LECTURE

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The Global Program for the Management of Farm Animal Genetic Resources[1]

ABSTRACT

At present there are 3.972 breeds for 28 domestic species according to FAO's Global Databank estimatives which are contributing significantly to the material, social and cultural welfare of the human population. It is estimated that 30% of these breeds are either at risk or endangered of becoming extinct. Maintaining diversity among and within species is crucial for the present and future development of sustainable animal production systems. The general framework of reference for the FAO Global Program for the Management of Farm Animal Genetic Resources (FAO Program for short) is the Convention on Biological Diversity (CBD) endorsed by the United Nations Conference on Environment and Development (*Unced*) held in Rio De Janeiro in 1992 and recommendations made by various FAO intergovernmental and other forums. The FAO Program is aimed at assisting countries to survey and document their breeds of livestock, better utilize these breeds, maintain them for possible future use and access those unique genetic resources. The FAO Program comprises four components: a country driven global structure, an intergovernmental mechanism to effectively monitor progress and develop international policy, a technical program of work, and cadres of experts to help guide the Program development. FAO's role is that of leading, facilitating and globally coordinating and reporting. The Program physical structure is composed of National Focal points in countries, Regional Focal Points in the main world regions and sub-regions and a Global Focus at FAO, Rome. The virtual structure of the Program is that of the Domestic Animal Diversity Information System (DAD-IS), available now on the Internet. At present the structure has been completed for Europe, started with 12 countries in Asia, in the process of formation in the Americas and initiation will start in 1997 in the Near East.

RESUMEN

Título: **El Programa Mundial para el Manejo de los Recursos Genéticos de los Animales Domésticos**

Actualmente existen cerca de 3.972 razas de crianza incluidas en 28 especies de animales domésticos según estimativos del Banco Mundial de Datos de la FAO, las cuales contribuyen significativamente al bienestar material, social y cultural de la población humana. Se estima que el 30% de estas razas están en riesgo o peligro de extinción. El mantener la diversidad entre y en las especies, es crucial para el desarrollo actual y futuro de los sistemas sostenibles de producción animal. El marco de referencia general del Programa Global para el Manejo de los Recursos Genéticos Animales de la FAO (Programa de la FAO), está apoyado por el Convenio sobre Diversidad Biológica (CBD), por la Conferencia sobre Medio Ambiente y Desarrollo de las Naciones Unidas (UnceD), realizada en Río de Janeiro en 1992 y por las recomendaciones hechas en varias reuniones realizadas entre gobiernos y con otras entidades. El Programa de la FAO colabora con los países en el estudio y la documentación de sus razas de crianza, en estrategias para su mejor utilización y conservación, de modo que sea posible su uso en el futuro y, además para facilitar el acceso a estos recursos genéticos únicos.

El Programa de la FAO incluye cuatro puntos básicos: 1) una estructura global dirigida en el país; 2) un mecanismo intergubernamental para controlar el progreso y el desarrollo de una política internacional; 3) un programa técnico de trabajo; y, 4) un grupo de expertos que asesoran el desarrollo del Programa. La función de la FAO es básicamente liderar, facilitar y, en general, coordinar e informar. La estructura física del Programa está compuesta por las Oficinas Centrales Nacionales en los países, por las Oficinas en las principales regiones y subregiones del mundo y por la Oficina Principal de la FAO en Roma. La estructura virtual del Programa está constituida por el Sistema de Información sobre Diversidad Animal Nacional (DAD-IS), disponible ahora en Internet. Actualmente la estructura está completa en Europa, comenzó con 12 países en Asia, está en proceso de formación en América y, en 1997, se iniciará en el Cercano Oriente.

INTRODUCTION

DOMESTIC ANIMALS are a crucial element in meeting future global food requirements. The species which have been domesticated contribute directly and indirectly some 30-40% of the total of food and agriculture production. Incorporating animal with plant species will commonly increase production and productivity of sustainable agriculture in most production environments. Animal genetic diversity too allows farmers to select stocks or develop new breeds in response to changes in the environment, threats of disease, new facts of human nutrition requirements and changing market conditions, all of which are largely unpredictable. Animal genetic diversity is critical for achieving food security for the rapidly growing population, not only with respect to the local or national situation but also because countries are becoming more interdependent for access to unique animal genetic resources. Furthermore, lifting trade barriers should create opportunities for developing countries to achieve more efficient and effective livestock sectors capable of increasing foreign exchange earnings and security for the world's majority. In addition, in developed countries consumer emphasis on product quality is increasing, markets are becoming more segmented and efficiency of input resources uses is being increasingly emphasized. These needs will intensify and should broaden efforts in the genetic development of animals for production, productivity, product quality and to help sustain primary national and regional agroecosystems.

The need for countries to develop and strengthen their capacity to benefit fully from their biological resources highlights the need for a global strategy for conservation of biological resources. The catalyst for such a global strategy, was an endorsement of the Convention on Biological Diversity (CBD) by representatives of 167 countries at *Unced* in Rio de Janeiro in June 1992. Following its ratification by 30 countries the CBD became law in December 1993. So far, more than 115 countries have ratified the CBD. The CBD specifically addresses agriculture and identifies the objectives: to conserve diversity, to use it in a sustainable manner and to share benefits arising from utilization of genetic resources.

In recognition of the importance of domestic animal genetic resources and the sizeable proportion which are currently at risk of loss, and in keeping with FAO's mandate under the CBD, FAO's governing bodies sought the development of a program for the global management of these resources. This report addresses the rationale and the operation of FAO's Global Program for the Management of Farm Animal Genetic Resources. Activities underway, the range of opportunities for involvement and priorities are also outlined.

State of World Farm Animal Genetic Resources

Resources by species and region

The FAO Global Databank now lists 3.972 (projection figure) breeds for 28 domestic species; the number of breeds is 3,882 according to World Watch List [1995], but it has increased since its publication in the second edition of *World Watch List for Domestic Animal Diversity* (Scherf, 1995). The information contained in this second edition shows that globally 30% of breeds are classified as endangered and critical based on population size. FAO defines endangered as populations having <1000 breeding females and <20 breeding males; and critical populations having <100 breeding females and <5 breeding males. Under these two categories, 36% are managed either through a conservation program or maintained by an institute. Presumably, the risk of loss for these breeds actively managed or maintained is far lower than breed populations outside such management programs. Of the total number of breeds with population data identified globally, 2.924 (19%) are categorized as endangered or critical and lack a breed conservation management program. As such, there is a very high risk of

Table 1. Breeds of domestic animals at high risk or endangered of becoming extinct, by region.

Region	Total breeds on file	Breeds with population data (% of total)	Breeds categorized as critical or endangered (% of which are maintained)	Breeds at high risk of loss (%)[1]
Africa	396	239 (60%)	27 (0%)	27 (11%)
Asia and Pacific	996	710 (71%)	105 (8%)	97 (15%)
Europe and former USSR	1688	1501 (89%)	638 (44%)	358 (24%)
Latin America & Caribbean	220	143 (65%)	29 (7%)	27 (20%)
Near East	378	214 (57%)	15 (40%)	9 (7%)
North America	204	117 (57%)	59 (31%)	41 (50%)
Global	3882	2924 (75%)	873 (36%)	559 (19%)

1. At risk determined based on breeds with population data having < 1000 breeding females or < 20 breeding males and for which there is no conservation program in place.
Source: Adapted from Scherf (1995).

loss of these animal genetic resources. Table 1 summarizes the analysis of FAO Global Data Bank for Animal Genetic Resources by region.

For species in Latin America and the Caribbean (LAC) and North American (NA) sub-regions, the current information indicates that for the 432 breeds on file for the two sub-regions, only 51% have population data compared to 75% with population data globally; 23% and 72% of mammals and 5% and 22% of avian species in the LAC and NA sub-regions are not actively conserved and are currently at

high risk of loss according to population figures. These figures are quite conservative because of the form of the analysis done.

Diminishing within-species genetic base

There are several factors which place breeds at risk of loss and threaten domestic animal diversity; these factors are listed in Table 2. By far, the greatest cause of genetic erosion is the growing trend to global reliance on one or few breeds developed to meet the needs of high input-output and

Table 2. List of causes for risk of loss or extinction of breeds.

Reason	Description
Incentive	Lack of incentive to develop and use breeds, giving preference to those few developed for use in high-input, high-output relatively benign environments.
Product	Undue research and development emphasis placed on a specific product or trait leading to the rapid dissemination of one breed of animal to exclusion and loss of others.
Cross-breeding	Indiscriminate cross-breeding which can quickly lead to the loss of original breeds.
Storage	Failure of cryopreservation equipment and inadequate supply of liquid nitrogen to store samples of semen, ova or embryos; or inadequate maintenance of animal populations for breeds not currently in use.
Technology	Introduction of new machinery to replace animal draught and transport resulting in permanent change of farming system.
Genetic evaluation	Poorly interpreted international genetic evaluation.
Biotechnology	Mis-use of artificial insemination and embryo transfer leading to rapid replacement of indigenous breeds.
Violence	Wars and other forms of socio-political instability.
Disaster	Natural disasters such as floods, drought or famine.

comparatively benign environments. The adverse trend in animal genetic resource development is of paramount concern as a cursory examination of the research literature suggests that about 50% of the total variation at the quantitative level is between-breed, the remainder being common to all breeds. Hence, a move to one breed would eliminate half of this variation in the species, in addition to jeopardizing readily available gene combinations in other remaining unique genetic resources. The short time horizon now involved with marked increases in world population size and the associated food demand increases suggests that at least for the adaptation complex in each primary production environment, and particularly for long generation species such as cattle, we must primarily rely on utilizing already formed genetic types for sustainable animal agriculture rather than on establishing very different genetic packages.

Animal breeding is increasingly promoting and otherwise facilitating the universal use of these very few "superior" breeds, via international sale and advertising of stock and semen, international genetic evaluation and assistance, and perhaps in the future via international patenting of generally important biological procedures. Abrupt changes in breed composition are continuing to occur in developing countries, with a small number of exotic breeds being rapidly introduced and expanded as straight and cross-breds, and with concurrent dramatic reduction in population numbers for many of the indigenous breed resources. These very few genetic lines will not achieve high levels of production, productivity and sustainability for each of the broad range of production environments and combination of needs.

Conservation Imperatives for Animal Genetic Resources

With the projection that more than 1.000 of the possibly 3.972 breeds of Earth's domestic animal species are currently at high risk of extinction, and with so little knowledge about most, scarce international funds cannot at this point be concentrated on a small number of breed rescue projects. Emphasis must be on implementing a sound global management infrastructure and a broad technical program which has the potential to help many countries design and implement national action strategies, as required under the CBD. With these considerations in mind, the imperatives for conservation of domestic animal genetic diversity can be stated (Hammond and Leitch, 1995):

• Identify and understand those unique genetic resources which collectively comprise the global gene pools for each of the important animal species domesticated and used to provide food and other uses.

• Develop and properly utilize the associated diversity, to increase production and productivity, achieve sustainable agricultural systems and meet demands for specific product types. Hence, the effective use of breeds is also an essential component of conservation and perhaps the most cost-effective; a further reason for enabling the development and use of more breeds.

• Monitor particularly those resources which are currently represented by small populations of animals; or which are otherwise being displaced by one or other breed replacement strategies.

• Preserve the unique resources for which sufficient current demand cannot be engendered.

• Train and involve people in management of these resources, including their best use and development, and in the maintenance of diversity.

• Communicate to the world community the importance of our domestic animal genetic resources and of the associated diversity, its current exposure to loss and its irreplaceability.

Note particularly that development and use of genetic resources must be integral to an effective conservation effort for the domestic animal species.

Structure of the FAO's Global Management Program

FAO is the sole intergovernmental organization with a broad international mandate for improving agriculture and food production for current and future populations with particular emphasis on developing countries. Few institutions have the capacity to coordinate geographic, species, technical and intergovernmental issues which are necessarily involved in developing a successful global program of management for the domestic animal sector. FAO's Global Program for the Management of Farm Animal Genetic Resources involves FOUR interdependent components (Hammond and Leitch, 1995):

• An intergovernmental support mechanism for enabling direct government involvement and ensuring continuity of policy advice and support.

• A geographically distributed and country based global structure, to assist and coordinate national actions throughout the world;

• A technical program of activities grouped under seven elements; and,

• A cadre of experts to guide the Program and to maximize its cost-effectiveness.

The Country-Based Global Structure

The Convention on Biological Diversity accepts each country's sovereignty over its genetic resources, and this alone means that the structure for a global program of management must focus at the country level. The need for such a focus is further underscored by the fact that countries possess different subsets of the global total of breeds forming each domestic animal species. Additionally, countries are likely to become increasingly interdependent in seeking to access unique animal genetic resources from elsewhere. Hence, effective conservation programs by nations must provide the foundation for a successful global program of management for each species. The Global FAO Program provides the structure for achieving country-based emphasis combined with the necessary regional and global coordination of policy and effort (Figure 1). This primary level in the global infrastructure will provide for the early implementation of the necessary within-country management networks and enable countries to design, implement and maintain comprehensive national strategies for the management of their animal genetic resources. Scarce financial resources are concentrated on initiating the key infrastructure required. Some aspects of the Program are already being implemented although complete implementation will take some years and will depend on strong collaborative support for the Program.

National Focus for each country, comprising a coordinating institution and a country technical contact nominated by, and strongly linked to, the government and to the regional focal point (Figure 1). The government must be responsible for the within-country component and can contribute internationally through the intergovernmental mechanism. This coordinator will be the point of contact for the country's involvement in the FAO AnGR Program and will assist in establishing and maintaining the essential in-country network. To date, 50 countries have established focal points: 38 in Europe, 12 in Asia and 11 countries in the Americas have made their nominations.

Regional Focus in each major genetic storehouse region of the world, to help develop effective national coordinators, design and implement effective regional networks as integral components of the global structure, help achieve early and wide introduction of national strategies, and trigger a range of a most effective projects covering the conservation complex for domestic animals. The regional focuses will need to be established with the assistance of extra-budgetary funds. Regional focal points are planned for Asia and the Pacific; Europe; the Americas; Africa; and, the Near East and Mediterranean. The regional focal point for Asia and the Pacific has now been initiated in Bangkok through funding from Japan and has quickly demonstrated the great value, at least early on, of this level of focus.

Global Focus for the Program is being established at FAO headquarters to facilitate, communicate and coordinate the global effort. This includes developing the necessary modalities for the countries and assisting them in establishing their management strategies for AnGR; developing, implementing and maintaining the Domestic Animal Diversity Information System (DAD-IS); communicating the issues globally; maintaining the Early Warning System for AnGR; involving the range of governmental, non-governmental and intergovernmental parties essential for the Program's success; servicing the intergovernmental mechanism; and seeking the essential extra-budgetary funding for the Program. The Global Focus, the core, at FAO Headquarters in Rome is funded from regular FAO's budget, while other budgetary resources must be found for the Regional and National Focuses. An important meeting was organized by FAO (Rome, December 1986) to really involve donors and stakeholders in AnGR Program and to assist countries and regions in getting their activities going.

Work Elements of FAO's Global Management Program

The structure must be accompanied by a cost-effective program of work if the global management strategy is to be effective in achieving the imperatives over time (Figure 2).

Domestic Animal Diversity Information System

A key feature in supporting the global operational structure is the Domestic Animal Diversity Information System (DAD-IS). DAD-IS, whose stage I was launched
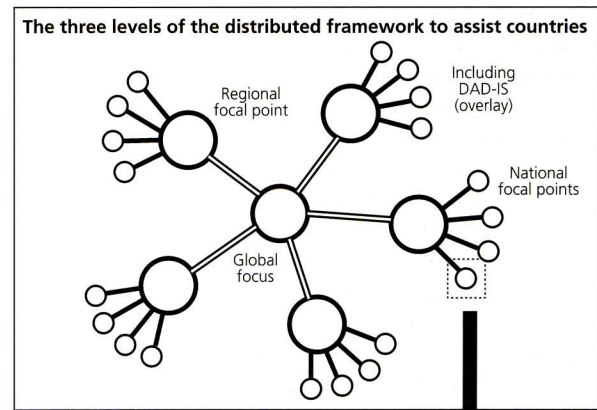

Figure 1. The country-based structure for the Global Strategy for the Management of Farm Animal Genetic Resources.
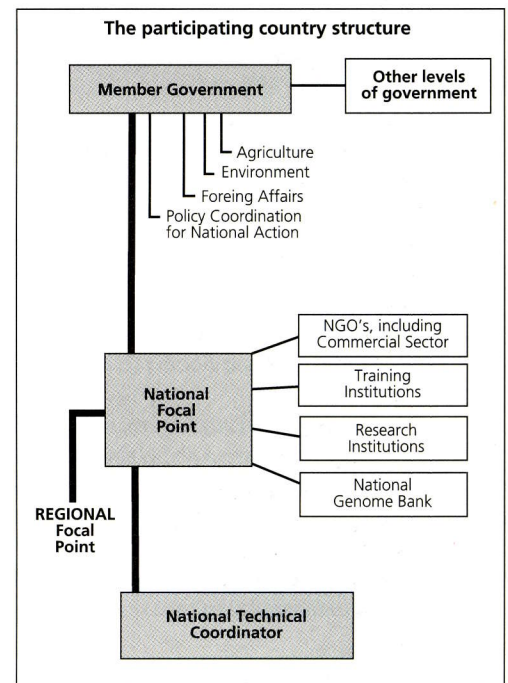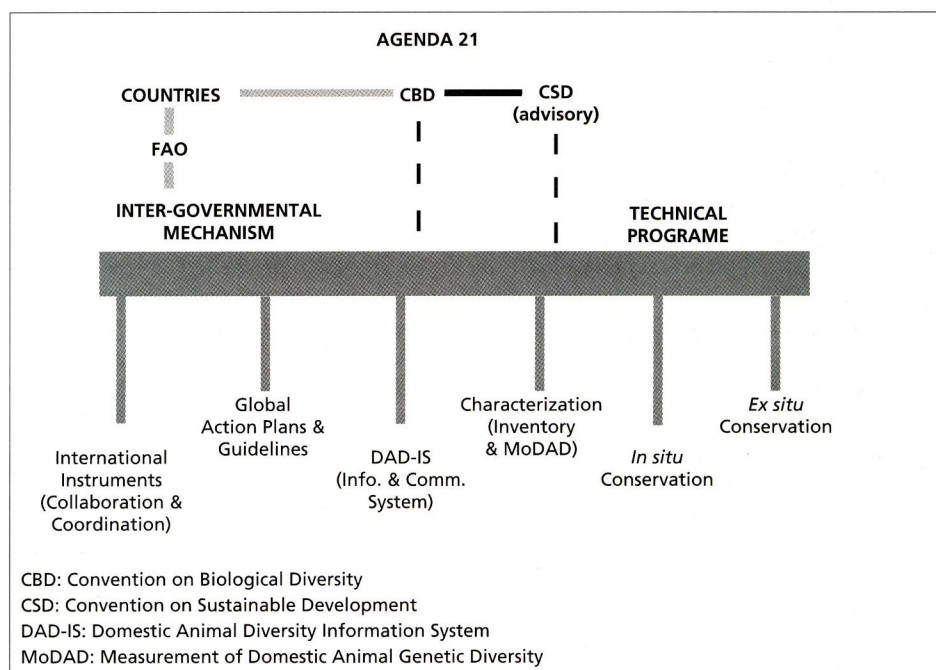
Figure 2. Primary intergovernmental and technical work for the Global Program for the Management of Farm Animal Genetic Resources and their relationship with CBD, CSD and Agenda 21.

CBD: Convention on Biological Diversity
CSD: Convention on Sustainable Development
DAD-IS: Domestic Animal Diversity Information System
MoDAD: Measurement of Domestic Animal Genetic Diversity

on the Internet in April 1996, will form the information axis for all aspects of the Program. It utilizes the Internet to enable low-cost, effective, ongoing communication and information transfer, but it has also been produced on a CD for wider distribution. DAD-IS will serve:

• To accommodate the range of essential and unique databases for the Program covering the global inventory and description and monitoring of resources for both breeds in use and genomebanks, and for Project MoDAD (see below); and to link in other specific genetic databases under development elsewhere.

• To provide The Global Early Warning System for AnGR and to facilitate continuous updating and ongoing access to it.

• To lower the cost and increase the amount and effectiveness of training and education in animal conservation genetics and procedures, through a system of shared expertise, information and computer assisted learning packages.

• To serve as a central and reliable source of aids for experimental design and data analysis, in order to increase cost-effectiveness of, and capacity for, research.

• To provide the global bibliography for AnGR.

• To assist in Program management at the country, regional and global levels, and execution of activities including the effective networking in project development and management.

• To facilitate active involvement of the world community in the Global Program.

Characterizing Animal Genetic Diversity

Establishing the magnitude of existing animal genetic diversity, and reliable rates of loss are corner stones for the Program. The enormity of this task is highlighted by the fact that globally, there are some 3,972 unique breeds, comprising 28+ species with some in most countries and largely no systematic monitoring in place and very limited baseline information available. FAO's Global Databank for AnGR now includes basic descriptive data on roughly 85% of these known breeds representing 28 species. This Databank is designed to include data on morphology, performance, molecular genetics and population size of different breeds, but at present it has information only on the first three types of data with population-size data being rather scanty. The data are collected from books, FAO publications and breed surveys. The population-size data surveys enable the monitoring of breeds at

risk of extinction. This information was first summarized in the FAO/UNEP World Watch List for DAD (Loftus and Scherf, 1993). Via DAD-IS, countries will both maintain and utilize information in the Databank, with this being regularly updated to incorporate missing data and used as a mechanism to monitor breed genetic resources at risk and rates of loss.

Comprehensive genetic evaluation at the breed level to cover all breeds for both current and future production potential for all primary production environments is not feasible nor required. Human and financial resources devoted to the management process in each country will continue to be at a premium over time. To help overcome this continuing difficulty, knowledge of the amount of breed-level variation in each species and of the size of each breed's unique contribution to this will assist priority setting for overall AnGR management. To better understand this relative uniqueness of animal genetic resources, a global research project in genetic distancing is planned as a critical characterization activity. This activity is entitled the Global Project for the Measurement of Domestic Animal Genetic Diversity (Project MoDAD). Project MoDAD will utilize microsatellite technology and initially focus on the analysis of genetic variation within some 14 species accounting for above 90% of food and agriculture production globally (Barker et al, 1993 and Gibson and Smith, 1989). The primary objective of Project MoDAD is to substantially increase the cost-effectiveness of the Global Program by establishing the comparative uniqueness of genetic resources in each species to aid rationalization of the total management task for countries and globally. This will be achieved primarily by directly utilizing MoDAD's results to objectively reduce the number of breeds that will need to be maintained. A secondary objective of Project MoDAD is to establish global repositories for both AnGR microsatellite data and DNA, for enabling more effective research and use in capacity building. Project MoDAD will benefit all nations. A detailed formulation document for the project, for use in assisting countries to be involved is available from FAO.

Mechanism for Conserving Animal Genetic Resources

Conservation is not an end in itself but a means of ensuring that animal genetic resources are better understood and available and more effectively used and deve-

loped by present and future generations. Once genetic resources have been identified and characterized, there are two basic conservation activities which may then be defined as either *in-situ* or *ex-situ* (Figure 2).

In-situ Conservation

The strategy for the global *in-situ* activity emphasizes 'wise use' of indigenous animal genetic resources by establishing and implementing breeding goals and strategies for sustainable production systems. Effective development of more of these adapted resources to meet the requirements is all important and will form the focus of FAO's *in-situ* emphasis. Because *in-situ* conservation involves the maintenance of live populations of animals in their adaptive environment, animal populations continue to evolve and be developed for more effective use. Infrastructure for animal recording and breeding is well established for developed countries. But the infrastructure which is appropriate to developing country systems remains scarce. Modalities for the simplified animal recording, genetic development and dissemination are needed for each species for a range of national livestock structures of developing countries.

Ex-situ Conservation

Ex-situ conservation activity includes cryogenic preservation and the maintenance as animal populations of breeds of domesticated species in farm parks, zoos and locations away from the environment in which they are being developed. In effect this is storage of AnGR for which farmers in a country are not currently interested in using. The biggest shortcoming of *ex-situ* genomebanks is that, once stored, animal genetic resources should removed from the evolutionary process they undergo in nature; and unless a concerted effort is made, the level of know-ledge about them is also frozen. Most *ex-situ* conservation is likely to utilize the cryopreservation at least for the larger species. Cryopreservation is technologically demanding and not yet developed for storing both male and female gametes of all species of interest. With long generation intervals of some domestic species regeneration of live animal populations of adequate size from cryopreserved material can be a time consuming and otherwise costly process. A range of quarantine issues must be overcome before much international storage of and access to such material can be effective for the domestic animal species.

The Global Program's *ex-situ* conservation strategy is still being developed but is based primarily on cryopreservation where technology exists or can be developed, combining within-country genomebanks with global gene repositories of last resort. This strategy is in keeping with the Convention on Biological Diversity. Interested governments, NGOs, research institutions, and private enterprises would also be encouraged to maintain *in vivo* samples of breeds at risk, with national inventories of these being established and maintained current, so that the genetic resources are directly available for use and study.

In-situ and *ex-situ* conservation are complementary, not mutually exclusive; their application for a particular AnGR depending on farmers current use of it and comparative uniqueness. Further, frozen germplasm can play an important role in the support of *in-situ* breeding strategies. For example, the use of artificial insemination (AI) in *in-situ* conservation of populations may enable much greater male selection differentials and dissemination than would be practical via natural mating using live adult males. The use of AI in back-crossing breeding systems may enable efficient regeneration of a population and alternate use of paternal breeds in reciprocal crossbreeding systems may also help achieve more productive and sustainable systems.

Global Action Plan and Guidelines
The Global Program provides assistance to countries in the development and implementation of comprehensive and practical guidelines for designing National Action Strategies for the management of animal genetic resources, and harmonizes with provisions of the CBD. The Global Action Strategy will be further developed by integrating all national action plans, and will be continually updated as knowledge, techno-logy, the negotiation of the CBD by member countries and implementation of policies progress.

International Instruments
The global activity for conservation and use of animal and plant genetic resources operates with technical input from FAO's intergovernmental Commission on Genetic Resources on Food and Agriculture. For the assistance in Program Management, DAD-IS so far includes two management tools, Guidelines for Development of National Domestic Animal (Farm) Genetic Resources Management Plans and Action Planner. The former's

objectives are to specify in detail steps and measures to be taken to establish and organize national plans. Action Planner main objectives are to simplify and standardize all operations in the management of local animal genetic resources, then help operatives organize, monitor and communicate their activities at all levels.

Activities Underway by FAO
The following activities are being undertaken to provide the essential core support to the Program and help ensure that it incorporates as much continuity as possible from the outset:
• Commencing preparation of guidelines for each area of animal management, to assist countries, e.g. animal recording.
• Initiating sub-regional identification missions to prepare a portfolio of effective activities for funding at medium term and to understand specific region's needs.

• Inviting interested countries to identify and support National Focal Points for the Program; these invitations must be sequenced by region.
• Implementing a pilot Regional Focus to gain experience of requirements and effectiveness of the regional level in the Program's global structure.
• Introducing global surveys for breeds and for *ex-situ* preserved material by establishing the Global Databank for Animal Genetic Resources, and developing the World Watch List for Domestic Animal Diversity as key components of The Global Early Warning System for Animal Genetic Resources.
• Developing the communications strategy for the Program, and commencing to involve other parties (international agencies, NGOs, etc.).
• Developing the stage II of the Domestic Animal Diversity Information System (DAD-IS). The stage I of DAD-IS was

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Working definitions proposed for management of animal genetic resources.

Animal Genetic Resources (AnGR). At the breed level, the genetically unique breed populations formed throughout all domestication processes within each animal species of interest to the production of food and agriculture, together with the immediate wild relatives of the species. Breed is accepted as a cultural rather than a technical term, i.e. to emphasize ownership, and also includes strains and research lines.

Domestic Animal Diversity (DAD). The genetic variation or genetic diversity existing among the species, breeds and individuals, for all animal species which have been domesticated and their immediate wild relatives.

Conservation (of domestic animal diversity). The sum total of all operations involved in the management of animal genetic resources, such that these resources are best used and developed to meet immediate and short term requirements for food and agriculture, and to ensure the diversity they harbor remains available to meet possible longer term needs.

Conservation (in general). The management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations. Thus conservation is positive, embracing preservation, maintenance, sustainable utilization, restoration and enhancement of the natural environment.

In-situ Conservation. Primarily the active breeding of animal populations for food production and agriculture, such that diversity is both best utilized in the short term and maintained for the longer term. Operations pertaining to in-situ conservation include performance recording schemes, and development (breeding) programs. In-situ conservation also includes ecosystem management and use for the sustainable production of food and agriculture. For wild relatives in-situ conservation (generally called in-situ preservation) is the maintenance of live populations of animals in their adaptive environment or as close to it as practically possible.

Ex-situ Conservation. In the context of conservation of domestic animal diversity, ex-situ conservation means storage. It involves the preservation as animals of a sample of a breed in a situation removed from its normal production environment or habitat, and/or the collection and cryopreservation of resources in the form of living semen, ova, embryos or tissues, which can be used to regenerate animals. Other methods of genetic manipulation, such as the use of various recombinant DNA techniques, may represent useful means of studying or improving breeds, but do not constitute ex-situ conservation, and may not serve conservation objectives. At present the technical capacity to regenerate whole organisms from isolated DNA does not exist.

Source: FAO, 1995.

launched on the WWW (in Internet) on 23 April 1996.

• Commencing training workshops at the regional level for the National Focal Points.

• Assisting with implementation of specific areas of the Program; for example, characterization, particularly surveying and MoDAD, genomebanking and indigenous breed development.

Getting Started in the Region

Accepting the need to address the imperatives for the better management of animal genetic resources; recognising the responsibilities of countries to effectively respond to the CBD, and that some countries in the region have recently begun to develop and expand such management activities; and appreciating that some subregional infrastructure already exists, but that both human and financial resources are currently seriously constrained; how might the America's Region and its countries best capitalize on the global initiative by FAO and design and implement cost-effective management plans for their range of animal genetic resources?

The above list of activities underway by FAO suggests some answers to this question. FAO has taken the position that an essential basic infrastructure and a comprehensive approach to management of these resources is required to be effective. This basic infrastructure provides the framework for documenting and better understanding those resources remaining, better using and developing them, whilst also ensuring that unique genetic resources which have low current interest amongst farmers, and are therefore most likely to be at risk of loss, are properly maintained for possible future use. This is considered a vastly superior approach to one which focuses on small numbers only of breeds together with a small number of breeds at risk within each species.

Hence, to fully utilize the FAO Program, countries will need an active and capable National Technical Focus. IICA is collaborating with FAO in that respect to obtain the necessary financial support for establishing at the earliest possible date an effective Regional Focus. This Regional Focus should be based at a relatively central point which already possesses solid infrastructure and expertise in management of animal genetic resources. FAO has already sent letters to countries in the Americas to nominate their National Focal Points and Coordintators. Preferably, at least two project identification missio-

ns for the Latin American and Caribbean Sub-regions of the Americas should be undertaken at the earliest opportunity, to identify and to promote a coordinated and most cost-effective implementation of the necessary activities. Of course, countries in the region could also be involved in a number of the other activities which FAO is implementing within the Global Strategy. This added involvement would be greatly assisted by implementation of the above-mentioned basic operations.

Brazil is a country in the Americas that started its national AnGR program using its local resources. They are progressing in most of the elements of the program, e.g. characterization, *in situ* and *ex situ* conservation, cryopreservation, etc. Lately, a National Focus has been designated. Activities presently carried out could be enhanced when they are integrated into a Regional/Subregional context. Perú has also designated its National Focus too.

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