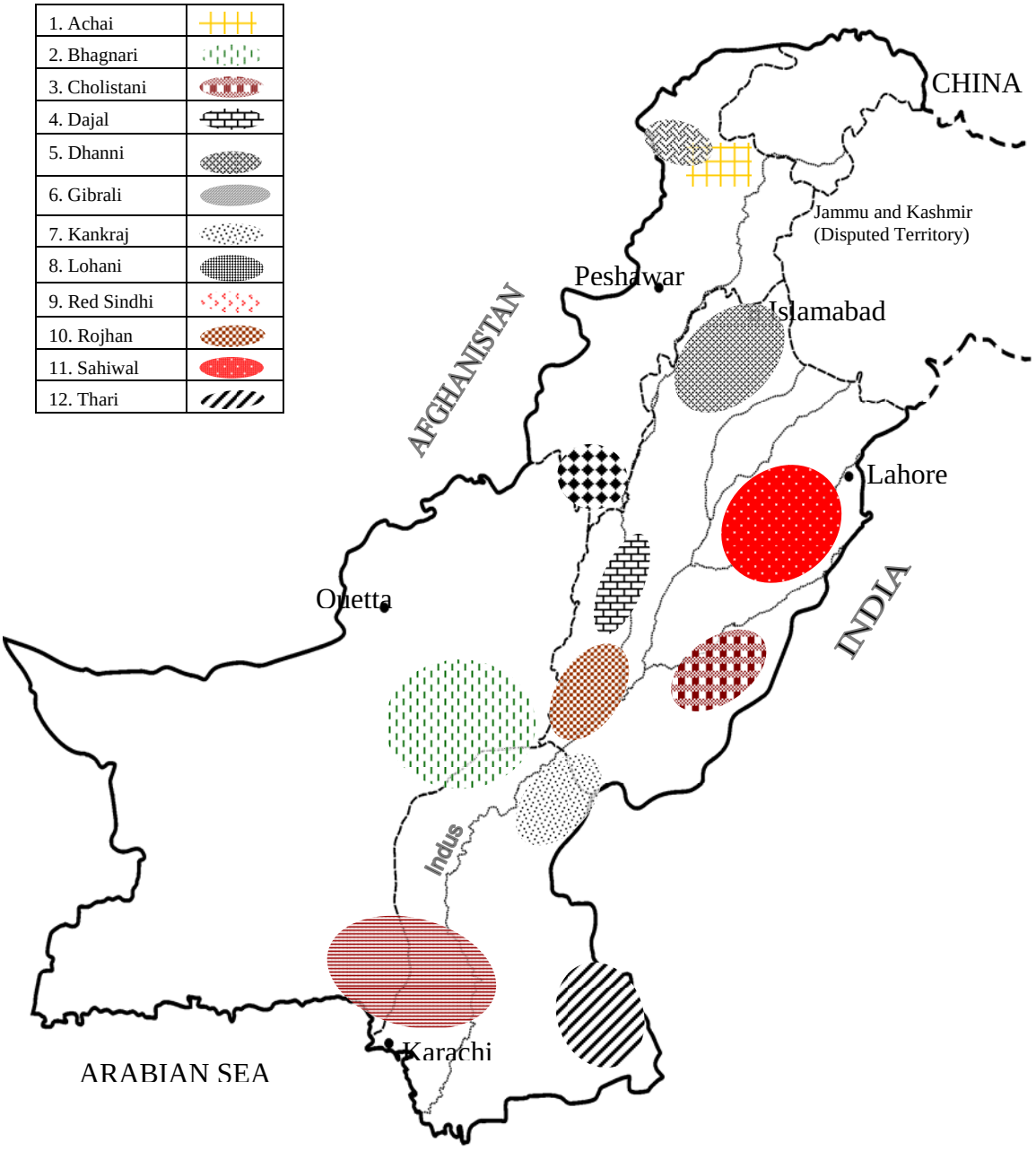


Figure 3. Home-tracts of Sheep Breeds in Pakistan.

1. Baghdale	18. Kali
2. Balkhi	19. Khijloo
3. Baltistani	20. Kohai Ghizer
4. Balochi	21. Kooka
5. Bibrik	22. Latti
6. Buchi	23. Lohi
7. Cholistani	24. Michni
8. Damani	25. Pahari
9. Dumbi	26. Pak-Awassi
10. Gojal	27. Pak-Karakul
11. Harnai	28. Poonchi
12. Hashtnagri	29. Rakhshani
13. Hissardale	30. Sipli
14. Kachhi	31. Thalli
15. Kaghani	32. Tirahi
16. Kail	33. Waziri
17. Kajli	

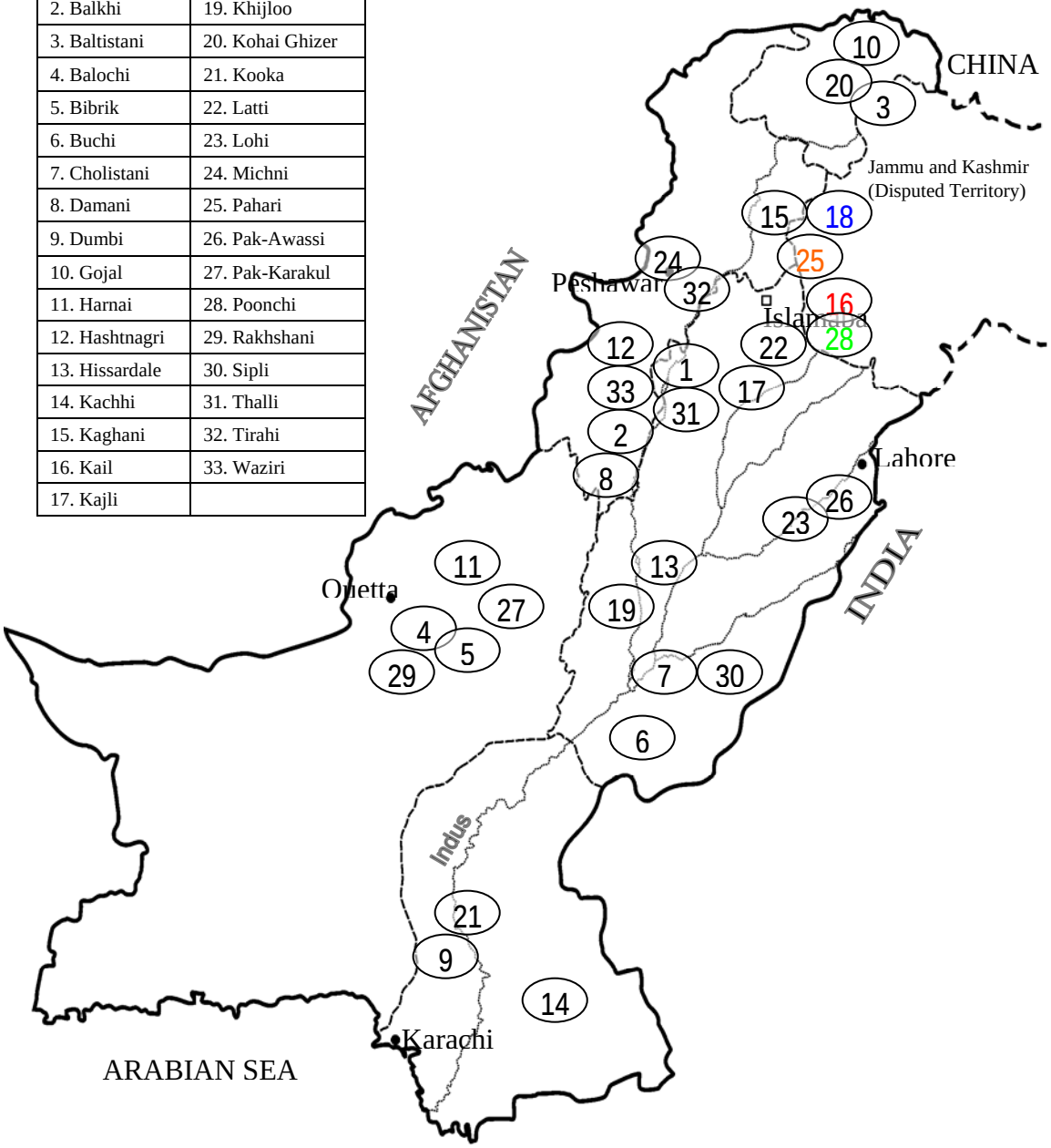


Figure 4. Home-tracts of Goat Breeds in Pakistan.

1. Baltistani	19. Kajli
2. Bari	20. Kamori
3. Beetal	21. Khurasani
4. Beiari	22. Kohi Ghizar
5. Buchi	23. Kooti
6. Bugi Toori	24. Kurri
7. Bujri	25. Labri
8. Chappar	26. Lehri
9. Damani	27. Lohri
10. D. D Panah	28. Nachi
11. Desi	29. Pak-Angora
12. Gaddi	30. Pateri
13. Hairy	31.Piamiri
14. Jarkheil	32. Potohari
15. Jattan	33. Shurri
16. Kachhan	34. Tapri
17. Kaghani	35. Teddy
18. Kail	36. Tharki

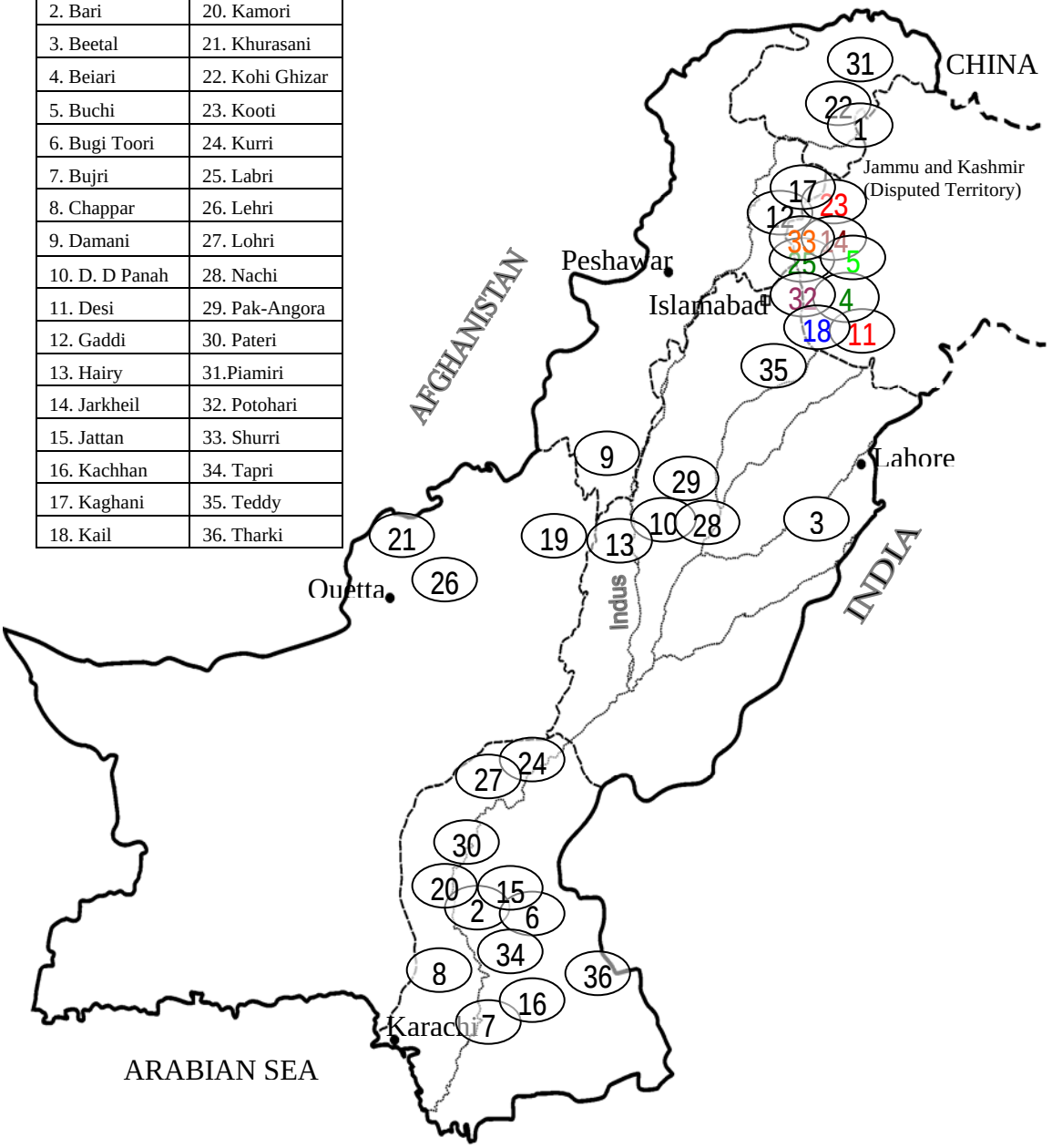


Figure 5. Home-tracts of Camel Breeds in Pakistan.

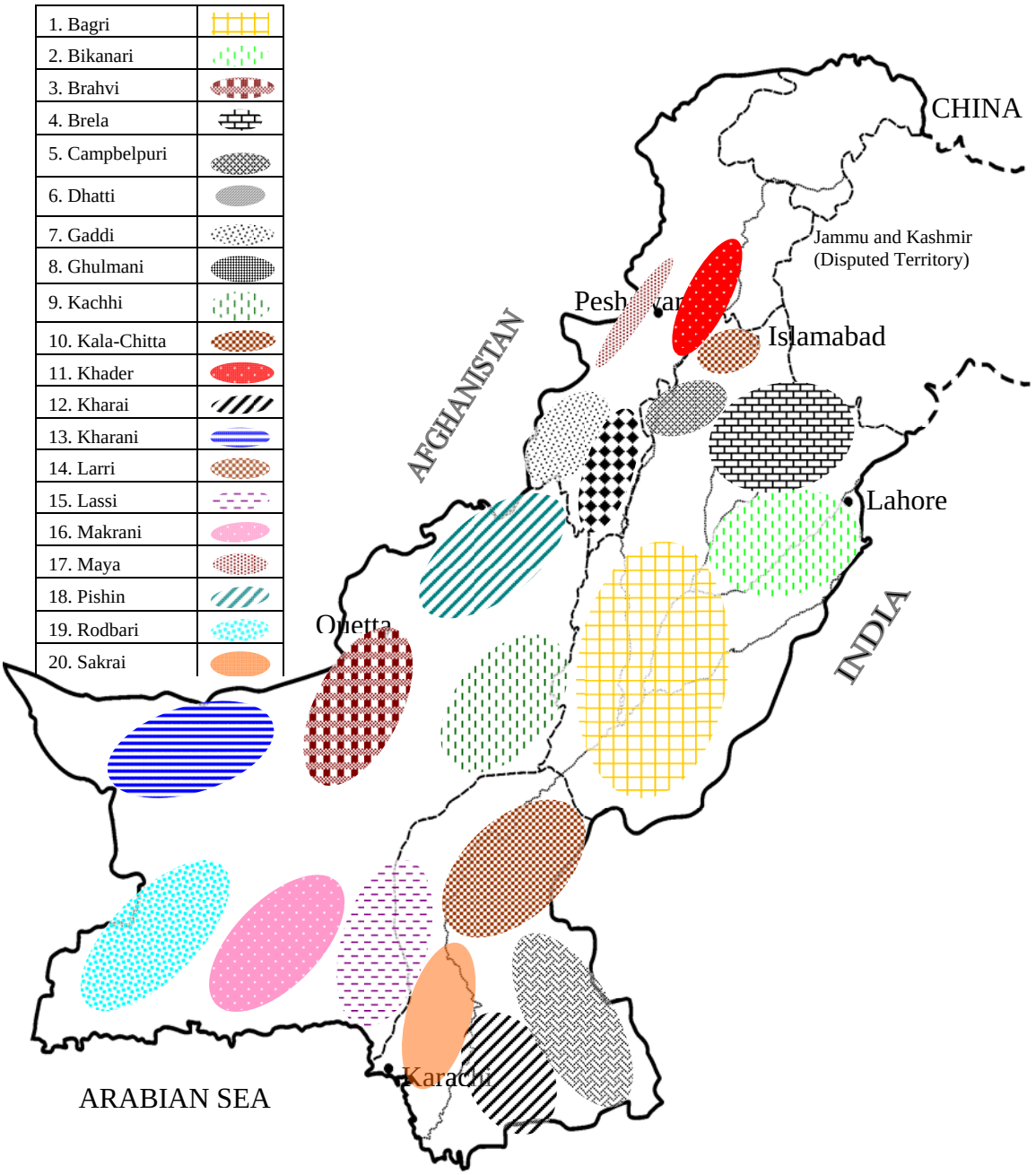


Figure 6. Wild Relatives of Sheep in Pakistan.

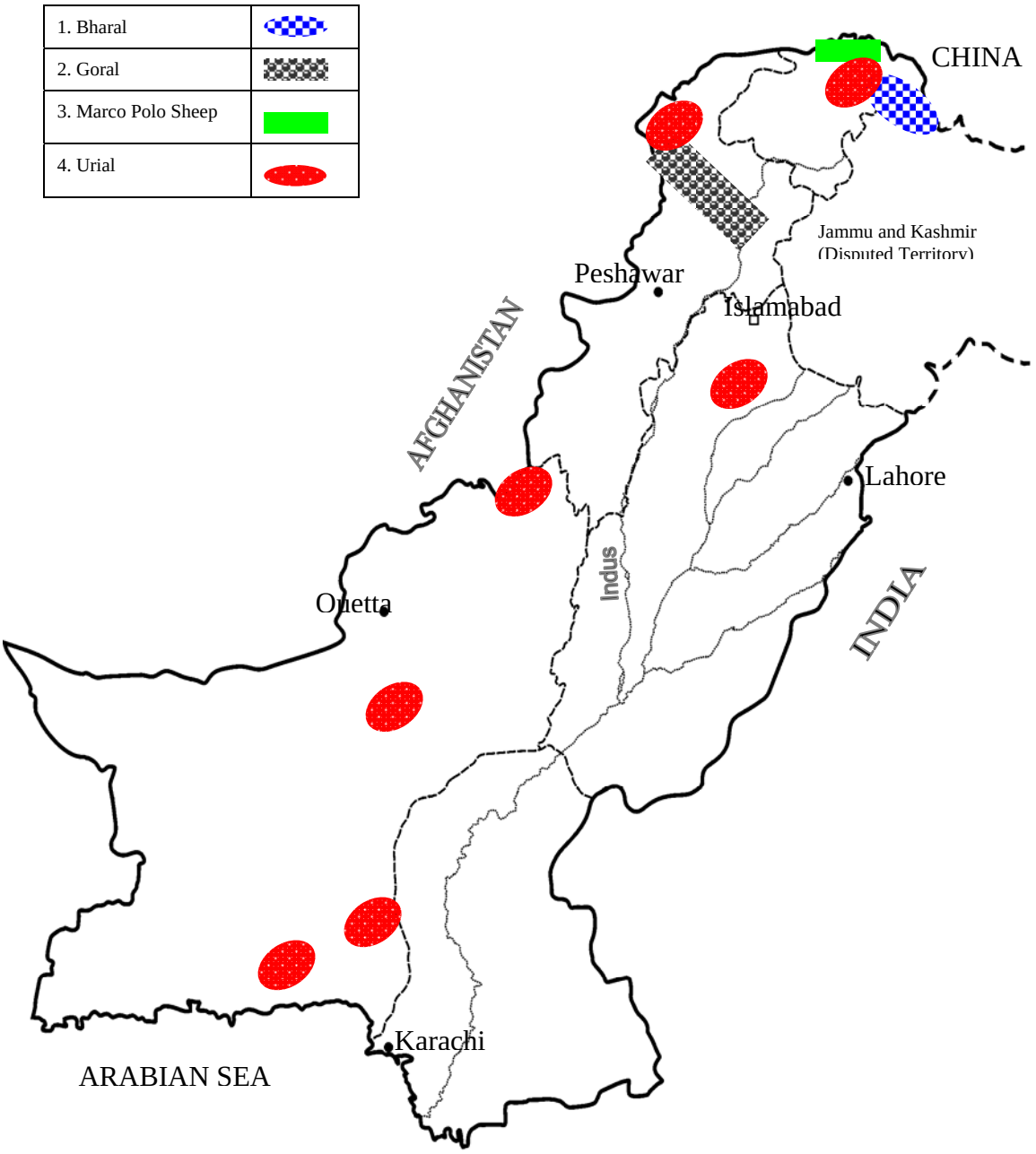
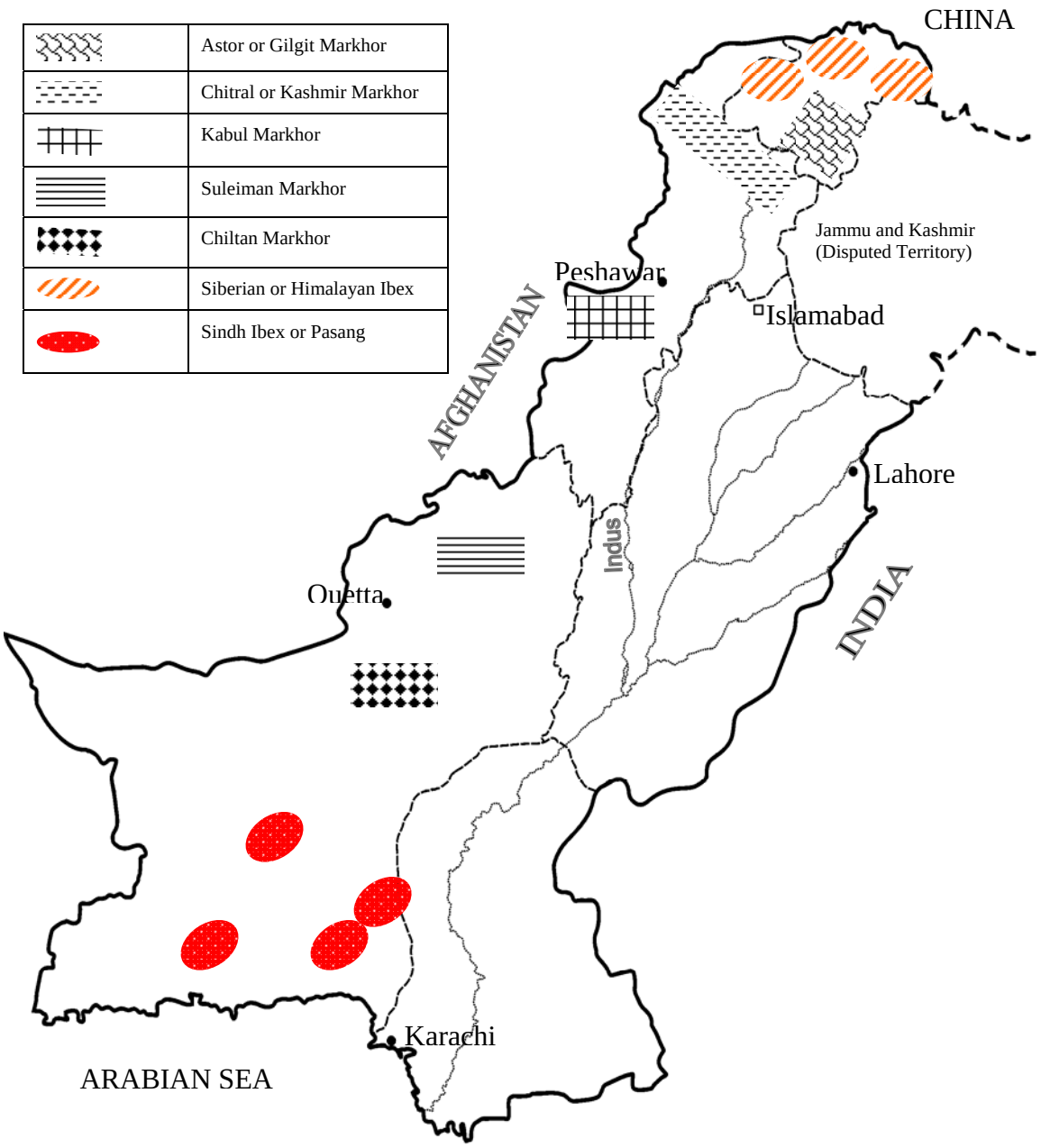


Figure 7. Wild Relatives of Goats in Pakistan.



5. REFERENCES

Amir, P. 1997. Oriental Horses of Pakistan. Asianics Agro-Dev. International (Pvt.) Ltd, Islamabad (Pakistan).

Anonymous. 1996. Wildlife of the Punjab. Punjab Wildlife Department. Soan Valley Press Lahore.

Ashraf, M., S. Mahmood, M.S. Khan and F. Ahmad. 2003. Productive behaviors of Lyallpur Silver Black and Rhode Island Red breeds of poultry. Intr. J. Agric. Biol. 5(3):384-387.

Beja-Pereira, A., G. Luikart, H. Jianli, P. Dobi, A. H. Bhuiyan, M. S. Khan, I. A. Zakharav-Hesehus, A. Chabchoub, M. Azevedo, M. El-Barady and N. Ferrand. 2003. Genetic clues to the origin of domestic donkey. Inaugural International Conference on Conservation Genetics, Front Royal (USA), 13-17 Sept, 2003.

Bunch, T. D., S. Wang, Y. Zhang, A. Liu and S. Lin. 2000. Chromosome evolution in the Blue Sheep/Bharal (*Pseudois nayaur*). J. Hered. 91:168-170.

Chaudhry, A.A. 2002. White-headed Duck Survey in Pakistan:2002. Wetlands International.

Chaudhry, M.A. 2002a. Progeny testing program for buffaloes in Pakistan. D-8 International Seminar on Conservation of Animal Genetic Resources. (April 1-4, 2002), Islamabad.

FAO. 1987. Report of the FAO/Asian Development Bank Cooperative Programme Investment Centre. FAO, Rome.

FAO. 2002. Selected indicators of food and agriculture development in Asia-Pacific region - 1991-2001. FAO, Rome.

FAO. 2004. http://faostat.fao.org.

GOP. 1986. Pakistan Census of Livestock 1986. Agricultural Census Organization, Statistics Division, Government of Pakistan, Lahore.

GOP. 1996. Livestock Census 1996. Agricultural Census Organization, Statistics Division, Government of Pakistan, Lahore.

GOP. 1999. Baseline environmental study of Kirthar National Park. Sindh Wildlife Department. http://www.sli.unimelb.edu.au/zerger/khirthar/index.htm

GOP. 2000. Biodiversity Action Plan for Pakistan. Government of Pakistan, WWF and IUCN, Pakistan. http://www.pakistan.gov.pk/environment-division/publications/bap.pdf

GOP. 2001. Agricultural Statistics of Pakistan (2000-2001). Ministry of Food, Agriculture and Livestock, Islamabad.

GOP. 2003. Economic Survey, 2002-03. Economic Affair Division, Government of Pakistan. http://www.finance.gov.pk/

Gregory, T.R. 2001. Animal Genome Size Database. [http://www.genomesize.com]

Grizimek, B. 1972. Grizimek Animal Life Encyclopedia. Van Nostrand Reinhold, Co., New York. Pp:458-514.

Hasnain, H.U. 1985. Sheep and Goats in Pakistan. FAO Animal Production and Health Paper 56. FAO, Rome.

Hiendleder, S., B. Kaupe, R. Wassmuth and A. Janke. 2002. Molecular analysis of wild and domestic sheep questions current nomenclature and provides evidence for domestication from two different subspecies. Proc. R. Soc. Lond. B. 269: 893-904.

Isani, G.B. and M.N. Baloch. 1996. Sheep and Goat Breeds of Pakistan. Press Corporation of Pakistan, Karachi.

Isani, G.B. and M.N. Baloch. 2000. Camel Breeds of Pakistan. The Camel Applied Research and Development Network, Pakistan.

IUCN. 2002. http://www.IUCN.org/

Khan, B.B., Y. Younas and S.H. Hanjra. 1982. Breeds and Types of Livestock in Pakistan. University of Agriculture, Faisalabad.

Khan, M. S. and A.H. Nizamani. 2004. Camelid genetic resources of Pakistan. FAO/ICAR Seminar on Camelids. 34 ICAR Session, Sousse, Tunisia (May 28-June 4, 2004) (accepted).

Khan, M.A. and M.S. Khan. 1999. Variation in pre-weaning growth rate of Bhagnari x Droughtmaster calves. Pakistan Vet. J. 19(1):4-6.

Kreutzmann, H. 2003. Yak keeping in Western high Asia. *In* The Yak (Eds: Wiener, G. H. Jianlin and L. Ruijun). FAO Regional Office for Asia and the Pacific, Bangkok, Thailand. Pp:323-336.

Roberts, T. J. 1991. The Birds of Pakistan. Vol 1. Non-Passeriformes. Oxford University Press, Oxford.

Roberts, T.J. 1997. The Mammals of Pakistan. Oxford University Press, Oxford.

Wahid, A. 1982. General pattern of production, breeds, management, disease, nutrition performance and problems. *In* Proc. International Seminar on Sheep and Wool. Pakistan Agricultural Research Council, Islamabad. pp:14-38.

5.1 Important Internet Sites

http://animaldiversity.ummz.umich.edu/site/accounts/information/Bovidae.html
http://books.nap.edu/books/030904295X/html/33.html
http://capra.iespana.es/capra/ingles/origen/origen.htm
http://dad.fao.org/en/Home.htm
http://medicine.ucsd.edu/cpa/goral.htm
http://www.callisto.si.usherb.ca:8080/caprinae/pdffiles/CSG%20November%2001.pdf
http://www.callisto.si.usherb.ca:8080/caprinae/speakers.htm
http://www.callisto.si.usherb.ca:8080/caprinae/taxo.htm
http://www.genomesize.com/mammals.htm
http://www.grisda.org/origins/13009.htm
http://www.iucn.org/themes/wcpa/wpc2003/pdfs/unlistpa2003.pdf
http://www.ultimateungulate.com/Artiodactyla/ Ovis_ammon.html
http://www.wildlifeofpakistan.com/ungulates_gs.html
www.callisto.si.usherb.ca:8080/ caprinae/pdffiles/Oct-03.pdf
www.snowleopard.org/islt/procite/fox89
www.vbeefweb.unimelb.edu.au/KNPsite/Fauna/Fauna.htm
www.wildlifeofpakistan.com/ProtectedAreasofPakistan/nationalparksofPakistan.htm

6. TOR

Background Study
STUDY ON THE STATUS, TRENDS, UTILIZATION AND PERFORMANCE OF FAnGR

- Current status of FAnGR based on the review and analysis of available data. It will include the list of all species/breeds present in the country, the breed origin, the synonym of the breed name, the breed geographic, distribution (including map distribution), its past and present population size, the breeds found in each production system and agro-ecological zone, the future expected trend in population size (increasing, stable, decreasing), the risk status of the breed1, whether or not the breed is endemic to the country or present in neighbouring countries.
- Current status of wild relatives of FAnGR based on the review and analysis of available data. It will include the list of species/subspecies present in the country, their geographic distribution (including map distribution), their past and present population size. The future expected trends in population size (increasing, stable, decreasing), the risk status of the wild relatives2. Whether or not the wild relatives is present only in the country or also present in neighbouring countries.
- Description whether or not the wild relatives contribute to breeding programme of domestic species and to what extent, as well as the degree to which they contribute economically to food and agricultural production in the country.
- Description of the past and present utilization and performance of FAnGR in the country in relation to the production system and the agro-ecological zone context in which they are found.
- Description of the farmer preferences and perceptions regarding indigenous FAnGR and wild relatives.
- Assisting the National Consultant in identifying constraints (including priority areas for capacity building) relating to breed surveys methodologies, phenotypic and molecular characterization, economic valuation, design of breeding programs.

---

1. Following FAO DAD-IS the risk status of the breeds will be classified as extinct, critical, critical-maintained, endangered, endangered-maintained, not at risk, unknown. Full description of these criteria are provided in the 'World Watch List for domestic diversity 3rd edition' see http://dad.fao.org/en/Home.htm

2. The risk status of the wild relatives will follow the IUCN threatened species categories http://www.IUCN.org/ as described in http://dad.fao.org/en/Home.htm , (extinct, endangered, vulnerable, rare, indeterminate, sufficiently known, threatened, commercially threatened).