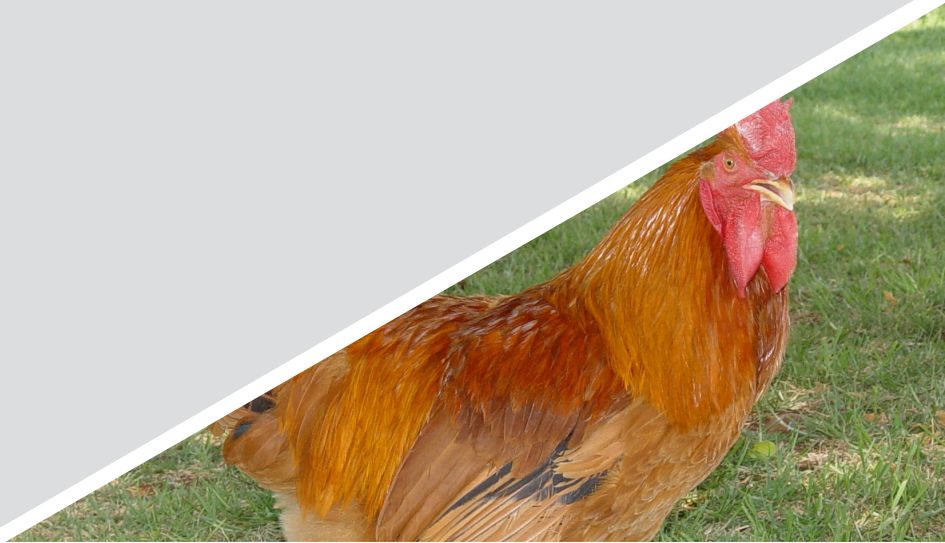


NATIONAL PLAN FOR CONSERVATION AND SUSTAINABLE USE OF FARM ANIMAL GENETIC RESOURCES



agriculture,
forestry & fisheries

Department:
Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

Report submitted for the **2015/16 Strategic Output** of the Department of Agriculture, Forestry and Fisheries. South Africa

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March, 2016



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1. SUMMARY

The National Plan for Conservation and Sustainable Use of Farm Animal Genetic Resources (The National Plan) is initiated by the government of the Republic of South Africa through its Department of Agriculture, Forestry and Fisheries (DAFF). This National Plan is in response to a call of the Food and Agriculture Organization for countries to implement the Global Plan of Action for Animal Genetic Resources. The National Plan provides goals and strategies for the conservation and sustainable use of farm animal genetic resources for food and agriculture during the period of 2015 to 2019.

2. DEFINITIONS

Animal Genetic Resources: The Convention on Biological Diversity (CBD) defines genetic resources as any material of plant, animal, microbial or other origin containing functional units of heredity. For the purposes of this document, animal genetic resources are understood to be material from farm and food-producing animals (farm animals).

Breeds: In contrast to populations, breeds are not exclusively genetically but also geographically, regionally, morphologically and otherwise defined animal groups of one species. Breeds can be part of one population (subpopulations) or a mixture of multiple populations (synthetic or pure breeds) used in breeding activities. In the context of conserving (animal) genetic resources, genetically related breeds must be regarded as one.

Effective population size (N_e): Effective population is a term used in population genetics and defined as the total number of male and female breeding animals in an idealised population that is expected to have the same rate of inbreeding and associated allele loss as the breeding population under study.

Ex situ conservation: The CBD defines ex situ conservation as the conservation of components of biological diversity outside their natural habitats. Except for the keeping of small animal groups in zoos and domestic animal parks, this means cryo-conservation of embryos, gametes, cell cultures and DNA in appropriate gene banks under laboratory conditions.

Indigenous breeds: According to the Animal Improvement Act (Act No.62 of 1998) a breed is defined as “indigenous” if the original herd-book was established in South Africa and has been maintained ever since. A breed can be acknowledged as “indigenous” by the responsible authorities, if the herd-book was not established in South Africa but the only herd book for the breed is maintained in South Africa and a breeding programme is carried out or a herd-book has been maintained since 1949 in South Africa and a separate breeding programme is carried out.

In situ conservation: According to the CBD, this means the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.

Landraces (local breeds, regional breeds): These are breeds with small population sizes or animal groups found in specific regions or ecological niches. They are often the remainder of a former larger local breed which, owing to prevailing environmental conditions or less efficient breeding programmes, has fallen behind in performance compared with intensively bred farm animals. These breeds therefore deserve particular attention in programmes designed to conserve animal genetic resources.

Population: In animal breeding, a population is more or less defined as a closed mating community, i.e. groups of animals that regularly contribute to a common gene pool. The members of one (breeding) population are therefore more closely related than members of different populations. Breeding lines and even inbred lines are special populations which provide the genetic resources for commercial breeding programmes. Breeding lines can show marginal genetic variability, something that happens by default in inbred lines.

Sustainable use: In terms of genetic diversity in farm animal breeding, sustainable use is defined by the CBD as the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations. As genetic diversity encompasses both genetic variability within and between populations and breeds, this definition calls not only for the conservation of endangered breeds, but also for the management of genetic variability within presumably larger production populations as part of a sustainable management programme.



Chapter 1

INTRODUCTION

Agricultural biodiversity includes all components of biological diversity relevant to food and agriculture, the components of biological diversity i.e. the variety of animals, plants and micro-organisms which are necessary to sustain the key functions of the agro-ecosystem, its structure and processes. It is widely reported that animal genetic resources for food and agriculture are an essential part of the biological basis for world food security, and contribute to the livelihoods of over a thousand million people. According to the *State of the World's Animal Genetic Resources for Food and Agriculture* prepared by FAO's Intergovernmental Commission on Genetic Resources for Food and Agriculture, the full potential of animal genetic resources is far from being realised and these genetic resources face serious erosion in both developed and developing countries. This erosion is caused by changes in production systems, disease outbreaks, inappropriate breeding policies and practices, inappropriate introduction of exotic breeds, to name but a few. Erosion of animal genetic resources threatens the ability of farmers and livestock keepers to respond to environmental and socio-economic changes, including changing diets and consumer preferences.

As early as in 1990, the Council of the Food and Agriculture Organisation of the United Nations (FAO) recommended the development of a global strategy for sustainable use of animal genetic resources. Subsequently, the so-called State of the World's Animal Genetic Resources (SoW-AnGR), based on national reports was prepared. This State of the World Report was published during the Interlaken Conference in 2007. During this conference, delegates from 109 countries also adopted a Global Plan of Action for Animal Genetic Resources (The Global Plan). The Global Plan reflects national, regional and international priorities for action and is the first internationally agreed framework to halt the erosion of livestock diversity and support the sustainable use, development and conservation of animal genetic resources. The main responsibility of implementing the Global Plan of Action for Animal Genetic Resources rests with national governments .

At the United Nations Sustainable Development Summit held on 25 September 2015, world leaders adopted the 2030 Agenda for Sustainable Development, which includes a set of 17 Sustainable Development Goals (SDGs) to end poverty, fight inequality and injustice, and tackle climate change by 2030 Sustainable Development Goal number three aims "to end hunger; achieve food security and improved nutrition; and promote sustainable agriculture". One of the activities identified in achieving this goal is to maintain genetic diversity of seeds, cultivated plants, farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at national, regional and international levels, and ensure access to and fair and equitable sharing of benefits arising from the utilisation of genetic resources and associated traditional knowledge as internationally agreed by 2020.

It is against this background that this National Plan for the Conservation and Sustainable Use of Animal Genetic Resources has been developed, in order for South Africa to determine its own priorities in light of those agreed in the Global Plan of Action for Animal Genetic Resources and within the framework of the country's needs for food and agricultural development needs



CHAPTER 2

LEGAL FRAMEWORK FOR MANAGING ANIMAL GENETIC RESOURCES IN SOUTH AFRICA

2.1 Introduction

While organised farm animal breeding associations have existed for more than 100 years, targeted and efficient production-based selection has been applied for the last 50 years, only a result of the growth in wealth since World War II. Advancements in biotechnology with artificial insemination (AI) and embryo transfer (ET), and in animal breeding with data processing, index selection, commercial cross and hybrid-breeding have led to a rapid improvement of the commercially significant characteristics milk, meat and egg production in intensively managed breeding populations of cattle, pigs and poultry.

Breeding is now focused on a few economically important performance traits of high market value, e.g. meat proportion, milk volume, egg numbers, while many of the characteristics that concern farmers, such as health, fertility or longevity, carry less weight. The latter, so-called functional traits may well be more deeply rooted within the indigenous breeds. This market driven trend has led to an intensive production of a few, sometimes globally used high-output breeds, for example Holstein cattle, a number of meat pig breeds, Leghorn hens and a few broiler lines. At the same time, many of the less productive indigenous breeds have lost their importance. As a consequence, their population size continues to decrease and they become endangered. The loss of these endangered breeds comes along not only with the risk that important alleles disappear, but also that stringent selection and global use of ever fewer sires leads to an increase in inbreeding within high-output populations. This in turn means ongoing reduction and potential loss of genetic diversity and of alleles that currently are not thought useful in achieving breeding objectives. It is feared that the use of molecular biotechnology, especially with marker assisted selection, will accelerate this trend. Changes in agricultural production and in industrial product processing also render formerly important farm animal breeds obsolete, which results in their declining numbers and therefore the risk of their extinction.

2.2 The significance of animal genetic resources.

The economic value of animal genetic resources is defined by their actual and potential value. The actual economic value consists of the contribution of animal genetic resources to the agricultural value chain and to the pre- (e.g. breeding programmes) and post-production sectors (e.g. processing industry, trade). Small endangered breeds have an actual value if they contribute specific characteristics to present-day breeding programmes, e.g. disease resistances like the trypanotolerance in African N'Dama cattle, improved claw integrity and endoparasite resistance in some landrace sheep breeds, quality characteristics like the intramuscular fat content in Duroc pigs or specific suitability for cross breeding like the Hampshire to produce fertile sires. The characteristics of landraces can be important for regional niche programmes, too, as is shown e.g. in the successful marketing of Bonsmara cattle and Dorper sheep.

The potential economic value of animal genetic resources, on the other hand, is their genetic diversity itself, which one day may be used to allow for product diversification, should, for instance, product standards, environmental conditions and management methods change. It is expected that with advanced application of molecular biotechnology in farm animal breeding, useful genes that determine product quality, animal vitality and disease resistance will be found in adapted indigenous animals, making them valuable for future breeding programmes.

Great ecological and considerable economic value is attributed to farm animals used in nature protection and landscape management. This often involves landraces that have adapted to the prevailing environmental conditions. Ongoing globalisation of farm animal breeding programmes will result in breeds having to adapt to a variety of different environmental and production conditions. Animal production in marginal areas and less developed regions call for animals that differ genetically from the dominating populations in intensive production systems in South Africa, and are rather bred from well-adapted landraces.

Breeding and husbandry of poultry and other species used in agriculture also have to be considered from this aspect. In organic farming, new and sustainable methods to use indigenous breeds in production can be developed. At present, organic farming, too, is dominated by high performance breeds. By using genetic resources from highly endangered local breeds, some farmers



seek to maintain healthy animal stocks because it is assumed that indigenous breeds can cope with the conditions in organic agriculture better than high-performance breeds and thus have a clear advantage. Unfortunately, the many benefits of endangered breeds are often enough outweighed by their low performance, which makes them unsuitable even in organic farming. Therefore, performance under the conditions in organic farming has to be improved based on the genetic material from endangered old breeds.

Farm animal breeds that have evolved over time and most traditional livestock management systems can be regarded as cultural and historical achievement of our forefathers. They are, therefore, to be valued as “cultural heritage of humankind” and have to be saved from disappearing for education and demonstration purposes. In a society focused on leisure time and tourism, this becomes more important in less economically developed regions where the display of historical landscapes, old methods of farming and handicrafts and past lifestyles in natural history museums, domestic animal parks and museum villages attract visitors and tourists.

2.3 Breeding of animal genetic resources in South Africa.

The importance of seed stock in the livestock industry is stemmed from the principle that the entire South African population benefits from the genetic improvement in producing herds. This is only possible if the industry is participating in recording and improving schemes on a national basis. The superior genetic material that is bred in the herds is distributed throughout the total animal population.

Most of the breeding associations in South Africa and many insemination centres, too, have the legal form of voluntary association or co-operative. Some insemination centers and embryo transfer institutes are private companies or limited companies and can also be special purpose associations. Breeding associations alone are authorised to carry out pure-breeding programmes. Breeding companies are a special form of breeding organisations under the Animal Improvement Act in the country. These private companies may only operate cross-breeding programmes. In South Africa, South African Stud Book and Livestock Improvement Association (SASB), is the only entity approved for breeding purposes under the Animal Improvement Act. The SASB is recognised by the International Committee for Animal Recording and is the organisation providing herd prefixes and suffixes to the pedigree livestock sector. SASB is the registering authority for 123 breeds of registered or recorded dairy cattle, beef cattle, sheep, goats, horses, pigs, dogs, alpacas and ostriches and thus can be considered as representing the majority of the seed stock industry. That is to say, with respect to animal genetic resources, that only breeding association can keep an officially approved herd-book and thus operate a breeding programme for a specific breed.

Though some breeding associations are authorised to operate nationwide, the area of activity of a breeding organisation is generally confined to a specific region. This may have the unwanted effect that several breeding organisations in different provinces keep a herd-book for one and the same breed. Breeding associations approved in accordance to the Animal Improvement Act can naturally deal with more than one breed, though they have to keep a separate herd-book for each breed. The breed association is recognised in terms of legislation as custodians of their respective breeds and is responsible for the standards that govern identification, recording, evaluation and improvement. They are a source of information for performance specifications, sales, standards, exports and imports. In addition they collect and record the ancestry of all animals in the breed in order to ensure breed purity. Breed societies provide members with a focus for breed promotion through sales, field days, demonstrations, conferences and advertising.

2.4 Legislative framework.

2.4.1 International instruments

In order to set up internationally binding treaties and conventions for the protection of the environment, the United Nations (UN) chose to hold a UN Conference on Environment and Development (UNCED) in 1992, otherwise known as the “Earth Summit” or “Rio Conference”. The conference resulted in five important documents:

- Rio Declaration on Environment and Development.
- The Forest Principles.
- The Convention on Climate Change.
- The Convention on Biological Diversity.
- Agenda 21.



The most significant regulatory framework for the conservation and use of genetic resources is the Convention on Biological Diversity (CBD). With its ratification in 1992, more than 170 signatory states have committed themselves to the conservation and sustainable use of biodiversity in their sovereign territory by developing national strategies, programmes and plans to integrate the convention's aims into their sectoral policies. A working programme for agricultural biodiversity was agreed at the Conference of the Parties (COP) in 2000.

Agenda 21, too, is of great political significance, though not a legally binding instrument. It provides a framework for sustainability which has to be filled in by the signatory nations from government level (National Plan) down to local authorities (Local Agenda 21).

In December 1992, the United Nations (UN) General Assembly established the United Nations Commission on Sustainable Development (CSD) to ensure effective

follow-up of the UNCED, i.e. to review the progress in the implementation of Agenda 21 and the Rio Declaration on Environment and Development.

The FAO plays another important role in implementing Agenda 21. In 1983, the FAO established a Commission on Plant Genetic Resources, the mandate which was expanded in 1995 to include farm animals, and then renamed "Commission on Genetic Resources for Food and Agriculture" (CGRFA). In May 1997, the Commission established a subsidiary Intergovernmental Technical Working Group on Animal Genetic Resources (ITWG-AnGR) to address issues relevant to the conservation and sustainable use of animal genetic resources for food and agriculture and to advise the CGRFA on the development and implementation of the Global Strategy for the Management of Farm Animal Genetic Resources.

The Global Plan of Action is the culmination of an extended process involving the participation of 169 countries. It was adopted by 109 country delegations at the International Technical Conference on Animal Genetic Resources, held in Interlaken, Switzerland, from 3 to 7 September 2007. The countries also adopted the Interlaken Declaration on Animal Genetic Resources, by which they confirmed their common and individual responsibilities for the conservation, sustainable use and development of animal genetic resources for food and agriculture; for world food security; for improving human nutritional status; and for rural development. They committed themselves to facilitating access to these resources, and ensuring the fair and equitable sharing of the benefits from their use.

At its Fourteenth Regular Session (Rome, 15 to 19 April 2013) the commission requested the Food and Agriculture Organization to prepare for the consideration of the Intergovernmental Technical Working Group on Animal Genetic Resources for Food and Agriculture (ITWG-AnGR) an update of The State of the World's Animal Genetic Resources for Food and Agriculture, the first authoritative global assessment of livestock biodiversity. The update was presented on the eighth session of the ITWG-AnGR, scheduled from 26 to 28 November 2014. The commission appealed to all FAO members and international organisations to provide, in a timely manner, the information required for the preparation of The Second Report on the State of the World's Animal Genetic Resources for Food and Agriculture. The FAO emphasised the importance of country report preparation and of the updating of national inventories in the Domestic Animal Diversity Information System as national strategic tools for the sustainable management of animal genetic resources for food and agriculture, and the need to establish national mechanisms to ensure all relevant national stakeholders are given the opportunity to participate in the preparation of the country report.

2.4.2 Regional instruments

An African Union initiative, under the AU-IBAR Genetic Project (Strengthening the capacity of African countries to conservation and sustainable use of African animal genetic resources), was launched in 2014. The initiative aims is to develop an African set of biodiversity indicators to assess and report on progress towards the set targets, which is to achieve a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth.



Against this background, the AU Commission adopted the “Biodiversity Action Plan for Agriculture” with the following priorities:

- Promotion and support of environmentally-friendly farming practices and systems that serve biodiversity directly or indirectly;
- Support of sustainable farming activities in areas rich in biodiversity;
- Maintenance and enhancement of good ecological infrastructures and
- Promotion of actions to conserve local or threatened livestock breeds or plant varieties.

2.4.3 National Instruments

2.4.3.1 Animal Improvement Act, 1998 (Act No. 62 of 1998)

This Act aims to provide for the breeding, identification and utilisation of genetically superior animals in order to improve the production and performance of animals in the interest of the country; and to provide for matters connected therewith.

The Animal Improvement Act focuses on the implementation and documentation of breeding animals, and governs the type and scope of performance testing and recording in compulsory breeding programmes. In addition, the Animal Improvement Act contains provisions on the implementation and use of biotechnology in artificial insemination and embryo transfer. The Act also governs the approval of breeding associations, breeding companies, insemination centers and embryo transfer institutes along with the approval of their breeding programmes, herd-book regulations (herd-book recording) and their area of activity. The responsibility for the implementation of the Act lies with the Registrar of the Animal Improvement Act of the Department of Agriculture, Forestry and Fisheries (DAFF).

2.4.3.2 Animal Improvement Policy

The Animal Improvement Policy was gazetted in November 2007. The objectives of this policy include promoting the sustainable use of Animal Genetic Resources as the major contributor to national food security and facilitating the conservation of Animal Genetic Resources for Food and Agriculture. This policy serves to guide the implementation of the Animal Improvement Act, 1998 (Act. No. 62 of 1998).



CHAPTER 3

NATIONAL PLAN FOR CONSERVATION AND SUSTAINABLE USE OF ANIMAL GENETIC RESOURCES

3.1 Introduction

In recognition of the need to develop an effective framework for the management of Animal Genetic Resources, the first International Technical Conference on Animal Genetic Resources for Food and Agriculture held in Interlaken, Switzerland in September 2007, adopted the Global Plan of Action for Animal Genetic Resources. The Global Plan of Action includes 23 strategic priorities for action to promote the wise management of these vital resources. The conference also adopted the Interlaken Declaration on Animal Genetic Resources, which affirms countries' commitment to the implementation of the Global Plan of Action and to ensuring that the world's livestock biodiversity is utilised to promote global food security and remains available to future generations. The second report on State of World's Animal Genetic Resources (SoWAnGR2) also emphasises that the effective management of farm animal genetic resources (FAnGR) is essential to global food security, sustainable development and the livelihoods of hundreds of millions of people.

This National Plan for the conservation and sustainable use of Farm Animal Genetic Resources is developed in response to the call for countries to implement the Global Plan of Action. The National Plan, with its Strategic Priorities for Action, was developed on the basis of national strategic priorities expressed in the national workshop that was held in Pretoria on 03 December 2015. Current and emerging policy issues and challenges in the field of conservation and sustainable use of AnGR and in the livestock sector more broadly, as identified during development of the National Plan, were taken into consideration.

3.2 The objectives of the National Plan

The objectives of the National Plan are to:

- Promote long term *in situ* and *ex situ* conservation of the diversity of animal genetic resources in scientifically sound and cost-effective breeding programmes;
- Enhance attractiveness of animal genetic resources for sustainable animal production systems by means of description, evaluation, documentation and breeding evaluations;
- Contribute to the conservation and use of agricultural grassland ecosystems and supporting the utilisation of animal genetic resources in nature and landscape protection areas;
- Support all actions concerning the conservation of animal genetic resources and establishing a transparent system of competence and responsibilities between the country and DAFF, NGOs and private livestock sector;
- Promote co-operation at national, SADC, African Union, and international level and exploiting the resulting synergies.

3.3 The structure of the National Plan.

The National Plan is prepared under four main strategic priority areas that are linked to the Global Plan of Action for management of FAnGR as follows:

- Characterisation and inventory of farm AnGR
- Sustainable use and development of farm AnGR
- Conservation of farm AnGR
- Policies, legislation, institutions and capacity building

3.3.1 Strategic priority area I: Characterisation and inventory of farm AnGR.

Characterization of animal genetic resources encompasses all activities associated with generating information on their identification, qualitative and quantitative description, geographic and demographic distribution of populations, native habitats and production systems etc. The process also includes understanding their status, trends and the associated risks that these resources are exposed to, and the systematic documentation of the indigenous traditional knowledge related to the resources,



their products and services. The initial step in characterisation is identification of distinct populations using information on their geographic and ecological isolation, traditional nomenclatures (traditionally recognised populations), phenotypic distinctness and the level of genetic differentiation among the populations.

Assessment of the population characteristics of identified breed is also an important component of livestock characterisation. This includes estimates of population sizes, flock structure and assessment of the level of indiscriminate or irrational crossbreeding which are indicators of threat to the survival of the adapted indigenous genetic resources.

Furthermore, information on the current merits of the breeds regarding their contribution to the socio-economic wellbeing of the communities maintaining them needs to be collected. Characterisation also aims to enhance sustainable utilisation while describing the broad set of the breed's unique attributes beyond simple production traits, including aspects such as the quality of products, efficiency of resource utilisation, adaptation to local agro-climatic conditions, and resistance to parasites and diseases. This may also serve as a means to identify and register the distinct breeds possessing unique niche products and services therefore providing recognition to the livestock rearing communities who have evolved and are maintaining the breeds. The process will facilitate in developing the inventory of farm animal breeds of the country and update the database.

3.3.1.1 Current status

- Technical standards and protocols for characterisation of breeds/populations both at phenotypic and genetic level like questionnaires and breed descriptors for collection of information by conducting surveys in the natural habitat of a breed, and a set of highly polymorphic microsatellite markers for all species of livestock and poultry have been developed.
- The ARC has taken up the activity of characterisation through network approach by involving species specific research institutes.
- Molecular genotyping for diversity analysis has been accomplished in different breeds and phylogeny has been established.
- More than 50 % of the registered farm animal breeds of different species have been documented in the form of breed bulletins and monographs.
- FAnGR survey has been initiated by DAFF from 2009 to date. Population status of breeds in their respective provinces as per survey of 2009 is available.
- DAFF has also developed an information system on animal genetic resources of South Africa (Inter-GIS) to inventorise and monitor trends. This database has the facility to store information on characteristics and population of breeds along with two photographs, and district-wise animal resources like species population, infrastructure, production, farms, semen availability, vaccine production, import and export, etc.

3.3.1.2 Identified gaps

- In addition to well documented and registered breeds, there is large number of non-descript populations which are also providing significant contribution to the economy. These populations need to be characterised, evaluated and documented.
- Large numbers of populations are yet to be registered.
- Inadequate numbers of trained technical manpower for carrying out FAnGR surveys.
- Lack of community based conservation programmes.

3.3.1.3 Actions needed

- Characterisation of remaining breeds and populations (both phenotypic and genetic) to be completed through networking of institutions.
- Conducting accurate FAnGR census for identification and enumeration of breeds and random sample surveys for revalidation through proper coordination between DAFF, PDAs, and ARC.
- Skill up gradation and imparting training to field functionaries.
- Estimation of population trends, identification of breeds under threat and preparation of breed watch list.
- Strengthening of Inter-GIS to include early-warning and response systems.



- Establishing National Register of communities or individuals keeping local breeds and best practices along with their profiles through accessible database system.
- Documentation of farm animal breeds in South Africa, specifically identification and updating stock numbers in a central database.
- Identification and monitoring of population parameters of genetic variability (effective population size, rate of inbreeding) for all breeds.
- Management of the national register of the cryogenic store.
- Documentation of all live and cryo-conservation activities.
- Central archive for data and methods for the National Programme under the supervision of the National Committee.
- Expertise and organisational support for the National Committee.
- Reports to the databases of SADC, AU and FAO.
- Co-ordination and support in the conservation of animal genetic resources in South Africa, particularly:
 - Close co-operation with breeding organisations on the implementation and use of methods in monitoring and conservation breeding programmes;
 - Support of breeding organisations in calculating population genetics parameters;
 - Calculation of parameters by means of combined herd-book data at breed level (subsidiary, if this task cannot be fulfilled by breeding organisations);
 - Promotion and co-ordination of the management of animal genetic resources.

3.3.2 Strategic priority area 2: Sustainable use and development of farm AnGR

The best way of conservation of the genetic resources is to sustainably utilise them in their ecological niches so that these are continuously evolved to produce while adapting in the changing environments. Long term breeding plans need to be implemented for continuous genetic improvement of indigenous breeds of farm animals. Livestock production with rearing indigenous farm animal breeds is mostly subsistence oriented system and performs multiple functions. The breeding goals of livestock keepers are often comprehensive and are mainly driven by the underlying production systems.

Smallholders also value the non-marketable by-products such as dung, urine, draft power etc and appreciate the intangible benefits of livestock in insurance and display of social status. In local environments and resource-constrained production systems and broader market demands, local breeds can perform as good as exotic/cross breeds. The conventional productivity evaluation criteria are inadequate because they fail to capture non-marketable benefits of the indigenous livestock. Therefore animal genetic resource management programmes including genetic improvement should always take into consideration the multiple breeding goals of the communities, cultural preferences and the local production system. It requires careful understanding of breeding goals, planning, establishment and maintenance of effective performance recording and breeding strategies so that the well adapted local breeds should sustain and remain a functional part of production systems.

The economic worth of the indigenous breeds should be enhanced through value addition by identifying and propagating pharmaceutical/nutraceutical properties of various animal products. There is plenty of information regarding usefulness (nutritional or therapeutically) of animal genetic resource products through traditional knowledge or scientific information e.g. use of cow urine and panchgavya in alleviating various human diseases. However, scientific basis of such observations in most cases is not known and needs to be studied for the proper validation, exploitation, utilisation and value addition of animal genetic resources.

Hence, to improve the utilisation of specific products of domesticated indigenous animal breeds and therefore strengthening their conservation efforts, it is desirable to test or validate them and also undertake research efforts to analyses and exploit specific useful biomolecules of such animal products.

Isolation and identification of active bio-molecules for their nutritional or therapeutically properties from animal genetic products would be of great significance. This will add value to indigenous animal genetic resources and will ultimately help in their conservation and utilisation. The outcome of such programmes will also add to the income of farm animal keepers.



3.3.2.1 Current status

Development and improvement of indigenous breeds has been taken up by various agencies from time to time. These programmes had assisted in increasing the productivity of the AnGR and also helped in conservation of indigenous germplasm. The programmes also created an awareness of adopting improved scientific techniques of animal husbandry among the farmers. Some of these are:

- Livestock Development Centers (LDCs)/ Research farms/stations for genetic improvement of indigenous farm animal breeds that are in operation both under organised farms and field conditions. Breeds covered under these projects are: **Cattle:** Nguni, Bonsmara, Afrikaner and Drakensberger; **Sheep:** Dohne Merino, Namaqua Afrikaner sheep, Persian sheep, Zulu sheep, Pedi sheep; **Goats:** Unimproved veld goats, Kalahari red and Savannah goats; **Pigs:** Lard and lean pigs, Kolbroek pig and Windsnyer pig; **Chickens:** Venda chicken, Ovambo chicken, Naked neck chicken, Koekoek chicken; **Horses:** Basuto pony, Boerperd.
- National Project for Cattle Breeding for breed improvement programme initiated by DAFF for indigenous cattle is continuing through an improvement scheme called “Kaonafatso Ya Dikgomo”.
- National Herd Registration Scheme is continuing for cattle and sheep breeds of the country.
- National Project on Animal Genetic Resources for characterisation, evaluation and conservation is continuing at LDCs.
- The elite animals of the breed are identified while conducting survey for characterisation and evaluation programmes and DAFF and the concerned organisations are updated for making use of these elite animals for conservation and genetic improvement.

3.3.2.2 Identified gaps

- Inadequate programmes for identification, evaluation and selection of genetically superior breeding males of indigenous breeds.
- Absence of animal identification and performance recording system under field conditions.
- Lack of awareness, participation and motivation of the livestock keepers regarding breed conservation and genetic improvement programmes.
- There is no Rural Backyard Poultry Development Programme targeting rural poor farmers
- Lack of coordination among various agencies involved in livestock improvement and conservation.
- Inadequate infrastructure for A.I. and animal health support particularly for indigenous breed development programmes.
- Lack of scientific basis and validation of traditional knowledge regarding usefulness (nutritional or therapeutically) of animal genetic resource products.
- The priority of state animal husbandry departments is more on improving the productivity of only few economically important breeds rather than conservation and development of the AnGR which are in the process of genetic dilution and degradation.
- The breeding programmes are difficult to implement at farmers level, as breeding at farmers' herds or flocks is mostly uncontrolled which results in dilution of genetic purity of the breeds.
- There is no regular system of monitoring of the breeds at risk.
- Lack of farmers awareness about the long-term impact of conservation of biodiversity and none or negligible immediate financial benefit also make them less interested in conservation programme.
- Insufficient manpower and infrastructure also hinders the implementation of the programmes.
- Almost all the conservation programmes on the AnGR are funded and implemented by government, agencies, participation of farmers and private sector is negligible.
- Absence of breeders' organisation barring few and lack of participation make the implementation of breed conservation programme more difficult and not sustainable.



3.2.2.3 Actions needed

- Establishment and strengthening of nucleus farms in the breeding tract for each breed. Breeding bulls, bucks, rams and males rearing farms should be established in the breeding tract for each breed to produce genetically superior germplasm to be used for frozen semen production and breeding the farmers' animals for bringing genetic enhancement as well as conservation and sustainable utilisation of indigenous breeds.
- The elite breeding males should be used for breeding the elite females maintained by the farmers and institutional herds for production of superior males conforming to respective breed characteristics. For a given breed, initially about 500 elite females should be identified with the farmers and institutional herds in the breeding tract. These should be tagged and recorded for performance traits. These females should be inseminated /mated with the best available semen/breeding male of that breed with the executing agency. The owners should be provided with an incentive for data recording, maintenance of animals and rearing of male progeny resulting from these matings up to a certain age. A total of 100 unrelated males should be selected on the basis of dam's performance (In the first year, young males should be selected from those available in the field on the basis of breed characteristics and dam's performance). These selected males should be purchased and reared by DAFF: GR directorate; PDAs LDCs and ARC: API executing the project. By recurrent selection and culling, a total of about 30 mature males would be available. Semen from selected males should be produced, cryo-preserved for long term storage and be used in the field for breed improvement and conservation. These bulls should be further evaluated through progeny testing programme and the proven bulls should be used for production of future sires. These pedigreed animals with records will also serve as a reference population to identify molecular markers for genomic selection of animals.
- Formation of breed societies/associations will encourage the participation of livestock keepers in sustainable management and judicious utilisation of indigenous breeds in the face of growing food demand and climate change. These will also help in development of mechanism for field performance recording of animals for undertaking genetic improvement programmes.
- Economic worth of the indigenous breeds should be enhanced through value addition by propagating environmentally important attributes of different animal breeds and useful pharmaceutical and nutritional properties of their animal products.
- Developing branded animal products and creation of niche markets for such products.
- Indigenous Knowledge Systems related to management of AnGR need to be collected, evaluated, validated and commercially exploited to benefit the communities rearing these animals (Access and benefit sharing).

3.3.3 Strategic priority area 3: Conservation of farm AnGR

Small-scale livestock keepers have developed animal breeds over centuries that are well suited to their local conditions and have been co-evolved with economies, cultures, knowledge systems and societies. This has endowed them with unique qualities of tolerance to abiotic and biotic stresses. They may continue producing meat, milk, egg, wool etc in areas where imported modern breeds succumb without expensive housing, feeding and veterinary care. They enable people to earn a living in otherwise inhospitable areas, and embody valuable genetics for future breeding efforts. Nevertheless, these breeds are in danger of disappearing, pushed out by modern production techniques and out-competed by exotic breeds.

Modern agriculture has developed specialised breeds with optimised specific production traits. This is a small number of high producing breeds account for an ever-increasing share of total production. This process leads to a narrow genetic base, as native breeds and species are neglected in response to market forces. Social changes have also greatly influenced the AnGR, especially small ruminants because present generation is not keen to continue their ancestral occupation of rearing livestock in migratory system of grazing.

The diversity of animal genetic resources is essential to satisfy basic human needs for food and livelihood security. They contribute to human needs by providing meat, milk and dairy products, eggs, fiber, garments, manure for fertiliser and fuel, draught power and marketable assets. Genetic diversity defines not only animal breeds' production and functional traits, but also the ability to adapt to different environments, including food and water availability, climate, pests and diseases. The important role of livestock keepers, pastoralists, and local communities in the use and development of livestock resources need to be recognised. The unique features of domestic animals need to be taken into account in ensuring the fair and equitable sharing of benefits deriving from them, and in tailoring the development of future policy and regulatory measures.



3.3.3.1 Current status

- Most of the animal genetic resources are currently maintained *in situ* (live animal breeding) by farmers and their communities, as integral components of their agricultural ecosystems, economies and cultures.
- *In situ* models of AnGR conservation have been developed by DAFF by providing technical inputs and incentives to the farmers/breeders in the breeding tract of respective farm animal breeds and it has been adopted under ARC projects. A total of five *in-situ* conservation programmes have been carried out on cattle, sheep, goat, pork and poultry.
- Under *ex-situ* conservation of AnGR programme, bulls of various cattle breeds are being selected and trained for semen donation. Semen from four Afrikaner bulls (230 doses), 11 Nguni bulls (2484 doses) and eight of Bonsmara (8000 doses) have been conserved.
- National Animal Gene Bank for research has been established at ARC: API with the objective of maintaining the indigenous livestock biodiversity of the country. A total of 1,09,200 frozen semen doses belonging to 277 breeding males (Bulls/Rams/Bucks) from 15 breeds representing cattle, sheep and goat have been successfully collected and preserved at National Gene Bank.
- Animal Genomic Bio-Bank is established which has the collection of genomic DNA from 130 breeds/populations of livestock.

3.3.3.2 Identified gaps

- Inadequate breeding policies for conservation of indigenous breeds.
- Criteria for assessing breed endangerment status are still lacking and needs to be developed.
- Lack of mechanism in place for coordination and monitoring different state programmes on conservation of indigenous breeds.
- Non-existence of breed societies or associations and lack of patronage for farmers participation in conservation and development of indigenous breeds.
- Inadequate capital resource and financial support for indigenous breed development.
- Habitat erosion e.g. squeezing grazing lands.
- Lack of participation of livestock keepers.
- Inadequate multiplication and production of germplasm of breeds from established or strengthened nucleus farms.

3.3.3.3 Actions needed

- All breeds, including large non-endangered populations (NE), should be subject to the monitoring process.
- As soon as the stock of a specific population falls below the first critical value (MP), a cryo-conservation programme, at least with semen collection, should be initiated.
- If the population falls below the second critical value (CP), *in situ* conservation must be included into the conservation breeding programme.
- Formulating species wise breeding policies by different provinces and to develop appropriate plans for breed conservation and improvement.
- Evolve criteria for assessing breed endangerment status.
- Enlist the breeds and populations at risk, and those that need conservation.
- Initiate conservation programmes for breeds at risk and collect germplasm for preservation and dissemination in the native habitats.
- Adoption of participatory approach by involving breeders, community-based conservation, non-governmental organisations and other agencies to participate in conservation efforts by making a joint approach.
- Declare all the livestock farms of state/centre government as *in situ* conservation centres of indigenous breeds. Each farm should maintain animals of indigenous breed(s) of that area.
- Strengthen National Animal Germplasm Repository to face the future challenges of AnGR diversity *vis-à-vis* productivity enhancement through networking of institutions.



3.3.4 Strategic priority area 4: Policies, legislation, institutions and capacity building

Animal husbandry in South Africa is a departmental subject and every department (National: DAFF or provincial: PDAs) is making its departmental policies for livestock and development. At the national level, Department of Agriculture, Forestry and Fisheries (DAFF) is coordinating the development programmes; and the Agricultural Research Council is taking care of research, extension and human resources development for the livestock sector.

In South Africa, national policies and regulatory frameworks for animal genetic resources are still inadequate and ineffective. Policy and legislative development is required to address the different dimensions that are shaping the sector in order to be able to deal with increasingly complex emerging issues, such as an increasing focus on consumer affairs, food safety and food standards, response to diseases (animal diseases proper and animal diseases that can transmit to humans), the humane treatment of animals, increasingly sophisticated biotechnology, as well as the assessment and mitigation of the environmental impacts of livestock production management practices. A further area that requires development is the framework for the exchange of animal genetic resources among countries.

Policy development should take into account the increasing role of intellectual property rights in the sector, and the need to secure fair and equitable benefit-sharing, the rights of indigenous and local communities evolved and maintaining native breeds, particularly pastoralists and the role of their traditional knowledge systems.

3.3.4.1 Current status

During the post-independence era, the government undertook various measures towards the improvement and development of the breeds, however, conservation of AnGR, as such, was not the area of primary concern. Conservation and sustainable utilisation of genetic resources across all farm animal species and breeds were recognised as a matter of national Animal Improvement Act and Agricultural Research Council Act that were followed by the Agricultural Research Council that was established in 1993 with the mandate of Agricultural Research in the country.

The aforementioned organisations and departments have been sensitised about the importance of AnGR and the activities related with their characterisation, conservation and utilisation. Despite all these achievements, there are still some key weaknesses of AnGR management, including inadequate policies and legislation, lack of financial support, scarcity of trained personnel and effective involvement of state animal husbandry and veterinary departments in programmes related with conservation of AnGR. Moreover, in the absence of strong legal provisions backed up by appropriate policies, the efforts being put up by various agencies working on conservation and development of AnGR remains on a weak footing.

The national focal point responsible for the tasks outlined in the FAO's Global Plan of Action for Animal Genetic Resources has been designated within the directorate responsible for the conservation and sustainable use of farm animal genetic resources at DAFF.

3.3.4.2 Identified gaps

- Inadequate legislation framework for conservation and sustainable use of animal genetic resources.
- Lack of harmony and coordination between various institutions involved in management of AnGR.
- Inadequate infrastructure facilities for national and provincial gene banks with appropriate modalities for production, processing, cryo-conservation of germplasm and dissemination.
- Lack of awareness among livestock keepers and stakeholders regarding the importance of conservation and utilisation of diverse AnGR.

3.3.4.3 Actions needed:

- Formulation of a regulatory legal framework for the conservation and sustainable use of animal genetic resources.
- Defining roles and functions of agencies working for management of AnGR to avoid overlapping and appropriate utilisation of funds.



- Develop a cadre of professionals to support management of AnGR on long-term basis, include special courses on management and sustainable utilisation of AnGR at graduate and post graduate levels of all the courses.
- Research and development programmes through networking of the breed specific nucleus farms for conservation and sustainable utilisation which will increase breed able population size of breeds at risk and enhance productivity and sustainable utility.
- Strengthening the national databases on AnGR to enable information sharing.
- Bringing awareness and skill up gradation of livestock keepers and the stakeholders regarding conservation and sustainable management of AnGR.
- Develop a legal mechanism for exchange of germplasm for an effective management of AnGR.
- Creation/provision of national and state fund for conservation of AnGR.
- Establishing the National Committee on the conservation and sustainable use of Animal Genetic Resources



CHAPTER 4

IMPLEMENTATION OF THE NATIONAL PLAN FOR CONSERVATION AND SUSTAINABLE USE OF FANGR.

4.1 Implementation plan

The National Plan for Animal Genetic Resources can be taken as a guideline to develop activities and draft the organisational requirements needed for the conservation and sustainable use of animal genetic resources. It is also an indispensable addendum to conventional farm animal breeding programmes. Once established, it should become good practice in farm animal breeding in South Africa. This can only be achieved if animal breeding regulations and the availability of long-term funding are consolidated. The DAFF and PDAs are thus called upon to establish the basis for this and to implement the plan. Table 1 presents the implementation plan.

Table 1 The implementation plan for the National Plan for Conservation and Sustainable use of Farm Animal Genetic Resources (Period 2016 to 2019).

Milestone	Time frame	Key role players	Estimated cost
Develop national policies on conservation and sustainable use of farm animal genetic resources for food and agriculture	Q4 2019	Breed societies PDAs Research institutions Institutions of higher learning DAFF Livestock breeders, owners and keepers Commodity organisations	R200 000
Establish a national working group for FAnGR	Q4 2017	Breed societies PDAs Research institutions. DAFF Livestock breeders, owners and keepers	R200 000
Conduct characterisation, develop inventory and monitor trends and risks for identified breeds	On-going	Breed societies PDAs Research institutions Institutions of higher learning DAFF Livestock breeders, owners and keepers	R2m
Establish and/or strengthen national conservation programmes	Q4 2018	Breed societies PDAs Research institutions Institutions of higher learning DAFF	R2m



Implement regional and global long-term conservation strategies	On-going	PDAs Research institutions DAFF	R500 000
Promote agro-ecosystems approaches to the management of animal genetic resources	On-going	Breed societies PDAs Research institutions Institutions of higher learning DAFF Livestock breeders, owners and keepers	R200 000
Support indigenous and local production systems and associated knowledge systems of importance to the maintenance and sustainable use of animal genetic resources	On-going	Breed societies PDAs Research institutions Institutions of higher learning DAFF Livestock breeders, owners and keepers Commodity organisations	R500 000
Establish or strengthen national institutions, for planning and implementation of activities related to conservation and sustainable use of farm animal genetic resources	On-going	Breed societies PDAs Research institutions Institutions of higher learning DAFF Livestock breeders, owners and keepers Commodity organisations	R3m
Strengthen national human capacity	On-going	Breed societies PDAs Research institutions Institutions of higher learning DAFF Livestock breeders, owners and keepers Commodity organisations	R2m
Raise national awareness about the role and value of farm animal genetic resources	On-going	Breed societies Provinces Research institutions Institutions of higher learning DAFF Livestock breeders, owners and keepers Commodity organisations	R500 000
Total estimated cost			R11 100 000



4.2 Stakeholders' roles and responsibilities

4.2.1 National department responsible for agriculture

- National coordinator and secretariat
- Source funding
- Administer policy, strategy and legislation

Provincial departments responsible for agriculture

- Coordination of provincial FAnGR management activities (including characterisation)
- Collection and verification of FAnGR data

Breed societies

- Custodians of breed standards (phenotypic characterisation).

Livestock breeders, owners and keepers

- Custodians of FAnGR
- Support conservation initiatives

Research institutions

- Conduct research and development relevant to the management of FAnGR
- Technology transfer relevant to the management of FAnGR
- Source funding

Institutions of higher learning

- Conduct research and development relevant to the management of FAnGR
- Technology transfer relevant to the management of FAnGR
- Graduate and post graduate training
- Source funding

Commodity organisations

- Source funding
- Value adding (marketing)
- Support conservation initiatives

4.3 Communication

Effective communication will be most critical for the implementation of the National Plan. Each of the strategic priority areas will require major communication efforts at all levels. Communication within DAFF, between national and provincial levels and between relevant stakeholders needs to be strengthened. Key stakeholders that will be involved include:

- Relevant DAFF directorates
- Breed societies
- Provinces
- Research institutions
- Institutions of higher learning
- Livestock breeders, owners and keepers
- Commodity organisations



Through communicating, the implementation of the National Plan, DAFF will:

- draw up a list of existing traditional breed schemes and identify relevant contacts
- approach relevant commodity organisations to publicise the conservation and sustainable use of FAnGR message and
- engage with all organisations and breeding companies that have a role in developing breeding objectives and indices or run genetic improvement programmes to increase awareness of the National Plan for conservation and sustainable use of FAnGR.

4.4 Monitoring and evaluation

A detailed monitoring and evaluation plan will be developed, in collaboration with DAFF's Monitoring and Evaluation unit, to keep track of progress of the implementation of the National Plan. This plan will ensure that, at the end of the lifespan of the National Plan, it would be possible to evaluate whether the objectives of the National Plan have been achieved and if not, the reasons for the under-achievement. Reports on the implementation of the National Plan will also be produced at the end of each financial year.

4.5 Funding strategy

The National Plan provides a broad framework that will guide national activities on the conservation and sustainable use of farm animal genetic resources for food and agriculture for the next five years. As such, only approximate costs are herein provided. Donor funding will be important for many of the interventions described in the National Plan. However, the majority of funding will have to come from within the country, the government and private sector. All components of the National Plan will have to be reflected in budgets at national and provincial levels.



CHAPTER 5

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Design and Layout:
Communication Services
2016