

MINISTRY OF AGRICULTURE OF THE REPUBLIC OF ARMENIA



NATIONAL STRATEGY

**FOR SUSTAINABLE USE AND DEVELOPMENT
OF FARM ANIMAL GENETIC RESOURCES**

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Executive summary

The proposed National Strategy for Sustainable Use and Development of Farm Animal Genetic Resources has been prepared as a follow-up to the Agricultural Sustainable Development Strategy. The Strategy emphasizes the necessity of full supply for the local market with fresh milk and dairy products, eggs, poultry, mutton and about 80% supply of beef and pork products, while guaranteeing the increase of export volumes of cheese varieties and processed meat products. The document details measures for the establishment of a modern breeding program, which would be based on the private ownership of livestock, the participation of farmers and livestock owners, with a supportive role by the State and its institutions.

Great importance is attached to the genetic improvement of existing breeds and populations of cattle, sheep and pigs as a decisive component of livestock development within the framework of this National Strategy for Sustainable Use and Development of Farm Animal Genetic Resources. The Strategy envisages the introduction of a system for animal identification, recording and genetic evaluation. Particular attention is paid to the conservation of local breeds. Import of alternative breeds for the improvement of local ones and use of world genetic resources for producing highly productive herds is also foreseen. The Strategy will be implemented by farmers, livestock owners and producers, with financial and technical support from the State, and its bodies and organizations taking into account the prevailing production systems in the various regions and agro-ecologic zones of the country.

Considering the specifics of the agro-ecological zones of the country, the distribution of livestock and the traditional experience in livestock management, the Strategy document proposes development options for each sub-sector (milk, meat, wool, etc.) and ways to conserve and improve the local breeds.

The existing policies and legislation, as well as the institutional framework, provide an enabling environment for livestock development and the attainment of the objectives of the Agricultural Sustainable Development Strategy. Legal instruments and institutions will certainly have to be changed and adjusted to meet future needs, in accordance with the economic and social growth of the sector and the country as a whole.

At this stage it is necessary to undertake the following measures:

- Recognise the Livestock Breeding and Pedigree Department of the Ministry of Agriculture as the responsible agency for the implementation of this Strategy. The Livestock Breeding and Pedigree Department will implement this Strategy in collaboration with other departments of the Ministry. Adequate resources are to be given to the said Department. The control and inspection of all structures and bodies involved in the implementation of the State policy related to livestock breeding should be assigned to the Livestock Breeding and Pedigree Department of the Ministry of Agriculture.
- Emphasise the role of the Scientific Center for Livestock Husbandry and Veterinary State Non-Commercial Organization (SCLHV SNCO) and State Agrarian University of Armenia (SAUA) in the process of improvement in the performance of agricultural farms and breeds, as well as in the identification and recording of animals.
- Encourage the establishment of breeders' or breeds' associations as representative bodies of producers and as business support organizations, as well as providers of services (marketing, supply of feed, Artificial Insemination [A.I], etc.) and undertake a gradual transfer of breeding services to these associations.

- Promote an advisory service in all Marzes through the regional/Marz units of Agriculture Support Centres, and the technical support of scientific and educational institutions (SCLHV SNCO and SAUA) to pedigree farms; this anticipates proportional funding by the State.
- Create the conditions for the introduction of animal identification and recording systems.

Enabling Environments for the Management of Animal Genetic Resources

SECTION A: GENERAL OVERVIEW OF LIVESTOCK SECTOR

1. Roles and importance of livestock

Origin and history

Livestock farming in Armenia dates back to the Palaeolithic period when primitive farming was first seen on the Armenian Plateau over a vast territory, between Asia Minor and the Iranian Upland. It was during the Neolithic period and the Early Bronze Age that animal husbandry was first developed. Since then, animal husbandry has become vitally important to the country, and between the 3rd and 2nd centuries Before Christ, animal breeding became a major occupation. Livestock breeding in the Armenian Upland also promoted the creation of historical and cultural values. After the invention of the Armenian alphabet (405 AD), and for hundreds of years after, the paper of Armenian ancient manuscripts (parchments) was made from the well-dressed hides of newborn calves. The old Armenian hand-woven rugs made from the wool of sheep, bred in the Armenian Upland, stood out for their quality and were exported to the Middle East, India and countries of Europe.

The existing wild breeds, related to the domestic ones, have also proven that Armenia was an ancient locale of breeding of farm animals. Wild sheep, goats and pigs, forbearers of modern domestic breeds, still live in the country. The dialogue, "Reason in Speechless Animals", ascribed to Metrodoris, was well known in Armenia. The Armenian historians Yeznik Koghbatzi, Yegishe, Movses Khorenatzi and others addressed issues of animals bred in Armenia, such as their heredity and instincts. The "On Six-Day Creation" by Barsegh Kesaratsi (St. Basil of Caesarea), which describes the multiplication and instincts of animals, was translated into Armenian in the 5th century. The love for animals was expressed in Armenian traditional folklore, particularly in the epic poem "David of Sassoun", as well as in numerous fairy tales, stories and songs, which were passed from generation to generation by oral tradition for millennia.

Importance of livestock for the national economy

The agricultural sector significantly contributes to the Armenian economy, though its contribution has been reduced in recent years. The contribution of the agricultural sector to the Gross Domestic Product (GDP) was 37 percent in 1999, but gradually declined to 21 percent in 2007. In 2007, livestock

accounted for 32 percent of the agricultural GDP, and about 50 percent of the employment in the agricultural sector, which represents 42 percent of the 1,200,000 labour force in the country.

Table 1: The Share of Livestock in National Economy

	1999	2007
Gross Domestic Product ¹	987.4	3 021.6
Agricultural GDP ¹	364.5	633.9
Total Value of Livestock Production ¹	127.0	204.1
Budget for Agriculture ¹	8.9	15.1
Share of Livestock in Budget for Agriculture ²	41.6	44.4

¹ in Billion Armenian Dram

² in percent

Farmlands cover over one third of the land area of Armenia, maintaining the landscape and local environment. In the agricultural sector, livestock production is a major segment, along with fruits (e.g. grape and apricot) and vegetables, and significantly influences national food security. Livestock provides a unique function in rural economies, in which 186,000 households own livestock as their means of livelihood, savings, and risk management. In remote areas, animal draught power is often used on small and medium scale farms for many agricultural purposes, particularly as a means of transportation. While the development of technology has greatly decreased the use of animals as draught force, it has not disappeared completely. Supplying animal manure is another important function of keeping livestock on farms. Animal manure is often used as manure compost, and livestock farmers use the manure compost as a fuel and fertilizer.

Changes in livestock population and structure

The situation and management system of livestock has changed dramatically over the last two decades. Before the transition from a planned to a market economy, livestock production was operated in collective farms, and many research programs were conducted for the improvement of Animal Genetic Resources (AnGR). All pedigree animals were registered, identified and assessed in the research centers, and a team of scientists conducted series of tests in order to improve AnGR. Due to the sharp decline in socio-economic conditions, caused by the transition from a planned economy in the 1990s, animal breeding was stopped and the volume of Artificial Insemination (A.I.) was sharply reduced. Animals were backcrossed to unselected local breeds, which has led to a decrease of the performance of cattle by 25-30 percent.

By 2000, the number of cattle had decreased by 27 percent compared with 1991. Starting in 2001, the number of cattle began to increase, and by 1st of January 2008 it had reached 98.3 percent of the 1991 number. However, the number of dairy cows increased by 23 percent from 1991 to 2008. The change in the herd structure could be explained by the fact that milk production appears to be more profitable for rural households than keeping other age groups of cattle.

Table 2: Evolution of the Size of the Livestock Population in Households

Year	Cattle	Cows	Pigs	Sheep and goats	Horses	Poultry 1000 head
1991	640070	250920	310869	1186264	6531	9352.3
1995	503693	276195	82281	636019	12101	2972.6

Year	Cattle	Cows	Pigs	Sheep and goats	Horses	Poultry 1000 head
2000	478730	262095	70556	548580	11502	4255.1
2005	573260	290069	89082	603252	11945	4861.7
2008	629146	310610	86710	637101	11776	-

After the privatization of large pig farms, the number of pigs also decreased, and in 2001 it was only 22.2 percent of the number of pigs in 1991. The number began to gradually increase, reaching 152,658 head by 2007. However, because of the African swine fever outbreak, which occurred in 2007, the total number of pigs sharply decreased and by January 1st 2008 only 86,710 pigs were counted.

The total number of sheep and goats has decreased by about two times as compared with 1991, and represented only 53.7 percent by 1st January 2008, with 637,101 heads.

The total number of horses increased during these years, contrary to other farm animal species. This can be explained by the fact that, after the privatization of large state and collective farms, the land given to rural households was divided into small plots which are not suited for the use of heavy mechanization, and horses can be used for agricultural operations. The progress of equestrian sports in recent years has also contributed to the increase in the number of horses, due to importing and local breeding by equestrian clubs. By 2008, the number of horses had increased by 45.6 percent in comparison with 1991.

Between 1991 and 1998, the poultry flock decreased by 1.9 times and only in 2003 did it start to increase, due to the recovery of some poultry farms.

Other changes

Other negative impacts on livestock production, apart from the difficulties induced by the transition period were the disastrous Spitak Earthquake in 1988 and the Artsakh War from 1988 to 1994. In 1991, when Armenia was subject to a transport blockade, the privatization of public-owned land was a key instrument in ensuring the minimum food needs for the entire population. The land reform – dividing land equally among rural households according to the number of family members – created many small-scale farmers in rural areas. These events seriously affected the sector by reducing the overall production level. On the other hand, positive changes have been seen since 1998, when additional funds were invested to help increase the production level. These initiatives helped the agricultural sector to increase its productivity, and in 2006 the production level came back to the level of 1998.

SECTION B: MARKET ANALYSIS

Two-thirds of rural communities are involved in milk and meat production. These communities supply 620,000 tons of milk and 40,400 tons of cattle meat to the population. Breeding sheep is also common on rural private farms, and 640,000 sheep are bred for meat and wool production. Pig production is less common among private farms, which keep only 54,000 head of pigs, producing 14,100 tons of pork. Large commercial farms operate mainly in poultry production. In regard to meat consumption, the share of beef is extremely high – with 60.5 percent of the total meat consumed.

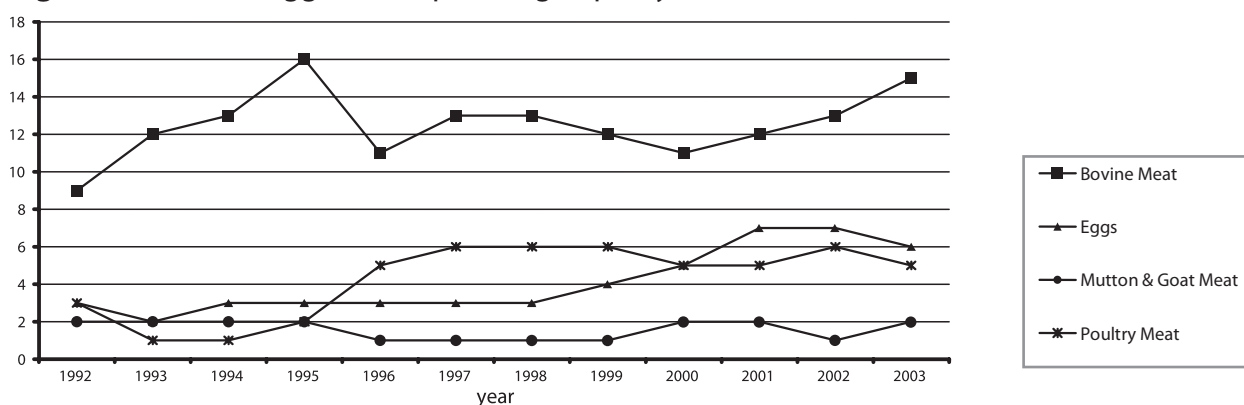
Table 3: Livestock Primary Product Production (1000 ton)

Year	Livestock and poultry (living weight)	Livestock and Poultry (slaughter weight)	Cattle	Pigs	Sheep and Goats	Poultry	Milk	Eggs, (in million)	Wool Ton (physical weight)
1990	145.1	92.8	34.5	15.2	9.3	33.6	431.9	517.9	2831.0
1995	82.4	48.4	29.7	4.8	7.1	6.8	428.3	197.6	1463.0
2000	88.8	49.3	30.9	9.1	8.1	1.2	452.1	385.4	1310.0
2005	99.1	56.0	34.4	9.4	7.6	4.6	594.6	518.2	1306.0
2007	122.2	-	-	-	-	-	642.0	-	-

Small-scale farmers produce 95 percent of the total cattle meat output and almost all milk output. Commercial farms own between 23 and 200 cattle, more than the national average, but produce only 5 percent of the total meat production. The contribution of commercial farms to poultry production is higher, with 65 percent of the total.

The food industry is growing rapidly in the country, fuelled by the growth of the economy. In 2005, the industry amounted to 629 billion drams, which comprised 30 percent of the total volume of industrial production. This is twice the volume of 2002. The increase of household expenditures and household consumption of main food products also highlights the growth of the market. The average consumer expenditures for main food products in 2005 were 1.5 more than in 2002. Of the main products which have increased in the volume of consumption, animal products are among the highest with a long-term increasing trend in the consumption of poultry, meat and eggs. The data on average food consumption per capita shows that animal products account for a major share of basic foodstuffs among the population, accounting for 30 percent of protein intake and 20 percent of calorie intake in 2003.

Figure1: Meat and egg consumption (kg/capita/yr)



Although domestic production is increasing, Armenia has mostly been an importing country of animal products. This highlights the fact that domestic production fails to meet the growth of the market. The increased volume in the import of animal products has brought about a reduction in the self-sufficiency level in animal production over the years.

Table 4: Evolution of Imports of Milk, Eggs and Meat (in tons)

Year	Milk Equivalent	Eggs in the Shell	Bovine Meat	Pig Meat	Poultry Meat
1992	52585	1500	0	0	2200
1995	106505	5358	6578	85	1440
2000	36030	1094	9238	1600	15171
2005	42583	41	12372	3380	17514
2006	34642	440	13729	4660	10015

Source: FAO (Food and Agriculture Organization of the United Nations)

The main animal products manufactured in the country are milk and dairy products, meat (beef, pig, chicken and lamb), eggs and honey. Wool and leather derived from sheep are regarded as important raw materials and provide materials for the carpet-making and leather manufacturing. However these branches are poorly developed. In general, domestic animal products receive consumer preference in the market, but require improvements in technology and food safety.

The majority of animals are slaughtered by private entrepreneurs at farms, by traditional methods. These entrepreneurs slaughter animals and deliver the slaughtered meat to urban markets (e.g. Yerevan or other cities). Additionally, there are three relatively large slaughterhouses (there are six in total) with meat processing plants, where both locally produced and imported meat are processed. In 2007, over 160,000 cattle were slaughtered, out of which only 24,000 (15 percent) were slaughtered in these large slaughterhouses. Backyard slaughtering is also common for pigs and sheep, of which more than 90 percent of the animals are slaughtered on the farms.

Most of the milk and dairy products are processed in seven large plants located at a distance of 50 to 100 km from Yerevan. These plants process up to 150 tons of milk per day and manufacture approximately 50 percent of the milk and dairy products sold. Additionally, there are over 300 units of dairy collection centers, located in around 250 rural villages, which process about 200,000 tons of milk annually. Half of this milk is transmitted to the plants and the rest is processed at the collection center. A number of small milk-processing units using local milk production are located in mountainous regions.

Although these small-scale processing units are very important for the country, a modern system of milk collection and processing is urgently required to meet the growing demand for animal products. The quality and quantity improvement of domestic animal products is essential in this context. There is an urgent need to strengthen veterinary-sanitary control of meat and milk manufactured. Small processing units and household processing should be upgraded to correspond to modern hygienic norms and requirements. Backyard slaughtering should be reduced to a bare minimum for on-farm consumption, and not for products intended for market. Additionally, it is necessary to create the conditions for a domestic supply of concentrated feed. More than 95 percent of the concentrated feed provided for poultry production is imported. Due to transportation costs, this feed costs 30-50% more in comparison with neighbouring countries or with countries from other regions. Currently, concentrated feed is manufactured in only five or

six functioning poultry breeding farms, and only for their own needs. Therefore, the development of concentrated feed, based on local raw materials and in compliance with the international standard, is a high priority which, in its turn, will increase domestic animal products and decrease dependency on imports.

Farmers sell their produce almost exclusively through two channels: to consumers directly or to traders and trading companies. Since the transition from a planned to a market economy, state procurement centres and consumer cooperatives no longer play a role in the sale of farm products. The inadequate organization of the sale of agricultural products adversely influences their price as compared to industrial products. In recent years, small co-operations for milk collection were organized in several communities with USDA (United States Department of Agriculture) support: fresh milk is purchased from farmers on a contractual basis, then cooled and transported to processing enterprises. The purchasing is seasonal; during the pasture period (May – October), the processing enterprises set lower purchase prices for milk, causing dissatisfaction among farmers. This issue can be regulated by establishing minimum milk prices by the State.

There are a growing number of consumers asking for safe and high quality animal products at reasonable prices. Consumers often reflect their preferences on the market, creating trends. In Armenia, as the economy and income grow, consumer trends will become more important. Meeting consumers' demands and preferences is critical for the farmers, who should reconsider the level and type of production. The development of the breeding sector will also be influenced by this market trend.

The strategic dilemma – reliance on import or on national livestock production – is to some extent resolved by the Sustainable Agricultural Strategy (SAS) which sets out production targets: full supply of the local market with fresh milk, dairy products, poultry, mutton, eggs, and with about 80% supply of beef and pork products. The SAS also measures the achievements of these strategic objectives.

The improvement of locally adapted species, and investment in production facilities and management by modernising support services (advisory, veterinary, credits), is necessary to increase milk and meat production. These changes require the reform of production systems, marketing and organization of the food chain. Industrializing poultry and pig productions could be done by large multinational companies, which use advanced technologies for feeding and management. New investment in the domestic market will be encouraged, if the industrialization, through the implementation of such large multinational companies, succeeds.

SECTION C: POLICY FRAMEWORK

1. Existing policies and legal framework

Numbers of international and national legal frameworks and policies relevant to AnGR management directly and indirectly affect the livestock sector in Armenia. This section reviews the international legal frameworks involving the Armenian government and describes relevant national legislation and policies, including institutional structures and their capacities. These frameworks include both legally binding and nonbinding instruments.

International legal framework for the management of biodiversity

The “Convention on Biological Diversity (CBD)”, a legally binding international framework for the management of biodiversity, was ratified by Armenia in 1993. Three objectives of the CBD, as set out in Article 1, are: conservation of biological diversity, sustainable use of components of biological diversity, and fair and equitable sharing of the benefits arising from the utilization of genetic resources. Conservation of animal and plant genetic resources required for food and agriculture is addressed by its program of work on agrobiodiversity. In 1999, the government developed the National Biodiversity Strategy and Action Plan to meet the requirements of the convention.

The “Commission on Genetic Resources for Food and Agriculture” (the Commission) is a permanent forum where governments discuss and negotiate matters relevant to genetic resources for food and agriculture. The main objectives of the Commission are: to ensure conservation and sustainable utilization of genetic resources for food and agriculture, and fair and equitable sharing of benefits derived from their utilization for present and future generations. The Commission strives to reach an international consensus on areas of global interest. Currently, the Government of Armenia, the European Community, and 170 other governments are members.

The “Global Plan of Action for Animal Genetic Resources”, adopted at the FAO International Technical Conference on Animal Genetic Resources for Food and Agriculture, held in Interlaken Switzerland on 3–7 September 2007, and later endorsed by the FAO Member Nations at the 34th session of the FAO Conference on 17–24 November 2007, is the first ever adopted international framework to promote sustainable use, development and conservation of AnGR. The framework addresses challenges in the area of AnGR at all levels.

National legal framework and policy for the management of AnGR

Article 10 of the “Constitution of the Republic of Armenia” defines that the state shall ensure the protection and reproduction of the environment and the reasonable utilization of natural resources.

The “Law on Pedigree Livestock Breeding” defines the scope of the government and the Ministry of Agriculture in pedigree livestock breeding. This law outlines the requirements for physical personnel and legal entities that deal with pedigree animal breeding and procedures for reproduction of pedigree animals. The law regulates relations regarding the intensification of livestock-breeding, receiving of pedigree materials, creation of new pedigree types of farm animals, conservation of their reproduction and utilization, as well as the protection of critically endangered pedigree types.

The “Law on Veterinary Medicine” defines the authorities of the government in the area of veterinary medicine and related veterinary services. The Ministry of Agriculture is authorised in regulatory, control and enforcement tasks. The law regulates the protection of animals from contagious and non-contagious diseases by applying preventive anti-epidemiological measures and mandatory diagnostic and hygienic measures. The state’s veterinary control is implemented

during production, storage, transportation and processing of foods and raw materials of animal origin, feedingstuff and fodder.

The “Law on Feedingstuffs” regulates import, export, production, storage, transportation, utilization, marketing, labelling and packaging of the feedingstuffs, as well as materials in contact with feed and feed additives.

There are also a number of government decrees which complement these laws and constitute the national legal framework for livestock production, such as:

- The “Government Decree on Approving Procedure of Export to the RA (Republic of Armenia) and Import from the RA of Pedigree Materials to be Used in Animals Husbandry”;
- The “Government Decree on Approving Forms of Application for Certification and of Certificate for Export to the RA and Import from the RA of Pedigree Materials to be Used in Animals Husbandry”;
- The “Government Decree on the Procedure of Production and Use of Pedigree Materials to be Used in Animals Husbandry”; and
- The “Government Decree on the Procedure of Organization and Implementation of Monitoring of Pedigree Animals Husbandry”,

Based on these legal instruments, a number of policies and strategies in livestock development were developed by the Ministry of Agriculture and then adopted by the State. According to the “State Mid-term Expenses Program for 2006-2008”, the main tasks in the field of agriculture, which come from the Poverty Reduction Strategy Plan (2003) and are included in the Agricultural Sustainable Development Strategy (2006), contain supports for the development of pedigree livestock breeding and improvement of veterinary system. The program also includes measures for artificial insemination, as well as the elaboration of a farm animal identification and registration system. The main priorities for livestock development within the framework of the Agricultural Sustainable Development Strategy are: to develop livestock production through animal pedigree breeding, to improve fodder production, feeding and animal growing, and to improve the animal health system.

The “Cattle-Breeding Development Program” envisages the improvement of pedigree-selection activities, supporting the formation of pedigree farms, promoting increases in the productivity of livestock animals and fostering gene-fund conservation activities.

The analysis of AnGR and livestock development is presented in the Country Report on the State of the Armenia’s Animal Genetic Resources for Food and Agriculture (2003), which was made in preparation for The State of the World Animal Genetic Resources for Food and Agriculture (FAO, 2007)¹. Types of livestock farms, and utilization and conservation of AnGR are presented in detail in the Country Report.

2. Institutions and stakeholders

The major laws relevant to livestock production define that the Ministry of Agriculture is the administrative authority, and a number of departments in the Ministry work as executive branches of the laws.

The “Livestock Breeding and Pedigree Department” oversees the implementation of Article 18 of the Law on Veterinary Medicine, identification and registration, as well as of the Law on Pedigree Livestock Husbandry. The Department is in charge of activities involved in animal breeding and

1 FAO. (2007.) *The State of the World’s Animal Genetic Resources for Food and Agriculture*, edited by B. Rischkowsky & D. Pilling. Rome.

issuing licenses for the activities. Despite the fact that both laws were enacted in 2005, the animal identification and registration tasks have not been launched yet due to lack of proper funding. The “Licensing Department” issues licenses for activities in the plant protection and livestock breeding sectors. In the livestock sector, licenses are issued to individuals and legal entities that are engaged in animal breeding or veterinarian activities.

The “State Inspectorate of Food Safety and Veterinary Services” is responsible for checking the implementation of measures taken to prevent the spread of contagious animal diseases that are common to animals and humans. The Department also audits the compliance of production procedures, storage, processing, transportation and marketing of foods and raw products related to animals and animal feeds, as well as veterinary medicinal products.

An Agribusiness Support Centre (ASC) has been operating under the Ministry of Agriculture since 1996. The ASC was created to provide extension services for the development of business plans in the food processing industry, to carry out marketing surveys and to provide consultancy on marketing issues. ASC is being consistently replenished with experts.

The “Scientific Centre for Livestock Husbandry and Veterinary State Non-Commercial Organization” (SCLHV SNCO) operates under the Ministry of Agriculture. SCLHV SNCO performs scientific research on animal breeding, production and reproduction of breeds, conservation of the gene-fund and the improvement of the pedigree and performance properties of breeds. All animal breeding research activities are done using the state budget account.

The “Armenian State Agrarian University” (former Armenian Agricultural Academy) was founded in 1994 based on the Armenian Agricultural, Yerevan Zootechnical, and Veterinary Institutes. The university is one of the largest scientific research centers in the country, and about 10,000 students are enrolled in six departments, such as the Department of Veterinary Medicine and Animal Husbandry. A program to improve livestock genetic resources is offered, and students are trained and conduct research on two experimental farms (1,130ha) owned by the university.

The “Farmers’ National Association of Armenia” (former Armenian Farmers Union) was established in 1992 as a national association of large-scale livestock farmers. This association, with about 5,000 members, functions as a cooperative entity for civic engagement and promotes improvement of the social situation of rural communities through supporting education and training, as well as the improvement of farmers’ quality of life.

The few existing NGOs (Non-Governmental Organizations) have no clear programs and resources, and there is no coordination between them. Only the Beekeepers’ Association has been able to implement several beekeeping development projects.

3. Assessment of institutional capacities at country level

Institutional capacity for AnGR management is limited, with only a few public institutions existing in the country. Currently, there is no nationwide program for animal identification and recording being implemented, although it has been provided for by the State’s Mid-term Expenses Program for 2006-2008. Likewise, programs for the conservation and sustainable use of animal genetic resources are not developed. Services for assessing the animals by their phenotype and genotype are non-existent. Reproduction takes place by the free multiplication method. Although a number of laws and programs have been implemented by the Ministry of Agriculture, which supports farmers in supply of pedigree livestock, the science-based infrastructure for animal breeding is not extended to the various regions of Armenia, with the exception of Multi-Agro Science (Research)-and-Production Centre in the village of Arinj, Kotayk Marz. The lack of a nationwide program for animal identification and recording makes the observation of zoo-sanitary rules by small-scale animal breeding farmers practically impossible. Legislation regarding animal identification and

traceability is in place; however, it has not been implemented yet due to the lack of funding and proper infrastructure. The limited capacity of other stakeholders makes the issues more complex. To implement these activities and expand its effect nationwide, stakeholder involvements are essential. Not only will a breeders' association backstop the activities as an implementing organization, but also research and educational institutions will be able to establish the proper science-based infrastructure. However, there is no such association in Armenia other than the Farmers' National Association of Armenia. The Association has no possibility of contributing to the development process of animal husbandry and is unable to perform recording and registration on the required level. Research and educational institutions also lack adequate resources, hindering the development of AnGR and the dissemination of knowledge to farmers.

For the prevention of infectious diseases, implementation of an animal identification system and control over animal movement are crucial. Meanwhile, it is especially hazardous that the local veterinarians do not utilize the diagnostic capacities of the national laboratory, thus, detection of numerous diseases is inadequate. A veterinarian may allow the meat of diseased animals to be marketed without testing, which can be potentially harmful. In fact, the safe movements and trade of animals depend on the availability of a comprehensive system of animal identification and registration.

Resources are required for: the establishment of an animal identification and recording system, the registration of all farms, natural and legal entities involved in livestock husbandry, animal breeding activities, financing of the works for monitoring of animals' movement by local veterinary services, and for building a network for the gathering and communication of information

A substantial enhancement and application of national capacity for the management of AnGR, with new institutional models (e.g. breeders' association) and collaboration among public institutions and between public institutions and private farmers, is therefore required if the activities of the Ministry of Agriculture are to be fully implemented

SECTION D: LIVESTOCK PRODUCTION ENVIRONMENTS

1. Agro-ecological conditions

Armenia is a landlocked country without any outlets to the sea and with limited natural resources. Located in the southern part of the Trans-Caucasus, it occupies a total territory of 29,800 square km and shares the borders with Iran in the south, Turkey in the northwest, Georgia in the north and Azerbaijan in the east. The territory is divided into ten Marzes (provinces), **Ararat, Aragatsotn, Ararat, Armavir, Gegharkunik, Kotayk Lori Shirak, Syunik, Tavush, and Vayots Dzor**, with the city of Yerevan holding special administrative status as the country's capital. Its territory consists of high mountains and wide valleys, which run parallel to the mountain peaks of the South Caucasian mountain chains. The elevations are between 380 and 4,095 meters, and some 70 percent of the surface lies between 1,500 and 3,000 meters above sea level. Only 0.3 percent of its territory has altitudes lower than 500 meters. In the majority of the mountainous areas of the country, the average annual temperature is 3-4 °C, and in the alpine zone the average is even lower. The duration of the vegetation period in lower areas is 250 days and in alpine zones 95 days. In lower areas, the climatic conditions allow 230 days of grazing for cattle, and 300 days for sheep, while in high-mountainous pastures the duration varies between 150-180 days, varying from year to year. The climate is continental. The coldest month is January (-1.2 to -12.8 °C); the hottest months are July and August (25.8 °C). Annual precipitation varies between 300 mm in the Ararat Valley and 600-800 in other areas of the country. Pastures lie in the alpine zones. The country lies between two water basins, that of the River Arax in the southwest and the River Kur in the northwest. Rich and deep soils prevail in the lower areas, mainly in the Ararat Valley; the so-called weak (surface) soils are in the alpine zones and hillsides.

Dictated by the natural and economic conditions, as well as production specialization, the country is divided into nine agricultural zones; Ararat Valley, Ararat Valley Foothill, Central, Sevan Basin, North-Eastern, Lori-Pamback, Shirak, Vayk and Zangezur (Table 5). In general, these zones represent a production-area combination, each characterized by a specific combination of agricultural activities and land use. Each zone shows its distinctiveness in the production of viticulture, vegetable, fruit, potato and livestock. Plant production (viticulture, fruit or tobacco) is developed in the North-Eastern, Vayk and Zangezur, zones. Livestock production is developed in the Sevan Basin and Shirak zones, where up to 18 percent of the total cattle population is concentrated. The zones of Ararat Valley and Ararat Valley Foothill are specialized in viticulture, fruit production, and dairy and meat production. A considerable part of the Ararat Valley is considered to be a suburb of Yerevan, which affects the distribution and specialization of agricultural production. Both zones have high shares of the sheep and goat (21.2 and 16.5 percent) and pig (23.9 and 19.0 percent) populations.

Table 5: Agricultural Zone in Armenia

Zone	General Overview	Livestock Production
Ararat Valley	Wine production, vegetable and fruit production, and dairy cattle-breeding on an industrial basis, are well developed in this zone. The zone is rich in other natural-climatic and soil resources, providing high yield for fodder crops production.	14.5 percent (91,400) of the total cattle population is concentrated in this zone, followed by cows 12.8 percent (39,500), sheep and goat 21.2 percent (135,300), and pig 23.9 percent (33,900).

Zone	General Overview	Livestock Production
Ararat Valley Foothill	Wine production, fruit production, as well as dairy and meat production on an industrial basis are developed in this zone. Sheep breeding is conducted by the population living in the mountains.	14.4 percent (90,600) of the total cattle population is concentrated in this zone, followed by cows 14.9 percent (45,800), sheep and goat 16.5 percent (105,200), and pig 19.0 percent (27,000).
Central	Cattle (dairy and meat) and sheep breeding are developed in this zone.	6.7 percent (42,000) of the total cattle population is concentrated in this zone, followed by cows 7.2 percent (22,000), sheep and goat 7.0 percent (44,500), and pig 2.8 percent (4000).
Sevan Basin	Stock breeding and potato production are developed in this zone.	17.7 percent (111,500) of the total cattle population is concentrated in this zone, followed by cows 18.8 percent (57,700), sheep and goat 16.7 percent (106,300), and pig 9.3 percent (13,200).
North-Eastern	Tobacco cultivation, cattle breeding, fruit production and wine production are developed in this zone.	7.8 percent (49,200) of the total cattle population is concentrated in this zone, followed by cows 7.8 percent (24,100), sheep and goat 5.4 percent (34,100), and pig 2.9 percent (32,600).
Lori-Pamback	Cattle breeding and potato cultivation are developed in this zone.	7.2 percent (45,400) of the total cattle population is concentrated in this zone, followed by cows 7.6 percent (23,400), sheep and goat 3.0 percent (19,100), and pig 4.9 percent (6,900).
Shirak	Dairy and beef production, sheep-breeding and grain production are developed in this zone.	16.4 percent (103,300) of the total cattle population is concentrated here, followed by cows 16.6 percent (51,100), sheep and goat 14.3 percent (91,200), and pig 9.0 percent (9,600).
Vayk	Wine and fruit production are developed in this region.	3.3 percent (20,700) of the total cattle population is concentrated in this zone, followed by cows 3.4 percent (10,400), sheep and goat 4.5 percent (28,600), and pig 1.3 percent (1,800).
Zangezur	Cattle and sheep breeding, tobacco cultivation and wine production are developed in this zone.	8.5 percent (53,300) of the total cattle population is concentrated in this zone, followed by cows 8.6 percent (26,300), sheep and goat 9.5 percent (60,300), and pig 6.8 percent (9,600).

2. Pastures and fodder crops

Pastures and fodder production are extremely important for the development of animal production. According to the Country Report on the State of Armenia's AnGR (2003), fodder production has been gradually replaced by cereal production. There are about 687,000 hectares of pastures, 139,000 hectares of natural meadows, and more than 65 percent of agricultural land is used as natural pastures. About 50 percent of forests are also used as pastures and meadows. 76.6 percent of the pastures and 87.1 percent of the meadows are located above 1,500m above sea level, and about 20 percent of (pastures) natural fields are above 2,500m. 43.8 percent of pastures and 28.0 percent of meadows are located on declivities higher than 7.1 degrees. This highlights the importance of adaptation of local breeds to the high mountainous conditions.

Approximately 80,000 hectares of natural fields had been privatized as of January 1st 2008, due to the current land legislation stipulating that these areas are subject to privatization. The average privatized natural field per rural household is about 0.25 hectare. The remaining 59,000 hectares of natural fields are managed by the village municipalities, which are entitled to rent them. No pasture improvement or control measures have been undertaken since 1991, which has led to overgrazing. Pastures located near villages were totally exhausted while those located far from the villages were almost unused. Moreover, the natural pastures were not fully utilized. In both cases, ineffective land use has caused serious economic loss of livestock and land degradation. The natural pastures have not been improved and the greater part of this area has been subjected to intensive soil erosion and degradation of the flora.

Ineffective utilization of pastures and grasslands has brought about a number of impacts. The field fodder pastures have become one of the most important resources for cattle. Pastures are a major wealth of the country; intermittent grazing, meadow improvement and irrigation are the main ways to maintain them. In the 1980s, importation of concentrated and compound feeding stuffs reached 1 million tons. Currently, the feed importation volumes have decreased by more than two times. Main imported feeding stuffs were compound feeding stuff, and corn and grains (mainly wheat) for poultry and pigs. The feed crop (grains) yield has fluctuated between 1.2 and 2.6 tons per hectare, but can be as low as 0.7 ton per hectare during arid years (e.g. in 2000).

Presently, the fodder crops (melilot, lucerne, annual cereals) grow only in 21 percent of arable lands. Fortunately, the privatization of arable lands has been constantly decreased, and now there is a tendency towards stabilization. The annual curtailment of the fodder crop arable lands has significantly distorted the crop rotation, and subsequently the effective usage of land. Thus, the animal productivity and food-production indexes drastically decreased during the period 1987-1998, but during the last 5 years there has been a tendency toward an increase, though it is imperceptible.

To develop fodder production, animal feeding and growing, the following measures are anticipated within the framework of Agricultural Sustainable Development Strategy:

- Increase in the volume of locally produced fodder through the increase of field fodder production and improvement of fodder ratio;
- Encouragement of long-term leasing and privatization of natural pastures, introduction of mechanisms to promote efficient use of remote pastures, ensuring technical assistance to lessee and owners of pastures on improvement of vegetation cover, and rehabilitation of ecological balance and watering points for animals;
- Regulation for the efficient use of Alpine pastures to promote Swiss cheese production;

- Improvement of the field fodder production structure through the expansion of perennial fodder areas;
- Assistance to small and medium-sized businesses in producing grain and compound fodder, as well as protein and vitamin additives; and
- Evaluation of the degradation level of mountainous pastures and elaboration of improvement measures.

3. Type of production systems

Landless industrialized farming systems. Large scale farms account for some 5% of beef and pork, and 65% of poultry meat production in the country. It is based on one-time or continuous import of technology, genetic material and feed. Its importance and market share will, most likely, increase parallel with the growth in demand for animal products and orientation of consumers towards cheaper food.

Grassland based systems. The grassland-based systems prevail in mountainous regions where sheep, cattle and, in some areas, also pigs are kept during the summer on pastures and wintered in stables. The use of pastures is combined with the production of hay and limited quantities of fodder crops and grains for the winter. Farms and production units operating under these systems use local and locally adapted breeds and crosses.

Mixed crop-livestock systems. Such systems are dominant in the lowland and foothill zones of the country. They are characterized by more intensive production practices involving greater use of external inputs and production of forage and fodder crops for winter feeding. Most farms are market-oriented and keep improved local breeds and crosses of exotic breeds.

Cattle production systems. In valley and foothill zones, cattle production is carried out mainly in crop-livestock systems (farms are producing milk and milk products, they also keep cattle for producing meat) combined with use of meadows and cropland after the harvest for pasture. In mountainous zones, the basic type of production is the use of pastures, hay and limited quantities of fodder crops for producing milk in small quantities and particularly for meat production. During the summer, cattle are grazing on pastures and during the winter are kept in stables and fed on hay and some fodder crops.

Sheep production system. Sheep production is unevenly spread throughout the country – the highest number of sheep are found in mountainous areas, but in valleys and foothills many farmers keep sheep in small or medium size flocks. The production is generally based on the use of pastures.

Pig production system. Pig production is based on a small number of pigs per farm and the use of crops and some pastures for feeding. In the North-Eastern part of Armenia pigs are raised mainly in forest-based systems. From April until late autumn they stay in the forests, during this period they are fed on acorns, crops and berries.

4. SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis of each production system

Each of the production systems existing in the country has its strengths, weaknesses, opportunities and threats. These are summarized in the tables below. A variety of factors can have a negative impact on the possibilities for the full use of the strengths of farm animal agriculture in the country in attaining policy and developmental objectives.

Table 6a: Cattle Production in Crop-Livestock System in Lowlands and Foothills

Strengths	Weaknesses
• Sufficient number of cows • Skilled producers • Available accommodations • Market demand • Potential for increase in herd and farm size • Potential for intensification	• Low and/or unused genetic potential of cattle • Lack of modern technologies • Inadequate feeding and feed shortages • Limited capital investments in the organisation of breeding activities
Opportunities	Threats
• Genetic improvement of existing population • Introduction of exotic (alternative) breeds • Increase in fodder production, reinforcement of the feed base; and • Use of concentrated feed to increase the performance/productivity of animals • Provision of imported pedigree calves on the installment plan; growing and sale of pedigree young (молодняк); and genetic improvement of breeds	• Lack of technical and financial support in the process of modernization of production • Low import prices and indiscriminate import of milk and milk products • High prices of imported pedigree genetic material; • Complete lack of pedigree structural units (receiving and freezing sperm at insemination stations, appraisal of producers and publication of catalogues, etc.) and national structures/associations and infrastructure

Table 6b: Cattle Production in Pasture-Based Systems in Hilly and Mountainous Zones

Strengths	Weaknesses
• Good genetic base of cattle adapted to local conditions and with quality milk and meat • Sufficient number of cows • Skilled producers • Demand for milk, beef and products • Large network of local processing enterprises	• Low and unused genetic potential of cows • Partial/incomplete implementation of breeding work • Inadequate feeding particularly in winter • Lack of appropriate/relevant infrastructure • Uncontrolled mating • Inbreeding
Opportunities	Threats
• Supply of market with local products • Cooperation among farmers in AI, use of pastures and licensed/pedigree bulls and marketing of milk • Readiness for local initiatives in cooperation with milk processors in establishing milk collection service • Establishment of a producers' and breeders' association	• Erratic climate and droughts • Lack of additional forage for winter • Epizooties • Uncontrolled and improper utilisation of pastures • Impossibility of providing the animals with drinking water

Table 6c: Sheep Production in Pasture-Based Systems

Strengths	Weaknesses
• Good genetic base, local breeds adapted to environment and production system • Availability of pastures • Growing demand for sheep milk and cheese • Skilled producers/owners of flocks • Use of Alpine meadows • Demand for coarse wool • Expanding of rugs and carpets production	• Low milk production per ewe • Partial/incomplete implementation of breeding work • Lack of services (advisory)
Opportunities	Threats
• Meeting growing demand • Export of sheep cheese • Better management and use of pastures	• Overgrazing of some pastures • Epizooties risks

Table 6d: Pig Production in Small Farms

Strengths	Weaknesses
• Local breeds adapted to the local natural and climate conditions • Sufficient available feed • Demand for pork	• Partial/incomplete implementation of breeding work • Poor housing and management • Carcass quality • Low level feed conversion • African swine fever
Opportunities	Threats
• Meeting growing demand • Provision of additional income to small rural households/farms	• Epizooties risks

Table 6e: Pig Production in Landless Industrial System

Strengths	Weaknesses
• High productive hybrids • High quality product – lean meat • High level of national and international professional support	• Dependence on import of genetic material, technology and feed
Opportunities	Threats
• Meeting growing demand • Supply of quality young to small rural households/farms • Promote production of quality meat through the cyclic method	• Disturbances in international markets • Problems connected with transport of imported animals

Identifying factors facilitates the choice of policy instruments and measures. The purpose of this document is to draw the attention of policy makers to the development potential of the sector and to propose policy measures for the maximum utilization of development opportunities.

SECTION E: LIVESTOCK DEVELOPMENT OBJECTIVES

One of the most important roles of the Armenian government is to ensure national food security. The government wishes to maintain the necessary production capacity to meet a substantial portion of domestic food needs from domestic sources. Over the years, Armenia has been a net importer of animal products. Local demand for animal products is increasing significantly, and it is expected to grow continuously along with the increase in animal products consumption, urbanization and improvement of the living standard. To meet the growing demand, the livestock sector needs to be more efficient, by increasing productivity and developing animal genetic resources. Development objectives, as set out in this document, take into account the need to meet future requirements of the country and to fully utilize natural resources and production potential of available and genetically improved farm animals.

1. Livestock development objectives in general

Livestock development objectives, in general, have been defined by the Agricultural Sustainable Development Strategy, namely:

- Supply of the local market with fresh milk, dairy products, poultry, mutton and eggs, and about 80% supply of the beef and pork products;
- Increase of export volumes of cheese varieties and processed meat products;
- Usage of local production potential for fodder by expanding fodder crop areas and applying mechanisms for the efficient use of pastures;
- Promotion of the formation of livestock breeding commercial organizations through the provision of consultancy and targeted crediting;
- Increase in agricultural produce volume through the improvement of animal feeding and animal growing, development of pedigree breeding and sanitary-veterinary activities;
- Development of traditional branches of light industry (carpet making, shoe and textile industry) with increase in demand for wool and leather based on this development;
- Increase in the volume of Swiss cheese production and export through the improvement of Alpine pastures and the application of a system for their targeted use; and
- Improvement of pedigree breeding and the animal health system based on the improvement of animal identification, registration and information system establishment, as well as on the implementation of state direct assistance program.

2. Livestock development strategies for each production system

Livestock development objectives will be attained by a set of measures, covering the whole range of components, ranging from efficient use of pasture and fodder crops to processing and marketing of livestock products.

Cattle production in crop-livestock system in lowlands and foothills

Cattle production in crop-livestock systems in lowlands and foothills will be oriented towards the supply of urban centers and milk processing plants with fresh milk and all farmers and cattle keepers with superior heifers and bulls. One-third of the cattle population of the country is located in these zones, which have the basic pre-requisites for an increase in milk production and for the development of an intensive dairy sector.

In order to achieve the complete use of natural conditions and the attainment of strategic

objectives, in addition to the measures envisaged in the Agricultural Sustainable Development Strategy, this will require;

- Increase and improvement in production, processing and storage of animal feed;
- Support in the establishment of market-oriented small to medium size family farms, as well as the encouragement of the establishment of larger commercial farms;
- Support of a modern milk collection and transport system;
- Provision of producers with credits;
- Organization of an advisory service;
- Genetic improvement of the existing cattle population; and
- Introduction of foreign highly-productive transboundary breeds.

Genetic improvement programs will focus on existing local breeds and crosses, and will rely on the genetic work in their populations of origin and import of bulls and semen of foreign highly-productive breeds. Production units maintaining foreign breeds will have to target the productivity attained in the country of origin.

Producers in the lowlands and foothills will use, for A.I. services, semen of national and international pedigree bulls of selected breeds with good selection indices and high breeding values for targeted traits. Farms that are not covered by A.I. service will use licensed pedigree bulls for natural mating. Some farms in these zones will function as pedigree farms for production of heifers and young bulls for testing and natural mating.

Cattle production in pasture-based systems in hilly and mountainous zones

Hilly and mountainous zones will produce milk for local consumption and production of specific traditional local animal products for urban markets and export, as well as calves for fattening on pastures for quality beef production. Increase in milk production in these systems will depend on:

- Improved productivity and management of pastures;
- Increase of fodder production and supply for winter feeding;
- Access to markets;
- Collection of milk; and
- Improved genetics of existing breeds and populations.

An increase in beef production will depend on the management and productivity of pastures. The genetic improvement of the existing cattle population will be based on within-breed selection through the establishment of nucleus herds and crossbreeding for improvement of specific traits. In view of the large number of small producers and the specificities of each agro-ecological zone, it will be necessary to support the establishment of regional breeders' and producers' associations. Their functions and tasks will include initiatives for controlled mating, introduction of A.I. services and the use of licensed pedigree bulls for natural mating.

Sheep production in pasture-based systems

Sheep production will be oriented toward supplying the market with high-quality cheese and mutton, as well as supplying the processing sector with wool and skins. Since sheep-breeding is primarily pasture based, an increase in mutton, milk and wool production will depend on:

- Increased productivity of pastures;
- Improvement of flock management;
- Provision of feed for winter period;
- Protection of animal health;

- Improvement in the marketing and processing of sheep products;
- Development of local milk processing capacities;
- Improvement of quality of sheep products; and
- Improvement of genetic resources.

Past national experience and current knowledge regarding the genetic improvement of coarse wool sheep will be used in straight and crossbreeding programs for increasing milk and mutton production. Genetic improvements in lamb and mutton production will be obtained on the basis of data collected at private or communal slaughterhouses. A new system of payment based on carcass quality and carcass classification will be gradually introduced. For this, it will be necessary to establish, at major sheep production centres, local slaughterhouses equipped with cooling systems. There is also a need for a central laboratory for dissection and analysis of meat quality.

Pig production in crop-livestock system

Pig production on small family farms in crop-livestock systems will continue to play an important role in supplying local markets, thus providing additional income to farmers. It will also continue to provide meat and fat for on-farm consumption. It is based primarily on the use of feed produced on the farm. The production will be improved by:

- Increased production of fodder on pig keeping farms;
- Use of commercial premixes and compound feed;
- Increase in number of weaned pigs through better management, hygiene and nutrition; and
- Genetic improvement of existing breeds to attain better feed conversion and an increase in meat yield percentage.

Particular attention will be paid to the Mountain-Forest pig breed for production of ecological products in an agro-forestry system.

Genetic work for small to medium size pig production units will be based on progeny testing, and the recording of production and quality traits. It will be necessary to establish payment on the basis of carcass quality, construct modern slaughterhouses close to consumption centers and establish a central meat analysis and control laboratory. Breeding work will include:

- Pure breeding of parental generations of mainstream breeds (Large White, Landrace, Pietrain–Duroc).
- Production of hybrids and lines for on-farm fattening and/or sale to fatteners.
- Medium-size farms with 10-20 sows will function as breeding units in the multi-center breeding system. Farms will function as closed units with controlled entries and movements of animals in order to prevent outbreaks of infectious diseases. This option is suggested in view of the costs of the establishment of modern breeding farms, protection of the environment and minimization of risks.

Pig production in landless industrial system

In view of the expected increase in the demand for meat, and in addition to an increase in output from small family farms and operations, industrial production of pigs could represent, as in other countries, a quick and economic response. Development of the industrial system requires substantive investment in production facilities, feed production, import of raw material and genetics, and the development of processing and distribution facilities. Development of the system will depend primarily on market signals and business opportunities in the country. The

Government will facilitate the establishment of new industrial farms within the framework of its business support policies and will ensure the strict adherence to local and international operators to national norms and regulations. The development strategy will be aimed at encouraging the reconstruction of the sector after the African swine fever outbreak and establishment of commercial closed systems protected against epizooties.

Breeding Strategies

SECTION A: BREEDING OBJECTIVES

Breeding objectives primarily aim at attaining livestock development objectives formulated in the Agricultural Development Strategy with regard to the volume and quality of livestock products. In cattle, the principal breeding goal is an increase in milk production. This will be attained by improving the dairy traits of the Caucasian Brown Cattle, and creation, in the short to medium term, of improved lines for production systems in lowland, foothills and mountainous areas. This will be achieved through the use of imported dairy and dairy and meat breeds, and the use of animals generated from crossbreeding and within-breed selection in nucleus herds. The genetic improvement for pigs and sheep will be attained by within-breed selection. Further studies and research will answer any questions in regard to the possible role of exotic blood in improving dairy traits and carcass quality of local sheep breeds.

1. Breeding objectives for cattle production

Crop-livestock system in lowlands and foothills

Higher milk production will be the main breeding goal for the cattle production system in the lowland and foothills. The target level of milk production (e.g. 5,000 kg for cows in nucleus herds) will take into account the productivity of the cows entering in the breeding program and the available feed base. The breeding goal will also include other traits of economic importance, in particular udder health and conformation, fertility and longevity. Udder conformation will include the adaptability to milking machine.

The importance of beef production traits (feed conversion, daily gain, carcass dressing) will depend on the populations used in the crossbreeding program.

Pasture based systems in hilly and mountainous zones

Cattle in hilly and mountainous zones are highly adapted to the local environment, endowed with good conformation, ability to use pastures and thrive during winters with limited feed resources. Improvements in dairy traits and feed conversion, while maintaining robustness, longevity and fertility will be the breeding goals for cattle in pasture based systems in hilly and mountainous zones. An increase in per cow milk production (e.g. from current average of some 1,800 kg to an average of 2,800) will increase the farm income and the standard of living of rural dwellers, and this will also increase the share of these zones in the total milk production of the country. Since the cattle in these zones are basically dual-purpose (milk and meat), future breeding programs will also include improvements in beef traits.

2. Breeding objectives for sheep production in pasture based systems

In view of the high market demand for sheep milk and cheese, increased milk production is the main breeding goal for sheep. The breeding work will concentrate on within-breed selection of breeds with good potential for milk production (e.g. Armenian semi-fine wool breed, Bozak) and, if necessary, introgression of exotic genes for increasing milk yield will be considered. Attention will be given to the maintenance and improvement of carcass quality, robustness and fertility.

3. Breeding objectives for pig production

For the crop-livestock system, the breeding work in pigs, particularly in the Armenian meat breed, will have multiple objectives. Namely, better fertility, feed conversion and high meat yield. For the landless industrial system, owners of large industrial farms will use exotic commercial breeds.

SECTION B: DECISION ON BREEDS AND BREEDING PROGRAMS

Taking into account recent trends and changes, the livestock sector needs high sustained productivity. This calls for the improvement of local animal genetic resources in Armenia, which include over 15 native mammalian and avian farm animal breeds (cattle, pig, sheep, goats and hens). Among them, approximately 6 breeds are at risk: Karabakh horse, Balbas and Armenian half-fine wool sheep, Armenian meat pig, Armenian Marder rabbit and the Yerevan chicken. Many of these breeds have played an important role in supplying the country with animal products. Adhering to the past land reforms, a large number of small farmers have been engaging in agriculture in mountainous areas. Local breeds, which are adapted to mountainous conditions, are essential for agricultural and livestock activities in such harsh conditions. Local breeds and the traditional agricultural practices of small farmers are crucial to the nation's future social and economic development. Future livestock development programs should increase the productivity of small farms, while taking into account the sustainable utilization of AnGR and the traditional practices of farmers. Additionally, global experience in utilising genetic resources should be used to improve the local breeds through imported alternative breeds.

1. Inventory and characterization of AnGR

This section presents an overview of the AnGR in Armenia and their characteristics. The analysis is based on the Country Report on the State of Armenia's Animal Genetic Resources.

Cattle

Caucasian Brown Cattle

This breed accounts for 93% of the cattle population in the country. It was created by crossing the local Caucasian cattle with bulls of the Swiss Brown, Kostroma and Lebedin breeds, and long-term selection of the resulting cross. The breed was created in Armenia, Georgia, Azerbaijan and Dagestan. The Caucasian Brown Cattle are not homogeneous in their conformation and productivity. This is due to the differences between the local cattle populations in the various districts, to the extent of the crossing with the Swiss Brown, and to the different natural, climatic and feeding conditions.

The Caucasian Brown Cattle have a homogeneous colour, resembling the Swiss Brown cattle, but they are smaller with a narrower body. The animals have a harmonious conformation but their specific feature is their short body; medium-size cows have a shorter neck and body than the Swiss Brown but longer than the local cattle. The chest is deep and of medium width. The rump is wide and somewhat sloping. The mid-part of the body is well developed. The legs are strong. The udder is satisfactorily developed; it has a well-developed teats; mammary veins are clearly defined; the milk wells are large. The skin is elastic. Morphologic measurements (in cm) are: withers height 123-129, chest width 37-41. The live weight of the cows entered in the herd book is 430-480kg; that of bulls is 700-800kg.

There are different varieties of the Caucasian Brown Cattle breed: dairy and dairy-beef. In most herds the dairy-beef animals predominate. Nevertheless, in some herds in the vicinity of Yerevan, most cows are of the dairy type. The dairy-type cows are superior to the other types in feed conversion. However, data on important economic production and functional traits is not available, except information on milk production in several large farms. It is necessary, prior to the establishment of the breeding program, to collect reliable information on the production, reproduction, health and longevity of the Caucasian Brown Cattle population.



Black-and-White Breed Cattle

The importation of this breed was dictated by the necessity of moving livestock to year-round stationary conditions. In order to organise industrial milk production, several large livestock complexes, mechanised farms and inter-farm specialised enterprises were built, particularly in regions lying close to urban areas. Beginning in 1970, many heifers were brought into Armenia and many herds were founded, but they had different productivity. Under favourable conditions of feeding and care, their milk productivity was between 4,000 and 5,000kg, but it decreased under adverse conditions. Nowadays, there are about 25,000 Holstein cattle and 12,000 Holstein cows (4% of the total population) in the Republic of Armenia.

On several farms, Holstein and Jersey breeds are used for crossbreeding to raise the Caucasian Brown cattle's production and fitness, respectively. Under stationary keeping and good feeding conditions, the milk production of such three-way breed cows (called Sevabghet) is about 4,500 kg, with 4.1 percent fat and 3.4 percent protein.

As in the case of the Caucasian Brown, there is a need to collect information on economic traits and characteristics of the present black and white population, as well as on the population size. This information is necessary for the decision on the modalities of future work in genetic improvement (reliance on imported genetics, national program for genetic improvement, and a combination of both).

Other Cattle Breeds

The Swiss Brown breed is well-adapted to Armenian climatic conditions. It has been used in the improvement of the Caucasian Brown breed for decades. For this purpose, the semen of Swiss Brown bulls was imported from the United States and Austria.

Simmental Cattle are increasingly used in Armenia as they have shown high productivity. In 2007-2008 more than 600 Simmental pedigree calves were imported from Austria into Armenia and their milk productivity during the first lactation was 4,500 kg with 3.95% fat. Today, pedigree farms have been formed in Armenia; they include more than 500 pure-bred animals.

Sheep

Bozakh Breed

The breed was developed in the mountainous regions of Armenia and Azerbaijan. Animals have a broad tail, consisting of two half-open lobes and a little appendage. They are fairly large: live weight is 45-55 kg for ewes and 65-75 kg for rams. Lambs weigh 3.3-3.5 kg at birth and 20-22kg at weaning. Bozakh sheep have the following measurements: height at withers 61.7 cm (range 53-71 cm), chest girth 86.6 cm (range 73-102 cm), and chest depth 28.5 cm (range 24-33 cm). Rams and

ewes are mainly polled (lacking horns). The facial profile is straight; the head is covered with short wool. The belly covering is good. The wool colour is chiefly dirty white or yellow-white but sheep with brown, light tan, grey or black colour are occasionally seen. In most cases the head and legs have some shade of brown;

Annual wool yield is 1.8-2.2 kg, with a clean wool yield of 75-80 percent. The wool is lustrous. It contains 32.4 percent of true wool, 17.8 percent of intermediate fibres and 49.8 percent of guard hair. The average fibres length on the sides is: true wool 8 cm; intermediate hair 10 cm; guard hair 12 cm; and short guard hair 5 cm; fibre diameter is 29.9 μ , 38.7 μ , 61.2 μ and 84.7 μ , respectively. Milk production is satisfactory: 36-38 kg of marketable milk annually.



Karabakh Breed

Karabakh sheep are mainly raised in Nagorno-Karabakh and the Armenian south (Zangezour). They are a coarse-wool breed of the mutton-wool-milk type. Karabakh ewes are hornless, and rams can be horned or hornless. The head is covered by short wool. Ear length varies greatly; there are sheep with long, short or no ears. These sheep are of medium size, extremities are thin and dry, adult live weight for rams is 70-80 kg, and that of ewes is 50-55 kg. Wool yield is 3-3.6 and 2.4-2.8 kg, respectively for rams and ewes. Their pure wool yield is 70-75 percent.

Armenian Semi-Rough Wool Sheep

This semi-rough wool, meat and milk breed has been developed in 5 regions of the country. It was created by crossing, followed by within breed selection. There are two types; Aragats and Martuni. The first stage of the breed creation (1931-1952) was conducted in the Alagyaz sheep breeding state farm in the Talin region. The ewes of local rough-wool Balbas breed were crossed with American Rambouillet and English Lincoln rams. The improvement of the crossbred animals resulted in the Aragats type, with semi-rough wool. The Aragats type is characterised by a strong conformation, with a semi-rough white wool cover of homogenous thick/dense even staple fibre yarn. The annual wool yield of the Aragats type is 3.4-3.5 kg, with 64-65 percent pure wool yield. The natural length of wool of rams is 13-15 cm, and that of ewes is 11-12 cm. The live weight of rams is 85-110 kg, and that of ewes is 55-58 kg. The meat productivity is high, with a pure meat yield of 53-56 percent, and 103-115 lambs per 100 mothers. The milk yield is 100-110 kg, annually.

In the second stage of breed creation (1952-1956), Aragats rams were backcrossed to local ewes of the Balbas breed. This crossing and subsequent selection resulted in the Martuni type. This new type has retained the exterior features of the Balbas breed, as well as their reproductive features. It has strong carcass composition with spots of different colors on different parts of the body. This type of sheep is of medium size, with white wool. The live weight of rams varies between 70-80 kg, and that of ewes is 50-55 kg; slaughter weight is 46-52 percent. Wool yield of rams is 4-5 kg, and that of ewes is 2.3-2.7 kg. Wool length is 13-18 cm. Pure wool yield is 60-75 percent and the milk productivity is 110-120 kg annually. Reproductive capacity is 110-115 percent. This breed is well adjusted to local high mountainous conditions.



Armenian Semi-Fine Wool Sheep (Koridel) Breed

The Koridel breed was generated by crossing ewes of local rough-wool Mazeekh breed with rams of semi-fine wool breed (North Caucasian, Mountain Koridel and Lincoln).

The Koridel sheep is characterized by strong constitution, big size, high milk and meat productivity, and is well adjusted to mountainous conditions. The live weight of Koridel rams is 80-90 kg, and that of ewes is 52-55 kg. Their wool yield is 3.6-3.9 and 2.4-2.7 kg, respectively for males and females. Wool length is 12-14 cm for rams and 10-12 cm for ewes. Pure wool yield is 58-65 percent.



Balbas Breed

This breed, one of the oldest local breeds in Armenia and Azerbaijan, originated from central Anatolia. They have a relatively short body, a deep broad carcass and a straight spine. Rams weigh 75-80 kg and ewes weigh 55-60 kg. Slaughter yield is 55 percent. Wool yield of rams is 3-4 kg and that of ewes is 2-2.8 kg. Pure wool yield is 55-65 percent. The wool is white, 10-12 cm long, with abundant intermediate fibres and little guard hair (3-8 percent). Its shiny wool is highly valued for carpet making. A specificity of this breed is the shape of the tail which comprises two fat cushions sitting one on the other, with a thin shapeless bent end. The entire torso/body is white, and it has black spots near the eyes, muzzle, ears and extremities (hooves). This breed is characterized by high milk productivity, yielding 65 to 75 kg of milk. It served as the basis for developing the Armenian semi-rough breed sheep. Offspring yield of this breed is 113-116 lambs per 100 mothers.



Mazekh Breed

This breed is one of the most common breeds in Armenia, and because of its limited spread in the other Trans-Caucasian republics, it is often referred to as the Armenian breed.

In Armenia, the Mazekh breed is mainly encountered in the Leninakan, Akhurian, Artik, Aparan, Etchmiatsin, Talin, Hoktemberian, Abovian and Artashat regions. Its external look and tail do not differ from Balbas breed. The wool is usually of a brown color containing various shades. Black and grey sheep also exist. The wool is rather rough and often contains dead and dry hair. The annual wool yield is 2-2.5 kg. This breed is the second largest breed, after the Balbas breed. Rams weigh 70-75 kg, and ewes weigh 45-55 kg.



Pig

Armenian Meat Breed

The Armenian meat breed was developed in 1994 by crossing Large White sows with Welsh and Duroc boars. The F2 animals, developed through reciprocal crossing, were then inter-crossed to produce the third generation. A selection program has begun for improving meat productivity and external features.

This new breed showed good adaptability to the various natural and climatic conditions of the country, and quickly spread through all the regions of Armenia. It is found in the Armavir, Tavush, Kotayk and Aragatsotn regions as well as in the Nagorno Karabakh-Askeran region.

The live weight is 280-320 kg for boars and 220-280 kg for sows. The body length is 170-180 cm and 160-170 cm, respectively, for males and females. A female gives birth to 9-12 piglets which, under intensive feeding, can reach 100 kg in 180-195 days; with an average daily growth of 620-650 grams.

Large White, Landrace, Welsh, Duroc and Ukrainian breeds were often used by collective farms for the improvement of local breeds.



Mountain-Forest Breed

The Mountain-Forest breed is also well adapted to local conditions. It is raised mainly in the north-eastern regions of the country. This breed was developed by crossing local pigs with the Large White breed. For nine months of the year they are kept in forests, and for the three winter months they are kept in stationary conditions. This is an invasive breed which causes ecological damage by digging holes under trees roots.



2. Matching AnGR with production systems

Breeding programs will cover, exclusively, autochthonous breeds and locally adapted ones. Therefore, breeding programs will be developed for the Caucasian Brown Cattle in the two production systems – lowland (crop-livestock) and mountainous (pasture based); for the local sheep breeds, with an emphasis on milk production; and for the two local pig breeds.

Breeding programs will be established and carried out with the full participation of farmers, breeders and owners of herds and flocks. The implementation of programs will require the use of up-to-date techniques and methods in: animal identification, register of farms participating

in breeding work, performance recording and genetic evaluation. Gradually, parallel with the development of molecular techniques, other methods, such as genomic evaluation, will also be introduced in order to increase efficiency and decrease costs.

Decisions on breeds, as presented in this Strategy, take into account the fact that the attainment of production targets set in the Agricultural Strategy also requires the introduction of trans-boundary highly productive breeds of cattle (Holstein, Simmental or Red Spotted). In view of the small population size, as well as the costs of progeny testing and other related activities, it is proposed to follow the example of other countries with similar conditions, that is, to rely on bull semen - or eventually bulls for A.I. station - to ensure genetic improvement.

Cattle

Breeding programs for cattle will cover, exclusively, the Caucasian Brown breed. The program aims at the fastest, most economic and sustainable improvements of productive traits and parallel maintenance and improvement of functional traits, particularly robustness and adaptability to local environment.

Caucasian Brown Breed

Although this breed is well adapted to the climatic conditions of Armenia, some traits need to be improved, while at the same time maintaining its strong hooves and ability to use mountainous pastures. Particularly, it is necessary to improve milk productivity and the udder, since the udder indexes are low (39-40%); the udder and teats are not well fitted to the automatic milking process.

In plain and foothill regions, milk production traits will be improved by crossing with the Swiss Brown. The proportion of Swiss Brown blood will increase in future generations, parallel with intensification of production. The breeding program may envisage *inter se* mating of the new composite breed. Up to 25 percent of Holstein blood will be used.

In mountainous regions, locally produced bulls of improved Caucasian Brown (e.g. progeny tested F1 crosses of local cows and Swiss Brown bulls) or dairy types of original Austrian Braunvieh or Italian Bruna Alpina breed will be used to increase the quantity of milk, to maintain specific quality of milk of the Brown cattle for cheese production and to maintain robustness.

Holstein Cattle Breed

There will be no specific breeding program for Holstein cattle in Armenia. The maintenance and development of the Holstein population in the country will rely on adequate genetics available internationally. However, good locally produced and tested bulls can be used for natural mating in specific conditions.

Simmental Breed

The imported Simmental breed should be subjected exceptionally to pure-breeding. Genetic improvement of this breed will rely on programs in the countries of origin (imported semen or bulls), but the best locally produced and tested bulls can be used for natural mating in specific conditions. The Simmental – Red Spotted breed is raised with the aim to preserve their milk and meat traits by controlled reproduction, and the young animals will be supplied to the agricultural farms of Armenia. The Simmental breed could be bred in mountainous regions, as well as in the foothills and plains.

Swiss Cattle Breed

Since 2007, Swiss pedigree calves were imported from Austria into Armenia and their population will be increased in the future. During the first lactation, these cows are able to produce 4000-4500 kg of milk. The pedigree nucleus will be formed by the imported Swiss breed animals and

the young animals will be delivered to farmers and rural households in Armenia. The bulls raised by the breeding farms will be used for improving the cattle herds in the mountainous areas and foothills of Armenia.

Sheep

The breeding work in sheep will concentrate exclusively on local breeds, particularly those with the potential for increased milk production (e.g. Armenian semi-rough wool, Balbas). After a survey of the production and other traits in flocks in selected regions, a nucleus flocks will be established with a view toward selecting the best individuals for reproduction (rams for A.I. and natural mating). There will be separate breeding programs for each breed, but they may be reduced to cover the most promising breeds or breeds with the largest numbers of animals. The introduction of crossbreeding between local and exotic breeds and between local breeds will be tested on an experimental basis, in a limited number of flocks.

Pigs

The Armenian meat breed will continue to be the main breed in the country. However, in view of the likely establishment and development of industrial pig production, based on composite lines and hybrid developments that have taken place in other transition countries, where locally improved meat breeds of pigs lost the battle against more productive hybrids and lines, may also occur in Armenia. In this case, the role of the Armenian meat breed could be reduced to that of a breed for lower to medium input production systems oriented toward supplying rural families with fresh and cured pork, with only a marginal role in the national market. A cost-benefit analysis should show whether a separate breeding program for this breed is justified or whether improvements could be made through other measures.

Research work will be undertaken to explore options for the future of the Mountain Forest breed and its economic potential. The breed may represent a base for production of organic and ecological pork. However, in view of its negative impact on forests, it may be abandoned as a breed of economic importance and reduced to being a rare breed under conservation.

3. Breeding programs

This chapter outlines the main features and elements of detailed breeding programs, for the relevant species, breeds and specific production systems.

Breeding program for cattle production in crop-livestock system in lowlands and foothills

Breeding programs for Caucasian Brown cattle in the crop-livestock system in lowlands and foothills will encompass the Ararat valley and Ararat foothill zones. The program will aim at creating a dairy type of Caucasian Brown adapted to a medium to high input (e.g. seasonal grazing combined with zero grazing) production system. Activities within the program will include:

- Establishment of nucleus herds composed of larger farms and several small farms; nucleus herds will be established on the basis of production (declared by the owner, and documented by an external control) and conformation;
- Insemination of cows from the nucleus herds with imported semen of selected Brown Swiss bulls on the basis of a precise mating plan;
- Establishment of the herd book of the Caucasian Brown Cattle breed;
- Identification, characterization/registration and performance control of newborn calves in nucleus herds;

- Establishment of a herd of potential bull mothers, on the basis of performance recording and evaluation of F1 heifers;
- Carrying out of progeny testing of F1 bulls Caucasian Brown X Brown Swiss for use in A.I. and natural mating;
- Upgrading of the existing facilities and equipment, or establishment of new facilities for bull semen storage and distribution;
- Definition of the need, time-frame and modalities for the reconstruction of the existing or construction of the new bull center; and
- Extension of the genetic improvement activities program, during the second stage, to farms and holdings which do not participate in the breeding program

Inseminating larger numbers of Caucasian Brown cows with the imported semen of Brown Swiss bulls will result in a F1 generation with a higher milk yield in the largest possible number of holdings and farms. F1 heifers could be inseminated with F1 bulls or with Swiss Brown bulls in order to obtain crosses with 75% of Swiss Brown blood.

Breeding program for cattle production in pasture based system in hilly and mountainous zones

Breeding programs for the Caucasian Brown in pasture-based system in hilly and mountainous areas will be implemented, in its initial phase, in the Lori-Pambak, Shirak and Sevan Basin agro-ecological zones. The programs will include:

- Establish nucleus herds on the basis of selection of holdings and best cows;
- Register selected cows in the herd book;
- Introduce the system of identification and recording of registered cows;
- Ensure the insemination of registered cows on the basis of their production traits, with the semen of bulls of European brown breeds (Austrian Braunvieh, Italian Bruna Alpina, original Schwytz) or the semen of F1 bulls produced by the above scheme;
- Organize identification, registration and recording of F1 calves;
- Organize progeny testing of crossbred (F1 or other type) bulls; and
- On the basis of performance recording, establish a herd of potential bull mothers.

At a later stage, the program may envisage *inter se* mating and further improvements through within-breed selection. However, it may be of interest to foresee pure breed selection of Caucasian Brown in these zones. The detailed breeding plan for the improved Caucasian Brown Cattle breed for hilly and mountainous zones in pasture-based production system will determine the type of bulls needed to attain higher milk production, parallel with the maintenance of robustness and ability to use pastures.

Swift results in the improvement of milk production in mountainous zones could also be attained by coverage of the largest possible number of cows with A.I. and/or the introduction into the system of licensed bulls for natural mating. For this, it would be necessary to ensure the full participation of local communities, municipalities and individual owners and farmers to eliminate random mating by the implementation of a set of measures. These measures may include; separation of males from females in pastures; obligatory or voluntary castration of males above a certain age supported by premium for castrates; and introduction of a premium for young males sold for harvesting or fattening. It is necessary to predict the required number of bulls for natural mating in remote villages in mountainous zones without access to A.I. services. The whole process could be coordinated by SCHLV and controlled by the Livestock Department of the Ministry of Agriculture.

Breeding programs for sheep in pasture-based systems

The genetic improvement of local sheep breeds will be based on within-breed selection for traits of economic importance. Programs will aim at maintaining and strengthening robustness, ability to use pastures, disease resistance and fertility. Forseen actions include:

- Identification of criteria for selection of flocks and farms for participation in breeding programs;
- Establishment of nucleus herds;
- Identification of animals in nucleus herds;
- Performance recording;
- Herd book keeping;
- Definition of selection criteria;
- Definition of selection and mating policies; and
- Dissemination of improved genetics.

In addition to straight breeding programs for selected breeds, well-defined experimental and research work will be undertaken to explore possibilities for increased milk production and carcass quality by the introduction of crossbreeding, or by the creation of new composite breeds.

Breeding program for pigs in crop-livestock systems

Subject to the outcome of the evaluation of future developments in pig production, a special breeding program will be developed for the Armenian meat pig. It will include improvements in economic traits and maintenance of its level of adaptation to local conditions.

SECTION C: ASSIGNMENT OF RESPONSIBILITIES AMONG STAKEHOLDERS INVOLVED

Stakeholders involved in the implementation of this Strategy are:

- Farmers and herders;
- Research, academic and scientific institutions;
- Field extension service; and
- Ministry of Agriculture.

Farmers and herders will:

- Actively participate in the implementation of the breeding program;
- Ensure good conditions for feeding and care of animals;
- Follow advice and instructions provided by experts from the Scientific Center for Livestock, Husbandry and Veterinary – State Non-Commercial Organization (SCLHV SNCO); and
- Facilitate and/or participate in animal identification and recording.

The Scientific Center for Livestock Husbandry and Veterinary – State Non-Commercial Organization will be in charge of the implementation of this Strategy.

In order to ensure the efficient implementation of the Strategy, tasks of the SCLHV shall be expanded so as to include:

- Characterization of the existing cattle, sheep and pig populations;
- Identification and registration, including registering of households keeping farm animals;
- Recording and genetic evaluation of animals;
- Keeping of the herd book;
- Organization of an SCLHV A.I. Center for cattle (a bull center and/or deposit of frozen semen);
- Support of the establishment of A.I. for sheep and pigs; or
- Support to the private sector in the organization of an A.I. Center.

The SCLHV SNCO will develop, on the basis of national knowledge and experience, specific breeding programs for cattle, sheep and pig breeds which have economic importance for the country. This will be done in cooperation with potential donors and FAO. A detailed work plan and budget will also be developed.

The SCLHV SNCO will establish at least two regional offices in areas that are included in the implementation of breeding programs for Caucasian Cattle and sheep.

The Agricultural Academy will provide scientific recommendations and guidance to all stakeholders involved in the program. This will include recommendations on issues relating to the successful implementation of this Strategy into its medium to long term research program.

The Ministry of Agriculture will establish an agricultural advisory service, this will be carried out at the national level and in all Marzes. The establishment of field units in Marzes can be undertaken gradually, in accordance with the volume of agricultural-livestock production. In regard to livestock, it may function as a special branch of the SCLHV. Services provided to licensed pedigree farms included in the implementation of national breeding programs should be paid by the state. In the future, farmers and herders, as end users and direct beneficiaries of genetic improvement of farm animals, will cover the operational costs of these services.

The Ministry of Agriculture will also re-define the role of the Livestock Breeding and Pedigree Department as the unit in charge of the control and inspection of all structures and bodies involved

in the implementation of the state policies, laws and regulations related to livestock breeding, including the implementation of this Strategy.

The Government and its bodies will encourage the establishment of breeders' or breed associations as representative bodies of producers and as business support organizations. For the implementation of this Strategy, two cattle breeders' association in regions and agro-ecological zones will be established. They will also support the development of breeders' and producers' associations as providers of services (marketing, supply of feed, A.I. and others) and undertake the gradual transfer of breeding services from state institutions to these associations.

National research-academic institutions will take an active part in the formulation and implementation of breeding programs for cattle, pigs and sheep. They will produce studies on the need for special pig breeding programs in the country and carry out experimental work on the use of exotic breeds in the improvement of sheep milk and mutton production. They will also include in their regular research program studies on the characterization (both phenotypic and molecular) of the present population of farm animals and on the introduction of modern technologies (genomics, information system, etc.) in animal husbandry.

The Ministry of Agriculture and SCLHV SNCO will initiate and support the upgrading of the technical knowledge of national experts involved in the implementation of this Strategy. They will support international cooperation, exchanges of experience with experts from other countries, participation in international organizations, and professional and scientific events concerning matters covered by this Strategy.

SECTION D: DECISION ON INVESTMENTS

The costs of the implementation of the Strategy include a number of items that will have to be covered by the State. Some costs, such as costs for the implementation of cattle breeding programs, could be covered by external donors and partners. For this reason, the Government will request FAO and potential donors to support the Ministry of Agriculture and national bodies in the implementation of the Strategy.

The highest expenditures, to be covered by the State, are required at the beginning of the implementation period. At the later stage, many measures foreseen in the Strategy, such as A.I., animal recording, genetic evaluation, and advisory inputs, will become regular costs of production and will be covered by producers.

The Government will ensure the adequate funding of measures envisaged in the Strategy, in particular:

- Characterization of the existing breeds included in the programs designed for the implementation of the Strategy; and
- Preparation of breeding programs for cattle, sheep and pigs, by providing for;
 - Establishment of an animal identification and registration system; at the beginning, the system could cover farms and households participating in the breeding programs (pedigree farms);
 - Establishment of agricultural advisory and extension services;
 - Development of animal recording and genetic evaluation adjusted to country conditions and production systems.
 - Establishment of herd books (pedigree); and
 - Support of development of A.I. of cattle, sheep and pigs.

The detailed work plan and budget of each breeding program will be developed by SCLHV SNCO and submitted to the Ministry of Agriculture for approval. Benefits of the implementation of this Strategy will be spread to all citizens of the Republic of Armenia:

- Increased volume of production, income and profits of livestock producers;
- Increased production will require more workers on farms, processing industry, transport and distribution;
- Improved genetic material as a science and knowledge based activity will require more qualified experts and workers and more research;
- Higher-quality products at affordable prices;
- Increase in entries into the budget from increased profits and turnovers;
- Significantly reduced import expenditures for livestock products; and
- Increased export earnings.

Annex 1

LIST OF TASK FORCE MEMBERS

The Strategy for Sustainable Use and Development of Farm Animal Genetic Resources was produced by the National Task Force, the membership of which is shown as follows.

Leader:

Ashot Hovhannisyan

Head of the Department of Animal Husbandry, Ministry of Agriculture

Ministry of Agriculture:

Baghdasar Kghmesyan

Head of Administration of Pedigree Stock Breeding

Slava Balayan

Chief Specialist of Division of Counting Farm Animals

Farmers' National Association of Armenia:

Roza Tsarukyan

Vice President

Research Institute:

Garnik Giloyan

Professor, Armenian State Agrarian University

Extension service:

Ararat Manukyan

Annex 2

IMPLEMENTATION OF “NATIONAL STRATEGY FOR SUSTAINABLE USE AND DEVELOPMENT OF FARM ANIMAL GENETIC RESOURCES”: A CONCEPT NOTE FOR THE DEVELOPMENT OF BREEDING PROGRAM FOR CAUCASIAN BROWN CATTLE IN THE REPUBLIC OF ARMENIA

1. Background and justification

The Government of Armenia, in collaboration with producers' associations and research and educational institutions, with the support of FAO, developed the National Strategy for Sustainable Use and Development of Farm Animal Genetic Resources (the Strategy). The Strategy elaborates measures for the establishment of a modern breeding program based on private ownership of livestock, participation of farmers and livestock owners, with a supportive role for the state and its institutions.

The Strategy recognizes the need to increase the output of animal products (milk, dairy products, meat and meat products), and has identified and prioritized the production systems and the species and breeds of animals. The breeding of these species and breeds has vital development prospects in the Republic of Armenia.

Priority has been given to the cattle sector in view of its economic and social importance, and the growing demand for cattle products.

This concept note presents a cattle breeding program, based on the existing breed population. The program will contribute to an increased income for farmers and herders, and will serve as a decisive component of livestock development within the framework of the Strategy.

1. Breeding program

Caucasian Brown breed

Among the cattle breeds of Armenia, the Caucasian Brown breed is of great economic, social and cultural importance. It was created by crossing the local Caucasian Cattle with bulls of the Swiss Brown breed and by long-term selection work. This breed accounts for approximately 93 percent of the cattle population in the country, and therefore greatly contributes to national food security and economy. To meet the surging demand for milk, milk products, meat and meat products, it is necessary to increase the productivity of the Caucasian Brown breed through the implementation of a comprehensive breeding program.

Target group

The target group is farmers and herders interested in increasing the productivity of their Caucasian Brown cattle. The target farmers are those producing cattle in crop-livestock systems in the lowlands and foothills, who supply urban centres and the processing industry with fresh milk. One-third of the cattle population of the country is located in these zones, which have the basic prerequisites for an increase in milk production and the preconditions for the development of an intensive dairy sector. The other target group is villagers and small farmers producing milk for local consumption and for the production of specific traditional and local products for urban markets in hilly and mountainous zones.

Breeding objectives

The objective is to increase milk production while taking account other traits (e.g. robustness, health, longevity and fertility) in which the target group has shown an interest.

Program design

The program is to be conducted in two phases.

Phase 1: Upgrade local Caucasian Brown breeds through crossbreeding with imported semen of progeny-tested sires of the Swiss Brown breed, and establish high-productivity herds of the new Caucasian Brown breed.

Phase 2: Initiate a within-breed selection (or straight breeding) program for the newly constituted population and produce high-performance cattle.

2. Roles and responsibilities

The program will be implemented by farmers, their associations and organizations, research institutions and the Government of Armenia (Ministry of Agriculture).

Farmers

Farmers are the key actors. They will:

- Actively participate in the implementation of the breeding program;
- Ensure good conditions for feeding and care of animals;
- Follow the advice and instructions provided by experts from the Scientific Center for Livestock Husbandry and Veterinary – State Non-Commercial Organization (SCLHV SNCO) regarding the reproduction, nutrition and health of animals included in the nucleus herd; and
- Facilitate and/or participate in animal identification and performance recording.

Farmers' associations and organizations

Farmers participating in this program will be assisted in establishing breeders' associations. These associations will gradually take up the technical activities related to herd improvement, dissemination of information, organization of dissemination and sale of pedigree material, and represent the interests of their members in contact with other institutions.

Research institutions

The Scientific Center for Livestock Husbandry and Veterinary – State Non-Commercial Organization (SCLHV SNCO) will be in charge of the coordination of this program. The Center will work closely with the farmers, their associations and organizations, and the Government. It will:

- Ensure technical and professional support to farmers constituting the nucleus herd, and to villagers and small farmers whose animals form the base population of the Caucasian Brown;
- Carry out or arrange for animal identification and recording;
- Carry out or arrange control of artificial insemination and natural mating in nucleus herds;
- Arrange or assist in the establishment of a distribution system of sires from the nucleus herd to villages in selected Marzes and regions; and,
- Implement the external assistance components of the program.

Government – Ministry of Agriculture

The Government of the Republic of Armenia will:

Ensure financial support and incentives to producers (farmers and villagers) participating in this program, as part of its overall policy of support in the development of animal production and the attainment of strategic policy objectives:

- Ensure adequate staffing and work space for the Marz Agriculture Support Centers (MASC) and regional implementation units;
- Ensure salaries for SCLHV SNCO and MASCs staff and office overheads (indirect costs), enabling them to establish more frequent contact with the farmers and provide extension services to them ;
- Provide offices, locations and adequate space for a data storage and data processing units (computer centre);
- Provide locations and adequate laboratory space for milk analysis, as required;
- Nominate a National Project Director and a steering committee;
- Ensure funding for the system of genetic improvement of cattle once the external financial assistance has been terminated; and
- Transfer the system to breeders' association and/or other organizations gradually.

3. Project activities

Activities within the project will be based on a participatory approach to promote national ownership of the project, and to ensure the widest possible involvement of the main beneficiaries and supporting agencies.

Nucleus herds composed of 10 to 15 larger elite farms and some smaller farms with above-average genetic material and production will be established.

Ararat valley, Lake Sevan Basin and Kotayk and Lori Marzes will be included in the project.

Target population size is a minimum of 3,000 cows.

Insemination of the cows in the nucleus herds with imported semen from selected Swiss Brown bulls that best match the established breeding objectives.

The new Caucasian Brown breed population developed in the previous step will constitute the base population for the straight breeding program.

A herd book will be established for the new breed of the Caucasian Brown cattle.

Animal identification and performance control will be implemented in nucleus herds.

Mechanisms for the distribution of improved materials will be established, including auctions, cow shows, as well as competitions and awards for best breeders.

4. External assistance required

Technical assistance

Although limited in number, the country is endowed with highly qualified professionals in cattle breeding and genetics. However, professional advice from external experts with experience in the design and implementation of cattle breeding programs in the conditions of a market economy will contribute greatly to the quality of the success of the work and to the rational utilization of the available resources. The disruption of practical work in this field and the lack of contacts with professionals from other countries – mainly due to the lack or scarcity of financial resources – impose the need to enhance familiarity with new technologies in animal identification, performance recording and genetic evaluation. Technicians and professionals in charge of the cattle breeding

program need to refresh their knowledge and acquire new skills in the use of new technologies through training and study tours. On-the-job training of young professionals is required. The latter may take place in institutions and organizations in the donor country.

Technical assistance is required in the following fields:

- Animal identification
 - Selection and use of identification tools and systems;
 - Practical on-farm implementation;
 - Registration of farms and animals;
 - Monitoring and control of animal movement;
 - Use of identification in breeding; and
 - Use of information technologies in animal identification.
- Milk recording
 - Selection of recording methods and tools; and
 - Storage and processing of data.
- Cattle classification
 - Local expertise and experience in this field needs to be combined with standards approved by international organizations of breeders of Brown Cattle and the International Committee for Animal Recording (ICAR).
- Design of breeding program and mating plans. This could include development of criteria for the selection of cows and farms for the participation in the breeding program.
- Supply of equipment and material
 - Animal identification
 - o Tags and tools for identification;
 - o Computer system for database (animal registration and register of farms) and for the control of animal movements; and
 - o Software for a register of farms and animals and for control of animal movements.
 - Performance recording and genetic evaluation
 - o Milk meters (scales, jars, and electronic milk meters);
 - o Tools and equipment for milk sampling;
 - o Computer system and software for data storage and processing;
 - o Software for genetic evaluation; and
 - o Vehicles for field technicians.
 - Milk analysis
 - o Equipment for the central milk analysis laboratory (or five mobile units with instruments for analysis of milk).
 - Herd book keeping (pedigree register)
 - o Computer system and software for herd book keeping.
 - Artificial insemination
 - o Central storage – deposit – of frozen semen;
 - o 5 regional deposit centers;
 - o Appliances and instruments for artificial insemination for field technicians/ inseminators;
 - o Vehicles for inseminators; and
 - o Minimum 40,000 doses of frozen semen from proven bulls

5. Tentative budget

Seven years is the minimum period for the implementation of the project. At this stage, it is not possible to cost all necessary expenditures. However, it can be estimated that the total costs of the project would be around US\$1,000,000. It should include the following:

Item	Amount (\$)
Personal services	100,000
Travel	70,000
Equipment and material	700,000
Training	30,000
General operating expenses	100,000
TOTAL	1,000,000

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NATIONAL STRATEGY
FOR SUSTAINABLE USE AND DEVELOPMENT
OF FARM ANIMAL GENETIC RESOURCES