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THE GLOBAL STRATEGY FOR THE MANAGEMENT OF FARM ANIMAL GENETIC RESOURCES: LINKS TO THE CONVENTION ON BIOLOGICAL DIVERSITY

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PREFACE

Domestic animal genetic resources are being lost at an unacceptable and accelerating rate. FAO estimates that one breed is lost per week and that 30 percent of all domestic animal breeds are currently threatened. The main reason for the loss of domestic animal breeds is that locally adapted breeds are being replaced with high input, high output exotic breeds. Farmers are attracted to high output breeds which are common in high input developed world agriculture systems. However, in many production environments, especially in the low input environments that are common in the developing world, exotic breeds fail to increase production or productivity, under real local farming conditions. Furthermore, intensive animal production with its dependency on imported technologies is neither affordable nor sustainable for most farmers in the developing world. Thus, often the best strategy for developing sustainable food and agriculture production in low input systems is to improve or enhance indigenous breeds. Maintaining indigenous breeds allows the use of the available broad array of production environments that characterize the developing world and takes advantage of traditional knowledge, rather than relying solely on imported technology. Maintaining and developing indigenous breeds not only contributes to sustainable agriculture, it supports the maintenance of traditional lifestyles and cultures, which may be lost or eroded as a result of adoption of non-traditional agricultural practices.

Indigenous breeds are well adapted to high stress, low input production systems, many of which will remain for the foreseeable future.

What impact will the loss of domestic animal genetic diversity have? Will we be able to breed animals to respond to changes in the marketplace or to changes in the environment? When disease breaks out, will we be able to find animal genetic resources that provide resistance to such stressors? What will happen to local and indigenous communities if their livestock are replaced with breeds that they have no experience with, and which have no cultural or religious significance to them? How will people heat their homes and fertilize their crops if animals are replaced with tractors? Are there unique characteristics of some breeds that would be valuable in other breeds, environments or countries? Are there unique characteristics in breeds that farmers are not fully aware of, characteristics that could significantly increase productivity and production and thus contribute to our efforts to achieve global food security?

Given our past experience in having to develop breeds to respond to changing markets and environmental conditions, the need to breed livestock for disease and pest resistance, and the importance that domestic animals currently play in achieving food security and maintaining cultural identity, the answers to these questions are quite simple. The future with greatly reduced domestic animal genetic diversity will mean: we will be less able to respond to change, we will have reduced capacity to breed animals for desired characteristics such as resistance to disease, and we will erode our overall capacity to achieve food security. The loss of indigenous breeds will also adversely affect community identity and structure reducing the ability of local communities to maintain their traditional lifestyles.

Recognition of the very significant role domestic animal genetic resources contribute to global agriculture productivity and production, and to community identity; and the accelerating decline of these resources, led FAO to initiate the Global Strategy for the Management of Farm Animal Genetic Resources (Global Strategy). The elements of the Global Strategy and possible linkages between it and the Convention on Biological Diversity are described in this document.

I. The Roles and Values of Domestic Animals:

Domestic animals account for 30-40 percent of the total value of global food and agriculture production. This major contribution is made from 4,500-5,000 breeds, which have been developed within approximately 40 animal species over the course of the past 12,000 years. Until very recently, domestication, especially in the developing world, has been a process of developing animal genetic resources to meet local or regional needs. Animals were selected for particular characteristics or for cultural values while recognizing that they were

also being selected for local conditions, diseases, available feeds, climate, predators, and many other persistent variables imposed by the local environment. The result has been the development of indigenous breeds that contribute to local and national needs and demands, and that are adapted to local conditions. Development of breeds over time has made it possible for humans to take advantage of the diverse production environments that exist in both developed and developing countries.

The contribution of domestic animals to agriculture and overall economic development has not been adequately evaluated or appreciated. Recent estimates indicate that domestic animals account for 30-40 percent of the total value of food and agriculture production. Currently, 1.96 billion people depend at least partly on domestic animals for their livelihood, and 12 per cent of this total depends upon them almost completely.

Domestic animals have been and will continue to be essential elements in global agriculture production performing several valuable roles, including: converting forage crops, crop residues and other by-products feeds into a range of high-quality human foods, providing draught power for agriculture production, harvesting and transportation, and supplying fuel, fertilizer, hides, wool and other fibers. They also provide a valuable source of income and act as an insurance policy in case of crop failures. This latter feature is an essential risk management element and is especially valuable in small farm operations and in nomadic and semi-nomadic systems. In addition to monetary values, domestic animals have become socio-cultural and religious resources and symbols. In many communities, indigenous breeds of domestic animals not only are valuable for food and agriculture, they play a central role in community identity and well-being.

Farm Animal Genetic Resources - are the genetically unique populations formed throughout all domestication processes within each animal species used for the production of food and agriculture, together with their immediate wild relatives.

A. Domestic Animals as a Source of Food:

Domestic animals provide a wide range of food products including: a variety of meat, milk and eggs. The role of domestic animals in global food production will increase in future as the contribution of animals to total food production is increasing at a higher rate than cereal crops. In the past 20 years for example, egg production increased by 331 percent and meat production by 127 percent, while cereals increased by 78 percent.

Much of the agricultural production involving domestic animals in the developing world occurs in high stress, low-input production systems. Indigenous breeds are essential in such environments as introduced exotic breeds fail to consistently produce or can't survive in high stress, low input production environments.

Animal products provide a primary source of protein , essential amino acids and minerals such as iron and calcium. They also make a significant contribution in terms of total calories, accounting for 30 percent of the calories in human diets in the developed world and slightly less than 10 percent in the developing world. Animal products provide an essential source of amino acids that balance the largely vegetable-based protein diets that are found in many developing countries, and provide diverse food products to meet demands for variety in diets. The great variety in quality and types of food products originating from animals also enriches our daily intake of food. Much of this variety is realized through diverse genetic resources.

The Arvana-Kazakh type dromedary of Kazakhstan, is a breed that has been selected for high milk yield and is well adapted to harsh continental desert climate, lack of water and poor feed supply. Currently, there are less than 1,000 surviving animals.

B. Domestic Animals as a Source of Energy:

Draught power provided by domestic animals is an essential energy resource in many parts of the world. It has been estimated that 52 percent of land cultivated in the developing world (excluding China), is worked by draught animals. Domestic animals provide draught power to irrigate and harvest crops, transport people and agricultural products and also provide an essential source of power for many non-agricultural activities, such as hauling logs and fuel wood.

The Bolivian Pony or Sunicho is an indigenous horse to Bolivia that can survive in the harsh highland regions. They were widely used for transportation but have now been replaced by the donkey.

Draught animals provide a renewable source of energy to farm operations and avoid the large drain of capital that is required to purchase tractors, spare parts and fuel. Special genetic qualities or characteristics are needed to provide draft capability and thus many indigenous breeds have been developed specifically for draft power.

While draught power is expected to decline slightly by the year 2000, it will remain the most cost-effective power source for small- and medium-scale farms in developing countries.

Farm animals are the source of a range of food products and of power, fuel, fertilizer, and provide raw materials for manufacturing numerous products. Maintaining indigenous animal breeds is essential to continue to produce multiple benefits and diverse products.

C. Domestic Animals as a Source of Fibers and Hides:

A broad range of clothing and other non-food products used in daily living of communities of many countries are derived from the fiber and hides of farm animals.

D. Domestic Animals as Sources of Fuel and Fertilizer:

In many countries, livestock waste products are highly valued sources of fuel. Cattle, camel, yak and buffalo dung for example, are widely used fuels for cooking and heating. This fuel source is renewable and reduces expenditures on fossil fuels and the need to harvest forests for fuel wood. In treeless areas such as the tundra area of Mongolia, dung provides the only available source of fuel.

The Yakut cattle indigenous to the Siberia area of the Russian Federation are highly adapted cattle that can tolerate temperatures as low as -60 C. They survive under poor feed conditions yet yield concentrated milk with high fat content. They are considered resistant to tuberculosis, leucosis and brucellosis. Despite their highly adapted qualities, only 900 individuals can now be found in Siberia.

Biogas production from livestock manure is a proven renewable energy resource. Recently developed plastic biodigesters have made it possible for many more farmers in the developing world to use biogas as a fuel sources for lighting, heating, driving machinery and even using the gas as an insecticide to control insects in grain storage areas.

Domestic animal waste products also serve as a valuable source of fertilizer and soil conditioner. Nutrient

recycling is an essential component of a sustainable agriculture system. Returning manure to crop land serves to integrate livestock and crop production, and reduces waste management problems.

E. Domestic Animals as Socio-Cultural Assets:

Another essential but often undervalued aspect of domestic animals is their socio-cultural role. Many communities have well established traditions and lifestyles that are fundamentally linked with domestic animals. While it is not always possible to assign monetary values to such linkages, the non-monetary religious and other cultural values to local community identity are essential. Replacement of indigenous breeds with exotic breeds can ultimately lead to the loss of local lifestyles.

The Navajo-Churro sheep have been re-introduced to Indian reservations in the United States. There are currently 540 animals which produce a special double coated fleece.

F. Domestic Animals as a Source of Income:

Products from domestic animals provide valuable income in both the developed and developing world. Globally, meat and milk products represent 3.5 times the value of wheat and rice. Animal products, such as meat, milk, hides, wool, manure, and fees charged for draught power, make essential contributions at the farm, community and national levels.

Domestic animals are also valuable in providing raw materials for manufacturing and in the development of medicines. Various parts of sheep for example, are used to make bone china, wax and surgery supplies. Both sheep and cattle are used as a source of insulin for the treatment of human diabetes.

It takes the pancreas of 26 cattle to provide a diabetic with a supply of insulin for one year.

At present, developing countries are major importers of animal feeds, meat and dairy products. Increasing animal production in the developing world will thus reduce foreign exchange costs and may even contribute to foreign exchange earnings. Other animal products, such as hides, offer opportunities for economic development in the developing world once the basic infrastructure is established.

G. Domestic Animals and Risk Management:

Domestic animals also provide economic security acting as a direct food resource in case of crop failure, and as liquid assets that can be sold or traded to purchase or acquire goods and services. Food security strategies require that attention be paid to both absolute levels of production and to reducing severe yearly fluctuations in levels of production and income. Farm animals serve to reduce the vulnerability of farmers to significant variations in production and incomes, and are therefore essential components of risk management strategies, especially for small farm operations. Small ruminants, pigs, rabbits and poultry are particularly valuable in this regard as farmers are able to maintain more of them than larger animals such as cattle, buffalo and camels.

Domestic animals provide a source of income, employment and are essential elements of risk management strategies for small farms that are vulnerable to crop or market failures.

II. The Current Status of Domestic Animal Genetic Resources - The Sinking Ark:

Agro-biodiversity is being lost at an accelerating and unacceptable rate as result of human population and

development pressures and the rapid transformation of traditional agricultural systems which still accounts for 75 per cent of production in the developing world. This change is resulting in the decline in the use of traditional farm animal breeds, and placing many breeds at risk of extinction. Unless action is taken these breeds will be lost before their genetic contributions can be clearly understood.

Over 30 percent of all existing domestic animal breeds are now at risk of extinction and are being lost at the rate of at least one breed every week.

The latest information available from the World Watch List for Domestic Animal Diversity indicates that 30 percent of the world's domestic animal breeds are at risk of extinction, and at least one breed is lost per week. This estimate is based upon a global survey which has established a data base for 3,882 breeds. The World Watch List has made it possible for FAO to establish The Global Early Warning System for Farm Animal Genetic Resources enabling countries to plan and respond to rapid declines in their livestock populations.

The Pak Angora goat of Pakistan is a very disease resistant and heat-tolerant breed that now consists of a single herd of 380 animals.

This severe loss of animal genetic resources has significant implications for future breed development, food security and maintenance of cultural identity and traditional lifestyles. The situation with the world's population of cattle is indicative of how rapid changes can occur in agriculture and result in negative long-term impacts. The world cattle population currently consists of 800 cattle breed populations, however, given rapid changes in this sector, within one human generation, the world's cattle population will consist predominately of only twenty breeds. This will reduce genetic diversity and result in the loss of many unique characteristics, reducing our ability to develop sustainable agricultural systems, reducing our capacity to respond to future market demands, and reducing our ability to breed animals to adapt to variables such as disease, climatic shifts and other factors. Loss or the narrowing of genetic resources will also reduce our availability to use all available production environments and thus will affect both production and productivity in the long-term.

In India, 50 percent of the indigenous goat breeds face the threat of extinction, and an estimated 80 percent of all poultry produced are now from exotic breeds. China harbours the vast majority of the world's pig breeds, however, these are now very rapidly being replaced by exotic breeds.

The loss of indigenous breeds also has implications for environmental quality and the loss of biodiversity. Many existing low input, low output agriculture systems that use locally adapted breeds have relatively benign impacts on environmental quality and biodiversity at the landscape level. Many indigenous breeds are used for vegetation management particularly in mountainous regions because of their hardiness and surefootedness. Rapid transformation of traditional agriculture systems dependent upon exotic breeds can result in: increased pollution, conversion of natural landscapes to produce livestock feeds, increased predator control programs and other impacts to ecosystems. Thus, development approaches in agriculture must occur with a full understanding of the production system, the role and value of indigenous breeds, impacts to local cultures and impacts to environmental quality and biodiversity.

Animal genetic resources contribute to both improved production (overall increases in agricultural output) and lifecycle productivity (efficiency - outputs relative to inputs). Improving productivity may in future become the most desirable strategy to increase agricultural outputs given the limited availability of agricultural lands, increasing costs of inputs, and concerns regarding the loss of biodiversity.

III. The Benefits of Maintaining Farm Animal Genetic Resources:

There are numerous benefits to maintaining a wide-range of animal genetic resources using a combination of active *in-situ* and *ex-situ* measures. The benefits include:

a) being able to develop genetic resources that are adapted to a wide-range of agro-ecosystems to meet demands for food and other products;

b) being able to access genetic resources to develop or enhance characteristics necessary to respond to changes in production environments, such as resistance to diseases or adaptability to climatic changes and changing consumer preferences;

c) being able to respond to our improving understanding of human nutrition needs;

d) being able to develop a variety of foods and other products to suit a range of post harvest processing and local cuisine needs;

e) maintaining traditional cultures, lifestyles and religious beliefs and responding to lifestyle changes;

f) taking advantage of research opportunities including genetic and physiological comparative studies; and

g) providing educational opportunities that historical development of breeding programs and farm management in a variety of production environments provide.

The Banaba chicken of the Philippines is a native chicken breed that can protect itself from many predators and is resistant to respiratory diseases, and Fowl Pox. Despite these valuable traits only 1000 Banaba chickens remain.

While it is impossible to predict the future, we can quite safely conclude that: environmental stressors; disease, pests, climate change and other stressors will be significant factors in agricultural systems. We can also predict that consumers will demand a variety of agricultural products, and that by the year 2050, food production from animals must be doubled to meet demands. In addition, consumers are increasingly seeking more natural products which can be developed from diverse animal genetic resources.

In the past, our ability to respond to environmental and market changes, was possible because farmers had access to enormous animal gene pools in both natural ecosystems and agro-ecosystems. These reservoirs or genetic insurance policies must be maintained if we are going to able to effectively respond to future needs and demands.

The small number of commercial breeds which are suited to high input production systems do not offer an adequate genetic reservoir to provide farmers with the resources they will need to meet future needs and demands in quantity and qualities of agricultural products.

IV. Responding to the Loss of Farm Animal Genetic Resources

A. The FAO Commission on Genetic Resources for Food and Agriculture:

FAO has a long history of involvement in the conservation and sustainable use of genetic resources of value to agriculture. In the field of plant genetic resources, for instance, FAO has, since 1961, organized a series of

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International Technical Conferences, that have helped mold international opinion and define strategies for action. In past decades, there has been a growing realization of the need to consider agro-biodiversity holistically, within ecosystem and farming system approaches to sustainable agriculture.

Most nations of the world signaled their awareness of the loss of biodiversity and the need for action, by signing the Convention on Biological Diversity in 1992. The Convention rapidly came into force in 1993, an indication of the high priority countries place on conserving biodiversity, sustainably using biological resources, and adopting measures to equitably share the benefits arising from the use of genetic resources.

In 1994, partly in responses to the holistic treatment of biodiversity in the Convention, FAO member countries began discussing the need to broaden the mandate of the FAO Commission on Plant Genetic Resources to cover all genetic resources relevant to food and agriculture. The FAO Council concluded that:

a) an intergovernmental framework for dealing with animal genetic resources for food and agriculture was urgently needed;

b) duplication of function with Conference to the Parties to the Convention on Biological Diversity should be avoided; and

c) current activities on plant genetic resources should not be affected by widening the Commission's mandate.

The FAO Conference in 1995 accordingly resolved that:

a) the mandate of the Commission on Plant Genetic Resources should be broadened to cover all components of biodiversity relevant to food and agriculture;

b) the Commission would now be known as the Commission on Genetic Resources for Food and Agriculture; and

c) implementation of the broadened mandate of the Commission should be carried out in a step-by-step approach, beginning with animal genetic resources, in a manner that did not adversely affect the negotiations underway for the revision of the International Undertaking on Plant Genetic Resources, and in harmony with the Convention on Biological Diversity.

B. Initiation of the Global Strategy for Animal Genetic Resources:

The FAO Conference in 1989 began the critical examination of the status of domestic animal genetic resources and the need for conservation of these resources. This process led to the acceptance of The Global Strategy for the Management of Farm Animal Genetic Resources in 1995. The framework for the Global Strategy comprises four major components and several key elements, which are described in the following sections and summarized in Figure 1.

V. Major Components of the Global Strategy:

1. **The Commission for Genetic Resources for Food and Agriculture has been established as the intergovernmental mechanism,** to provide for direct government involvement and opportunities for participating governments to provide policy advice and other support for the strategy.

2. **A country-based global infra-structure,** has been designed to assist countries to develop, implement and maintain comprehensive national strategies for the management of their farm animal genetic resources.

3. **A technical programme,** has been developed and is aimed at supporting effective management action at the country level. The technical programme is comprehensive and is designed to improve understanding of farm animal genetic resources, increase management and policy capacity, provide training within countries, encourage and facilitate communication, assist with development and implementation of essential activities of characterization, and *in-situ* and *ex-situ* conservation.

4. **A cadre of experts,** have been identified to guide the strategy and to ensure that it is technically sound and cost-effective.

VI. Key Elements of the Technical Programme:

A. Characterization-Understanding Domestic Animal Genetic Diversity:

Little information exists on performance, product, and adaptive qualities of most animal species of interest to agriculture. Even more critical, there is no complete, worldwide inventory of domestic animal genetic resources, nor a comprehensive system of monitoring, by which farm animal breeds at risk of extinction may be identified and monitored.

Characterization of domestic animal breeds is necessary to plan the effective utilization of genetic resources, and to identify breeds most at risk in order to determine conservation priorities and approaches. Characterization requires: national inventories of animal genetic resources, ongoing monitoring of these resources, comparative evaluations to increase knowledge of the unique qualities of breeds in order to better utilize these traits and determine appropriate production environments, and comparative molecular descriptions using gene markers and genetic distancing measures to establish the comparative uniqueness of breeds and the genetic diversity they harbour.

Indigenous livestock breeds often possess valuable traits such as disease resistance, high fertility, good maternal qualities, unique product qualities, longevity and adaptation to frequent bouts of harsh conditions and poor quality feed, all desirable qualities for low-input, sustainable agriculture.

Project MoDAD - Measurement of Domestic Animal Diversity, is an essential activity of FAO's characterization strategy. The magnitude of the accelerating loss of domestic animal genetic resources is so great that it is unrealistic to devote scarce international financial resources to a few breed rescue projects, or to hope to maintain all remaining breeds in perpetuity. Project MoDAD has been designed to better target conservation efforts in order to use scarce financial resources effectively. It is based on a rigorous experimental design where blood would be collected from the 14 domestic animal species that are most important to agriculture. DNA extracted from the blood would be subjected to molecular techniques to establish the extent of diversity within a species by quantifying the genetic distance between breeds, based on differences in genetic makeup. To obtain full utility of results, the sampling, laboratory assaying and advanced statistical analysis must be coordinated globally for each species. If funded and implemented, MoDAD would greatly support efforts to identify breeds which harbour the most significant genetic diversity and assist all countries to better target efforts in the management of their farm animal genetic resources. MoDAD would also provide repositories of DNA and detailed genetic data, that would support research, training and teaching.

Project MoDAD would be conducted with the full involvement of host countries to ensure that access to genetic resources is according to mutually agreed terms and prior and informed consent. Countries of origin will also obtain data and information that result from testing and research.

B. DAD-IS - Domestic Animal Diversity Information System:

DAD-IS, is the virtual element of the strategies country-based global structure. DAD-IS is a multi-language, multi-faceted, computerized information system that is accessible to anyone who has access to a computer and Internet access to the World Wide Web, or a CD-ROM reader. This tool has been designed for country use and will help updating country data and ensure country-based data and information security.

DAD-IS is being developed to link all parties to the Global Strategy for the Management of Farm Animal Genetic Resources. It is the window of the world for the management, teaching and research for animal genetic resources. It is the primary element of a clearinghouse mechanism for the farm animal sector of biological diversity.

DAD-IS has been designed to facilitate many activities necessary to implement all programme elements of the Global Strategy, and is now available to countries.

DAD-IS will:

- **Assist countries to design, implement and maintain cost-effective action plans** for animal genetic resources for all domestic species, support efforts to develop and monitor action plans for each species, and will assist in developing status reports.

- **Enhance in-country breeding strategies** by helping countries to secure, validate and organize data and information on current breed population size, location, production and performance characteristics and appropriate production environments.

- **Act as a clearinghouse mechanism** providing developing country farmers with access to experts and information from around the world, including information on breeds that may be of interest to local farmers.

- **Assist in setting country and regional conservation priorities** by providing a catalogue of breeds not currently in demand, those that are being conserved using *in-situ* and/or *ex-situ* measures, and will support global conservation efforts by supporting the early warning system for domestic animal genetic resources.

DAD-IS provides instant information to support effective utilization of genetic resources. For example, breed X in country Y is rapidly declining due to displacement by the imported exotic breed Z. However, breed Z suffers periodic high mortality and low productivity due to stress and disease. DAD-IS can provide information needed to determine whether to take steps to halt the decline of breed X, improve the resistance of breed Z, or embark on another management option.

C. Conservation of Domestic Animal Diversity:

Conservation of agro-biodiversity is the third key element of the Global Strategy and is a low-cost way of achieving food security. This is particularly true in the developing world where diversity provides a greater assurance of food. It enables farmers to select and develop livestock breeds that are adapted to specific environmental and production conditions.

Indigenous breeds commonly exhibit very high between-animal differences in low-fitness production traits, resulting in very rapid genetic development of these traits when effective *in-situ* breed development schemes are implemented and maintained.

Encouraged by promises of increased production, farmers in recent years have come to rely upon imported exotic breeds which are rapidly displacing indigenous breeds. All too often however, productivity and sustainability are reduced as the exotic breeds are intolerant of local climate, lack resistance to local diseases, exhibit low reproductive rates and high death rates, and do not perform well in nutrient-poor environments that are common in the developing world.

An effective conservation strategy is required utilizing and integrating both active *in-situ* and *ex-situ* measures. Conserving breeds with unique characteristics is an investment that is necessary to ensure the long-term viability of many agro-ecosystems, and will support efforts to achieve global food security.

Exotic breeds often lack resistance to local diseases and climatic conditions, produce poorly and lack persistency without considerable high-quality feeds.

The Global Strategy for the Management of Farm Animal Genetic Resources includes a strong conservation element. It proposes to assist participating countries to manage and conserve irreplaceable domestic animal genetic resources. The Global Strategy emphasizes wise use of animal genetic resources to achieve food security and sustainable development imperatives. With one of every three breeds of domestic animals threatened, the conservation challenges are very significant. In addition to the large number of threatened breeds, several other challenges exist, which include:

- Over 60 percent of animal breeds are in developing countries that lack the financial resources to establish and maintain domestic animal conservation programmes.
- Conservation of breeds that are not of current interest to farmers receive very little attention.
- There are no systematic monitoring programmes in place for breeds that are at high risk.
- There is inadequate descriptive information for the vast majority of animal genetic resources.
- There is a lack of awareness of the long-term value of indigenous breeds as many countries and their farmers are attracted to imported breeds to increase yields, even though they require high-input production systems that are most often not available nor sustainable in the developing world.

Conservation programmes are lacking for over two thirds of breeds that are at risk of being lost.

The following steps are required to effectively determine conservation priorities and sustainable management approaches for domestic animal genetic resources:

- Identification, description and monitoring of all breeds with special attention to breeds most at risk.
- Development and use of a wide spectrum of breeds with an adequate understanding of production environments.
- Integration of active *in-situ* and *ex-situ* measures including the storage of adequate samples of

genetic materials of breeds at risk.

- Country, regional and global cooperation and coordination in the development of management strategies and relevant polices.

- Programmes of research and training in areas related to the conservation and management of domestic animal resources.

- Education and awareness to promote understanding of the roles and values of indigenous breeds.

- Maintenance of traditional knowledge and lifestyles that are necessary to conserve and use indigenous breeds.

Little use has been made of the earth's total animal genetic diversity. Of 50,000 known avian and mammalian species, only about 40 have been used for agriculture and of these just 14 species contribute 90 percent of agriculture and food production under current systems of farming.

D. Developing a Management Capacity and Strategy for Action:

The final key element of the Global Strategy for the Management of Farm Animal Genetic Resources is enhancing country capacity to conserve and use domestic animal genetic resources, and for each participating country, develop and implement a Strategy for Action.

The proposed Global Strategy provides a mechanism for national and international planning, communication, cooperation, technical activities and policy development in managing animal genetic resources. To be able to fully take advantage of the Global Strategy, countries are advised to establish a **Management Capacity or Focal Point**. This should consist of a programme coordinator and an advisory committee. The focal point will act as the contact between the country and FAO and will thereby greatly facilitate rapid implementation of the strategy.

Countries are becoming increasingly dependent upon access to unique genetic resources which often exist in other countries. Effective national conservation efforts and international cooperation are the foundations to the global management and conservation of animal genetic resources.

Each participating nation will also be encouraged to prepare a **Strategy for Action** as the conservation and sustainable use of domestic animal genetic resources requires the setting of goals and operational objectives based upon local needs and capacities. The Strategy for Action should be integrated with national biodiversity and sustainable development strategies.

The main activities that are required to prepare and implement a Strategy for Action are:

- Inventory and characterization actions for each breed.

- Preparation of comprehensive action plans for each important species including determining required resources, costs and time schedules.

- Determining highest priorities for training, technical development and other aspects of capacity building.

- Implementing action plans in the most efficient and effective way while providing opportunities for

stakeholders to participate.

- Monitoring, evaluating and reporting progress towards objectives.

Detailed guidelines for preparing National Action Strategies for the management of domestic animal genetic resources are available from FAO, via the Internet or in hard copy form.

VII. Priority Activities for Establishing and Implementing the Global Strategy:

1. Develop the global surveys for all domesticated animal species (commenced for 28 species) and establish ongoing monitoring programmes for all animal genetic resources determined to be at risk.

2. Update and maintain the Global Databank for animal genetic resources and update the World Watch List for Domestic Animal Diversity.

3. Further develop and fully implement the Domestic Animal Diversity Information System (**DAD-IS**).

4. Establish effective National, Regional and Global Focal Points.

5. Undertake regional pilot projects to assist countries to assess and promote conservation of farm animal genetic resources and encourage the use of these resources in appropriate production environments.

6. Prepare for and rapidly implement intergovernmental discussions on policy matters relating to domestic animal genetic resources.

7. Facilitate characterization to better understand the qualities of resources, and particularly, to facilitate and coordinate the development of the MoDAD project.

8. Examine and promote cost-effective performance recording and active *in-situ* breeding strategies for low to medium input, high stress production environments.

9. Continue to examine and promote *in-situ* conservation measures for breeds not currently of wide interest to farmers.

10. Continue to examine and promote cost-effective *ex-situ* measures for unique, rare and threatened domestic animal resources, including the establishment of Global Repositories of Last Resort.

11. Develop and implement a global communications strategy incorporating basic training, reporting and public awareness.

12. Further develop and implement comprehensive guidelines for the development of National Farm Animal Genetic Resources Management Plans.

13. Mobilize donor involvement and support and, at the request of member governments, provide assistance with technical coordination for the range of funded activities. Also, mobilize and assist in coordinating the support of the spectrum of other stakeholders.

VIII. Linking the Global Strategy and the Convention on Biological Diversity

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Both the Global Strategy and the Convention arose as result of the accelerating loss of biodiversity. As a result, both initiatives are complementary and mutually supportive. The origins and mandate of both initiatives requires international and national coordination to implement them effectively and efficiently, and to avoid duplication.

The following section describes three opportunities for immediately linking three key elements of the Global Strategy with Convention activities.

A. DAD-IS and the Convention:

DAD-IS is a critical and high priority component of the Global Strategy, that will contribute to achieving all three objectives of the Convention. DAD-IS will support **conservation** of agro-biodiversity by providing databases, cataloguing all domestic animal breeds and aiding in monitoring those most at risk and in the range of activities underway for each breed; thereby acting as a comprehensive early warning system. This will enable countries and international institutions to set conservation priorities and respond before highly endangered levels occur which results in crisis management responses.

DAD-IS is a communications tools which will provide information to countries and farmers, it will also support conservation by communicating the values and roles of domestic animal genetic resources and especially the need to conserve indigenous breeds. DAD-IS will act as a global network by putting countries and their farmers in contact with other farmers, agricultural research, training and education institution, and scientists from around the world. Developing and sharing public information is an important requirement of the Convention; DAD-IS provides an efficient means to do this for the domestic animal sector.

DAD-IS will support efforts to use domestic animal genetic resources in a **sustainable manner**. Information will be communicated to countries and farmers to assist them to develop and implement appropriate management regimes for their local conditions. DAD-IS will contain comprehensive guidelines for developing National Strategies for Action and detailed guidelines designed to assist countries and farmers to implement specific elements of the Global Strategy, such as characterization and information on animal genetic resources that will be valuable in developing country-based breeding strategies.

Farmers urgently need access to practical guidelines to assist them to develop effective *in-situ* breeding programmes and to allow them to take advantage of appropriate technologies.

Within countries, DAD-IS will provide a database to maintain the range of essential descriptive data and information on breeds including performance and production attributes, and environmental parameters. This system will assist countries and their farmers to better use their genetic resources.

Through its cascade of security protocols, DAD-IS can be used by countries as their own communication and information tool for facilitating, coordinating and monitoring management of their animal genetic resources. DAD-IS is also able to accommodate confidential data to maintain a validation mechanism and permit the release of particular data internationally, as determined by each country.

The objectives of DAD-IS are to involve, co-ordinate and assist governments, non-governmental organizations, international agencies, training and research groups in all countries to achieve better management of animal genetic resources used to produce food and other agriculture products.

The Convention requires contracting parties to facilitate access to genetic resources for environmentally sound uses by other contracting parties. DAD-IS will assist countries to **provide access to genetic resources** under mutually agreed terms and with prior and informed consent.

DAD-IS also provides a mechanism to support the **fair and equitable sharing of benefits arising from the use of genetic resources.** The contribution of DAD-IS to this objective is two-fold. First, DAD-IS can provide the necessary information base for countries to agree mechanisms for the fair and equitable sharing of the burdens and the benefits derived from the conservation and sustainable use of animal genetic resources for food and agriculture.. Secondly, one form for sharing benefits under the Convention is technology transfer. Thus, transfer of DAD-IS as a technology supports the achievement of this very important objective of the Convention.

B. Project MoDAD and the Convention:

The Convention requires contracting parties to conserve their biodiversity at the ecosystem, species and genetic levels. Biodiversity conservation and sustainable use efforts are usually directed at the ecosystem or species levels, with occasional theoretical observations being made about genetic conservation requirements. **Project MoDAD** offers a practical opportunity to investigate biodiversity conservation and sustainable use at the genetic level. The relatively low number of species of domestic animals and the fact that domestic animals are also relatively easy to sample, makes **MoDAD** technically and financially feasible.

Enhanced understanding of the relative uniqueness of domestic animal genetic resources is required to facilitate objective priority setting in the conservation and use of these resources.

The results of genetic diversity studies of domestic animals will provide direct benefits to both conservation and sustainable use. **MoDAD** will determine levels of rarity. This will provide an objective basis to set conservation priorities, both *in-situ* and *ex-situ* measures, and will also provide some added information to countries and farmers on the use of genetic material.

MoDAD will provide benefits beyond the agriculture sectors as it could have the additional benefit of providing a basis for genetic level studies in wild animal populations, both in terms of experimental design and use of technology. This could be extremely useful to many countries as they struggle to set conservation priorities with very limited financial resources.

C. National Action Strategies and the Convention:

The Convention requires contracting parties to develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans and programmes which shall reflect, *inter alia*, the measures set out in the Convention (Article 6a).

The Convention on Biological Diversity recognizes the importance of genetic resources to agriculture and the need to identify and monitor species and genomes that are valuable to agriculture, including wild relatives of domesticated species.

Given the need for a National Biodiversity Strategy and the need for a National Strategy for Action as part of the Global Strategy for the Management of Farm Animal Genetic Resources, countries may choose to integrate these obligations. The Farm Animal National Strategy of Action could be a subcomponent of the National Biodiversity Strategy. This level of integration would ensure coordination between the Animal Genetic Resources National Focal Point and the National Biodiversity Unit and would effectively coordinate activities such as: developing sectoral and cross-sectoral plans; identification and monitoring of components of biodiversity; *in-situ* and *ex-situ* conservation; adopting sustainable use and incentive measures; establishing and maintaining research and training programmes; and promoting and encouraging public awareness of the importance of measures required to conserve and sustainably use biodiversity.

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Conclusions:

1. Ago-biodiversity is an integral component of global biodiversity and must be maintained in order to enhance global food security and to maintain traditional cultures and lifestyles. Domestic animal genetic resources are a crucial element of agriculture and food production, locally, nationally and globally.

2. Domestic animal genetic resources, especially indigenous breeds that are adapted to low to medium input production, high stress environments, are being lost at an unacceptable and accelerating rate, and will continue to do so unless effective and immediate action is taken locally, nationally and internationally. Indigenous breeds allow farmers to take advantage of a wide range of production environments and provide the foundation for improved animal agricultural production and productivity in most developing countries.

3. Response to the global loss and decline of domestic animal genetic resources must be comprehensive and integrated; the Global Strategy for the Management of Farm Animal Genetic Resources has been designed with an understanding of these requirements. Management of agro-ecosystems must emphasize long-term and sustainable approaches through integrated resource and land management approaches, and the full involvement of all stakeholders.

4. Further development and implementation of the Global Strategy will require partnerships to fund elements of the programme with FAO leading, coordinating and providing core funding.

5. The Global Strategy is fully in harmony with the Convention on Biological Diversity, and will facilitate its implementation. It puts major emphasis on the need for international and national coordination for efficient management of farm animal genetic resources and to avoid duplication of efforts.

6. Parties to the Convention should consider funding implementation of elements of the Global Strategy, in particular: support to enable rapid and effective establishment of national and regional focal points, supporting the development of DAD-IS and Project MoDAD, and assistance to countries to develop their National Action Strategies for animal genetic resources.

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