Iran's Country

Report on Farm Animal Genetic Resources

Ministry of Jihad-e-Agriculture

Agricultural Reserch and Education Organization

Animal Science Research Institute

IN THE NAME OF GOD

The Islamic Republic of Iran

Ministry of Jihad-e-Agriculture

Food and Agriculture

Organization of the United Nations

Draft

IRAN ' S Country Report

On Farm Animal Genetic Resources

Translated from the original in Persian

Prepared by

Animal science research

Institute of IRAN

Tehran, July 2004

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Foreword

Since ancient time, Iranian plateau with its geographical situation, extensive plains, climatic diversity and being as a junction for west to east highways, accounted for gathering and shuttling of various livestock and poultry species. Hence, certain species of sheep, goats, poultry and cattle could possess relatively desired range of diversities and reputed the country for their authentic genetic stocks. Unfortunately, the past century encountered a rapid industrialization, invention of scientific tools in genetic areas, expansion of environmental pollution, development of urbanization, deterioration of may ecosystems and change of climate that resulted in decrease of animal population or even risk of extinction of some species. Although, the developed countries have attended to the importance of AnGR and enormous attention is paid to that, due to being pioneer in aforementioned subjects in the previous century there has been the least genetic diversity in their economic activities. On the other hand, the developing countries still enjoy quite a number of gene pools which may face to same destiny unless be conserved promptly. The Islamic Republic of Iran also experienced certain genetic invasion in native species by exotic breeds which resulted in huge genetic mixtures and population decline, intensified by non-economic production of native species. Rearing of some native species is no more economic mainly due to change in market pattern or life style which could lead to lower consumption and decreasing trend of their population.

In this report, it has been tried to take a step for gathering available information related to AnGR Iran. To this end, the FAO instruction was based for documenting all quantitative data within the country report framework and to generate an overall perspective on diversified AnGR of Iran. Various authorized sources of statistic data including National Center for Statistics and Informatics, as well as the

Dept. of Livestock Affairs catered to enrich this report. Many animal science professionals were called to fill in different questionnaires and to share their comments in the process of the report compilation.

1. THE STATE OF AGRICULTURAL BIO-DIVERSITY IN LIVESTOCK SECTOR

This part of the report briefly describes various aspects of the country i.e. population, livestock status and prevalent production systems. A considerable portion has been allocated to the farm animal genetic resources and major breeders involved in rearing and utilization of livestock breeds.

1.1 I . R. of Iran, its agriculture and livestock sectors

The country covers an area of 1,648,195 sq. km. and situated between latitudes 25°3′ and 39° 47′ N, and longitude 44°02′ to 63°20 ′ E . It extends to Azerbaijan, Armenia, Caspian sea and Turkmenistan in north, Afghanistan and Pakistan in east, Oman sea and Persian Gulf in south, and Iraq and Turkey in west. More than half of the country underlies the mountains and uplands, a quarter covered by deserts, and the remaining goes for arable lands. Average altitude reaches to 1200 m. above sea level, and the Zagross, the longest mountainous chain, extending north-west to south towards the Persian Gulf shores, and then turns to east into the south-eastern provinces. The Alborz, chain forms another structure whose trend starts from north-west to southern margins of Caspian Sea. The central plateau is confined by the foregoing mountain chains and covers more than 50% of the country's area. Saline deserts are also extensively available (enclosed maps no. 1 and 2).

1.2 Climatic situation

Iran is ecologically divided into 5 zones:

1. Arid zone: with less than 100 mm annual rainfall ;
2. Semi-arid zone: with 200-250 mm annual rainfall ;
3. Arid and semi-humid zone: with 250 –500 mm annual rainfall ;
4. Semi-humid zone: with 500-1000 mm annual rainfall ;
5. Humid zone: with more than 1000 mm annual rainfall ;

Despite the aforesaid categorization, there exist other isolated plots characterized by severe cold, warm and dryness which however, create enabling beds for growing diversified plant and animal species (enclosed map no. 3).

1.3 Country Population

Population of Iran has experienced a growing trend from 62,745,540 to 66,479,838 people during 1999-2003 which represents a growth and drop of 63.53% and 36.47% to 66.76% and 33.24% respectively in urban and rural regions. On the basis of nomad census conducted in 1998, they constituted a population of 1,304,089 comprising of 19993 households (101 tribes and 592 independent clans).

Mean population density reaches to 41 persons per sq. km. ranging from 10 in western regions up to nearly 150 persons in northern or costal patches like Guilan province. Annual population growth rate was estimated at 1.5% during 90s. In 1986, totally 9,055,000 households were identified of which 5,033,000 and 4,022,000 were residing in urban and rural localities respectively. The same composition revealed 12,398,000 households in 1996 including 7,949,000 and 4,449,000 urban and rural ingredients. During 1986-96, family dimension dropped from 4.8 to 4.6 in urban and from 5.36 to 5.1 in rural areas. In Iran, population composes of 60% below 24, 35% at 24-64 and 4% above 65 years with 1% unidentified age-group. Following the population rise and its per capita consumption growth, there happened an outstanding demand for agro-products which seems inconsistent to meet the growing needs mainly due to decreasing population, poor yield and productivity in rural regions. This is an alerting situation which may endanger food security at national scale. During 1986-96, there was an improvement in literacy rate from 24 to 42 million individuals broken into 28 million urban and 14 million rural people.

1.4 Agriculture in Iran

Iran is globally assumed as one of the richest centers for diversified genetic resources amounting up to 12000 plant species of which, 59156 domestic and wild samples have been already recorded.

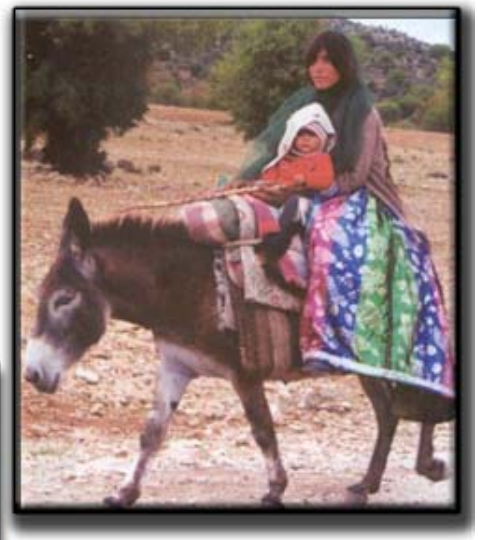
The overall arable lands extend up to 51 million ha. covering 30% of the total country area. Approximately, farming lands cover 18.5 million ha. 12.4 million ha. under forest cover and 90 million ha. allotted to rangelands. Of the total rangelands, there are good, medium to poor, and poor to very poor parcels with 10.3%, 41.5% and 43.4% coverage respectively. The harvesting carrying capacity allowed for rangelands is 10.5 million tones of dried forage (5.9 million tones TDN); while presently twice pressure is imposed on their potential. Moreover, due to various reasons have intensified deterioration trend and expansion of desert areas some of these reasons are over grazing by conventional users, successive drought occurrences, and inadequate investment. These calamitous consequences entail actualizing serious protective attempts against natural disasters like flooding, desertification, etc. Watershed management proved effective to rehabilitate the ranges from 469,000 ha. in 1991 to 2,200,000 ha. by 2001. Agricultural value-added amounts up to 45217.9 billion Rls. (5650 million USD) and constitute more than 20-21% of GDP, with 23% of total manpower employed in the sector. There are three types of farming systems mainly traditional, industrial and semi-industrial in Iran. The country deserves huge wheat production as its first yield proceeding by barley and rice as the next major crops.

There are also commending forage (Alfa-Alfa) production followed by sugar-beet and canes as the first and second industrial crops respectively.

1.5 Animal production systems in Iran

Animal production in Iran composes of traditional, semi-industrial and industrial system with main concentration in traditional rearing by private and cooperative farmers. This categorization is based on available facilities and tools in different herds.

Due to almost complete economical dependence of nomadic tribes on animal rearing, they deserve undeniable share in animal genetic resources. They possess extensive habitat of over 963000 sq. km. scattered on 59% of the total country area. General demographic dispersion pattern in nomadic societies indicates various provincial population e.g. Fars 12%, Kerman 9.6%, Khuzestan 9.2% and West-Azerbaijan 8.6% which had respectively greatest population distribution.



In the recent decades, there was a gradual drop of their population from 38% in 1966 to 1.8% of the total country population in 1998

Table 1-1: Comparative trend of change in nomadic population to total country population.

Year		Population × 1000		Percentage share of nomads to total
		Total country	Nomads	
Historical Sources	**1874**	7654	1910	24.9
	1899	9332	2138	22.9
	1923	10000	2000	20
	1939	15090	3100	20.5
	1963	21000	2000	9.5
The National Center of Statistics	**1966**	25789	2500	9.6
	1974	31951	877	2.7
	1987	49445	1152	2.3
	1998	62432	1304	2.1

A comparison made on the results of the previous two census on migrating nomads disclosed a remarkable rise of their animals from 17.4 in 1987 to 22.7 million heads by 1998. Light livestock's are the major animal capital for nomads including 58.5% sheep and lambs, and 39.7% goats and kids. Average herd size is 105 animal units which shows 5 units more than the same 1987 census.

During the foregoing census interval, a drop was observed in the statistical range of households bearing less than 50 light animals, whereas the share of other nomadic classes in particular the middle class, was increased. It means in 1987, nearly 9.3% of households bearing no light flocks have decreased to 1.5% in 1998. Moreover, the households with less than 50 heads of animal decreased from 39% in 1987 to 25.5% by 1998, showing 13.5% drop. It is noticeable that various household classes shares of

were realized as 50-99 heads (6.2%) 100-149 heads (4.4%) and 150-199 heads (2.2%) could realize respective growth (Iranian National statistics Center 1987-1998).

The foregoing figures emphasize on gradual poverty or improvement in flounced into the nomadic livelihoods by loosing or increasing their flock sizes. Under certain circumstances, some families turned away the business and movement for its inconsistent cost-benefit and embraced sequestration.

Major animal products include red meat, milk or their processed production. At the time being, nomads are excessively producing red meat for a gradual shift of their feeder-animals to rather beef herds to meet their living requirements. Inclination to broiler-animals accounts for a considerable change in nomadic dairy economy and livelihoods towards new socio-economic states of their life. In another word, this attention mainly formed due to movement difficulties, increase of meat price, impacts of Jumpy-market pressures, and weakened self-running economy of tribal livelihoods. In decamp-based breeding system, pasture was considered as the main source of grazing with exception of disabled animals who were manually fed. But, census made in 1998 disclosed that in addition to pasture land potentials, manual feeding has been used more than before by nomads.

Animal production enjoyed positive changes over the last decade by touching 105% of the National Plan's target and realizing a rise from 5,390,000 tons in 1991 to 8,107,000 tons by 2002 claiming for 3.8% annual growth in performance. In this among, milk, red meat, chicken meat and egg production respectively, have the highest rank. Quantitatively since 1998, milk, red meat, chicken and eggs raised from 3,530,000 ; 390,000 ; 500,000 and 300,000 tons to 5,877,000 ; 770,000 ; 792,000 and 588,000 tons by 2002, respectively. Animal production with higher emphasis on dairy products, have presently targeted domestic consumption whereas this business anticipates higher yield, greater per capita protein consumption and meeting the world standards as well. Exporting animal products is yet a far-reaching official priority with

limited quantities of eggs and sheep hides. Unofficial export is also recorded through private dealers.

1.6 Animal species and breeds in Iran

In this section, outstanding breeds, production systems, trends and changes are discussed briefly:

Cattle

Cattle is a domesticated livestock with useful force, dairy and meat production. Cattle breeding have been a conventional business since very beginning in Iran. Based

on available evidences recovered in "the Shahr-e-Sukhteh"[1], the genuine Yoked Cattle (*Bus Indicus*) have scattered from south-east of Iran to other parts of Asia.

Iran possesses two species i.e. *Bus tarus* and *Bus indicus* for its specific climate and hence, diverse bio-genetic resources including at least six native cattle breeds (Sarabi, Golpaigani, sistani, Dashtiyari, Najdi and Taleshi) have so far been identified. Moreover, there are various gene pools i.e., Kurdi, Mazandarani, … which have got accustomed to their habitats. Entrance of exotic cattle has started since last 60 years, followed by gradual arrival of Holstein, Brown-Swiss and Jersey to boost dairy production. At present, there is usual import of exogenous genetic materials e.g. sperms and embryos resulting in general decrease of native cattle and increase of hybrids. In 1995, 6,882,970 native cattle, 895,828 hybrids, and 625,500 imported breeds were recorded, but new figures as 4,185,000 native cattle, 2,633,000 hybrids and 717,000 heads imported breeds were similarly counted by 2003.

Different breeding systems are classified into 3 major types i.e. traditional, semi-industrial and industrial. Industrial system is characterized by rearing over 20 heads of exotic cattle (Holstein, Brown-Swiss and Jersey) and is based on providing the least breeding criteria such as, management and feeding practices. The system also enjoys private ownership with partial involvement of cooperatives and limited public possession. Industrial breeders deserve small and large enterprises and, like semi-industrial system, but slightly rely on genetic materials, feed, drugs, veterinary services etc. In semi-industrial type, there are less than 20 heads of hybrids, exogenous and even native breeds rose together. The system is thoroughly run by private holders who bear rather qualified knowledge and equipments compared to traditional system. The breeders normally form small-scale holdings with remarkable dependence on external feed, drugs and genetic resources. Traditional system mostly focuses on native cattle, but occasionally incorporates few cross bred exotic breeds. Breeding operation

1. The Burnt City

explicitly relies on indigenous knowledge and experience with locally-designed stables. Cattle population ranges from 5 to 7 heads running on a subsistence basis, partially small-scaled with least dependence on public inputs. In terms of environmental impact-assessment, no similar status prevail among the foregoing systems, so that drought and social condition have greater effect on traditional system whereas industrial farm receives maximum impacts generated from capital access and foreign-exchange rates. The main cattle products are milk, meat, skin, manure and animal power with various performances as follows;

Table 1-2: Various primary cattle products during 1995-2003

Year	Milk (1000 tones)	Meat (1000 tones)	Skin
1995	3178	268.73	2,300,000
2003	5451	328	2,100,000

In general, milk production is the main goal of cattle breeding, but its role on red meat production can not be ignored. There is unsteady distribution of production quantity and farms across the country leading to internal consumption of major milk and meat produced under traditional system. Given the forthcoming scopes for excessive production of such items through industrial and semi-industrial operations, there is commending potential to export some parcels to the demanding markets.

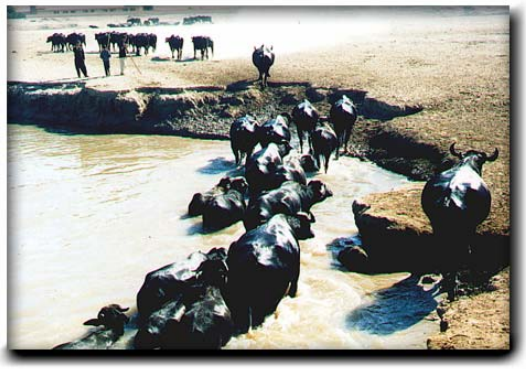
Industrial system is mainly used to yield huge milk around the big cities. Traditional pattern has effective impacts principally derived from native culture, farming texture and animal breeding particularities. Table 1-2 indicates the trend of changes on milk and meat production in relation to different cattle breeds in 1995 and 2003.

Table 1-3: Cattle milk and meat production during 1995-2003

Breeds	1995		2003	
	Milk	Meat	Milk	Meat
Native cattle	1644	133.46	1130	139.58
Scrubs	490	88.54	2317	125.99
Exotic breeds	1044	46.73	2004	48.39
Total	3178	268.73	5451	313.95

(Scale: 1000 tones)

In line with the production ranges observed over the past decade, a gradual switch-over from traditional to industrial and semi-industrial was also underway. This scenario greatly encouraged by drought occurrences, supportive policies to hybridization, and growing demand for increased milk and red meat at national level.



Buffalo

Iranian buffalo is assumed of river-buffalo who has been already adapted to local climatic situation of the south-east, north-west and north of the country (enclosed map no.5 indicates its distribution in Iran). Recently, no exotic breed was imported in, and the business runs under traditional, semi-industrial and industrial systems. In traditional system, other species like sheep, goat, cattle, and even mono-dactyl animals are normally maintained along with buffalo, while the other two systems exclusively deal with buffalo. Buffalo farms are thoroughly private-owned with almost no cooperative or public sector involved. Farm size ranges from small-holders bearing 8-9 buffalo heads in north and north-eastern provinces, to small-scale commercial farms composed of about 30 heads in south-east (Khuzestan province) region. Buffalo primary products are milk, meat, skin and manure with economically very important values for the herders. The foregoing products have unique relative importance but the highest

preference is given to milk and meat production. Concerning essential demands raised for animal protein, all such outputs have totally been consumed by growing population with almost no change over the past decade.

There would be potential growth in future demanding of milk and meat which shall require more buffalo for domestic as well as export use.

Table 1-4: Buffalo population and production trends in 1995 and 2003

Description	1995	2003
Population (1000 heads)	329	392
Milk production (1000 tones)	173.7	207
Meat production (1000 tones)	20.46	-

However, the traditional system gradually shifted towards semi-industrial and industrial farming with increasing tendency to high-yield breeds. The important points most be considered for modifying the buffalo breeding systems are as follow:

- Need for improving productivity;
- Meeting the increased demands for animal products;
- Alteration of consumption pattern and public policies, education, health and social issues.

Sheep and goat

Based on archeological findings, hilly region of Sarab in Iran was the origin of the world wool-sheep which dates back to 6000 years ago. Iranian sheep and goats have the world sixth and fifth ranks for their quality meat and milk. In 2000 census, it was reported that sheep and goat populations reached to 54 and 27 million heads respectively accounting for a GDP equal to 7.6 billion $. This potential composes of 400,000 tones of meat, 820,000 tones of milk, 60,000 tones wool, 8400 tones of goat fuzz and hair, 22 million skins and 188,000 tones of guts. At present, more than 1.6 million people are directly involved in sheep and goats breeding which plays a significant economic role in rural and nomadic livelihood. In fact, such flocks constitute an outstanding capital quite influential in their households. Averagely, 22.6% of sheep and goats population are reared under nomadic and semi-nomadic system and the remaining 77.4% are managed under composite (rural-farm) method. Every rural/nomad household keeps about 95 sheep and 65 goats. Traditional movement and

shepherding are almost conventional countrywide. Animal-keepers are used to displace their flocks in between the provinces. Generally, rams are integral parts of the rural herds, while in nomadic system; they only stay 1.5 to 6 months with the herd.

In 1991, there existed 47.7 million sheep and lambs which increased to 54 million by 2001 (8.2% growth), comprising of 26 pure breed and their hybrids (Table 1-5). This trend expresses an increase from 24.7 to 27 million heads of goat during the same period (3.2% growth) bearing 9 native breeds and their hybrids (enclosed maps numbers 6 and 7 indicate the sheep and goats distribution by regions in the country)

Table 1-5: Population of small ruminant breeds, during the last decade and current population distribution.

Breed	Population in 1990, No.	Population in 2000, No.	Ratio within species %	
			1990	2000
Sheep				
Afshari	1,227,500	1,500,000	2.57	2.77
Arabi	1,400,000	1,500,000	2.93	2.77
Bahmei	300,000	200,000	0.42	0.36
Balouchi	8,347,000	6,500,000	13.63	12.05
Chal	490,000	500,000	1.03	0.92
Dalagh	100,000	100,000	0.21	0.19
Ghezel	2,000,000	2,500,000	4.19	4.62
Gray Shiraz	55,5000	500,000	1.16	0.92
Karakul (black)	400,000	300,000	0.84	0.56
Kurdi	1,470,000	1,100,000	3.08	2.04
Lory & Lory Bakhtiyari	4,000,000	4,500,000	8.39	8.33
Makui	1,470,000	1,500,000	3.08	2.77
Mehrabani	1,150,000	1,000,000	2.41	1.86
Moghani	3,437,000	3,500,000	7.21	6.49
Sangsari	122,000	100,000	0.25	0.19
Sanjabi	1,000,000	1,000,000	2.10	1.86
Taleshi	339,000	400,000	0.71	0.76
Turki Ghashghaei	1,227,500	1,500,000	2.57	2.77
Zandi	400,000	500,000	0.84	0.92
Zel	2,100,000	2,000,000	4.40	3.70
Other (pure breeds)	2,546,500	3,400,000	5.34	6.29
Crossbred	14,600,000	19,900,000		36.86
Total Sheep	47,681,500	54,000,000		
Goats				
Marghoz	*	14,000	*	0.05
Najdi	*	50,000	*	0.19
Native Balck	*	1,500,000	*	5.56
Raeini	*	2,000,000	*	7.4
Tali	*	140,000	*	0.52
Mixed Breed	*	11,000,000	*	40.7
Not Characterized	*	4,000,000	*	14.8
Crosses	*	829,600	*	30.73
Total Goats*	24,635,000	27,000,000		
Total sheep and goats	72,316,500	81,000,000		

No.: number of heads

*** The No. of animal is not available in 1990**

Most Iranian sheep and goat breeds primarily impressed and developed by natural selection and adaptation to environmental condition, followed by impacts from various breeders. These breeds are traditionally named upon their breeding tribes or geographical origin. To date, Iranian sheep or goats are not racially registered but claimed as native stocks. Few percent of many identified breeds have undergone the National Breeding Plan (Ram performance test) which constitutes 2% of the total sheep and goat population. Nearly 65% of the available sheep are relatively pure whereas the rest 35% are hybrid. Less than 14% of goats are genetically pure and 86% are categorized as either scrub and mixed or untitled. Many sheep breeds are multipurpose and used for meat, milk and wool production. Besides, three other pelt breeds exist in the country. More than 96.3% Iranian sheep are fat tail and the 4% rest semi-fat or tailed breeds. “Zel” is the sole tailed breed together with well-known semi-fat Taleshi and Dalagh (Atabai) breeds living in northern areas and Caspian shore (Table1-6). Different goat breeds are raised for their meat, milk and hairs. There are populous and famous breeds as “Raeini” and “Siahmouie”, together with less populous ones as “Marghoz”, “Najdi” and “Tali”.

Various systems as traditional, nomadic and semi-nomadic are the major operations so far identified. Normally, nomads and rural communities are used to implicate traditional system. Semi-intensive system predominantly represents for fattening and breeding of sheep and goats in farms, whereby in intensive system, sheep tends to be grown at agro-industries run by public holdings and large cooperatives. In nomadic and semi-nomadic breeding systems, various animal species i.e. horses, mules and sometimes camels are kept together with sheep and goats mainly for transportation purpose.

Moreover, the system composes of some poultry i.e. hens, cocks, geese ducks and turkey living with sheep and goats as the main flocks near the black tents. At rural level, in addition to sheep and goats, cattle and poultry farming and in places, buffalo and camels are also conventional. In industrial and semi-industrial systems, raising any species (goats and sheep) is specially conducted for their meat. These systems practically enjoy rather productive and heavy breeds for raising intention (Table 1-7).

Table 1-6: Distribution of breeds by regions

Breed	South	Center	North	Total
Sheep				
Afshari			1,500,000	1,500,000
Arabi	1500,000			1,500,000
Bahmei	200,000			200,000
Baluchi	1,500,000	3,000,000	2,000,000	6,500,000
Chal		500,000		500,000
Dalagh			100,000	100,000
Ghezel			2,500,000	2,500,000
Gray Shiraz	500,000			500,000
Karakul (black)			300,000	300,000
Kurdi			1,100,000	1,100,000
Lory & Lory	1,000,000	3,500,000		4,500,000
Makui			1,500,000	1,500,000
Mehrabani		1,000,000		1,000,000
Moghani			3,500,000	3,500,000
Sangsari			100,000	100,000
Sanjabi		1,000,000		1,000,000
Taleshi			400,000	400,000
Turki Ghashghaei	1,500,000			1,500,000
Zandi		500,000		500,000
Zel			2,000,000	2,000,000
Goat	**9,000,000**	**12,000,000**	**6,000,000**	**27,000,000**

In triple system, raising sheep and goat shall thoroughly comprise of locally adapted breeds. There exist some genetic disturbances at border strips, for instance Pakistani goats along the Iranian south-eastern border are very similar to Bital and Tary

breeds. Given the diversified climates, ranges, traditional rearing systems, and socio-economic status of the animal-keepers, there are particular importance and opportunities for locally adapted breeds. Noteworthy, a few foreign breeds e.g. Sanan goat, Merino sheep, and Suffolk were recently imported for research and training centers, came up with new hybrids which however were not fully developed for some reasons. Sheep and goat husbandries are predominantly run by private ownership. Cooperative units constitute smaller portions and minor industrial sheep-breeding farms enjoy public ownership.

Table 1-7: Production systems associated with the different breeds of small ruminants in Iran.

Breed	Production system
Sheep	
Afshari	Semi-nomadic, mixed crop livestock and village
Arabi	Nomadic, semi-nomadic and village
Bahmei	Nomadic and semi-nomadic
Baluchi	Nomadic and semi-nomadic
Chal	Mixed crop livestock and village
Dalagh	Semi-nomadic, mixed crop livestock and village
Ghezel	Nomadic, semi-nomadic and village
Karakul (black)	Semi-nomadic, mixed crop livestock and village
Gray Shiraz	Nomadic, semi-nomadic and village
Kurdi	Semi-nomadic, mixed crop livestock and village
Lory & Lorry Bakhtiyari	Nomadic, semi-nomadic and village
Makui	Nomadic, semi-nomadic and village
Mehrabani	Semi-nomadic, mixed crop livestock and village
Moghani	Nomadic, semi-nomadic, village and farming
Sangsari	Nomadic, semi-nomadic and village
Sanjabi	Semi-nomadic, mixed crop livestock and village
Taleshi	Semi-nomadic, mixed crop livestock and village
Turki Ghashghaei	Nomadic and semi-nomadic
Zandi	Semi-nomadic, mixed crop livestock and village
Zel	Semi-nomadic, mixed crop livestock and village
Goats	
Marghoz	Village
Najdi	Semi-nomadic, mixed crop livestock and village
Native Black	Nomadic, semi-nomadic and village
Raeini	Nomadic and semi-nomadic
Tali	Mixed crop livestock and Village in small family flocks

Generally, sheep and goat herds include 100 to 150 productive animals and albeit, other quantities are more or less traced. Nowadays, sheep breeding systems is mostly self-sufficient followed by negligible imported drugs for veterinary purposes. So, any

fluctuations in imported medicines, can not affect them significantly. Flocks reared in industrial systems are relatively less vulnerable to dryness, social issues, access to capital and labor force, but rather sensitive to diseases and exchange fluctuations. In semi-intensive and extensive systems either rural, nomadic or semi-nomadic, greatest impact originates from dryness, social changes and access to capital. Presently, social changes and demand for more welfare may create serious threats to rural and nomadic rearing systems, and if not appropriately addressed, the production shall experience a drastic loss. In view to remarkable population rise at rural level, scarcity of the resources, socio-economic problems, and basic changes in consumption pattern, there expects a fundamental inclination of traditional and subsistent sheep and goat production towards intensive and semi-intensive systems. This scenario entails a rapid switch-over to adapted breeds upon indigenous stocks which may lead to elimination of some low-yield breeds from production cycle. Therefore, significant tasks have to be foreseen for sustainable development and genetic resources protection, relying on the state of the art technology and know-how through grasping workable mechanisms for action. In a preferred order, meat, milk, wool, quail, skin, hair, mohair, edible and inedible additives form the most important sheep and goats products. To date, economy of scale assumes as the highest feature in sheep breeding operation (Table 1-8). Meat production deserves the first priority in all regions, but sometimes, its position could be occupied by milk and fibers. Noteworthy that there is no significant role played by exotic animals in sheep and goat breeding in Iran. Meat and milk are totally consumed in domestic markets, and the sheep wool is employed in carpet weaving industry but the quails are exported to foreign markets. Goat hairs are partially exported while its mohair used for knitting traditional cloths. Sheep skins are greatly exported as pickles, whereas goat skins used as leather for local purposes. All guts have domestic consumption but intestines are exported after treatment. Manures are normally applied as fertilizers or sometimes as fuel by rural households. Over the past decades, no significant change was experienced in relative production shares of sheep or goats at

national scale. Hopefully, introduction of enabling systems in future, may lead to deserve higher shares for the afore-mentioned outputs. Unless a reliable condition created for optimum utilization of native genetic resources, all the foregoing yields and in particular, the animal protein provision would expose serious risks in future. In last decade, traditional pastorals were decreasing mainly owing to socio-economic impacts and government policies. For instance, reduce the pastures and range area, destruction of pastures, pasture and livestock equilibrium plan, withdrawal of livestocks from forest and range areas, tendency to migration, urbanization, and greater welfare have contributed in giving up nomadic and semi-nomadic pastoralism. Same adventure runs in public-owned industrial systems explicitly for poor policies formulated on entrusting such holdings to private or cooperative entities. Therefore, due to prevailing climatic, socio-economic and environmental conditions plus government consideration, there is promising chances for development of semi-industrial system compared to traditional and industrial ones.

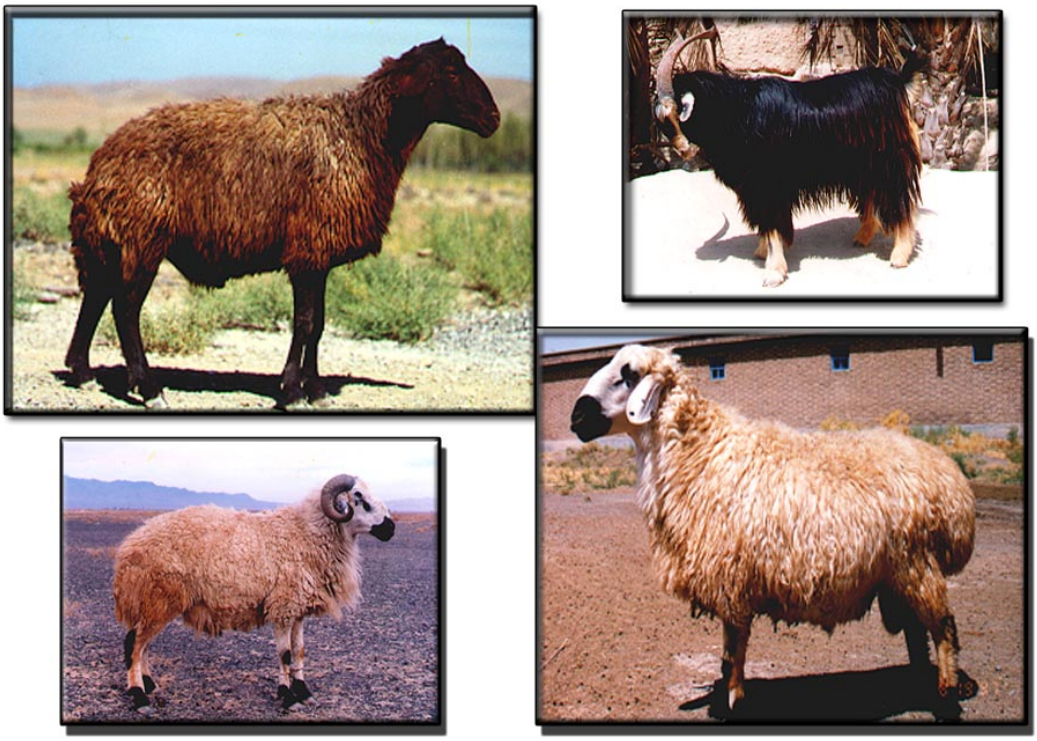
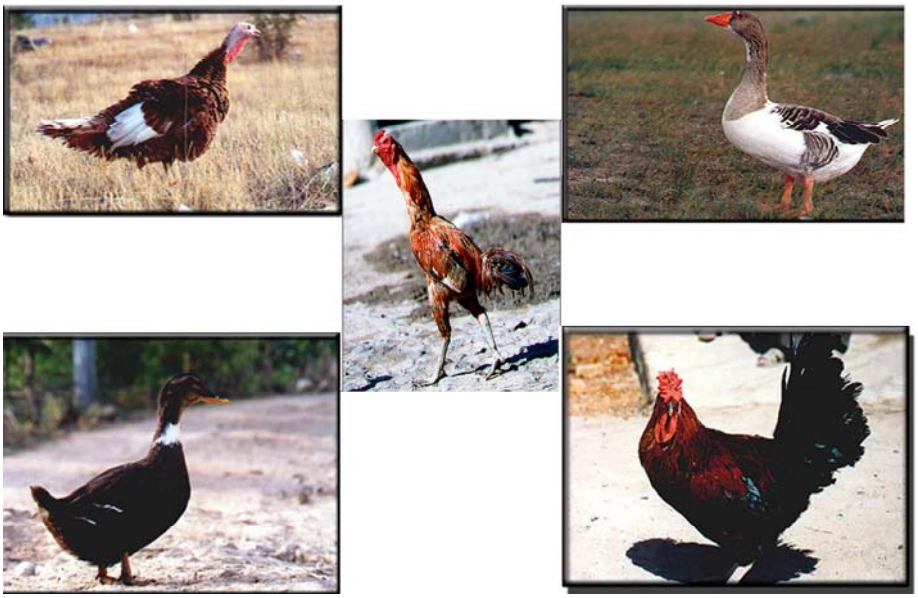


Table 1-8: Main products and estimated market possibilities

Breed	Main products	Current market demand and market possibilities
Sheep		
Afshari	**Meat**	High, due to popular internal demand, particularly sold as lamb. Export to the Persian Gulf and Europe offers possibilities if production is organized
Arabi	**Meat & wool**	Meat: High, due to popular internal demand, particularly sold as lamb. Export to Gulf and Europe offers possibilities if production is organized Wool: Low due to depressed demand for Iranian carpets in international market
Bahmei	**Meat**	High, due to internal demand, particularly sold as lamb. Export to Gulf and Europe offers possibilities if production is organized
Baluchi	**Meat & wool**	Meat: High, due to popular internal demand, particularly sold as lamb. Export to Gulf and Europe offers possibilities if production is organized Wool: Low due to depressed demand for Iranian carpets in international market
Chal	**Meat**	High, due to internal demand, particularly sold as lamb. Export to the Persian Gulf and Europe offers possibilities if production is organized
Dalagh	**Meat**	
Ghezel	**Meat**	High, due to internal demand, particularly sold as lamb.
Karakul (black)	**Meat & pelt**	Meat: High, due to internal demand, particularly sold as lamb. Export to the Persian Gulf and Europe offers possibilities if production is organized Pelt: extremely low during last years due to the economic depression. No possibilities in international markets
Gray Shiraz	**Meat & pelt**	
Kurdi	**Meat**	High, due to popular internal demand, particularly sold as lamb. Export to the Persian Gulf and Europe offers possibilities if production is organized
Lory	**Meat**	High, due to internal demand, particularly sold as lamb.
Makui	**Meat & wool**	Meat: High, due to popular internal demand, particularly sold as lamb. Export to the Persian Gulf and Europe offers possibilities if production is organized Wool: Low due to depressed demand for Iranian carpets in international market
Mehrabani	**Meat**	High, due to internal demand, particularly sold as lamb. Export to the Persian Gulf and Europe offers possibilities if production is organized
Moghani	**Meat**	
Sangsari	**Meat**	
Sanjabi	**Meat**	
Taleshi	**Meat**	
Turki Ghashghaei	**Meat**	High, due to internal demand, particularly sold as lamb.
Zandi	**Meat & pelt**	Meat: High, due to internal demand, particularly sold as lamb. Export to the Persian Gulf and Europe offers possibilities if production is organized Pelt: extremely low during last years due to the economic depression. No possibilities in international markets
Zel	**Meat**	High, due to popular internal demand and non fat-tailed (low fat carcass), particularly sold as lamb. Export to the Persian Gulf and Europe offers possibilities if production is organized
Goats		
Marghoz	**Meat & Mohair**	Meat: High due to domestic demand Mohair: Domestic demand, promising export possibilities
Najdi	**Milk & Meat**	Milk: Medium due to domestic demand Meat: High due to domestic and overseas demand
Native Black	**Meat, Milk & Hair**	Meat: High demand in southern part of country and overseas market Milk: Mainly for cheese, butter and yogurt to domestic demand Hair: High for domestic demand for flock keeper and nomad as dwelling
Raeini	**Cashmere & Meat**	Cashmere: high market demand mainly in European countries Meat: High due to domestic demand
Tali	**Milk & Meat**	Milk: High due to domestic demand Meat: High due to domestic demand

It is expected to compensate the missing shares by implicating suitable change in semi-industrial mode which however, entails serious considerations by policy-makers and professionals at national level. Over the past decades, outstanding diversification was enforced in milk and dairy products mainly by importing the state of the art of technology in processing and packaging fields. Meat and skin also enjoyed diversified outcomes. In general, tangible progressions are now realized in recording techniques, genetic breeding, technical supports and processing industries (slaughter-houses, dairy plants, etc). Such steps have either supported producer and production, or improved quality and quantity of the products, which rationalizes further inputs for an integrated patronage.



Poultry

The first attempt in development of poultry and introduction of new livestock practice was shaped by establishing “National Enterprise for Livestock Breeding” in 1930. This body took initiative by importing 60000 pieces of exotic breeds chicks like New-Hampshire, Road Island and Plymouth Rock. Now a day the poultry industry is one of the biggest investments in agricultural sector of Iran. During the recent years,

growing population and increased demand for animal protein provided unique opportunities for poultry production in traditional and industrial systems in rural regions. This business could accordingly receive governmental subsidies at rural level so that 17 centers of native day-old chicks became operational by 2002 and increased native chicken population from 20 million pieces in 1987 to 40 million by 2001. As shown in Tables 1-9 and 1-10, raising capacities of commercial layers and broilers are progressively enhanced. More than 11279 broiler farms bearing totally 145 million chick capacities plus 1406 layer and pullet farms were operational in 2001. Table 1-11 indicates the number and rearing capacity of breeders. In 1991, totally 70 breeder farms were active which expanded to 274 farms by 2001 (the enclosed map no.8 shows an approximate distribution of poultry population). There is no thorough figure on other poultry species. Based on a report released by the Livestock Affairs Department of the Ministry of Jihad-e-Agriculture, round about 27000 turkey day-old chicks were incubated up in 2002. Moreover, by 2002, sum 43 certificates were issued for production of 3213 pieces of ostrich farms, 15 certificates for 1741 pieces, 90 certificates for raising more than 5500 and 83 became operational for 5100 pieces. Finally, more than 1500 ostrich chicks were produced by locally-grown breeders followed by importing 200 pieces of chicks in 2002.

Table 1-9: Numerical illustration of the existing broiler farms and their capacities

Year	Active		Inactive		Total	
	No.	Capacity (1000 pieces)	No.	Capacity (1000 pieces)	No.	Capacity (1000 pieces)
1995	13094	144563	2040	13634	15173	158197
1997	12950	153336	2340	11699	15291	165036
2000	12342	157597	2951	38284	15293	195881
2001	11279	144946	4104	39839	15383	184786

Table 1-10: Layer and pullet farms

Year	No. of farms	No. of workshop	Capacity (1000 pieces)
1991	881	3361	40491
1994	789	3201	40851
1996	1023	3600	50495
1999	1365	4595	67748
2001	1406	4839	71282

Table 1-11: Breeder farms information

Year	No. of farms	No. of rearing house	Capacity (1000 pieces)
1991	70	1192	7020
1992	80	1274	6620
1994	134	1567	9159
1996	170	1794	9938
1999	230	2564	12476
2001	274	2599	13869

Simultaneous to growing population and relative promotion of economic status, substantial demands were also raised that could never be met by traditional production system. To this end, traditional farms gradually switched over to industrial production system which encompassed numerous productive plants, specializing poultry business and hiring different specialties in animal science for higher productivity. Since 1953, native poultry farms used to be operating as a cottage traditional practice which was gradually substituted by semi-private and industrial modes supported by emergence of

modern farms and introduction of improved breeds. Needless to say, traditional system was always engaged in diseases outbreak, social and environmental challenges which are now greatly controlled and hence is less vulnerable, but sensitive to pathogens and exchange rate fluctuations. On the other hand, industrial system heavily relies on imported inputs; so that exotic breeds either layers or broilers have 98% share in meat and eggs production. Poultry farms are generally private-running, but however, public and cooperative farms are also operational in dealing with line poultry. The average capacity of broiler farms ranges from 5-15 thousand pieces, and for layer farms are 20-50 thousand. Native poultry farming mainly runs under extensive subsistence system by rural households. Traditional system for native poultry farming is conventionally accompanied with other species as ducks and geese by rural farmers. This occupation is explicitly run with 5-30 pieces of hens and cocks for provision of meat, eggs and income for the rural households. Women are the core breeders in their village whose yields are comparatively poor due to inadequate feeding and caring operations. Rural households had remarkable contribution in production and provision of animal protein (chicken meat and eggs) society prior to arrival of exotic breeds in Iran. Besides, over the last two decades, extension and distribution of native chicks by the Ministry's corporations led to influence of semi-industrial activities into rural households and increase of native breeds population and yield.

Following the growth of demands for protein stuff, poultry farming was broadly embraced, primarily for existing obstacles in heavy livestock breeding tasks. As clarified in Table 1-12, in 1981 per capita eggs consumption amounted up 6.61 Kg. per year which rated up to 8.26 Kg. by 2002. In addition, chicken meat consumption rate also increased from 6.68 Kg per capita to 14.32 Kg. in the same time frame. Given the figures of the following Table, per capita consumption of poultry products remarks an outstanding growth compared to other protein sources. Table 1-13 indicates

quantitative information on major poultry products in various years. The potential provinces for commercial poultry production are Tehran, Qazvin, Mazandaran, Azerbaijan, Esfahan, Fars and Khorasan where all world commercial hybrids are profitably grown. Now, and due to over-production trend which crossed over self-sufficiency border, this business is highly capable to access foreign market for meat and eggs export. At present, procuring the feedstuff requirement through foreign suppliers blinks as the key constraint. Diversification, processing and packaging technologies have also drawn attention in recent years.

Table 1-12: Comparison of per capita consumption of animal products (Kg)

Year	Red meat	Chicken meat	Eggs	Milk
1981	14.2	6.68	6.61	88.9
1991	13.32	7.52	6.09	86.31
2001	11.96	13.62	8.62	89.74
2002	11.97	14.33	8.26	90.32

Table 1-13: Quantities of some poultry production in different year (scale: 1000 tones)

Year	Chicken meat	Eggs
1986	390	300
1991	420	340
1996	676	486
1997	712	470
1998	696	498
1999	725	570
2000	803	580

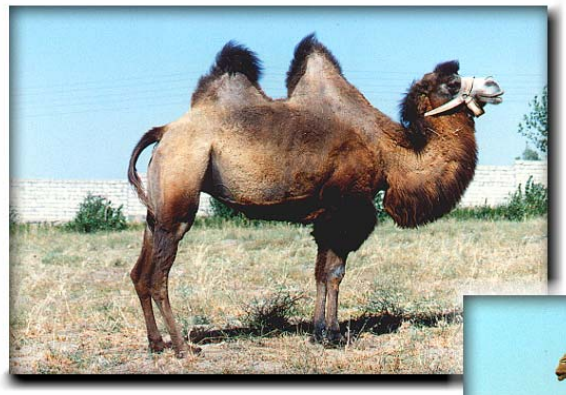
Mono-dactyls

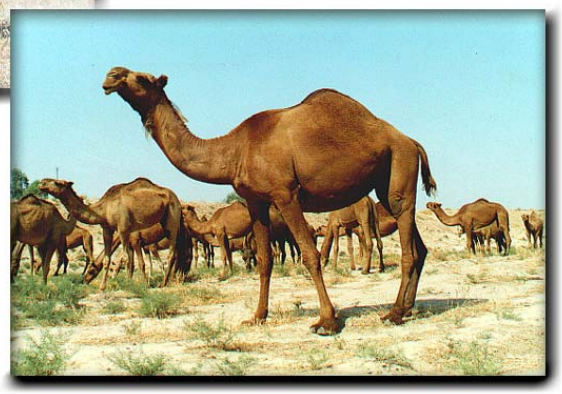
There are 1,727,000 heads of mono-dactyls animals of which 155,000 horses, 122,000 mules and the rest are donkeys (enclosed map no.9 indicates its distribution in Iran). Iranian native horse, with all its characteristics and upon historical evidences, is assumed as the ancestor of all thoroughbred horses in the world. Iranian horses are warm-blooded and bear reputable breeds as Turkemin in north-east, Arab in south-west and Kurd horses in north-west of the country. Assil or Iranian Arab horse is of the most genuine and oldest species world over. This horse is widely used in horse-racing. It lives in southern provinces especially in Khuzestan, Kerman, Yazd, Fars and Tehran with few breeds as Kahilan, Haddian, Hamdani, Saglawi and Ebian. Turkemin horse has also native families like Akhal Tekkeh, Yamout, Chenaran, and Googlan which are mostly potential for racing and recreation. Taropud is an authentic hybrid of Turkemin and Arab breeds. “Caspian miniatorhorse” as the world most thoroughbred and unique breed belongs to Iran and is the source of Arab horse derivation. This horse has about

700 heads population world over of which, 500 heads are available in Iran. They are widely used for riding by teenagers, cart-driving and circus shows. Kurd horse and its families like Jaf, Afshari and Sanjabi, generally live in Kurdistan province bearing

arduous roads and hilly regions. Their population reaches to 2700 heads in Iran. There are also other breeds as Qarabagh, Dareshuri and Taleshi scattered over Iranian plateau. Almost 50% of the horses are raised under semi-industrial system at district level, 40% under traditional condition run by nomads and villagers, and the remaining 10% grow at industrial breeding centers. Despite the low population of mono-dactyl species in the country, but there are diversified professions affiliated to them. Various employment opportunities may be generated upon revival of horse breeding activities. This is a thoroughly private-owned business with a few cooperatives around. Horse-farming enjoys very small size units whereas evidences spell out large holdings for such job which now however annihilated. In traditional breeding system, other species may also present with horses, while the industrial system absolutely takes care of horses. Small-scale holdings with traditional arrangements are relatively more vulnerable against dryness, diseases and inadequate investment.

Horses are usually employed for riding and entertainment in cities, and for transportation and forcing purposes in rural areas. Native breeds are mainly used in farms or to less extent, in local races and sports, while the exotic breeds are exclusively called for athletic races. A few native and authentic breeds are highly demanded and hence their breeding deserves great importance for exportation. Native horses are incredibly capable to adapt their environment and withstand against diseases and pressures, while the exotic ones are specifically trained for racing and commercial purpose for their breeders. Usually, horse-raising tends to small-scale and self-sustaining businesses which are however, depends on basic external inputs e.g. feeds and veterinary service. At present, more than 95% of the generated offspring are absorbed by domestic markets, and due to their limited production, illegal export is more or less encouraged. It seems a commending export and genetic resources conservation could be fulfilled if quite a number of domestic offspring are commercially generated. There are also some risks imposed on native breeds including social constraints, false-market for exotic breeds and holding races among them.





Camel

There exist about 145,600 camels including 100 Bactrian camels (two-humped) in East-Azerbaijan and Ardebil provinces, and the Arabian camels who are widely scattered in the great desert and central region of Iran. The Arabian camels(single humped) are generally reared alone but the Bactrian breeds are kept together with other animals. The enclosed map no.10 and appendix tables contain the dispersion order and herd size of this livestock in different provinces. This animal possesses diversified and vital potentials form different perspectives as follows:

- adaptability to natural constraints e.g. fodder shortage and water deficit;
- Resistance against diseases and temperature fluctuations;
- Capability for covering far distances under harsh and desert condition;
- Unbelievable power for carrying heavy loads; and

- Potential for yielding animal products e.g. meat, milk, skin, manures, qualified fats, etc.

In view of all such values and extensively poor rangelands in central desert of Iran, focusing on camel farming and propagating its products deems highly justified.

Existing system is mostly traditional in nature and low in population, which has a negligible contribution in providing employment opportunities. In terms of production, camel products are domestically consumed with no export demand. The business runs under private holdings mostly at small scale but few traces of medium-sized farms are also identified. Foreign assistance may enhance productivity and profitability of camel farming. Camel milk and meats production scaled up over the past years principally due to their growing demands and increased economic values. No doubt, policy supports towards motivation of camel-breeders and promoting public culture to include animal products in their consumption pattern, have effectively revived this farming. Noteworthy that despite the growing trend, the farming system and its management stayed unchanged with probable measure for cross-breeding and growing population of camels to better tolerate the common risks as dryness, diseases, inadequate investments, etc. The most important camel products are wool, meat and milk plus transportation which are realized at traditional scale with relatively equal socio-economic importance in respective regions. Identifying foreign markets may encourage this business and improve its population. Though there are blinking demands for the camel yields, but serious change yet to happen at infra-structural levels e.g. adequate technical management, and consistent supportive policies.

1.7 The State of genetic diversity of livestock species in Iran

Specific climatic situation has resulted in emergence of numerous genetic diversities in Iran so that more than 110 variations of animal ecotypes have already been identified with 40 species properly conserved. Total animal population of the country from 106 million units in 1991 has rised up to 120 million units by 2001, which shows a 1.3 percent annual increase. In terms of aquatic resources, considerable diversity was detected containing 363 marine species living in Caspian Sea and northern water bodies.

Cattle

Iran has various genetic variation due to different climatic circumstances. There are at least six native cattle breeds i.e. Sarabi, Sistani, Golpaigani, Taleshi, Najdi, and Dashtiyari which possess particular characteristics. A preliminary identification were conducted on available native cattle and the result, developed in a national Domestic Animal Diversity Information System (DAD-IS). However, limited data are collected on cross-bred cattle (native×exotic) followed by processing and analysis. Due to inadequacy and inconsistency of collected data and the absence of a comprehensive guideline for due analysis, there is no clear policy-orientation for cross-bred cattle at national level. Reliable system and thorough information are widely available for the exotic genetic resources and their production and reproduction particularities. Although, initial studies about native and cross-bred cattle have been done in Iran, it is imperative to repeat them extensively focusing on population records at regular intervals.

Lack of adequate and up to data on native and cross-bred cattle in traditional and semi-industrial systems, followed by doubtful figures on their population and its changing pattern constitute overall informative gaps in cattle breeding operation.

Moreover, all academic thesis and research articles, so far, compiled on comparative advantages of native and exotic breeds or their hybrids, mainly cover a single lactation period on a single generation were carefully collected. The task also includes any molecular and genetic researches taken on native cattle e.g. Sarabi, Gopaingani, Sistani, Nagdi, Taleshi, and Dashtiyari, as well as exotic and hybrid animals. What can be elaborated on a general basis, emphasizes that the collected data is neither inclusive nor rationally targeting a transparent vision. Accessing a suitable strategy for utilizing the native, exotic and cross-bred potentials implicates formulation of transparent Action-Plan aiming to augment production and decrease its cost through mobilizing technical and professional capacities as well as molecular/genetic knowledge nationwide. Based on the available breeding plan for exotic cattle, an opportunity blinks for breeding the native and cross-bred cattle by enhancing their genetic characteristics and notify obtained information to stakeholders and private breeders.

Preliminary recognition of productivity and reproduction abilities of native cattle has been done, however, supplementary information, especially about their different breeding systems and the possibility of using these systems is necessary. Although, preliminary surveys launched on cross-bred cattle in certain region, but still rather précised and integrated information has to be piled up to discover a thorough genetic value in breeding with exotic animals. It is necessary to gather more comprehensive and accurate information about genetic share of exotic breeds and the status of cross-bred and new breeds for different prepared climates. Regulations, policies and strategies foreseen by government would naturally affect the changing process of animal genetic resources. Considering the government contradictory policies on milk and meat production accompanied by poor supportive mechanisms forwarded to native cattle and insufficient provision of native semen and technical services have collectively imposed a stagnant. For instance, Golpaigani cattle have lost more than 95% of their members while on the other hand; they are increasing their flocks by new

hybrids and exotic breeds. In a general sense, there is no integrated agenda to address conservation of native cattle, but a few plans yet pending for financial allocation. Designing workable programs to ensure positive change on genetic resources entails following crucial prerequisites for successful implementation and effectiveness:

- Increasing knowledge and awareness of all stakeholders concerned on confirmed need for conservation of genetic stocks in Iran;
- Developing comprehensive "Plan of Action" through extension and cultural campaigns; and
- Designing suitable laws to reward the native-cattle farmers.

Buffalo

There are 3 buffalo ecotypes in Iran consist of Azari ecotype which is living in East-Azarbaijan, West-Azarbaijan and Ardebil provinces, Shomali (Northern) ecotypes is found in Gilan and Mazandaran provinces, and Khuzestani ecotype which is prone to Khuzestan province. They have neither wild species nor any such ecotypes returned back to wild-life. All buffalo ecotypes are predominantly reared for milk and meat production. The National center for Animal Breeding (NCAB) has already attempted to stock frozen semen and a few embryos for conserving buffalo genetic resources. The initiative runs on a limited scale mainly due to poor financial supports. The business highly requires adequate funds, incentive mechanisms favoring the buffalo farmers, and legal instruments on animal bio-diversity as the key priorities towards capacity building and better understanding of animal genetic state at national level. Currently, buffalo population enjoys progressive trend backed by growing demands for increased protein stuff in domestic markets. Primary studies have already started and focused on derivation of information on buffalo characteristics, milk production, and fat and protein percents in Khuzestan, East/west Azerbaijan, Gilan and Mazandaran. Besides, some research stations and academic centers have obtained useful information on reproduction performance, productivity, feed-conversion factor, production traits and

milk ingredients. Initial steps have also been directed towards molecular identification of buffalo genetic stocks and waiting for its comprehensive project is preparing. However, the process of study needs to be completed and entails further précis investigations about genetic resources on regular periods of time. Pertaining the ongoing state and trend, various systems got operational but not competent enough to monitor and save the species endangered to extinction. Few commitments so far adopted for inter-specific comparison but not yet formulated as a project-oriented format. There are ongoing record-keeping operations for a complete animal life-span whose findings shall be accessible at the NCAB and reflected in scientific literatures too.

Sheep and goat

Several studies have been done on identification and determination of existing status and breeds linked to sheep and goat species. The information collected seem reliable but not compatible to DAD-IS criteria nor a systematic strategy yet outlined for an integrated and periodic survey on the state of national genetic resource. The available recording measurements on sheep and goats are poorly conducted without predefined purposes, but the findings are well documented and archived in scientific/research centers. The following reasons can be addressed for poor progression in identification and conservation process of sheep/goat genetic stocks:

1- Lack of a responsible organization;
2- Absence of well-defined and transparent regulation on genetic resources;
3- Lack of reliable and comprehensive data-banks;
4- Devoid of NGOs, unions and relative associations
5- Available and diversified animal species and breeds with extensive dispersion across the country;

6- Cost-bearing activities for data collection owing to wide animal diversities and distribution; and
7- Inadequate awareness of public and private stakeholders on genetic importance and requirements that retards optimum productivity and information use.

There exists no effective system for monitoring the progression status and trend of various sheep and goat breeds. Many scattered surveys were commenced on various phenotype breeds and now made accessible at research centers. However, molecular studies are also under initial progress beside a series of field studies made on farming status of various breeds over the last decade. There are precious findings, research reports or academic thesis at master and doctoral levels. In recent years, numerous case studies have been made on molecular characterization and acquaintance of the researchers with biotechnologies. In addition, serious projects are currently underway to genetically compare certain breeds of sheep and goats. For this purpose, modern techniques including genetic distance, protein micro-satellites, RFLP and other methods were accordingly employed, and their relevant findings made available to public use. Molecular evaluation and identification is a very thorough and preferred technique to directly disclose the animal competence for genetic breeding and management purpose. At present, more than 20 sheep breeds and 7 goat breeds are broadly grown at commercial scale. Many of the aforementioned breeds enjoy either fixed or growing population (except few others which are endangered for imperfect cross-breeding and unsuitable body weight). They are well-preserved under specific climatic condition and farming adaptability over the years by skillful breeders. The foregoing generations also received no sound and sustainable supportive policy on their conservation by public or private bodies.

Though important plans like“Ram Performance Test”, livestock and pasture balancing plan, development of cross-breeding operation, etc. were put into place by the Dept. of Livestock Affairs for conservation and purification of certain breeds, but they partly

failed due to transient supports and follow-ups. Regarding supportive inputs e.g. barley, bran, drugs, vaccines, and so on, certain services are being rendered with negligible impacts on enhancement of breeds states mainly due to poor consistency and sustainability in designing and operational phases. Few activities such as holding festivals for introducing merit Livestock to policy-makers and animal farmers, as well as technical seminars for encouraging the breeders are all authentic measures to preserve pure native stocks. Certain sheep breeds population e.g. Sangsari, Baluchi and Zel are drastically decreasing for their little bodies, low growth rate and irrational hybridization process on their clones. Moreover, grazing enclosure and limited carrying capacity of pastures also contribute to expose the foregoing breeds to shrink, and forced the farmers to use additional diets in feeding their animals. This imposes incremental cost on breeders (Table 2-1) therefore; they give preference to foster heavier animals with higher growth rate. The exotic breeds had no serious effects on native sheep. For instance, Merino breeds imported in 1960s could no longer stay owing to their tail, unfair mutton smell, poor adaptability to their new environment and unsuitable market for their wool. Even after Azerbaijan and Armenia war, some Arkha-Merino sheep arrived in Arasbaran area, but failed again for the same reasons.Quite a few breeds as Safulak, Kussi, Colombia, Targi and also Sanan goats were imported for research studies in the Animal science research institute and the University of Shiraz, but all were gradually eliminated due to rejection of cross-breeding trial and their population inbreeding and scarcity. The adventure however turned up positive after unofficial cross-breeding of Iranian goats with Afghani and Pakistani Bitals along the borders or even partly extended inland which attracted the breeders for bigger bodies, greater birth-rate and milk production.

Table 1-13 Basic information available on the breeds in Iran and degree of risks that threaten the genetic diversity.

Breed	Availability of documented information	Population change, % 1990-2000	Degree of risk of threat	Reason
Afshari	Available, however on the basis of limited studies	+22.2	No risk	Population is increasing in view of the breed's performance
Arabi	Available, however on the basis of limited studies	+7.1	No risk	Population is increasing in view of the breed's performance and adaptability for the breeding area
Bahmei	Not available because the breed was not yet studied	-33.3	Extremely high risk of erosion	Non-systematic crossbreeding[1] with heavier breeds to improve growth rates
Baluchi	Available	-22.1	Medium risk	Non-systematic crossbreeding with heavier breeds to improve growth rates
Chal	Available	+2.1	Elevated inbreeding	Breed performance is good for the breeding area, but the capacity of sheep breeding is limited
Dalagh	Not available because the breed was not yet studied	0.0	Elevated inbreeding	Breed performance is good for the breeding area, but the capacity of sheep breeding is limited
Ghezel	Available	+25.0	No risk	Population is increasing in view of the breed's performance
Gray Shiraz	Available	-9.9	Low risk	Non-systematic crossbreeding with heavier breeds to improve growth rates
Karakul (black)	Available	-25.0	Medium risk	Non-systematic crossbreeding with heavier breeds to improve growth rates and displacement due to drought in yr 2000
Kurdi	Available, however on the basis of limited studies	-25.2	Medium risk	Displacement due to drought in yr 2000
Lory & Lory	Available	+25.0	No risk	Population is increasing in view of the breed's performance
Makui	Available,	+1.1	Elevated inbreeding	Breed performance is good for the breeding area, but the capacity of sheep breeding is limited
Mehrabani	Available, however on the basis of limited studies	-13.1	Low risk	Non-systematic crossbreeding with heavy breeds to improve growth rates
Moghani	Available, however on the basis of limited studies	+1.1	Elevated inbreeding	Breed performance is good for the breeding area, but the capacity of sheep breeding is limited

[1] Crossbreeding by the flock holders without attention to the long-term effects of the process.

Sangsari	Available, however on the basis of limited studies	-18.0	Low risk	Non-systematic crossbreeding with heavy breeds to improve growth rates
Sanjabi	Available, however on the basis of limited studies	0.0	Elevated inbreeding	Breed performance is good for the breeding area, but the capacity of sheep breeding is limited
Taleshi	Not available because the breed was not yet studied	+18.0	No risk	Population is increasing in view of the breed's performance and adaptability
Turki Ghashghaei	Available, however on the basis of limited studies	+22.2	No risk	Population is increasing in view of the breed's performance
Zandy	Available, however on the basis of limited studies	+12.5	No risk	Population is increasing in view of the breed's performance and adaptability
Zel	Available, however on the basis of limited studies	-0.95	Elevated inbreeding	Good breed performance, but the capacity of sheep breeding is limited
Goats	There is no information about the goats breeds under threaten			

The exotic Sanan goats were hybridized with Najdi breeds whose backcrosses with Sanans left in Yazd, Fars and Zanjan provinces. In general, 3 different breeding systems which exclusively recognized for sheep and goats are as follows:

- Industrial system deals with Moghani, Chal, Afshari, Kurdi and Mehrbani breeds.
- Semi-industrial system covers Moghani, Chal, Afshari, Dalagh (Atabai), Ghazel, Baluchi, Bahmei, Arabi, Karakul, Kurdi, Lori, Lori-Bakhtiyari, Makui, Mehrabani, Sangsari, Sanjabi, Taleshi, Turki-Ghashghaei, Zandi and Zel.
- Traditional system which tends to raise all aforementioned breeds.

Almost all native goats including Birjandi, Raeeni, Siahmoie, Marghoz, Najdi, Nadushen and Talli are bred under industrial and traditional systems. Iranian Sanan goats are normally kept at back yards in Meibod and Ardakan districts of Yazd. Nomadic pastorals individually undertake various sizes of herds with average of 200-250, but average of villagers' herds is usually 400-500 goat heads composing of 10-20 heads per household. In industrial system, herd size is usually 700 to 1200 heads, whereas the system may potentially maintain 20-50 thousand heads of animals

organized in several herds took over by 2-3 shepherds each. Age-composition of herds generally comprises of 45% ewes, 15% female lambs 35% young lambs, 3% bucks and 2% ram which however fluctuate in different seasons or when encounter harsher climates.

There are not reliable figures on ewe breeds population state. In many regions, sheep and goats are raised together, with exception of Persian Gulf margins where Tali goats live in pure herds with no sheep involved. Other regions are known for greater accumulation of goat breeds e.g., Najdi, Marghoz and Raienie. Moreover, Siahmouie goats which constitute major breeds, normally stay with sheep and scatter every where around. Based on this fact, goat ratio varies in many regions, except for the pure herds, forming 30-40% of every herd composition. Various wild relatives as Armani sheep, mountain goat and wild ram are assumed as close breeds to sheep (Tables 2-2 and 2-3) dispersed in certain locations (West/East Azerbaijan, Esfahan, Fars, Qom, Tehran, …) .

Table 1-14: Ecosystems under which the breeds produce

Breed	Brief description of the ecosystems
Sheep	
Afshari	Mountains with rain fed foothills and foothill steps with < 320 mm rain, 40% of the nutrition is based on range and 60% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (temperature up to 40 °C) and semi-dry, and winter is cold (as low as –30 °C) and with abundant snow covering the soil. There is sufficient availability for water points. Critical period is winter.
Arabi	Foothills and foothill steps with < 400 mm rain, 70% of the nutrition is based on range and 30% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (temperature up to 41 °C) and dry and winter is cold (as low as –28 °C). There is sufficient availability for water points. Critical period is winter.
Bahmei	Mountains with rain fed foothills and foothill steps with < 355 mm rain, 80% of the nutrition is based on range and 20% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (temperature up to 38 °C) and dry and winter is cold (as low as –23 °C) and with little snow covering the soil. There is sufficient availability for water points. Critical period is winter.
Baluchi	Desert, foothills and foothill steps with < 250 mm rain, 80% of the nutrition is based on range and 20% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 41 °C) and dry and winter is cold (as low as –28 °C). There is a not sufficient water point. Critical period is winter.
Chal	Plain steppes with < 320 mm rain, 40% of feeding is based on range and 60% on post harvest cereals and summer crop food. Winters are cold (as low as –20 °C) with little snow and summers hot (up to 40 °C) and dry. There is sufficient availability for water points. Critical season is winter.
Dalagh	Mountains with rain fed foothills and foothill steps with < 950 mm rain, 70% of the nutrition is based on range and 30% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 40 °C) and humid and winter is moderate (as low as –4 °C) and with little snow covering the soil. There is sufficient availability for water points. Critical period is summer.
Ghezel	Mountains with rain fed foothills and foothill steps with < 325 mm rain, 60% of the nutrition is based on range and 40% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 41 °C) and semi-dry and winter is cold (as low as –26 °C) and with little snow covering the soil. There is sufficient availability for water points. Critical period is winter.
Gray Shiraz	Mountains with rain fed foothills and foothill steps with < 300 mm rain, 70% of the nutrition is based on range and 30% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 43 °C) and dry and winter is cold (as low as –14 °C). There is sufficient availability for water points. Critical period is summer.
Karakul (black)	Foothills and foothill steps with < 250 mm rain, 70% of the nutrition is based on range and 30% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 41 °C) and dry and winter is cold (as low as –28 °C). There is sufficient availability for water points. Critical period is winter.
Kurdi (Kurdistan)	Mountains with rain fed foothills and foothill steps with < 480 mm rain, 60% of the nutrition is based on range and 40% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 44 °C) and winter is cold (as low as –31 °C) and with abundant snow covering the soil. There is sufficient availability for water point. Critical period is winter.
Lory &Lory Bakhtiyari	Mountains with rain fed foothills and foothill steps with < 340 mm rain, 70% of the nutrition is based on range and 30% on forage produced in farms for winter feeding. Summer hot (up to 42 °C) and dry and winter is cold (as low as –32 °C) and with abundant snow covering the soil. There is sufficient availability for water points. Critical period is winter.
Makui	Mountains with rain fed foothills and foothill steps with < 355 mm rain, 70% of the nutrition is based on range and 30% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 38 °C) and semi-dry and winter is cold (as low as –23 °C) and with little snow covering the soil. There is sufficient availability for water points. Critical period is winter.

Mehrabani	Mountains with rain fed foothills and foothill steps with < 310 mm rain, 50% of the nutrition is based on range and 50% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 40 °C) and semi-dry and winter is cold (as low as –33 °C) and with little snow covering the soil. There is sufficient availability for water points. Critical period is winter.
Moghani	Mountains with rain fed foothills and foothill steps with 250-600 mm rain, 75% of the nutrition is based on range, and 25% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 40 °C) and dry and winter is cold (as low as –30 °C) and with abundant snow covering the soil. There is sufficient availability for water points. Critical period is winter.
Sangsari	Mountains, plain steppes with < 140 mm rain, 70% of feeding is based on range and 30% on post harvest cereals and summer crop food. Winters are cold (as low as –13 °C) and summers hot (up to 44 °C) and dry. Grazing is limited by low availability for water points.
Sanjabi	Mountains with rain fed foothills and foothill steps with < 490 mm rain, 65% of the nutrition is based on range and 35% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 44 °C) and dry and winter is cold (as low as –27 °C) and with little snow covering the soil. There is sufficient availability for water points. Critical period is winter.
Taleshi	Mountains with rain fed foothills and foothill steps with < 1300 mm rain, 70% of the nutrition is based on range and 30% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 37 °C) and humid and winter is moderate (as low as –19 °C) and with little snow covering the soil. There is sufficient availability for water point. Critical period is summer.
Turki Ghashghaei	Mountains with rain fed foothills and foothill steps with < 300 mm rain, 70% of the nutrition is based on range and 30% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 43 °C) and dry and winter is cold (as low as –14 °C). There is sufficient availability for water points. Critical period is summer.
Zandi	Plain steppes with < 150 mm rain, 50% of feeding is based on range and 50% on post harvest cereals and summer crop food. Winters are cold (as low as –20 °C) and summers hot (up to 40 °C) and dry. Grazing is limited by low availability for water points.
Zel	Mountains with rain fed foothills and foothill steps with < 950 mm rain, 70% of the nutrition is based on range and 30% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 40 °C) and humid and winter is moderate (as low as –4 °C) and with little snow covering the soil. There is sufficient availability for water points. Critical period is summer.
Goats	
Marghoz	Mountains with rain fed foothills and foothill steps with < 950 mm rain, 80% of the nutrition is based on range and 20% on forage, dried leaves of Oak trees and post harvest cereals produced in farms for fall and winter feeding. Summer moderate and humid and winter is cold (as low as –20 °C) and with snow covering the soil. There is sufficient availability for water points. Critical period is winter.
Najdi	Coast and plan steps with < 400 mm rain, 70% of the nutrition is based on range and 30% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 41 °C) and winter is moderate (as low as 1 °C). There is sufficient availability for water points. Critical period is summer.
Native Black	Mountains with rain fed foothills and foothill steps with < 340 mm rain, 70% of the nutrition is based on range and 30% on forage produced in farms for winter feeding. Summer hot (up to 42 °C) and dry and winter is cold (as low as –32 °C) and with abundant snow covering the soil. There is sufficient availability for water points. Critical period is winter.
Raeini	Mountains, foothills and foothill steps with < 250 mm rain, 85% of the nutrition is based on range and 25% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 35 °C) and dry and winter is moderate (as low as 1 °C). There is sufficient availability for water points. Critical period is summer.
Tali	Coast and plan steps with < 250 mm rain, 70% of the nutrition is based on range and 30% on forage and post harvest cereals produced in farms for fall and winter feeding. Summer hot (up to 41 °C) and humid winter is moderate (as low as 1 °C). Grazing is limited by low availability for water points. Critical period is summer.

Table 1-15: Scheme illustrating the seasons of the year and the main features of the management of sheep in Iran.

	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	*Nov*
Mating [1]	**	**							***	***		
Pregnancy	***	***	**	**	**	**	**			***	***	***
Lambing		***	***			**	**					
Lactating		***	***	***	***	**	**	**	**			
Shearing					***					**		
Grazing	*	*	*	***	***	***	***	***	***	***	***	*
Stubble feeding	***	***	***	***								**
Concentrate feeding	***	**	*					***				***
Antiparasite treatment					***					***		
Maine seasons	Winter, wet season and frosts			Spring and warming			Summer hot and dry			Fall, cooling and wet season start in Nov		

* Less frequent
** Relatively frequent
*** Frequent
[1] Rams are mixed in flocks year-round

There are serious protective umbrella expanded over these breeds by the National Environment Protection Organization (NEPO) with limited hunting permission in certain seasons solely issued for their population control. No specific breeding plan yet designed for improving the foregoing wilds. (However, there was a positive case on hybridization scheme to cross them with Farahani sheep which its report archived in the Institute). These wild breeds contribute a bit in meat supply, but are rather hunted for entertainment. There is neither wild goat nor sheep originally branched from the domestic breeds, nor bearing remarkable share in foodstuff provision of the country.

Poultry

Native poultry are broadly diversified in genetic or breed variation. Many studies, so far, has been done on native chicken resulted in identification of 7 major genetic pools in the country. In general, various hybrids are widely expanded which mainly happened due to usual animal displacement and conventional folklore on exchanging poultry breeds in cultural occasions. Hence, no particular attribution can be made to some poultry groups. Meanwhile, there are several other breeds having local names according their geographic habitats. Regarding domesticated ducks, about 4 native breeds are named upon their local residences over the country. There exist 6 different turkey breeds, each with particular habitat, color or weight. The same attribution is applied to 3 distinct goose breeds. Since 1982, a systematic scheme established at national level for breeding the native poultry in 7 central stations which led to promising improvement of various breeds in northern, central and southern localities. Government also has made some regional stations for breeding native turkeys, geese and ducks, and some are still operational in Azarbaijan on research-extension campaigns for turkeys and geese improvement. Other Iranian poultry including pigeons, quails, Guinea fowls partridges and pheasants are well-known of which, pigeons are kept as entertainment, quails recently and intensively raised for meat, Guinea fowls as beautiful birds and partridges used for hunting.

Concerning the government supports, there are extensive veterinary services being rendered to the native birds. There are different statistics on every species population which however, not reliable for reference. Following, are the main obstacles for identification and conservation of poultry genetic stocks:

1. Lack of supported and updated data on available native poultry species and breeds;
2. Wide geographic dispersion and diversification of the native poultry in Iran;

3. Poor perception on the important roles and values of the native poultry at national macro-economic level;
4. Excessive focus on intensive rearing of cross-bred poultry;
5. Import of attractive exotic coloured breeds in the past;
6. Lake of confidence of some veterinarians to, native poultry species, because of inability for hygienic plans diseases control.
7. Lack of an authorized institution for recording and preserving the poultry genetic stocks;
8. Deficiency of a capable informative mechanism to highlight the native poultry place, their characteristics and role in organic foodstuff production; and
9. Lack of competent NGOs or other people's organizations involved to native poultry affairs.

Since last 50 years, only two autonomous censuses at national level were carried out in agriculture sector of Iran. The aforesaid tasks disregarded the breeds and just aimed at major animal species. At the same time, appreciable studies have been accomplished to identify and evaluate the enormous breeds of native species. These research-oriented activities could apply conventional and molecular methodologies to discover genetic potentials for nutritional performances, phenotypic and genetic variances of key economic indexes, and ability and performance after combination with exotic breeds. Such investigations deserved relative importance over the last couple of decades, whose findings were incorporated to some extent in breeding operation of native poultry on stations scale. Farmers normally grow poultry to meet their household's requirements. Prior to arrival of exotic breeds and expansion of industrial intensive system, native species and specially chicken were the sole resources of poultry meat and eggs in the country. Even today, poultry production partially

contributes in provision of foodstuff for rural or urban communities. Various poultry species possess prioritized shares in foodstuff production as follows:

1. Hens and cocks;
2. Ducks and geese, particularly in north and north-west;
3. Turkeys, specially in western provinces;

Note: No reliable comments can be stated on population distribution of poultry however a demographic zoning map which is enclosed to this report.

Poultry herd-size varies upon different climates and households' capacities ranging from 5 to 30 pieces of hens and cocks. There are, however, certain regions running closed or semi-closed herds with 200-500 pieces capacities. Major wild and semi-wild poultry species are partridges, few Guinea fowls, quails, geese, ducks and pheasants with less hunting permission issued on partridges and Guinea fowls for their extinction risk. Exotic quails are recently raised under closed system with commercial benefits, but wild ducks are hunted under intensive monitoring forwarded by the National Environment Protection Organization (NEPO) in Northern provinces. In general, the NEPO extends its protective umbrella over all native wild birds which led to lower supply of their products in the market.

During the last 30 years, development of intensive systems in Iran resulted in vast import of commercial exotic hybrids for production of meat and eggs. The initiative also intensified exotic diseases outbreak which imposed serious mortalities on chicken, ducks and turkey. Despite the available and cheap veterinary services which could help conservation of genetic resources, but the strategy failed due to poultry distribution and change of living style within the urban premises. In addition, no particular supportive regulations are enforced exclusively for protecting native species with only few cases enacted on wild individuals. There exist differential production costs in native and exotic breeds with almost no effective legislation formulated towards direct support of them. Fortunately, substantive enhancement in chicken, turkey and ducks population is realized after using long-run schemes over the past two decades. Apart from all, certain

limiting or threatening policies still affect the genetic resources i.e. arrival of_colored chicken in 1980s, or hygienic barriers put by veterinary corporations which draw further supports to closed-farming systems. Moreover, underestimation of a true share for economic and nutritional value of poultry products in national income and social food security would lead to an irrational negligence of such livestock in governmental planning process. Nowadays, rural poor households and remote living people greatly rely on poultry products as the best and cheapest foodstuff available to their access. Besides, some specific outputs like native quails or turkey products have already influenced into neighboring markets and hence, can create financial impetus for development of such species. Notwithstanding these opportunities, yet convincing attempts and financial interactions have to be activated to generate additional demands for other poultry species, too. Certain birds like pigeon as game bird used to be kept for its manure in central parts of Iran. Normally, native poultry could rather stay safe from mixing with exotic breeds and preserve their precious gene pool by adapting to improper habitats for reproduction, feeding, escaping from natural enemies and less-dependence on manual feeds. Neither Government policies emphasize on such hybridization, nor exotic breeds have proved successful result at rural scales mainly due to their less motion and poor resistance against diseases.

Mono-dactyls

Iranian Arab horse is progressively improving its position mainly due to compiling the Stud Book, close supervision and holding horse-racing matches. No function other than transportation or entertainment is expected from Dareh shuri, Taleshi, and Qarabagh breeds. Turkemin breed is well-preserved for racing purpose under a good management system. There is annual festival going on authentic horse breeds to encourage and support the breeders. Thoroughbred is an exotic breed which undergoes genetic improvement but no positive response has been observed yet. There is no national plan or supportive inputs for promoting specific mono-dactyl animal to

their breeders. Population figures are currently decreasing owing to ongoing hybridization of native and exotic breeds. Many mixtures occurred among thoroughbred and Turkemin horses which resulted in a drastic population drop in native one.

The records of the existing native breeds are as follows:

1- Iranian Arab (purebred) 1000-1200 heads
2- Turkemin 300-400 "
3- Caspian miniatorhorse 150 heads recorded and 500 heads not recorded yet
4- Kurd 1000-1500 "
5- Qarabagh 200 "
6- Darehshuri 300-400 "
7- Taleshi 4500(counted but not recorded yet)

There are also some wild animals such as Iranian Zebra, living in Kavir, Samangan and Neyriz (Fars) which is under serious protection.

Camel

Concerning the camel breeds, initial information was collected under DAD-IS format which requires further completion. Normally, such information relates to regulated time-frames and covers Kalkuie, Baluchi, Afghani, Mahabadi, Turkemini, and Khuzestani breeds. Primary data also exists on certain characters e.g, reproductivity, distribution, products, physical features and production qualification. Inconsistent information together with deficient fund for its completion entails financial remedies and substantive harmony between the concerning institutions on applying new technologies as molecular techniques which can effectively improve camel genetic resources. Emphasis is now put on absence of a monitoring system which seems highly essential to enrich the process of information collection. However, no exotic camel breed exists in Iran, but useful data so far gathered on productive or reproductive characters and molecular markers or cytogenesis details of native camels. Embedding a

good management system, mobilizing competent NGOs and adequate funding shall holistically cater to build capacity upon the existing data. As a whole, the following issues have to be remarked for better understanding of camel genetic diversity:

- Promoting common knowledge on camel bio-diversity and its importance among the people and authorities;
- Providing adequate fund either internal or external, for protecting the camel diversity;
- Approval of providing legislation inclusive regulation on conservation of camel genetic diversity.

No significant changes, so far, seen in camel breeds and population, but the problem is smuggling them abroad. There is no wild breed related to domestic camels in Iran. High adaptability of camels to harsh and desert condition lies behind their increased tolerance to certain habitats. Moreover, they generate specific cultural position and social dignity for their owners which in turn, help conserving and encouraging their breeds. Despite the suitable adaptability of the native camels and people's attraction to them, few changes recorded on their share in foodstuff supply principally for their lower population and particular habitats. In northwest, two-hump breeds followed a decreasing trend in number, and hence stayed at risk, because they grow under primitive traditional and nomadic system (unstructured breeding) with no compensating scheme for breeding improvement. On the other hand, this business runs without a structured hybridization system, instead the gap mobilized the breeders to attempt unstructured cross-breeding of single and double hump camels. However, a research plan is underway to put these interventions on a scientific structure. Besides, a series of techniques i.e., recording, artificial insemination, cytogenesis and molecular examinations were also employed which are not widely usual.

These activities were undertaken by research stations affiliated to the Institute which however, requires skilled officials, well-equipped labs, qualified extension-training services and logistic facilities. Generally, no significant change recently was experienced on camel breeds farming in the country. Partial demand-driven impacts under certain circumstances with less effect from international markets could only generate temporal attention to camel products at national level.

2. ANALYZING THE CHANGING DEMANDS ON NATIONAL LIVESTOCK PRODUCTION AND THEIR IMPLICATIONS FOR FUTURE NATIONAL POLICES, STRATEGIES AND PROGRAMMES RELATED TO ANGR

2.1 Reviewing past policies, strategies, programmes and management practices (as related to AnGR)

Cattle

There is a legal gap for well-defined utilization policy on genetic stocks at national level. Therefore, no specific strategy is currently followed up on protein provision by executive organizations. Certain legislations enacted in Environment, Forest and Range sectors opposed the native animal genetic stocks and even encouraged exotic breeds' introduction. At the same time, other policies e.g. nomad sequestration plan and range enclosure scheme could bring about enabling impacts on native cattle genetic wealth. Under circumstances as deficient cross-breeding plan imposed drastic damages on native cattle population together with distortion of traditional breeding system. Given the commending cattle supply by domestic farmers and less exportation, no serious change threatens their genetic nobility. Domestic requirement for livestock products, particularly certain cattle breeds for their qualified fat milk or meat yield, contributes to maintain specific breeds under specific bio-environments. Practically, specific habitats with certain aspects largely improve adaptability and conservation of native cattle like Dashtiyari breed under serve temperature and harsh conditions. Meanwhile, a mutual emotion between native animal and its local breeder would substantially lead to better sustainability of the breed. There is no structured breeding plan for the cattle are raised under traditional and semi-industrial systems in Iran. There is not any breeding program in native or exotic cattle systems too. The current recording tasks also do not consider breeding purpose, whereby the public research stations are gradually ceasing their function due to

inadequate fund and poor integration of their mission. Noteworthy, exotic cattle farming enjoys rather comprehensive breeding plan. In traditional scale, genetic exchange is conventional among the breeders with no incorporation of domestically improved breeds into their production process. There is another trend running in hybridization activities i.e., cross-bred cattle with exotic breeds are upgraded in successive generations followed by progressive tendency of exotic genes towards further purification in future. The exotic breeds are continuously supported by imported genetic materials followed by genetic use of merit exotic breeds into the native cattle. Worth-mentioning to express that in rural system composite herds are normally dispatched for grazing including male and female cattle. This opportunity facilitates inbreeding of the enclosed breeds of a village to generate a gene pool. Somewhere else, bull may not accompany the females and hence other bull is hired for due cross-mating. Every rearing system benefits its own technical tools contingent on existing situation. Exotic cattle are mostly used for higher milk yield, artificial insemination, embryo transfer (very limited), genealogy, genetic value assessment, and employing molecular instruments to promote production efficiency. Artificial insemination is broadly applied on mixed cattle followed by regulated recording of milk, fat, etc on limited scales. Also, the same practices are limitedly conducted in native cattle breeding system supported by molecular research at laboratory level. The aforesaid interventions are accordingly committed by the National Center for Animal Breeding (NCAB), the Institute, and sometimes by breeders' cooperatives, formations and NGOs affiliated to exotic breeds. On the other hand, all research or experimental functions are exclusively undertaken by the foregoing bodies and the breeder organizations have least cooperation because of their poor technical or financial capacities.

Buffalo

No consistent regulation is legally operational to ensure implication of indigenous knowledge and information in boosting the buffalo genetic stocks. Instead, executive

institutions occasionally develop certain unofficial plans and projects for animal protein provision from domestic resources. However, appropriate use of genetic stocks lies within ongoing programs of the executive departments for improving the animal products through deploying high yield livestock sperms. There are also legal codes in action to ensure sustainability of environment which may indirectly lead to genetic resources degradation. Existence of following factors shall favorably act as incentives for maintenance and enhancement of buffalo breeding business:

- Enabling climates and habitats;
- Available reedy lands or sugar cane farming (Khuzestan province) as the source of fibrous feeds;
- Improved emotional relation between the breeder and buffalo
- Increasing demands for buffalo fat milk; and
- Having a buffalo as the sign of cultural and social distinction

Structure of buffalo breeding operation does not follow a systematic pattern for genetic improvement and only goes on primary recording the animal specification, milk and its fat percentage, with almost no crisp criteria for sustainable development. The ongoing operational technologies comprise of production recording, artificial insemination and limited transfer of embryos, in addition to application of molecular tools at research scale which only provide opportunities for breeders to access merit genes for higher milk yield. Among the relevant institutions dealing with buffalo genetic stocks, no particular body or department exists to render support but the National Research Institute of Animal Science and its affiliated field stations which deliver certain services in this regard. There are also various academies for educating numerous experts or technicians. Other research centers are committed to forward more or less suitable scientific services through qualified staff and instruments. There is hardly any change occurred in genetic composition of buffalo population whereby a gradual increase is seriously anticipated in their number to tackle with the rising markets for animal products.

Sheep and goat

Owing to overall reliance of sheep and goat farming on domestic genetic stocks and its prevalent traditional system, relatively local tradition, production aspects, and economic competition are the integral components of governing policy on this business.

The sector suffers lacking in definite regulation for supporting its genetic potentials. Instead, the traditional herders are used to raise specific breeds under certain conditions i.e. climate, food availability, market status, etc. On the other hand, no special mechanisms persist to ensure adoption and application of indigenous knowledge which contains thousands years of breeding practices of sheep and goat in traditional system (rural, nomadic and semi-nomadic systems). This knowledge seems highly precious and may cater as a firm backing for increased production. Lately, the Dept. for Extension and Farming System took initiative to collect scattered experiences and information under a unique topic as “Indigenous Knowledge in Animal-Keeping”. Since no extinction risk yet encountered the sheep and goat breeds, hence the business underestimated any arrangement for recording the indigenous background. The eminent changes recently actualized in the animal farming system paved the way for shaping genetic-based organizations or unions, but still suffers from legal gaps to support and strengthen the genetic outputs favoring the breeders. As elaborated earlier, various policies or regulations became operational and affected traditional breeding particularly sheep and goat through:

- Using forests and ranges;
- Combating desertification;
- Maintaining a balance on livestock and pastures; and
- Protecting eco-systems of the wild-life;

Basically, sound utilization of animal genetic stocks had been perceived by professionals, researchers, and experts but however faced quite a number of obstacles

and planning failures at implementation phase. Worth-mentioning that due to poor technical awareness and modern skills, there are substantial untapped potentials in sheep and goat sub-sector e.g. proper feeding, sanitation, breeding management, and market opportunities whose adoption have to get preference than genetic improvement task. Except in Kashmer goats and compared to hair-goats, there is no significant difference in sheep breeds products from consumers' opinion. Certainly few consumers may prefer selected milk or meat that affect on consumption rate of relevant breeds. For instance, tropical regions of the country show more interest to goat meat than other species. In some regions like Northern provinces, such meats are less demanded, while the citizens show more tendency to beef and veal for lower fat. Marghoz breed, for its authentic fibers application in local clothing, has attracted more attention by villagers. Albeit, certain breeds bearing qualified outputs or less fat meats with desirable taste, are commercially preferred for export. Concerning prolong background of sheep and goat breeding in Iran and diversified variations e.g. climatic, cultural, and economic aspects, all native breeds could develop and adapt to their specific regional characteristics. For instance, certain sheep or goats are now matched enough to reach uplands and graze on arduous or arid pastures. A close linkage governs on their hair and wool production with direct impact from carpet and Gelim (short napped coarse carpet) market. Nowadays, international market failure has greatly affected the internal market of hair and wool. Since very beginning, there have been and still are considerable reliance on Iranian livestock and poultry in folklore and religious ceremonies, event predictions, entertainment, matches and domestic sports. Prevailing share of sheep and goat products is well-blinking in food and agriculture sector with negligible impact from exotic breeds. All existing sheep and goat breeds are substantially playing their relative roles in food staples provision. On the other hand, Baluchi, Kabudeh (Fars), black karakul, Kurdi (north Khorasan), Sari Julagh, Mehrabani; and Sangsari breeds are gradually loosing their population for their little bodies, poor quality products, inappropriate markets and socio-economic impressions.

Other goat breeds e.g, Marghoz and Najdi have tangibly dropped in number over the recent years. Raeini goat also encountered the same adventure while Karakul breed is doubly discarded because of no more demand for its skin. Note-worthy that genetic improvement system is essentially traditional on sheep and goats with pure-breeding practice absolutely conducted for large breeds. There are also irregular cross-breeding activities involving native large sheep and goats to respond the market demands for red meat. This issue does not necessarily include the smaller breeds. For example, Baluchi sheep has quite potential for its quality wool and adaptability to graze on poor pastures; hence pastorals are reluctant to hybridize them with larger breeds. Consequently, smaller ruminants do not undergo a sustainable and scientific breeding system, whereas case studies which commenced at research level and industrial scale, have justified invaluable efforts towards upgrading meat and reproduction yield. They are widely published as research schemes, academic thesis, and technical articles in domestic literatures or bulletins abroad (Table 3-1).Principally, small ruminants are under extensive breeding system with the best natural selection order proportional to environmental features. The system almost misses a structured hybridization module, and as stressed before, tends towards unscientific inbreeding operations for increased meat production. Moreover, various research plans have been so far executed by research stations on cross-breeding of native fat tailed breeds and exogenous tailed sheep, but they ceased as the hybrids indicated no comparative advantage to traditionally bred animals under extensive rearing condition. As repeatedly emphasized, sheep and goat breeding enjoys an extensive raising method with almost no innovative plan of genetic improvement or information implication.

Table 2-1 Availability of flocks controlled genealogy, the location and institutions involved.

Breed	Location	Institution	Number of heads under control	Availability of breeding programs
Sheep				
Baluchi	Khorasan Province, Mashhad	Baluchi Station	1,500	Yes
Chal	Ghazvin Province, Ghazvin	Ghazvin Station	100	Yes
Kurdi	Khorasan Province, Shirvan	Kurdi Station	600	Yes
Ghezel	West Azarbaiejan Province, Miyandoab	Miyandoab Station	1,000	Yes
Karakul (black)	Khorasan Province, Sarakhs	Sarakhs Station	700	Yes
Kermani (Baluchi)	Kerman Province, Shahre-Babak	Kermani Station	600	Yes
Makui	East Azarbayejan Province, Maku	Makui Station	500	Yes
Moghani	Ardebil Province, Jafarabad	Jafarabad Station	1,200	Yes
Sangsari	Semnan Province, Damghan	Sangsari Station	1,000	Yes
Sanjabi	KermanshahProvince, Kermanshah	Mehreghan Station	400	Yes
Zandi	Tehran Province, Khodjer	Khodjer Station	1,000	Yes
Crossbreds with exogenous breeds	Tehran Province, Karaj	Animal Science Research Institute	100	Yes
Goats				
Birjandi	Khorasan Province, Sarbisheh	Birjandi Station	500	Yes
Iranian Sannen	Yazd Province, Ardakan	Ardakan Station	200	Yes
Iranian Sannen	Zanjan Province, Zanjan	Zanjan Station	190	Yes
Tali	Hormozgan Province, Bandarabass	Bagho Station	250	Yes
Marghoz	Kurdistan Province, Sanandaj	Sanandaj Station	500	Yes
Marghoz	Kurdistan Province, Saghez	Saghez Station	200	Yes
Najdi	Khozistan Province, Dezfoul	Dezfoul Station	200	Yes
Raeini	Yazd Province, Baft	Raeini Station	1,200	Yes

Instead, every state of the art of technology e.g., biotechnology and information technology for recording and genetic evaluation, artificial techniques in reproduction (artificial insemination, estrus synchronization, sexing, and embryo transfer), molecular

techniques as application of markers, and using indigenous knowledge were employed whose findings were diffused in various scientific journals and academic thesis.

Poultry

Basically, modification of livestock breeding industry greatly contributed in diminished use of native poultry in Iran. They can resume their position by changing management system, particularly on native chickens at small scales, and via simple training schedules on their place and feeding diets. Next is their genetic potential enhancement which shall lead to quality of meat and eggs production, more tolerance to stress, less rearing cost, and better adaptability to environment. Meanwhile, poultry rearing is feasible in limited place allowing practicable provision of households' protein as well as marginal income. All such opportunities imply researching on sound planning patterns for boosting poultry business. To this end, emphasis is put on establishing a beneficial involvement of both consumers and producers in a win-win situation.

Mono-dactyls

Iranian native breeds, unlike exotic breeds, are internationally demanded for their power, resistance to diseases (Iranian Arab, Turkemin and etc.) and their beauty (Caspian miniatorhorse and etc.). Horse is extremely admired and well-positioned in our religion and culture, and this aspect caused further motivation of horse-breeding and racing. Socio-economic factors are also involved in improvement process of these animals, so that poor domestic market for Khazar minihorse, Qarabagh and so forth would expose them to extinction risk. In general, there is hardly regulatory and pre-defined program running for genetic improvement of native horses, but the purebred genes especially Arab, Turkemin and Caspian miniatorhorse enjoy rather structured cross-breeding methodologies. Systematic hybridization is quite usual among native

and exotic breeds whereas irregular crosses are also carried out for certain purpose or to achieve stallion horse.

The aforementioned activities have substantially qualified the existing horses but without scientific evaluation of their new characteristics. Cross-breeding scheme has specified more shares from exogenous partners to upgrade the new generations, but the natives are gradually substituted by exotic breeds for absence of a monitoring mechanism. There seems a big gap for a definite plan on new production or breed synthesis process at national level. The ongoing technology exclusively encompasses genealogy recording in native and exotic horses. Embryo transfer and molecular techniques are currently enforced at laboratory scales. No institution is now committed to genetic improvement of horse breeds. Private sector is mainly organized under cooperative discipline. Arab horses in Khuzestan province were all registered by WAHO and increased for racing purpose. A new association recently emerged up to record and monitors the Caspian miniatorhorses.

Camel

Unfortunately, correct use of genetic resources of this animal was not included in development programme of animal production. The gap persists while the local markets keep on demanding various products of camel breeds. Exportation seems idle, but the southern parts of the country acquire camel wool for wearing mantle, and the eastern region where it offers transportation and riding services.

2.2 Analyzing future demands and trends

Cattle

There is hardly a structured regulation and codes for developing genetic resources of native cattle in Iran. Hence, the sector essentially needs formulation of consistent legal mechanism for the sake of development and sustainability of national genetic

stocks. Progressive growth of human population has consequently encouraged broad demands for nutritious animal foodstuff such as meat and milk. On the other hand, some religious restrictions on certain species force the system to concentrate on available animal potentials. Therefore, under enabling conditions wherever feeds and human power were adequately available, native cattle chanced to mix and increase hybrids. Exotic breeds could also occupy a remarkable place in Iran through industrial breeding system which resulted in decreasing the native genetic stocks. Golpaigani breeds are the best sample. National genetic breeding program, particularly in traditional and semi-traditional systems, poorly addressed a sustainable strategy in genetic resource development, mainly focused on production and paid less attention to quality, tolerance, and feed efficiency parameters. Despite the regular and sustained recording measures in industrial rearing system, exotic breeds' development is still carried out without consideration of scientific aspects and sustainability of breeds. All such deficiencies emphasize on designing workable research plans towards derivation of executive policies for operational breeding systems at national level.

Buffalo

A similar legal gap is also felt in development process of buffalo genetic resources, and hence proclaims an overall act to conserve and protect animal genetic potentials and buffalo stocks in particular. On the other hand, considering this fact that in development programmes the aim is higher production, so non-genetic measures got more attention. Given the socio-cultural and environmental impressions, particularly in buffalo prone regions, Khuzestan and north-western provinces are becoming enabling sites for rearing operation supported by extensive sugar cane complex. Government sector adopts few functions as phenotype assessment, recording the specifications and production with aiming to bull selection and sperm collection. From technical point of view, other sectors like extension, education and research have devoted a lot, but largely failed due to poor planning and inadequate funding. Recording program is

carried out on limited buffalo herds. In traditional system, breeders are exempted of recording cost and due to carelessness recording done by governmental sector mostly are ignored to be used by data analysis system and breeders enjoy less these findings. Recently and after changes realized in ongoing breeding systems, the adoption of new breeds needs comprehensive examinations. For sure, invaluable endeavours i.e. artificial insemination, timely regular ostrous detection and adoption of new breeding approaches may push this business forward.

Sheep and goat

This sub-sector also suffers from comprehensive regulations to preserve its potentials with almost no suitable tools for supporting and extending the indigenous knowledge in favor of related genetic improvement. However, the research divisions have understood the relative issues and taken some attempts which may hopefully be converted to reliable guidelines. Since no specific policy yet formulated for genetic improvement of sheep and goat breeds, the skilled herders are used to select merit animals with higher growth and less tallow to meet better the market requirements. Sometimes, they prefer potential breeds for their multi-bearing characters. Appreciably mobilized private sector adopt pure-breeding schemes on certain sheep and goats under traditional system, but this measure also failed due to interruption of supportive mechanisms and irregular hybridization. Under few research studies, certain breeds e.g., Chal, Ghezel, Baluchi, Kurdi, Karakul, etc have undergone limited phenotype assessment and animals phylogeny used for merit selection. The recent years conduct a few applications of molecular markers in genetic identification schemes have been used, whereas the prevailing raising systems can not easily chose these techniques in their herds due to their breeding system. Lately, a series of joint research are launched by the Institute and the Dept. to expand genetic improvement systems at national level. As a whole, improvement of various sheep and goat breeds is however dependent upon

climatic status, pasture potentials, environmental adaptability, and demand market on various yields e.g. meat, milk, wool, and skin with more confirmation on meat.

Poultry

This sub-sector seriously requires legal supports to incorporate indigenous knowledge into development process of its diversified genetic stocks. However, scattered activities were already operated by eager researchers or professionals to identify and preserve the poultry breeds. It is hopped that it leads to creation a codified guideline. Prioritized measures that should be considered as key efforts toward animal genetic enhancement and capacity building are as follows:

1. Creation of enabling structure for sound recording, registration and conservation of genetic resources;
2. Outlining a long-run plan on how to conserve genetic stocks of various species and breeds:

3- Providing sustained fund for implementing the required tasks e.g. recording, registration and conservation of stocks under In situ and Ex situ conditions.

3. Forwarding assistances to animal keepers through insurance, health and feeding subsidies;
4. Mobilizing the local communities to establish workable systems for collecting animal products;
5. Formation of special markets for livestock outputs;
6. Training the villagers, in particular the rural women on how to raise, cross mate and reproduce their flocks;
7. Designing research schemes in order to enhancement of economic production of animal breeds; and

8. Researching on the major challenges e.g. reproduction, breeding, feeding and biological constraints faced to animals, followed by dissemination of the results to the rural producers.

There are some factors shared to underestimate the animal genetic resources as follows:

- Poor awareness of stakeholders on importance of genetic resources;
- Inadequate capitalization on genetic improvement schemes;
- Focusing on economic production rather than genetic values promotion by producers.

On the other hand, expert training, providing needed facilities or equipments for small-scale poultry keepers and rendering hygienic services are all assumed as capacity building makers. At the same time, establish special markets for placing organic products and defining suitable standards for such commodities would upgrade their enterprise. Although there is no political restriction on genetic production and resources, regarding to hygienic matters there are some legal restrictions for genetic material imports and exports. Fundamentally, changes so far realized in the animal breeding industry served the key elements to decrease native poultry consumption. Among authentic traits in native poultry, the naked-neck gene has bearing favorable potentials for defeathering and growing performance in tropical region. This unique gene deserves other aspects e.g. resistance and mobility for feed finding and escaping from enemies which blink for possible attention in future. On the other hand, native poultry's sensitivity to exotic diseases along with their low yield and higher cost of production caused a minor share in national protein supply of the country. Moreover, progressive attention to exotic commercial breeds led to over-concentration of research sectors on their performance, habitats and feeding diets and consequently, disregarding the native breeds.

Over the recent years, enormous investigations were made by the Institute on genetic assessment of native breeds, comparing them with commercial hybrids, identification, breeding operations, and various campaigns for their expansion at national level. Last two decades were obviously characterized for improvement of native poultry, turkey and ducks in reproductive characters e.g. eggs number and weight, sexual maturity, etc.

Mono-dactyls

For this time there is not any codified act for developing of horse genetic resources in country, but enacting of act for animal genetic conservation can encourage developing of horse genetic resources of IRAN. Regarding to propagation of horse riding in our culture, religion and special social circumstance, its development in country would be possible, and the necessity of performing some case studies is obviously needed.

In sport, preference is given to effective characters i.e., high speed, jumping, parents records, physical type and phenotype, etc, which help rise horse's efficiency and chance for wining the race. There are also key principles as phenotype, genealogy, technical opinions in physical evaluation, and the existing records of the races which are implicated for selection of male or female horses. Horse-riding federation, cooperatives and private sectors are directly involved in pure-breeding activities at country level. They also have appreciable contribution in process of horse genetic development.

There exist precious potentials at technical institutions, academic centers and research firms on genetic-oriented fields. Normally, the horse owners are committed to perform recording function at their own responsibility. Certainly, adoption of modern technology shall upgrade on stocks of native horse breeds at national scale.

Camel

Obviously, formulating potential regulation assumes an enabling action towards protecting and enhancing genetic stocks of camel breeds. The Ministry of Jihad-e-Agriculture committed to develop some initiatives which may result in shaping the required legal tools in favor of camels' promotion. Since the major policies are tangibly production-oriented in nature, hence preference is comparatively given to non-genetic attempts e.g. feeding improvement, hygienic affairs, etc. Camel's products are mostly demanded internally and its inputs have local origin with least impact from overseas markets. Any how, considering the socio-cultural backgrounds and existing capabilities, climatic change and authentic desert ecosystem all encourage developing camel genetic resource. However, almost all camel breeds are more or less active in production process but possess unstable breeding opportunities and incompetent place in genetic improvement strategies. Consistent programs on camels upgrading would increase its yield, reproduction performance and life span, while the private sector and NGOs must be called for efficient cooperation. No doubt, application of modern technology by government will affect this business under legal arrangements. Currently neither recording measure is operational, nor is any enthusiasm showed by private sector. Presently, promising efforts are underway for introduction of exotic camel breeds on national scale which can rely on extensive arid and desert habitats

2.3 Discussion of alternative strategies in the conservation, use and development of AnGR

Climatic structure of some regions of Iran is shaped in a way that only native species deserve to adapt, product, reproduce and conserve their generation. For instance, despite the feed shortage and unfavorable habitat, Sistani cattle, is well matched and now assumed as a unique genetic stock face serious deficiencies of adequate feed and drought reoccurrence. This challenge entails a comprehensive

intervention for outlining scientific and workable remedies. Under traditional systems, certain barriers e.g. lack of comprehensive plan, poor profitability and a partial share of animal products in the household's income, are the major components that hamper the animal genetic improvement. Besides, absence of a comprehensive modality has hindered provision of desired genetic material for promoting animal products. Hence, apart from sound planning and technical inputs, consolidated supports and incentive have to be foreseen toward mobilizing the herders. In semi-industrial system, upon progressive increase of awareness, demand for higher products, and better supportive premiums led to broader implication of exotic genetic material. However, in some cases, selection of genetic material neither fitted the environmental aspects nor based on scientific consideration which came up with unwanted constraints.

There exist few but essential factors i.e., adequate fund, technical training for animal rearing, and strengthen their cooperatives potentials for preparing suitable genetic inputs which create enabling background for the business concerned. Moreover, due to economic, cultural and social complications, traditional system is gradually failing in production and instead, showing more inclination towards industrial and semi-industrial modes. Traditional operation is no longer justifiable and the situation may expose to risk or reduce native genetic stocks. Needless to say, reliable information and technically colleted records on stock's potentials play vital roles in promotion of genetic resources in particular, of low yielding breeds. Such information e.g., recording, characters identification and genealogic intelligence facilitated verifiable prediction of breeding value and derivation of selection criteria by the National Center for Animal Breeding (NCAB) which now govern on exotic cattle breeds. Cooperatives or private institutions are poorly committed in this connection and need to be encouraged for more presence. Given the technical facilities and professionals available in the country, emphasis must be put, apart from genetic improvement, on developing an efficient recording approach jointly cooperated by public and private stakeholders for pilot execution during the ongoing decade.

Although the approach requires new technologies, and legal and financial supports will generate crucial impacts, relies on socio-cultural infrastructures in advance. To this end, small producers have to perceive conservation of breeds which may have remarkable impacts on their livelihood; otherwise they will loose their enthusiasm and incentive. No doubt, involvement of rural women and children can enrich the genetic conservation projects.

At present, various governmental institutes either research; extension or executive bodies are directly or indirectly responsible for livestock, aquatic and natural resources affairs. But, owing to poor synergy and unstructured plans, they are not organically linked and oriented toward common target. On the other hand, irrespective of well-organized industries for poultry and genuine cattle breeding, other potential business or people's organizations are underdeveloped which may otherwise, create impressive opportunities.

In general, certain unscientific measures are under implementation by traditional practitioner for boosting native animal productivity rate. The most effective action seems to be sustainable support for creation of business organizations undertaking native breeds of various species, followed by formulating overall regulation and guidelines together with competent institutional set up for direct involvement in conservation, development and exploitation of animal genetic potentials.

On exotic species, keep a close relationship with research centers will facilitate transferring of experience for technical development of available stocks. There are numerous limitations and challenges on the way of viable genetic resources use, which mainly categorized as under:

- Poor perception of relevant stakeholders;
- Lack of adequate skill and knowledge among animal breeders;
- General illiteracy;
- Inadequate investment;
- Scarcity of feedstuff specially under drought condition;

- Low income of animal breeders;
- Lack of responsible institutions for identification, registration and conservation of animal genetic resources; and
- Financial deficit in long-term programs.

At the same time, thorough statistical figures have to be generated and made accessible for due alerting on the breeds stayed at risk.

2.4 Outlining future national policy, strategy and management plans for the conservation, use and development of AnGR

Some identified series of hampering factors affecting productivity and efficiency of traditional and semi-industrial systems are as follows:

- Inadequate technical knowledge and managerial skill among producers;
- Poor extension service to promote technical knowledge;
- Inconsistency of the ongoing production systems proportionate to prevalent-economic status in the society;
- Input and output price fluctuation;
- Instability of local livestock markets;
- Low investment,
- Inappropriate linkage and efficiency of training , extension and research disciplines;
- Poor control and surveillance on pathogenic agents;
- Environmental stresses; and
- Lack of overall policies

Industrial system also suffers from transient policy and planning which mostly rely on temporal managers' views, exotic inputs and hence launches inefficient operation.

These are the reasons behind gradual reluctance and hindering of the industrial system which encouraged the government to shift it to private and cooperative

societies. Following are the key recommendations in favor of developing livestock products and genetic resources:

1. Upgrading technical knowledge of the breeders;
2. Sound policy-making and programming to make reliable plans and projects;
3. Boosting enterprise organizations e.g., breeding associations, etc;
4. Rendering workable credits (low-interest and long term) to real producers;
5. Extending legal support to all thematic components, proportionate to their effectiveness in production trend;
6. Forwarding technical service to the animal breeders through pertinent enterprise organizations;
7. Employing young experts in managerial position of the production units and strengthening the linkage between research and executive disciplines;

The priorities for increasing of utilization and development of genetic resources are as follows:

1. Creation and supporting the relevant business organizations e.g. unions, associations, cooperatives, NGOs, …
2. Formulation and approval of supportive policies and guidelines;
3. Justification of the importance of animal genetic resources to the authorities and policy-makers in the country.
4. Building a unique responsible institute to undertake the function;
5. Allocation of adequate fund and facilities
6. Rendering regular extension and training services through mass media;
7. Setting up direct and concrete linkage between governmental institutions and the producers;
8. Developing suitable information and statistical networks

In general, the country confronts two different paradigms in relation to AnGR.

Firstly, urbanization trend has limited the animal habitats followed by progressive growth of demands for protein staples which encouraged intensive production systems of exotic commercial breeds. Meanwhile, increased public awareness and supports of animal rights have improved the demands for organic products, which however may loose their sustainability primarily due to reliance on closed system intensive feed and limited resources. Under such condition, native genetic resources are the best alternatives for their potential to feed on leftovers, wastes and pastures. For instance, only native chicken and turkey are produced at specialized stations and their products are sold to rural breeders for rearing purpose. This method shall be successfully extended for development of other genetic stocks. Presently, rural breeders are made aware of the role and potentials of native animals with less interest in hybridizing them with exotic breeds. Besides, the urban consumers are ready to offer higher price for native products, but inadequate information and lack of macro strategy for organic production and creation of specialized markets have all vandalized the idea.

Secondly, over-emphasis on industrial production modes and employing the exotic species for immediate provision of food stuff has led to gradual negligence of decentralized production systems at small-scale level. Lack of an enabling marketing system of livestock commodities for rural small producers followed by limited centralized operation share to hide the size of their economical impact and value. Instead, the adaptability of some native genetic resources e.g. sheep and goats to rural ecosystems and contribution in easier food provision made, their population is satisfactory, though certain breeds such as Golpaigani cattle seriously stayed at risk. As a whole, the main opportunities which mobilize poultry genetic resources are categorized as follows:

1. Expansion of rural households and population;
2. Existence of proper feeding potentials at rural scale;
3. Rural tendency, in particular the women, to poultry farming;
4. Less dependence of the native poultry breeds on imported inputs;

5. More public inclination to organic products;
6. Assigning some pilot farms and requirements for operation of conservational schemes;
7. Relatively lower rearing cost compared to other livestock;
8. Existence of successful patterns on genetic improvement of chicken and turkey for possible implication to other species;
9. Available potentials as cultural interest, social priorities, family heritage protection and eco-tourism;
10. Environmental adaptabilities, abundant marginal lands, bio-diversity and resistance;
11. Related handicraft occupation as carpet industry;
12. Existence of eminent researchers, and qualified stations or laboratories;

3. REVIEWING THE STATE OF NATIONAL CAPACITIES AND ASSESSING FUTURE CAPACITY BUILDING REQUIREMENTS

3.1 Assessment of national capacities

Principally, the Iranian government is the sole national steering authority to organize the overall endeavors for genetic resources conservation.

The Ministry of Jihad-e-Agriculture is the highest authority committed to research, education, and training services and promoting the animal genetic resources. The Agricultural Research and Education Organization linked to the Ministry, has implemented invaluable actions directly or indirectly, in developing animal genetic stocks though the Institute or the NABC. At the time being, no specific policy governs on the issue, but lately and in favor of sustainable exploitation of animal genetic potentials, a Draft under the title of " The Bill for Conservation and Utilization of Domestic Animal Bio-diversity" was formulated by the Institute and left with the Ministry for due approval. The Draft considered establishment of an independent "Institute for Conservation, Research and Registration of Animal Genetic Resources" to undertake bio-diversity's affairs at national size.

Also, other training bodies affiliated to the Ministry of Research, Science and Technology have to elaborate and emphasize more on the crucial function of genetic stocks in sustainability of agriculture and animal performance. This Ministry plus its academic and research centers are considerably linked to educating the required human power for conservation purpose, but however, corporate connection with the leading countries would also be fruitful for the eager students.

Very recently, certain NGOs were also involved in native cattle farming to conserve their genetic potentials. However, organizing animal breeds festivals may stand as central incentives for genetic conservation and their reputation, but left negligible impact on the objective. The past years witnessed several but small innovations relating to formation of sheep-and goat enterprises in Northern provinces e.g., union of sheep breeders in Mazandaran, with possible replication in other regions. Quite lately, a project proposal on conservation of two-humped camels was also submitted to an international specialized agency for immediate implementation in Iran. Reinforcing information communication among technical bodies of the regional states and preferably executing joint projects on genetic identification by implicating bio-technologic methods would greatly pave the way for disclosing broad spectrum of enormous poultry breeds in their diversified species. Such detection may shed enough light on conserving a particular breed in a particular place through transfer of identical genetic material available in other places. Noteworthy, accessing to precious capacities on legal, social and cultural arrangements in neighboring countries deem essential for conservation and development of genetic resources

3.2 The state of conservation trend of animal genetic resources

Cattle

In view to arrival of exotic genetic materials, the population change of native cattle assumed as a source of concern for experts and professionals of this sub-sector in Iran. They focused on In situ and Ex situ conservation of genetic stocks and made the breeders aware of significant position of their animal breeds and conservation measures. But, the native breeds are still endangered due to poor revenue of the

breeders and lower performance. Besides, successive drought, social disruption, economic constraints and environmental stresses either caused gradual elimination of the native breeds or crossing into exotic cattle. The ongoing challenge, if not properly settled, would result in extinction of 6 native breeds as well as domestic cattle which were exposed to irregular mixing with exotic animals. Although, the Dept. of Livestock Affairs and the Institute are jointly committed to in-situ and ex-situ conservation operations (on embryos and sperms), but they faced some problems such as issues as high expenditures, keeping animals at stations, stocking the sperms and embryos under governmental control.

The breeds not facing with eradication (exotic cattle), their sperms or embryos are well preserved for a short period. The last conservational practices exposed severe difficulties or partly stuck due to lack of technical or financial supports, deficiencies or void of a legal platform. Moreover, marginal pressures for instance, forest protection and livestock withdrawal programmes shared in collapse of the genetic schemes. Noteworthy, collection of precise data on existing cattle breeds constitutes an outstanding tool for conserving genetic stocks by governmental institutions. The governmental bodies have verifiable instruments to fulfill the aforesaid commitment, but however, require sound planning and adequate funding. Finally the sub-sector widely suffers from the absence of a unique authority being individually committed to collect the statistics and derive specific indicator for detecting animal population change.

Concerning the incentives, occasional holding of genetic festival to highlight the native breeds were substantially effective to introduce the various breeds but seemed not fully effective on their conservation. In respect to genetically adapted exotic cattle, several companies and holdings are specifically established followed by adequate budget for running festivals, courses and seminars which largely encouraged their genetic development. The overall attempts, as elaborated above, approve comparatively higher investigation and consideration on exotic cattle than the native genetic breeds.

Buffalo

All stakeholders are well aware of value, importance and the role of livestock genetic stocks on their bio-diversity aspects, and the breeders believe in economic potential of their animals to meet social requirement and being money earning for their householders. Needless to reemphasize that lower income and over-pressure for increasing the production, led to drastic distortion of genetic resources or even exposure of an ecotype, breed or species to extinction risk. Despite the aforementioned challenges, neither comprehensive approach yet legislated to cover and protect native breeds, nor exists a definite institution adopted as responsible for animal genetic conservation. Plus, substantial cost for long-term preserving of native pools especially live animals led to absence of a comprehensive strategy to actualize the purpose. Apart from all such obstacles, few attempts so far have been took place as In situ and Ex situ through collection and preservation of sperms or embryos of certain ecotypes by the Institute and the NCAB. Meanwhile, construction of some dams, and vicinity of the buffalo habitats to border lines of Iran and Iraq imposed drastic damages on their population.

Sheep and goat

Generally, and due to special breeding method applied on sheep and goat, and their genetic diversities, no serious danger has ever threatened their population. Bahmei breed however, faced to remarkable loss in number followed by gradual decrease in other sheep as Baluchi, Karakul black and Kurdi Many breeds keep on economically viable production in different farming systems, but lately the trend encountered some difficulties due to the following restrictions:

- Enforcement of a national plan for balancing the livestock and pastures capacities;
- Livestock withdrawal from the forests;
- Elimination of extra animals from the pastures;

- Expansion of the enclosures for greater protection of fauna and flora on the vast pastures in arid regions;
- Prevention of desertification; and
- Tendency of traditional breeders to migration and better livelihoods

Therefore, effective changes have to be practiced in animal farming systems whose basic consequence is gradual elimination of non-commercial breeds in new discipline. This arrangement would result in reduction of productive flocks and hence requires more attention to conservation of sheep and goat genetic resource. The proposal is well-understood by scientific and research panels, but is pending for further justification and planning procedures at policy level. Over the last years, appreciable efforts conducted to conserve native sheep breeds through pure-breeding approaches videlicet “the Ram Performance Test”. As described before, conservation of sheep-goat resources is upon breeder under the governing system with less interference made by specific institution. However, the foregoing issues stress upon serious plans for creating reliable infra-structures devoted to conservation of the existing genetic stocks under an appropriate infrastructure. To this end, following remedies considered as important factors for immediate effect:

- Development of qualified human resources;
- Raising public awareness;
- Provision of required fund;
- Upgrading infrastructural capabilities;
- Transferring the modern technology; and
- Involving NGOs, local, national and international bodies through sharing their most capacities;

Poultry

Conservation of poultry breeds has been mainly commenced by in-farm rearing operation and in sheered habitats with other species. Native turkey and chicken are genetically under conservation and development via establishment of breeding stations and distribution of cheap and vaccinated chicks to rural dwellers. The livestock breeding sector is aware of value and importance of conservation measure, but poor awareness of certain policy-makers hindered any specialized plan to support urgently specific markets for different species. Generally, the society is ready to meet even higher cost of livestock outputs, but lack of suitable institutional set-up on genetic diversities together with inadequate perception have vandalized an impressive strategy for this sector. Quite exclusively, limited actions made as In-situ or Ex-situ conservation schemes on certain poultry breeds. This sub-sector also exposed to lack of a distinct responsibility or authorized body at national level. Absences of NGOs plus inadequate fund are other major reasons behind poor performance of conservation efforts on native poultry. It seems rather difficult to precisely point out the endangered breeds with inadequate information, whereas the Dept. of Livestock Affairs and the Institute have solicited reliable data on chickens, turkey, geese and quails. Accordingly, the afore-mentioned breeds did undergo research-training program to improve rural nutrition and subsistence scales through better utilization of their available sources. Regret that such interventions and in particular, maintenance of relevant stations, usually face to financial failure which led to tripping of certain provincial branches.

Mono-dactyls

Despite no structured strategy so far designed at national level, scattered activities are recorded in this respect by government. Perhaps, lack of explicit responsibility for genetic conservation and poor synergy among various corporations contributed are the reasons of misleading to the target.

Many native horses are exposed to serious risk. Presently, Caspian miniature horse are raised and conserved temporarily through In situ and Ex situ modes at Khojeir researching station in Tehran. Other horse breeds have been successfully undergone pure-breeding operation over the years based on existing ecosystem by local horse breeders.

This long-lasting practice still continues by the breeders and they have almost retained thoroughbred horses under control, hence less involvement has been so far done in this system by governmental institutions. Currently, the prevalent socio-economic and cultural circumstances the relative organizations to initiate efficient endeavors for conserving the horse genetic stocks. The purpose may compose of holding various racing matches among native pure bred and arranging stimulus festivals. Moreover, the vital role of private sector in registration and breeding the native pure-bred horses can not be denied, who basically accomplished an autonomous operation in favor of growth and development of the horse breeding industry at national level. They could greatly capitalize on this field and commercially proceeded their business by native breeds development. Today, poor investment and inadequate holding of racing matches impose a gradually declining trend on native horse breeding operation. The following are, the major gaps on the way of genetic conservation of horse breeds:

1. Lack of an authorized and autonomous institution;
2. Lack of a dynamic data bank;
3. Absence of genetic-oriented organizations;
4. Poor allocation of adequate fund;
5. Poor research and training schemes
6. Lack of regional and international linkages; and
7. Inconsistent technology, capacity and spatiality;

The ongoing information and communication systems are not responding the expectations mainly due to not adopting modern technologies as internet, or convening

seminars at national, regional and international levels. In addition, there seem certain very impressive measures as follow to bind concrete relation with Persian Gulf states on authentic horse breeds bearing common genetic characters:

1. Continuous relationship with professionals;
2. Develop internet web sites;
3. Hold regional racing matches;
4. Celebrating stimulus festivals at international level;
5. Conducting joint studies and research schemes;

In general, according to the regulation enacted by the Iranian Veterinary Organization (IVO), displacement of horses from one to another region needs to be legally authorized. There are other quarantine regulations which are laid down by the IVO on exotic horses.

Camel

There are key points which must be taken into consideration in respect to legal policies and instruments linked to camel genetic stocks. Of course, serious gaps now encounter with the way of conservation and protection of native livestock, especially camels as national genetic resources. But, certain policies also exist in relation to upgrading and adoption of effective technology which yet is enforced due to poor legislative supports.

On the other hand, some efforts which not yet legalized are currently underway to employ indigenous knowledge and protect the camel breeds. They include designing certain impetus or incentive mechanism to use animal diversities in the country. There are no legal supports to protect and increase productivity of camel breeds, but worse thing is the occasional restrictions made by the NEPO which may tentatively lead to gradual elimination of camel genetic resources.

4. IDENTIFYING NATIONAL PRIORITIES FOR THE CONSERVATION AND UTILISATION OF AnGR

4.1 National cross-cutting priorities.

1. Improving information infrastructure by creating of data bank and networks to include stakeholders, breeders, research institutes, NGO_S and commercial organization focoused round a central database.

2. Transferring new technology and new information among breeders and other relevant groups.

3. Allocation of more financial and human resources for AnGR conservation.

4. Complete Identification and gather a comprehensive census for Animal breeds, particularly, endangered species.

5. Emphasize on Constitution of NGOs at National level and collaboration enhancement of research institutes for the utilization and maintenance of AnGR.

4.2 National priorities among animal species breeds, country's regions and rural communities.

1. Development of AnGR data banks.

2. Training in genetic management and improving involved departments in AnGR conservation by the aid of agricultural colleges and universities.

3. Emphasize on the importance of AnGR Conservation and its development by raising awareness throughout society of AnGR, legislation of protective laws and attempt to improve animal Products based on conservation of genetic diversity.

4. Develop expert resources for the management of AnGR and the maintenance of diversity.

5. Conduct relevant case studies to help preparation of comprehensive and environmentally Compatible Programs.

6. Recognition Animal breeds adapted to different climates to select and recommend them based on economic circumstances and country needs.

7. Help breed improvement programmes and the preservation of genetic variability using by new technologies such as cryopreservation of genetic materials.

8. Reinforce rural infrastructure by developing its businesses. It can be down by the utilization and marketing of productes obtained from native breeds, e.g. (extension breeding of native chicken breeds by government over recent decades), creation special markets and facilities to encourage rural breeders.

9. Excluding endangered native Animal breeds from prohibition acts for entering to rangelands & forests.

10. Determination an Organization for protecting of at risk and rare $AnGR_S$ in critical times such as draught, flood, earthquake and etc.

11. Encourage recreational and sport bodies to consider and pay more attention to AnGR.

5. RECOMMENDATIONS FOR ENHANCED CO-OPERATION IN THE FIELD OF FARM ANIMAL BIODIVERSITY

5.1 Recommendations

Iran as a developing Country has entered into critical phase for conservation of many breeds. In this regard it seems some initiative activities can help it and any other similar country to exit from this phase and reach to a sustainable status. The following is an attempt to put forward some ideas for international cooperation in the field of AnGR:

1- It is recommended that countries all around the world, particularly, developing countries be encouraged for conservation and utilization of AnGR at governmental, NGO and research Institute level. Certainly, supporting the capacity building, enhancing institutional structure and manpower training in these countries as well as creating regional, inter-regional and global database networks can help and reinforce this important issue.

2- Under developing and developing countries should be supported in conserving, developing and using their genetic resources by preparing financial resources, knowledge and technology for them

3- Encouraging the NGO'S formation at national level.

4- Harmonization of conservation criteria and goals with regional and global policy.

5- Identification, evaluation and prioritization of native breeds in every country, region and even at global level to achieve more effective conservation programmes of native AnGR.

6- Determination a focal point and make an inter regional network system among Iran, Bangladesh, Azerbaijan, Turkmenistan, Armenia, Gergizestan, Iraq, Afghanistan, Pakistan and turkey to reinforce regional co-operation.

7- Contribute in international agreements, related to AnGR and enacting those signed by Iran such as Biodiversity Convention.

8- Conduct joint studies and research projects at national, regional and inter regional levels with the aid of international organizations and institutes such as ILRI.

9- Establish Closer linkages with the regional and inter regional institutions and international expert organizations in livestock conservation era.

10- Allocate, as appropriate, adequate financial resources and capacity for border control and quarantine measures with a view to improve Animal health, welfare and livestock protection.

11- Consider the introduction of positive incentive measures for the eradication or control of invasive alien species and the use of native species as much as possible in farm management and other programmes.

12- Encourage, both small and large stakeholders, in the prevention and mitigation of impacts of alien invasive species, including by awareness – rising and training as well as through the design and implementation of appropriate incentive measures.

13- Clarify the gaps and inconsistencies in the international regulatory framework that are significantly hindering countries' efforts to manage the AnGR Conservation.

5.2 Some important attempts done by Iran to support national capacity building

Pursuant to relative perception realized by national stakeholders on animal genetic conservation, tangible supports in terms of technical, research and extension services were recently forwarded which may increasingly continue in future. In this respect, "the Law of Livestock Breeding System was" prepared by the Ministry of Jihad-e-Agriculture and presented to the Government for ratification. The Law has obligated the Ministry for conservation of aquatic, livestock and poultry genetic resources.

To date, the Act of National Veterinary System, which laid down in 1971 and encompassed overall regulations on hygienic aspects, still governs on quarantine codes and trans-boundary movement of the native or exotic animal genetic resources. The Act also covers the following measures under its domain:

- Prevention and controlling the animal diseases or the common human and animal diseases;
- Issuance of hygienic certificate for animals and related raw products for export;
- Hygienic supervision on pastures, watering places, stables, and other breeding establishments;
- Monitoring on the feeding plants; slaughter houses and processing units;- Controlling the production, import, export and marketing process of various biologic materials e.g. drugs, vaccines, serums, etc.

Despite the general effects of ongoing regulations on quarantine, health care, and insurance issues and consequently on native and exogenous species, but other limiting initiatives as insurance coverage for exotic animals and negligence of native ones followed by breeders reluctance to native cattle, have imposed their negative impacts on their population. Key priorities for capacity building in management of animal genetic resources comprise of statistical sampling, identification and evaluation of the breeds, conservational techniques, managing the available population, data management, socio-economic assessment, genetics and breeds improvement. To this end, and since very beginning, legal bill on animal breeding system was outlined by the Ministry and offered to the government. The bill consists of regulatory supports to sustainable development of animal farming, animal genetic resources, and their legislation process. Concerning genetically adapted breeds, many private farms and breeds-oriented organizations devoted substantial inputs together with various festivals,

workshops and seminars held for expansion and expedition of exotic breeds absolutely incomparable to native genetic resources.

5.3 How the country report was prepared

This Report aims at compiling information on national AnGR to fulfill the FAO objective for preparing the State of world's AnGR Report appealed in 1990, and followed the evolutionary process as below:

Based on a recommendation sounded by the FAO Conference (1990), a comprehensive plan was requested to found a sustainable management on AnGR. Later, the next conference (1992) could develop an integrated strategy for the aforesaid management by 1993. Signing the Declaration of Agenda 21 and approval of Bio-diversity Convention dedicated further supports to that strategy. In 1995, the FAO Committee of Agriculture (FAOC) reviewed and attested the initial stage of programming and called all stakeholders to share their up most potentials into the strategy development trend. A substantial fund was also allocated to ensure satisfactory progression of the task. In 1995, the FAO Conference adopted the plant genetic resource as the main agenda but took the AnGR issue under consideration too. In the following year, the World Food Summit happened to re-emphasize on the importance of the AnGR during the third general meeting of bio-diversity for the integrated planning. Again, the FAO conference in 1997 urged the Director General to assign the AnGR expert group for preparing a guideline for FAO inter-governmental working group on AnGR. The expert group stressed on an inter-governmental mechanism to facilitate and conduct a better management on AnGR at national and regional levels. Then, the seventh Commission of Genetic Resource for Food and Agriculture (CGRFA) held in 1997 agreed upon formation of technical Working Group on AnGR who presented a series of suggestions on further promotion and expansion of the Strategy, to the eighth general meeting of the Commission in 1999. The I.R. of Iran, the

Arab Republic of Egypt and Sudan were selected as the members of technical working group in the Middle East region. They met each other in Sept. 1998 and concluded the following recommendation:

"The FAO may implicate the available country reports and work out the existing world state of genetic resources so that a reliable assessment could be achieved on the countries' AnGR as well as their domestic animal status. " The Working Group highlighted the need for development of a guideline and consultancy on how to prepare the respective reports by the countries, and emphasized on rapid completion and use of the domestic animal diversity information system (DAD-IS). The Country Reports have to be officially confirmed by the relevant countries as they may be employed by the FAO to compile the final report on the world state of AnGR. To this end, a liaison officer has to be nominated by non-member countries or as National Coordinator by each member state to expedite preparation trend of the reports. Moreover, every country shall constitute a National Consultative Committee comprising of professionals and leading producers to cooperate and advise to the report preparation process.

The foregoing NCC converged in Iran and worked on the issue through different perspectives. Later, the focal office employed the qualified staff and directed them to collect the basic data and extract related questionnaires for due distribution. Few working sub-committees were also formed on various subjects as follows:

-Sub committee of sheep and goats

-Sub committee of cattle and buffalo

-Sub committee of horses and other mono-dactyls

-Sub committee of poultry

The above-mentioned sub committees allocated 410 Person/hour effort to explore questionnaires and compile 45 the received reports, and finally drafted up a final 2319 person/hour input appreciably dedicated by all officials and professional concerned whose names, functions and institutions are indicated in the following pages, the report

draft would assume as a source for rather qualified reports in future. The main obstacles in preparation of such reports refers to lack of precise and updated information which has to be seriously tapped and resolved at national levels.

NCC members participating in the preparation of SoW Report

Name*	Address	Email	Telephone	Fax
Dr. M.A. Kamali **(chair)**	Animal science research Institute, Karj	m_kamali@asri.ir	0261 4430010-14	0261 4413258
Dr. A.A.Gharahdaghi	Animal science research Institute, Karj	i_gharahdaghi@Asri.ir	0261 4430010-14	0261 4413258
Dr. M.R Kianzad	Animal science research Institute, Karj	kiyanzad@yahoo.com	0261 4430010-14	0261 4413258
Dr. H.R. Ansari	Animal science research Institute, Karj	hrans2003@yahoo.com	0261 4430010-14	0261 4413258
Dr. S.Amirineya	Animal science research Institute, Karj	c_amirinia@yahoo.com	0261 4430010-14	0261 4413258
Dr. F.Afraz	Animal science research Institute, Karj	f_afraz2000@yahoo.com	0261 4430010-14	0261 4413258
Dr. F.Sarhaddi	Animal science research Institute, Karj	fathollah_sarhaddi@yahoo.com	0261 4430010-14	0261 4413258
Dr. J. Tavakolian	Animal science research Institute, Karj	javad_tavakolian@yahoo.com	0261 4430010-14	0261 4413258
Dr. F.Amini	Animal science research Institute, Karj	fred-Amini@yahoo.com	0261 4430010-14	0261 4413258
Dr. Charkhkar	Veterinary organization	ivoheilth@.ivo.org.ir	021 8953400-3	021 8962392
Dr. S.R.Ashteyani	Animal science Department, Tehran university	ashtiani@UT.AC.IR	0261 2248082	0261 2246752
Dr. M.Moradi	Animal science Department, Tehran university	moradim@UT.AC.IR	0261 2248082	0261 2246752
Dr. Rahimi	Animal science Department, Mazandaran university	rahimimianji@yahoo.com	0152 3822571	0152 3832577
Dr. F.A.Malayeri	Agricultural planning and economic researches institute	farzin-malayeri@yahoo.com	021 8808632	021 8896660
Mr. S. Nomi	Animal science research Institute, Karj	snomig@yahoo.com	0261 4430010-14	0261 4413258
Mr. H.Izadi	Department of livestock affairs, Ministry of jihad-e-agriculture	epstir@yahoo.com	021 64582302	021 6412868

Mr. Shahiri	Department of livestock affairs, Ministry of jihad-e-agriculture	m.shahiri @ agri-jihad.ir	021 6465010	021 6480690
Mr. Jahandar	Department of livestock affairs, Ministry of jihad-e-agriculture	_	021 6490443	021 6419817
Mr. Yosefi	Department of livestock affairs, Ministry of jihad-e-agriculture	_	021 6497650	021 6419817
Mr. Molasalhi	Animal breeding center Ministry of jihad-e-agriculture	abccen@Istn.Irost.com	021 6601874-75	021 6601873
Mr.Asadi	National center of statistics	asadi_ma(2003)@yahoo.com	021 8964476	021 8969891

The working group members

- **Sheep and Goat group members**
  Dr. A.A.Gharedaghi
  Dr. M.R Kianzad
  Dr. H.R. Ansari
  Mr. M.Monem
  Mr. N.Taher pour
  Mrs. M.Salehi
- **Poultry group members**
  Dr. M.A. Kamali
  Dr. F.Afraz
  Mr. H.lotfolahian
  Mrs. J.Mirabdolbaghi
  Mr. T.Tohideyan
  Mr. S.A.Hoseyni
- **Cattle, Buffalo, Hours and Camel group members**
  Dr. F.Sarhadi
  Dr. J. Tavakolian
  Dr. F.Amini
  Dr. S.Amirineya
  Dr. H.Mansori
  Mr. A .Aghashahi
  Mr. M. Khaki
- **Supporting group**
  Mr. S. Nomi
  Mss. SH.Ghorbani
  Mrs. F.Izadi
  Mr. A.M.K.Beheshti
- **English Translation**
  Mr. A. Yosofy
- **Editors**
  Dr. M.A.Kamali
  Mr. A.Ariana
  Mss. SH.Ghorbani

Collaborator organizations

1. Department of livestock affairs, Ministry of Jihad-e-Agriculture.
2. Agricultural planning and economic researches institute.
3. Department of planning and economic affairs, Ministry of Jihad-e-Agriculture.
4. National center of statistics

5.4 Executive Summary

This Country Report on Animal Genetic Resources is the Iran's official contribution to the Food and Agriculture Organization's "First Report on the State of the World's Animal Genetic Resources". It has been produced by a 21 member National Consultative Committee on Farm Animal Genetic Resources representing all main farmed species interests, a number of non-governmental organizations engaged in breed management and conservation and the leading institutes and University Departments involved in animal breeding and genetics.

The Report describes the current state of the Iran's livestock industry and the key role that the country's rich diversity of livestock breeds and commercial strains play in maintaining the economic and genetic sustainability of its farm animal production systems as well as being part of the country’s rural culture. It also analyses the changing demands on national livestock production and future breeding programmes driven by the globalization of livestock product marketing and by evolving Government policies on the environment, animal welfare and food safety. A review of what needs to be done to assist the industry to meet those demands by improving co-ordination among the relevant stakeholders and building capacity in the animal breeding and conservation sectors is given. National priorities for action are given as well as a number of recommendations relevant to both Government and the private sector on how the conservation and utilization of the country's animal genetic resources can be improved.

The animal breeding sector responded very effectively to demands for increased production particularly during recent 40 years by applying selection pressure to certain high yielding breeds, some imported, to improve production efficiency and yield especially in the dairy and poultry sectors. However this has led to a reduction in the number of traditional native breeds which are utilized in mainstream production. As

national policies change towards more environmentally and biologically sustainable systems of agriculture to deliver public goods, the utilization of a wider diversity of locally adapted and traditional native breeds is expected to increase.

Conservation programmes both *in situ* and *ex situ* for the country's breeds at risk (locally adapted, genetically distinct and rare breeds) have been mostly well managed by government with the support of animal research institutes and universities and some private breeders. However, financial problems have restricted government to maintain livestock in animal research stations as well as stocking sperms and embryos.

There is also a need for greater co-operation at international level to ensure that conservation activities are managed as cost-effectively as possible.

A number of recommendations are made regarding the development of greater co-operation between Government, NGOs, private and commercial breeding organizations and scientific institutes at international and national level.

5.5 Case studies

In order to Identification, evaluation and conservation of Animal genetic resources , Also , determination of the most appropriate and economically best way of their conservation and recognition of capacities and potentials for this sector, respectively, 22,1 and 14 research projects have been done in animal science research institute and relevant research centers in the country.

APPENDIX 1. Maps of IRAN

Fig. 1.1 Situation of IRAN in Middle East

Fig. 1.2 IRAN map

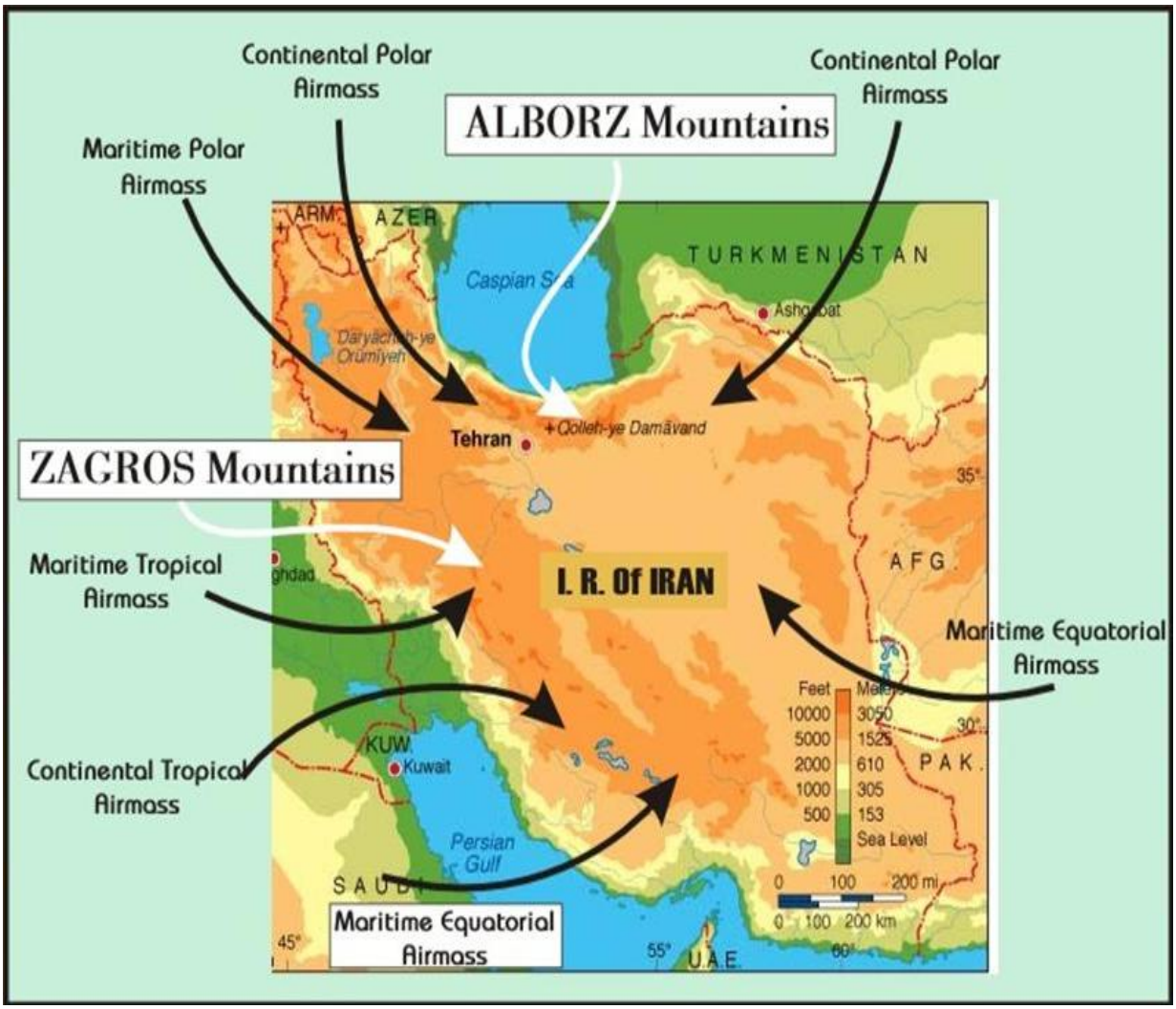


Fig. 1.3 Weather Systems and Topography of the I.R. of IRAN

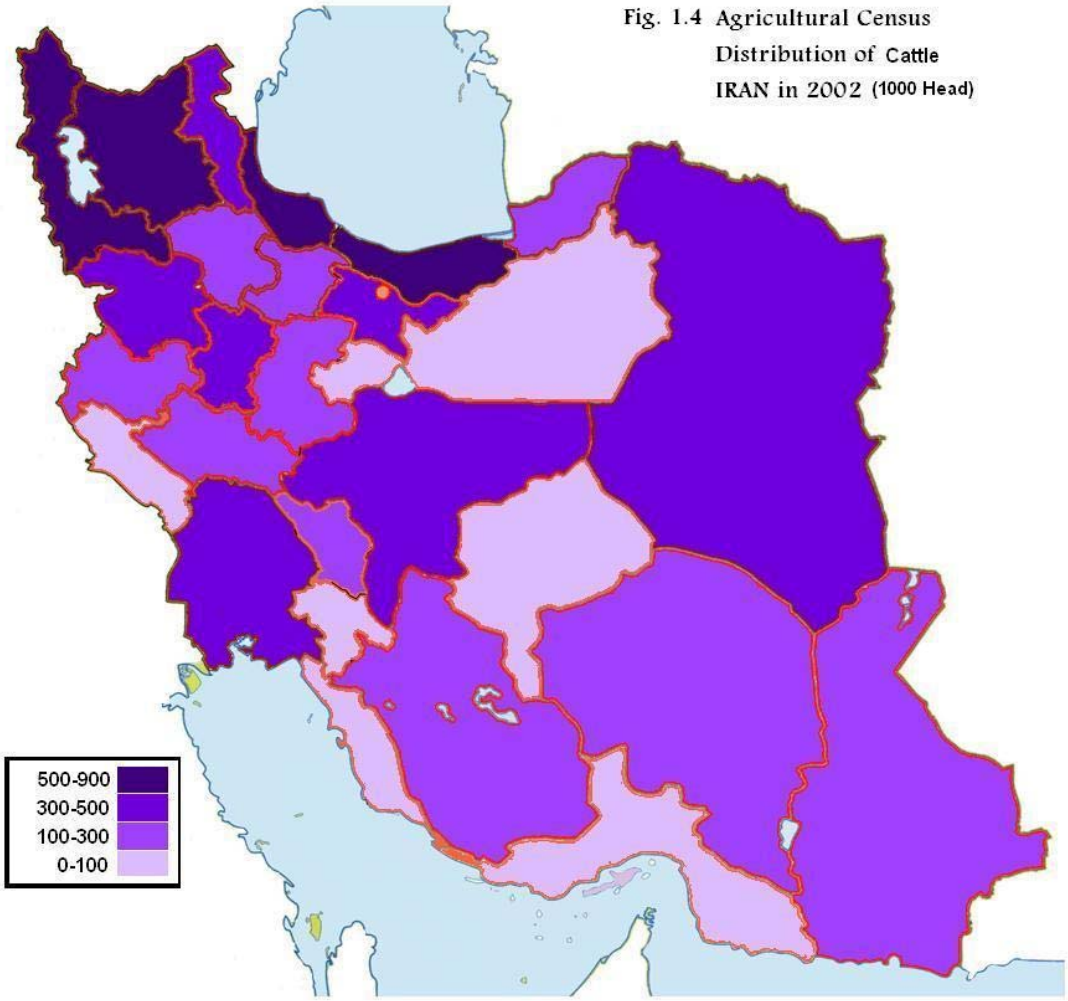


Fig. 1.4 Agricultural Census
Distribution of Cattle
IRAN in 2002 (1000 Head)

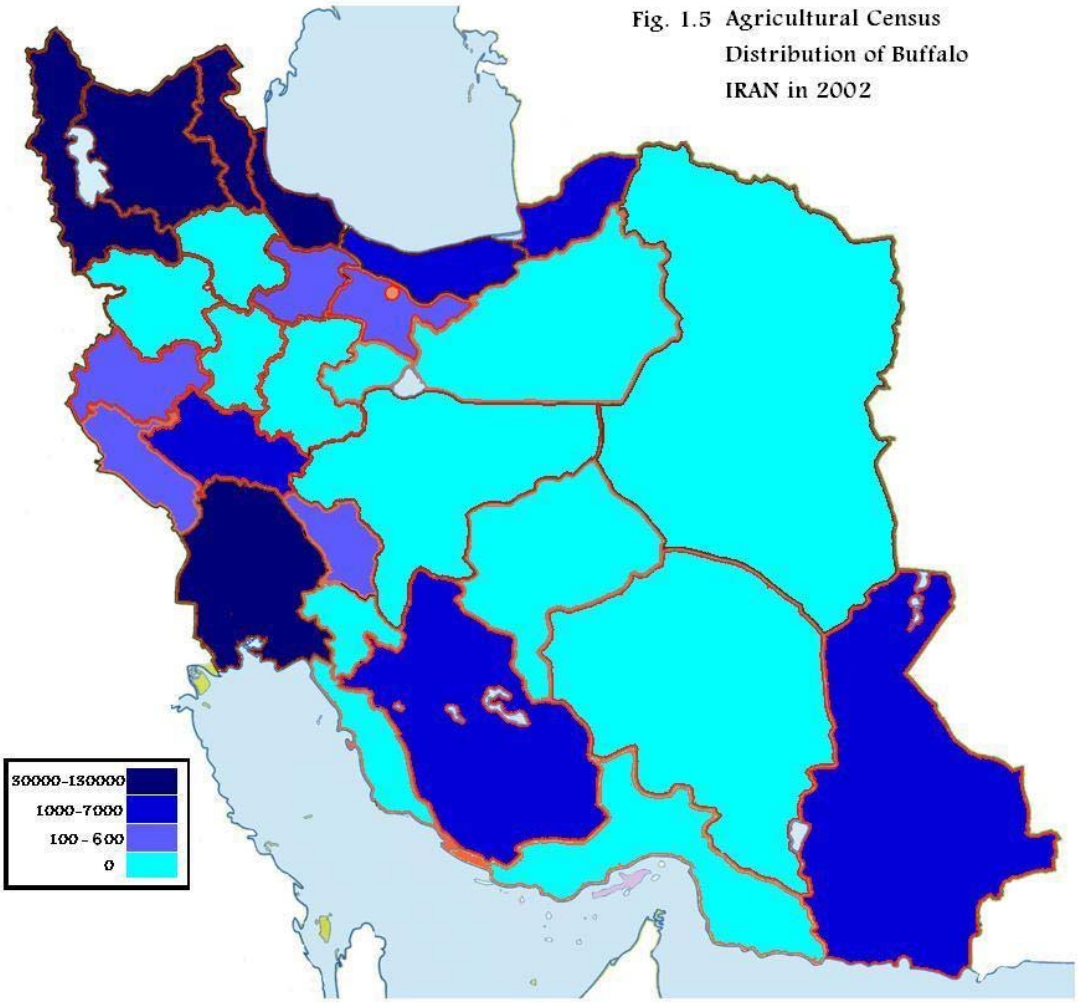


Fig. 1.5 Agricultural Census Distribution of Buffalo IRAN in 2002

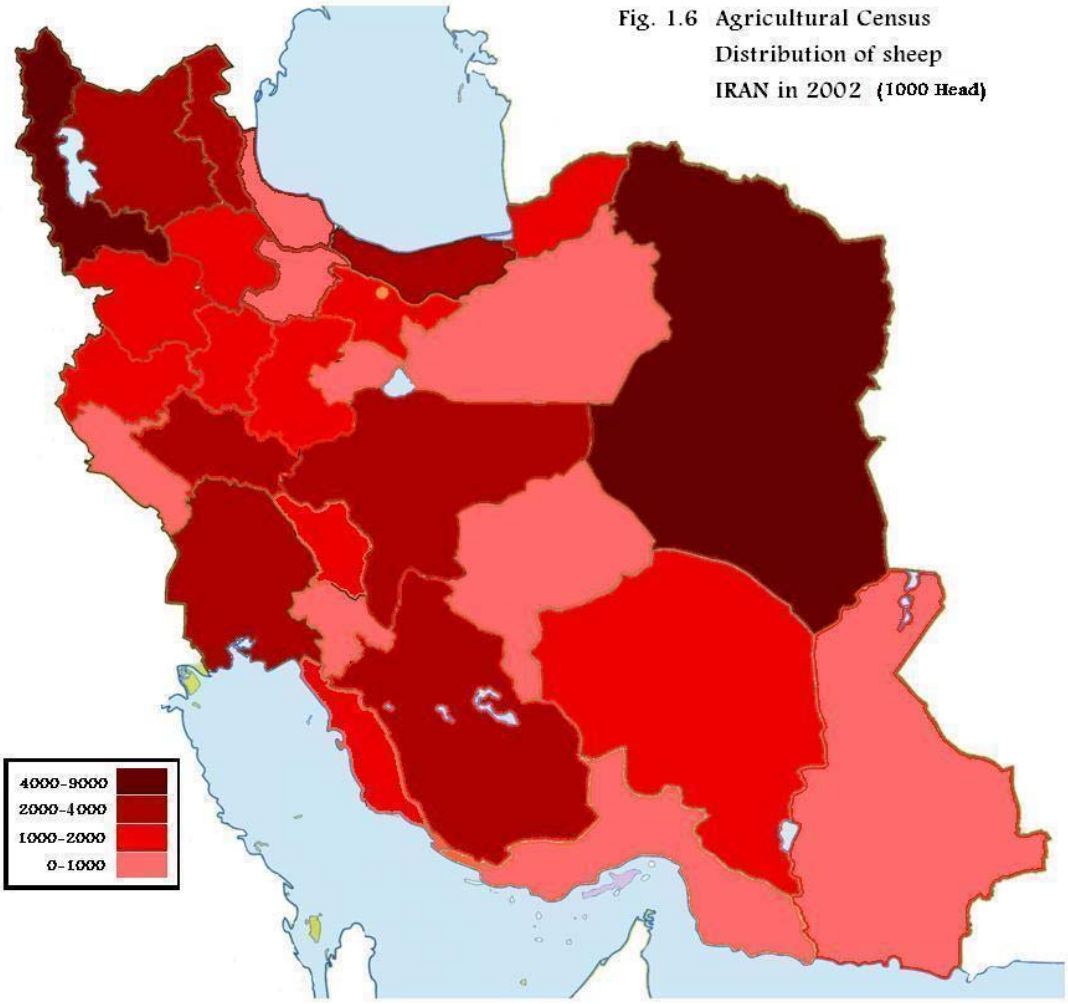


Fig. 1.6 Agricultural Census
Distribution of sheep
IRAN in 2002 (1000 Head)

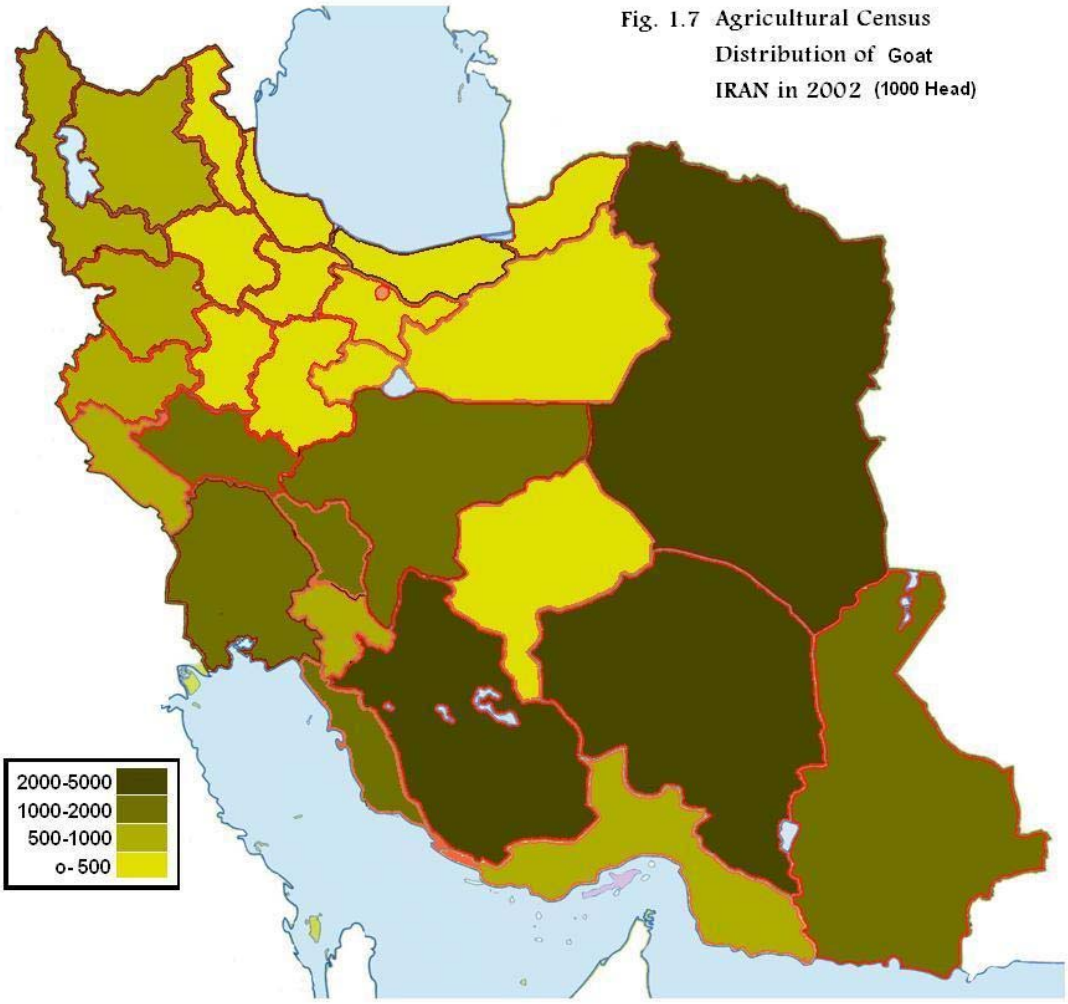


Fig. 1.7 Agricultural Census Distribution of Goat IRAN in 2002 (1000 Head)

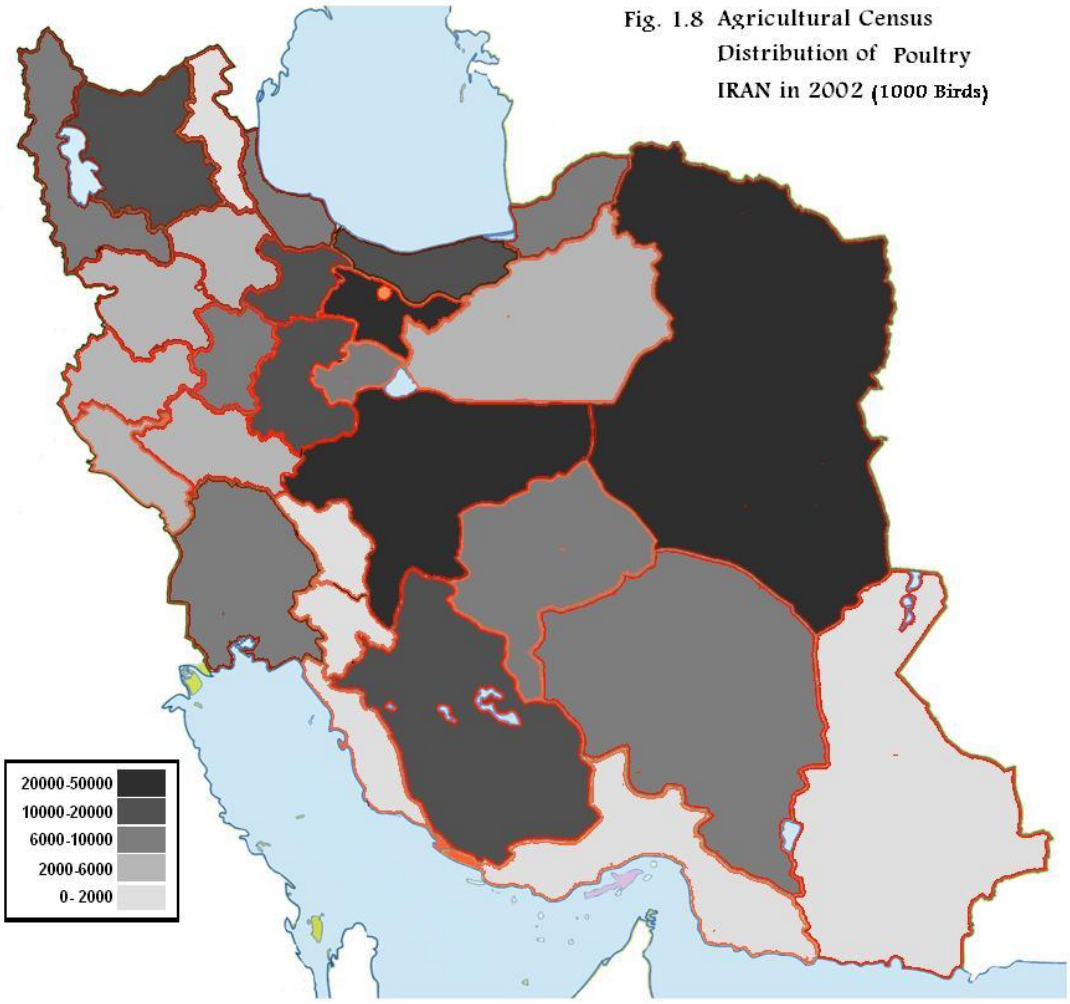


Fig. 1.8 Agricultural Census Distribution of Poultry IRAN in 2002 (1000 Birds)

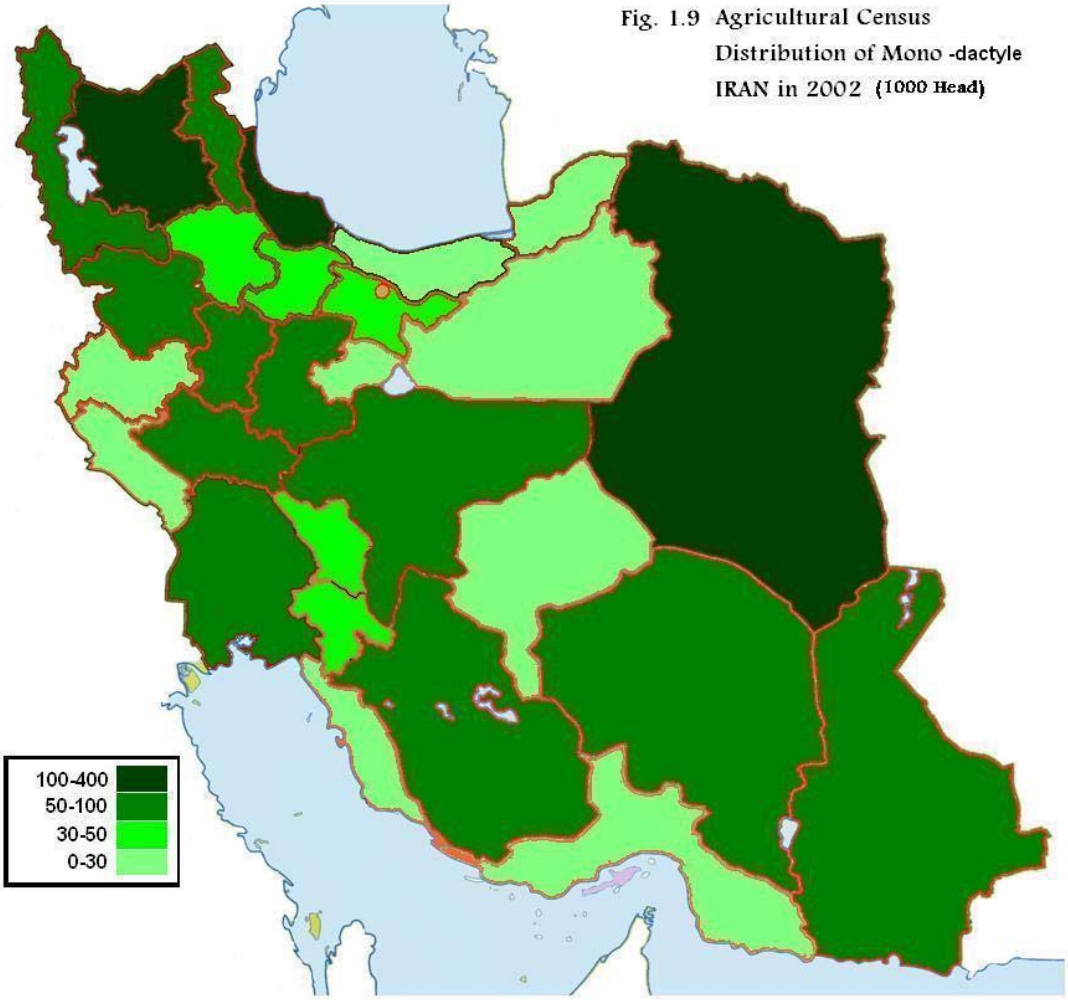


Fig. 1.9 Agricultural Census
Distribution of Mono -dactyle
IRAN in 2002 (1000 Head)

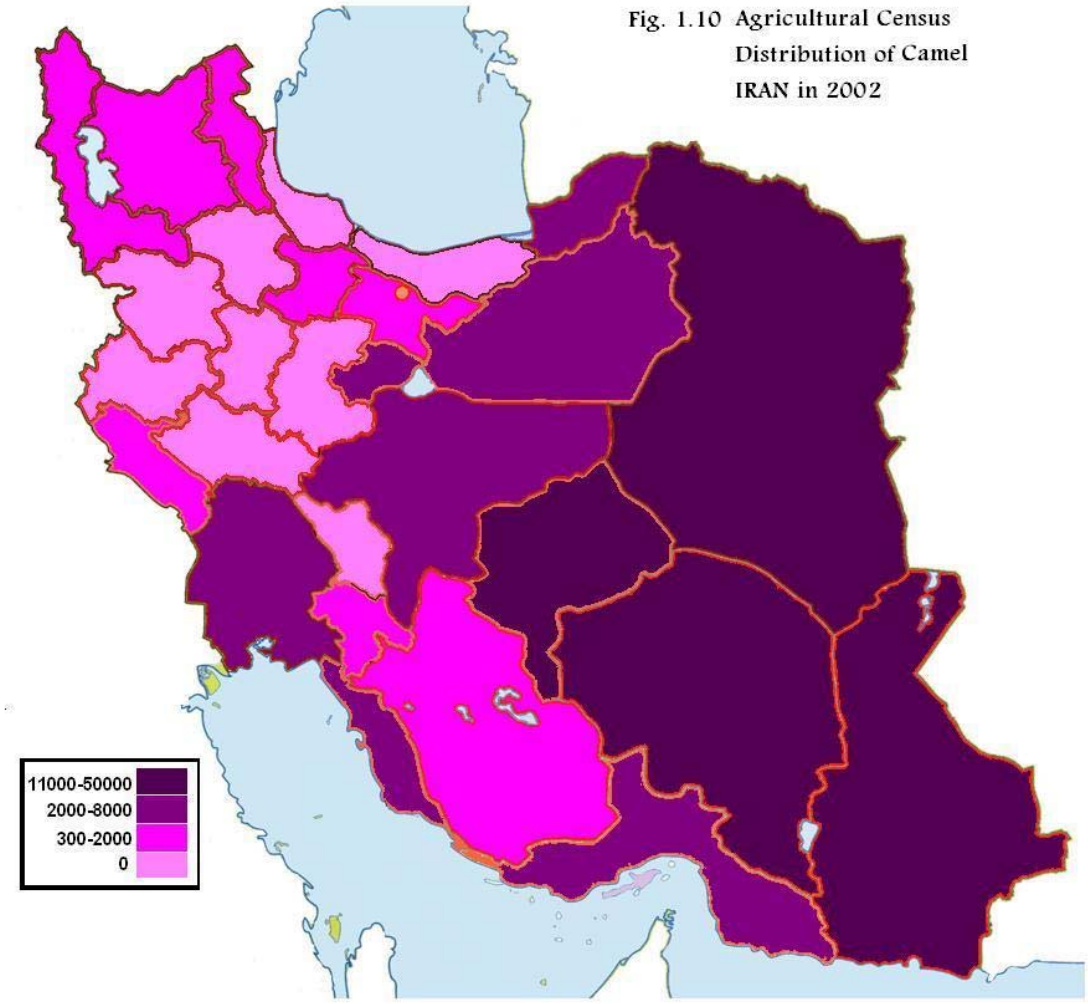


Fig. 1.10 Agricultural Census Distribution of Camel IRAN in 2002

APPENDIX 2: Tables of FAO

Table 1.1 Importance of livestock to the gross domestic product in agriculture (millions of $US)

Activity	$US (millions)	Data from Year
Livestock production (official statistics)	NA	NA
Other agricultural production (official statistics)	NA	NA
Best estimate of additional value of livestock	NA	NA

Table 1.2 Land use and current trends (1000 ha)

	Area (1000 ha)	Area (1000 ha)	Current trend
Category	**1990**	**1999**	
Arable land	NA	NA	NA
Permanent crops	NA	NA	NA
Permanent pastures	90000	90000	NA
Agricultural area	18500	18500	NA
Land area	NA	NA	NA
Total Area	1648195	1648195	

source: Annual Statistics Yearbook, 2000.

Table 1.3 Land use for livestock and current trends

	Area (1000 ha)	Area (1000 ha)	Current trend
Category	**1990**	**1999**	
Cropping for food	9676	8570	NA
Cropping for feed	2650	2196	NA
Cropping for food and feed	NA	NA	NA
Natural pasture	90000	90000	NA
Improved pasture	7162	5562	NA
Fallow	5349	NA	NA
Forest	12400	12400	NA
Non-agricultural	NA	34100	NA
Total			

source: Annual Statistics Yearbook, 2000.

Table 1.4 Land tenure for livestock production

Category	Area (1000 ha)	%
Private	NA	NA
Government and communal	NA	NA
Total		

Table 1.5 Farm structure and distribution

Category	Number of farms / households	%	Number of farms / house-holds with livestock	%
Landless	1700	0	1266230	26
> 0 to 2 ha	1290780	46	1518740	31
> 2 to 10 ha	1091880	39	1429960	30
> 10 to 50 ha	398360	14	584550	12
> 50 to 100 ha	20650	1	27380	1
> 100 to 500 ha	5160	0	7730	0
> 500 ha	NA	—	NA	
Unknown	NA	—	NA	
Total	4022000	100	NA	100

source: Annual Statistics Yearbook, 2000.

Table 1.6 Livestock population, number of owners/house-holders and employment by species

	Livestock population (1000)	Number of owners / householders	Number of persons additionally employed	
Species			Fully	Partially
Cattle	7535	1376440	NA	NA
Buffalo	392	54280	NA	NA
Sheep	54000	542440	NA	NA
Goats	27000	346750	NA	NA
Camels	146	16860	NA	NA
Lamas and Alpaca				
Horses/Mule	155 /122	NA	NA	NA
Donkeys	1450	NA	NA	NA
Pigs				
Chicken	864295	NA	NA	NA
Turkey	NA	NA	NA	NA
Ducks	NA	NA	NA	NA
Geese	NA	NA	NA	NA
Rabbits				

source: Ministry of Jihad –e- Agriculture.

Table 1.7 Human population in the country

Year	Total (millions)	Rural or Farming (%)	Urban or Non Farming (%)	Total
1990	54.483	43.53	56.47	100
1999	62.736	36.47	63.57	100
Average annual growth rate	1.520	-0.35	2.95	

source: Annual Statistics Yearbook, 2003.

Table 1.8 Major livestock primary production (1000 tonnes/numbers)

	Meat (t)		Milk (t)		Eggs (t)		Fiber (t)		Skin (No.)	
Species	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999
Cattle	210	286	2600.2	4403					36	41.04
Buffalo	9.9	10.65	121.4	214					1.45	1.56
Sheep	238	293	535	549			44.6	73.9	44.62	54.9
Goats	99.5	104	643.4	354.2			1.6	1.6	17.75	18.57
Camels	1.3	1.66	—	—			—	—	—	—
Lamas and Alpaca										
Horses									—	—
Donkeys									—	—
Pigs										
Chicken	380	725			295	570				
Turkey	10.5	15			—	—				
Ducks	2.24	2.3			—	—				
Geese	2.5	2.5			—	—				
Rabbits										

source: Ministry of Jihad-e – Agriculture.

Table 1.9 Major livestock primary product imports (1000 tonnes/numbers)

	Meat (t)		Milk (t)		Eggs (t)		Fiber (t)		Skin (No.)		Animals (No.)	
Species	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999	1990	1991
Cattle	125	25.55	0.220	—					1.4	111.7	—	—
Buffalo	15	2.11	—	—					—	—	—	—
Sheep	—	—	—	—			0.08	5.03	—	—	—	—
Goats	—	—	—	—			—	0.008	0.008	—	—	—
Camels	—	—	—	—			—	—	—	—	—	—
Lamas and Alpaca												
Horses	—	—	—	—			—	0.003	—	—	—	—
Donkeys	—	—	—	—					—	—	—	—
Pigs												
Chicken	—	14.35			—	0.257						
Turkey	—	—			—	—						
Ducks	—	—			—	—						
Geese	—	—			—	—						
Rabbits												

source: Ministry of Jihad-e – Agriculture.

Table 1.10 Major livestock primary product exports (1000 tonnes/numbers)

	Meat (t)		Milk (t)		Eggs (t)		Fiber (t)		Skin (No.)		Animals (No.)	
Species	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999	1990	1991
Cattle	—	0.01	—	0.06					0.04	0.19	—	—
Buffalo	—		—	—					—	—	—	—
Sheep	—	0.004	—	—			—	0.83	14	21.1	—	—
Goats	—	—	—	—			1.6	1.6	0	0	—	—
Camels	—	—	—	—			—	—	—	—	—	—
Lamas and Alpaca												
Horses	—	—	—	—					—	—	—	—
Donkeys	—	—	—	—					—	—	—	—
Pigs												
Chicken	—	5.214			5	2.256	—	—	—	—	—	—
Turkey	—	—			—	—	—	—	—	—	—	—
Ducks	—	—			—	—	—	—	—	—	—	—
Geese	—	—			—	—	—	—	—	—	—	—
Rabbits												

source: Ministry of Jihad-e – Agriculture.

Table 2.1 Distribution of livestock by production system (%)

	Production systems			
Species	**Low input**	**Medium input**	**High input**	**Total**
Cattle	55	35	10	100
Buffalo	75	23	2	100
Sheep	40	58	2	100
Goats	50	50	0	100
Camels	90	10	0	100
Lamas and Alpaca				0
Horses	40	50	10	100
Donkeys	100	0	0	100
Pigs				0
Chicken	10	10	80	100
Turkey	70	29	1	100
Ducks	55	35	10	100
Geese	90	10	0	100
Rabbits				0
Pigeon	90	10	0	0

source: Ministry of Jihad-e – Agriculture.

Table 2.2 Changes in the distribution of production systems during the last 20 years

	Production systems			
Species	**Low input**	**Medium input**	**High input**	**Total**
Cattle	-	g	++	0
Buffalo	-	+	0	0
Sheep	-	+	0	0
Goats	-	+	0	0
Camels	0	+	0	0
Lamas and Alpaca				0
Horses	-	0	+	0
Donkeys	0	-	-	0
Pigs				0
Chicken	+	+	++	0
Turkey	0	0	0	0
Ducks	0	+	+	0
Geese	0	0	0	0
Rabbits				0
pigeon	0	0	0	0

Comment:

- (-- = strongly decreasing, - = decreasing, 0 = stable, + = increasing, ++ = strongly increasing).

Table 2.3 Type of livestock farm by production system for cattle (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	80	20	0	100
Smallholder	70	30	0	100
Small-scale-commercial	0	60	40	100
Large-scale-commercial	0	20	80	100

Comments:

- **Subsistence:** less than 50% of production is marketed.
- **Smallholder**: small family farms with more than 50% of production marketed
- **Small-scale-commercial**: medium family farms with more than 50% of production marketed
- **Large-scale-commercial**: large farms or companies with all production marketed
- Definitions of production systems are given at the bottom of Table 2.1.

Table 2.4 Type of livestock farm by production system for buffalo (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	90	20	0	100
Smallholder	80	30	0	100
Small-scale-commercial	0	60	40	100
Large-scale-commercial	0	20	80	100

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.5 Type of livestock farm by production system for sheep (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	50	50	0	100
Smallholder	40	60	0	100
Small-scale-commercial	20	40	40	100
Large-scale-commercial	0	40	60	100

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.6 Type of livestock farm by production system for goats (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	80	20	0	100
Smallholder	40	60	0	100
Small-scale-commercial	0	90	10	100
Large-scale-commercial	0	0	0	0

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.7 Type of livestock farm by production system for camels (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	100	0	0	100
Smallholder	80	20	—	100
Small-scale-commercial	0	20	80	100
Large-scale-commercial	0	0	0	0

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.8 Type of livestock farm by production system for llamas and alpaca (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence				0
Smallholder				0
Small-scale-commercial				0
Large-scale-commercial				0

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.9 Type of livestock farm by production system for horses (%)

Type of operation	Low input	Medium input	High input	Total
Subsistence	90	10	0	100
Smallholder	0	80	20	100
Small-scale-commercial	0	0	100	100
Large-scale-commercial	0	0	100	100

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.10 Type of livestock farm by production system for donkeys (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	100	0	0	100
Smallholder	90	10	—	100
Small-scale-commercial	0	0	0	0
Large-scale-commercial	0	0	0	0

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.11 Type of livestock farm by production system for pigs (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence				0
Smallholder				0
Small-scale-commercial				0
Large-scale-commercial				0

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.12 Type of livestock farm by production system for chicken (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	95	5	0	100
Smallholder	10	90	0	100
Small-scale-commercial	0	0	100	100
Large-scale-commercial	0	0	100	100

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.13 Type of livestock farm by production system for turkey (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	95	5	0	100
Smallholder	10	90	0	100
Small-scale-commercial	0	0	100	100
Large-scale-commercial	0	0	0	0

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.14 Type of livestock farm by production system for ducks (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	95	5	0	100
Smallholder	10	90	0	100
Small-scale-commercial	0	0	100	100
Large-scale-commercial	0	0	0	0

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.15 Type of livestock farm by production system for geese (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	93	5	0	100
Smallholder	10	90	0	100
Small-scale-commercial	0	10	90	100
Large-scale-commercial	0	0	0	0

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.16 Type of livestock farm by production system for quail and ostrich (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	0	0	0	0
Smallholder	0	0	0	0
Small-scale-commercial	0	0	100	100
Large-scale-commercial	0	0	100	100

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.17 Type of livestock farm by production system for pigeon

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	50	50	0	100
Smallholder	30	70	0	100
Small-scale-commercial	0	0	0	0
Large-scale-commercial	0	0	0	0

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 3.1 Breed Diversity (Number of Breeds)

	Number of breeds									
	Current Total		At risk		Widely used		Others		Lost (last 50 yr)	
Species	L	E	L	E	L	E	L	E	L	E
Cattle	7	4	2	—	2	1	3	3		
Buffalo	1**	—	—	—	1	—	—	—		
Sheep	26	—	—	—	20		6			
Goats	9	2	2	—	7	1	—	1		
Camels	2*	—	1	—	1	—	—	—		
Lamas and Alpaca										
Horses	7	4	5	—	2	4	—	—		
Donkeys	NA	NA	NA	NA	NA	NA	NA	NA		
Pigs										
Chicken	7	10***	—	—	7	6	—	4		
Turkey	1**	1	—	—	1			1		
Ducks	1**	1	—	—	1	1	—	—		
Geese	1**	—	—	—	1		—	—		
Rabbits										
Pigeon	1**	3	—	—	1	—	—	3		

Comments:

- L = Locally Adapted or Native; E = Exotic (Recently Introduced and Continually Imported).
- Breeds at risk are those with total number of breeding females and males are less than 1,000 and 20, respectively; or if the population size is less than 1,200 and is decreasing.

* Dromedarius and bactrian camel are existing in country but there are no information concerning dromedarius.

** On the basis of external characteristic breed diversity can be observed that it was not characterized yet.

*** Six of them are commercial hybrids.

Table 3.2 Number of breeds for which characterization has been carried out (Number of breeds)

	At population level				At individual level		
Species	Baseline survey	Genetic distance	Breeds and crosses evaluation	Valuation	Performance recording	Genetic evaluation	Molecular evaluation
Cattle	7	—	2	—	6	6	3
Buffalo	1	—	1	4	—	—	1
Sheep	26	10	10	4	15	8	6
Goats	9	6	7	—	4	2	1
Camels	2	—	2	—	2	—	—
Lamas and Alpaca							
Horses	4	—	1	4	1	1	4
Donkeys	—	—	—	—	—	—	—
Pigs							
Chicken	3	5	2	2	4	4	5
Turkey	1	—	—		—	—	—
Ducks	—	—	—	—	—	—	—
Geese	—	—	—	—	—	—	—
Rabbits							
Pigeon	3	—	—	—	—	—	—

Comments:

- Consider breed characterization during the last ten years.
- Baseline survey summary data describing the identification and observable characteristics, location, uses and general husbandry of the AnGR for each species used in the country for food and agricultural production.
- Genetic distances among breeds computed from molecular analyses.
- 'Breeds and crosses evaluation' refers to estimation of direct and maternal additive genetic, and heterosis effects.
- Valuation = description of the extent to which market values of AnGR predict their 'real' or 'fair' value, accounting for all goods and services they may provide to current and future generations of humankind. In the case of market failures, market prices will differ from the value that society attaches to AnGR
- *Performance recording is based on individual animal data for milk yield, growth, reproduction, etc.*
- *Genetic evaluation refers to estimation of breeding values.*

Molecular evaluation includes information of markers, DNA, blood type, protein alleles, etc.

Table 4.1 Relative importance of livestock products and services within species (%)

Species	Milk	Meat	Eggs	Fiber	Skin	Risk management	Fertiliser manure	Draught	Culture	Recreation	Fuel	Feather	Environmental management	Total
Cattle	63	32			1.5	—	2	1	—	—	0.5		—	100
Buffalo	58	38			2	—	1	—	—	—	1		—	100
Sheep	5	84.5		1	2	5	1		1	—	0.5		—	100
Goats	17	72.5		1	2	5	1		1	—	0.5		—	100
Camels	5	82		1	1	2	1	5	2	1	—		—	100
Lamas and Alpaca														
Horses	—	—		1	—	—	5	34	5	45	—		—	100
Donkeys	—	—		—	—	—	1	98	—	1	—		—	100
Pigs														
Chicken		60	38			—	1.5		—	—		0.5	—	100
Turkey		96.5	2			—	1		—	—		—	0.5	100
Ducks		95	1			—	1		—	0.5		0.5	2	100
Geese		92.5	1			—	1		—	0.5		3	2	100
Rabbits														
Quail		80	20	—	—	—	—	—	—	—	—	—	—	100
Pigeon		28	2	—	—	—	10	—	—	70	—	—	—	100

Comments:

- Think of the food and agricultural outputs as products that have a relative contribution to national production. Therefore, assign relative contributions for the important products listed below, based on a thorough analyses and valuation of data available in the country (sum of each species = 100).

Table 4.2 Relative importance of species within livestock products and services (%)

Species	Milk	Meat	Eggs	Fiber	Skin	Risk management	Fertiliser manure	Draught	Culture	Recreation	Fuel	Feather	Environmental management
Cattle	86.5	17.6			35	NA	33	5	NA	—	70		NA
Buffalo	3.2	1.2			0.3	NA	2	0	NA	—	5		NA
Sheep	4.5	13.2		97	47	NA	20		NA	—	15		NA
Goats	5.8	7.6		2.5	16	NA	10		NA	—	10		NA
Camels	—	0.4		0.5	0.7	NA	1	5	NA	8	—		NA
Lamas and Alpaca						NA			NA				NA
Horses	—	—		—	—	NA	1	30	NA	86	—		NA
Donkeys	—	—		—	—	NA	3	60	NA	2	—		NA
Pigs		—		—		NA	—		NA	—			NA
Chicken		58	99			NA	30		NA	2		95	NA
Turkey		1	0/4			NA	—		NA	—		—	NA
Ducks		0.5	0.3			NA	—		NA	1		2	NA
Geese		0.5	0.3			NA	—		NA	1		3	NA
Rabbits													
Total	100	100	100	100	100	100	100	100	100	100	100	100	100

Comments:

- Assign relative contribution values for each product as a % of total output of that product, based on a thorough analyses of data available in the country (sum of each column = 100).

Table 4.3 Number of widely used breeds with breeding strategies (No. of breeds)

		Breeding strategies		
Species	Total number of breeds	Purebred selection	Cross-breeding	Both
Cattle	3	—	—	3
Buffalo	1	1	—	—
Sheep	20	20	—	—
Goats	8	7	1	—
Camels	1	—	—	1
Lamas and Alpaca				
Horses	6	5	—	1
Donkeys	1	—	—	1
Pigs				
Chicken	8	7	—	1
Turkey	1	1	—	—
Ducks	2	—	—	2
Geese	1	1	—	—
Rabbits				

Table 4.4 Number of breeds with current breeding strategies and tools being used (No. of breeds)

		Breeding strategies		Tools				
Species	Breeding goals	Designed	Designed and implemented	Individual identification	Recording	AI	ET	Genetic evaluation
Cattle	10	7*	6	3	7*	3**	1	8
Buffalo	1	1*	1	—	1	1*	—	1
Sheep	26	26*	26*	—	—	14**	—	15
Goats	3	3*	3*	—	—	—	—	—
Camels	1	1	1	—	—	—	—	—
Lamas and Alpaca								
Horses	7	7	1	—	—	—	—	—
Donkeys	—	—	—	—	—	—	—	—
Pigs								
Chicken	8	8	8	4	4*	—	—	4
Turkey	1	1	1	1	1	1**		1
Ducks	—	—	—	—	—	—	—	—
Geese	1	—	—	—	—	—	—	—
Rabbits								

Comments: AI = Artificial Insemination; ET = Embryo Transfer.
* Pilot studied in some of breeds.
** Recently started.

Table 4.5 State of the art of technologies / methodologies used in breeding strategies.

	Used for:	
Technology or Methodology	**Research**	**Breeders**
Multi-trait selection index construction	70	30
Optimization tools for breeding plans	90	10
Electronic database related to recording schemes	85	15
Genetic evaluation Software for: phenotypic selection breeding values	80	20
Reproductive technologies (AI, ET, etc)	70	30
Microsatellite linkage maps for QTL identification for Marker Assisted	100	0
Other technology (specify)	—	—

Comments: Assign a percentage to indicate the extent that the technology or methodology is being used at research institutions or by breeder's associations in the country.

Table 4.6 Role of stakeholders in the implementation of tools for the development of AnGR

Stakeholders	Breeding goals	Individual identification	Recording	Artificial insemination	Genetic evaluation
Federal Government	3	3	2	2	4
State Government	1	2	3	3	3
Local Government	1	1	1	1	1
Breeder’s	2	2	3	3	1
Private companies	1	1	2	3	1
Research	2	3	3	2	4
NGO’s	1	1	1	1	1

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) based on thorough analyses of data available, to indicate the role of involvement of each stakeholder on the implementation of tools that support the development of AnGR.

Table 4.7 Involvement of stakeholders in activities related to the development of AnGR

Stakeholders	Legislation	Breeding	Infrastructure	Human	Farmer's
Federal Government	3	3	4	2	2
State Government	1	1	2	3	3
Local Government	1	1	2	3	2
Breeder's associations	1	3	2	2	3
Private companies	1	3	1	1	1
Research	2	2	2	2	1
NGO's	1	2	2	2	1

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) based on thorough analyses of data available, to indicate the degree of involvement of each stakeholder on activities that support the development of AnGR.

Table 4.8 Stakeholders preference for animal genetic resources

Stakeholders	Locally adapted breeds	Imported within region	Imported exotic breeds
Federal Government	4	2	4
State Government	4	2	4
Local Government	4	2	4
Breeder's associations	1	2	5
Private companies	1	2	5
Research	4	2	2
NGO's	2	2	2

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) based on a thorough analyses of data available, to indicate the degree of preference of the various types of AnGR by stakeholders.

Table 4.9 Priority of needs for utilization of technologies for the development of AnGR

Technology	Needs			
	Knowledge	Training	Financial resources	Breeder's organization
Recording	2	3	5	5
Genetic evaluation	3	4	5	4
AI / ET	3	4	4	4
Molecular techniques	3	4	5	2
Breed organisation techniques	4	4	4	4

Comments:

- AI= Artificial Insemination; ET= Embryo Transfer
- Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the priority of solving specific needs in order to use technologies to support the development of AnGR.

Table 5.1 Current number of breeds in managed conservation programmes

Species	Number of locally adapted breeds at risk			
	Total	Managed *in situ*	Managed *ex situ*	Both (*in* and *ex situ*)
Cattle	1	—	—	1
Buffalo	—	—	—	—
Sheep	—	—	—	—
Goats	1	—	—	—
Camels	—	—	—	—
Lamas and Alpaca	—	—	—	—
Horses	5	—	—	2
Donkeys	—	—	—	—
Pigs	—	—	—	—
Chicken	—	—	—	—
Turkey	—	—	—	—
Ducks	—	—	—	—
Geese	—	—	—	—
Rabbits	—	—	—	—

Comments:

- *In situ* conservation: includes all measures to maintain live animal breeding populations, including those involved in active breeding strategies in the agro-ecosystem where they either developed or are now normally found, together with husbandry activities that are undertaken to ensure the continued contribution of these resources to sustainable food and agricultural production, now and in the future.
- *Ex situ* conservation: genetic material within living animals but out of the environment in which it developed (*Ex situ in vivo)*, or external to the living animal in an artificial environment, usually under cryogenic conditions including, *inter alia*s, the cry conservation of semen, oocytes, embryos, cells or tissues *(Ex situ in vitro).* Note that *ex situ* conservation and *ex situ* preservation are considered here to be synonymous.

Table 5.2 Current number of breeds receiving incentives and for which various tools for management of *ex situ* conservation programmes are used

	Incentives			Tools				
Species	Gov.	NGO	Market	Semen storage	Embryos storage	DNA/Tissue storage	*In vivo*	Monitoring system
Cattle	6	—	—	6	2	—	5	1
Buffalo	1	—	1	1	—	—	1	—
Sheep	26	3	1	—	—	—	17	—
Goats	6	—	—	—	—	—	6	—
Camels	2	—	—	1	1	—	2	1
Lamas and Alpaca								
Horses	2	6	—	—	—	—	2	1
Donkeys	—	—	—	—	—	—	—	—
Pigs								
Chicken	6	—	1	—	—	—	6	—
Turkey	1	—	—	—	—	—	1	—
Ducks	—	1	—	—	—	—	1	—
Geese	1	—	—	—	—	—	1	—
Rabbits								

Comments:

- In vivo, such as zoological garden, farm park, etc.
- Incentives means any kind of support (human and financial resources, tax waving, higher prices, etc.) that stimulates conservation programmes of AnGR
- Monitoring system refers to the number of schemes in which more than 10% of population size is conserved.

Table 5.3 Current number of breeds receiving incentives and for which tools for *in situ* conservation programmes are used

	Incentives				Technical tools			
Species	Gov.	NGO	Market	Private	Recording	AI	ET	Others
Cattle	5	29	1	1	6	6	1	—
Buffalo	1	1	1	—	1	1	—	—
Sheep	26	3	1	—	20	20	—	—
Goats	4	—	—	1	4	—	—	—
Camels	2	—	—	—	2	1	—	—
Lamas and Alpaca								
Horses	2	1	—	5	6	—	—	—
Donkeys	—	—	—	—	—	—	—	—
Pigs								
Chicken	6	—	6	1	6	—	—	—
Turkey	1	—	1	—	1	1	—	—
Ducks	—	1	—	—	—	—	—	—
Geese	1	—	—	—	1	—	—	—
Rabbits								

Comments:

- AI = Artificial Insemination; ET = Embryo Transfer.

Incentives means any kind of support (human and financial resources, tax waving, higher prices, etc.) that stimulates conservation programmes of AnGR.

Table 5.4 Stakeholders involvement in the management of conservation programmes

Stakeholders	*In situ* Conservation	*Ex situ* Conservation
Government	4	4
Breeder's associations	2	2
Private companies	1	1
Research institutions/universities	3	3
NGO's	2	2

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) based on thorough analyses of data available, to indicate the degree of involvement of each stakeholder on conservation programmes.

Table 5.5 Priority of needs for utilization of technologies for *in situ* conservation programmes

Technology	Needs			
	Knowledge	Training	Financial resources	Technology
Recording	2	3	5	4
Genetic evaluation	3	3	5	4
AI / ET	3	3	5	4
Molecular techniques	4	4	5	5
Breeder improvement techniques	4	4	5	5

Comments:

- AI= Artificial Insemination; ET= Embryo Transfer
- Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the priority of solving specific needs in order to use technologies to support conservation programmes.

Table 6.1. Effects of existing policies and legal instruments on the utilization (use and development) of AnGR

	Urban/peri-urban systems		Rural production	
Species	**Industrial systems**	**Small-holder systems**	**Industrial systems**	**Small-holder systems**
Cattle	5	4	3	3
Buffalo	1	1	2	3
Sheep	1	2	2	2
Goats	1	1	2	2
Camels	1	1	2	2
Lamas and Alpaca				
Horses	4	3	2	2
Donkeys	1	1	1	1
Pigs				
Chicken	5	4	4	4
Turkey	2	2	2	2
Ducks	3	2	2	2
Geese	1	2	1	2
Rabbits				

Comments: Assign a score (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the extent that existing policies and legal instruments support the use and development of AnGR.

Table 6.2 The focus of current policies on activities related to the utilization (use and development) of AnGR

	Activities			
Species	**Use of exotic breeds**	**Use of locally adapted breeds**	**Training, research and extension**	**Organization of breeders/farmers**
Cattle	4	2	3	3
Buffalo	1	5	3	3
Sheep	1	5	3	2
Goats	2	4	3	2
Camels	1	5	3	2
Lamas and Alpaca				
Horses	4	3	2	4
Donkeys	1	1	1	1
Pigs				
Chicken	4	3	3	4
Turkey	1	4	2	2
Ducks	3	3	2	3
Geese	1	4	2	1

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the extent that current policies support activities related to the utilization of AnGR.

Table 6.3 Prioritising the needs to enable the development of AnGR policies

	Required		
Needs	Immediately	Medium term	Long term
Palicies and Regulationes	+	—	—
Organizational structures	+	—	—
Financial resources	—	+	—
Infrastructure	—	+	—
Human resources	+	—	—
Technology	+	—	—

Comments: identify the main needs for policy development and specify if it is critical (immediately required) or important in the medium or long term.

Table 6.4 The priority of future needs in policy development for AnGR conservation programmes

Species	Policy development related to:				
	Technology	Infrastructure	Human resources	Financial resources	Organizational structures
Cattle	3	4	3	5	5
Buffalo	4	4	4	5	5
Sheep	4	4	3	4	5
Goats	4	4	3	4	5
Camels	4	4	4	5	5
Lamas and Alpaca					
Horses	4	3	4	3	4
Donkeys	4	4	4	5	5
Pigs					
Chicken	3	3	4	4	3
Turkey	3	4	4	4	3
Ducks	3	4	4	4	3
Geese	3	4	4	4	3
Rabbits					

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the priority for the development of policies to support AnGR conservation programmes.

Table 6.5 The priority of future needs in policy development for the utilization (use and development) of AnGR

Species	Policy development related to:				
	Technology	Infrastructure	Human resources	Financial resources	Organizational structures
Cattle	2	3	2	3	3
Buffalo	4	4	2	4	4
Sheep	4	4	2	4	4
Goats	4	4	2	4	4
Camels	4	4	2	4	4
Lamas and Alpaca					
Horses	3	3	2	3	3
Donkeys	2	5	2	4	4
Pigs					
Chicken	3	3	2	3	3
Turkey	3	3	2	3	3
Ducks	3	3	2	3	3
Geese	3	3	2	3	3
Rabbits					

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the priority for the development of policies to support the utilization of AnGR.