



Farm Animal Genetic Resources

Safeguarding National Assets for Food Security and Trade



Animal Production and Health Division



Deutsche Gesellschaft für
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Farm Animal Genetic Resources

Safeguarding National Assets for Food Security and Trade

A Summary of workshops on farm animal genetic resources held in the Southern African Development Community (SADC)

This publication is based on workshops which were held in a specific region of the world but the findings are relevant worldwide.

Ilse Köhler-Rollefson



Deutsche Gesellschaft für
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Preface

Agro-biodiversity represents an important resource for livelihood security and for social and economic development.

Diversity of these genetic resources for food and agriculture (GRFA) provides for a range of products and services even in the most marginal environments. Plant and animal genetic resources are the primary source material for the further development of crop varieties and animal breeds by farmers and breeders.

Unfortunately, a large number of these genetic resources have been lost and many more are threatened. The countries of the SADC region (Southern African Development Community) have expressed their firm interest to improve food security for their population and to fight poverty by sustainably using and conserving their genetic resources and especially their farm animal genetic resources (AnGR).

Three quarters of the farm animals in the SADC belong to smallholders and consist mostly of indigenous breeds. Over long periods, these breeds have been adapted by their communities to the various environments. Today, about

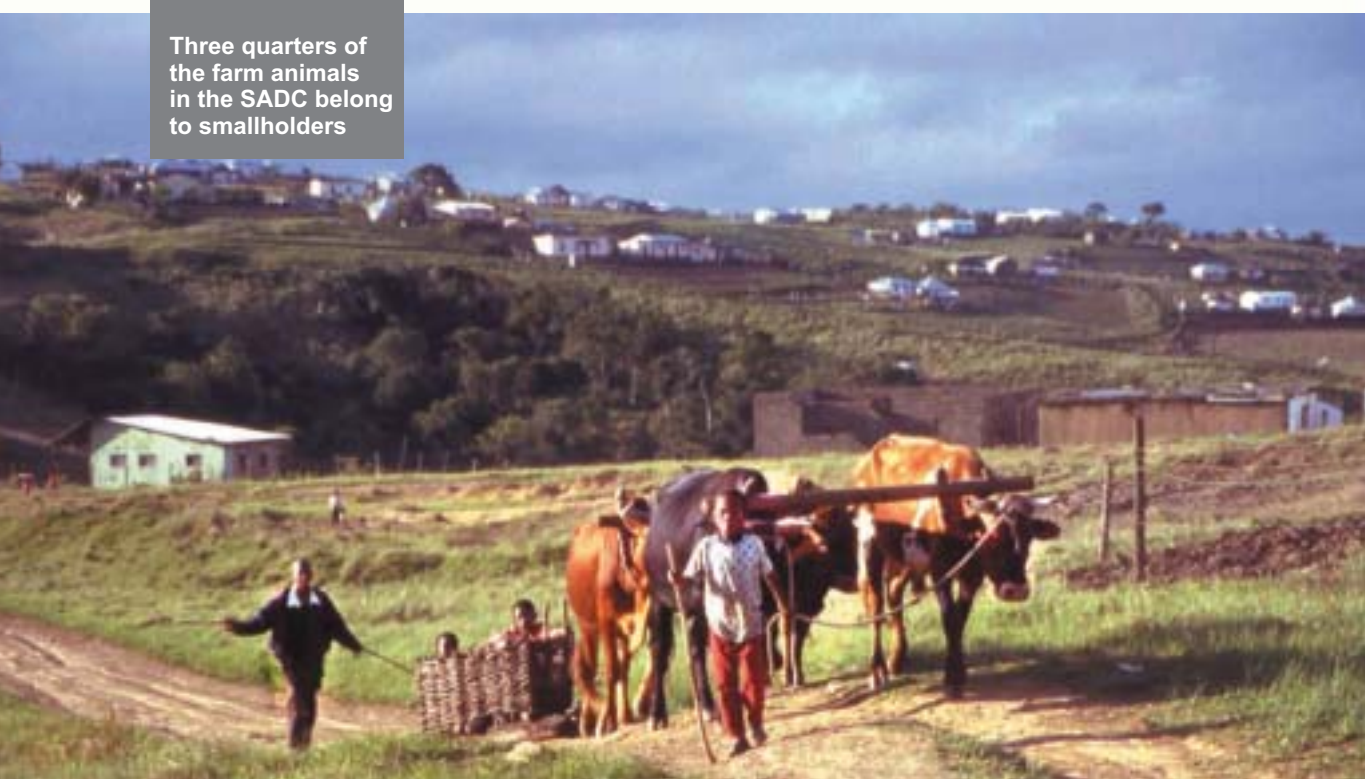
60 % of all households in the region depend - at least partly - on farm animals to cover their transport, draught, nutrition, energy, housing and income requirements.

Consequently, policy makers of all countries in the region strive for strategies to increase the productivity of the livestock sector and to improve and conserve its genetic basis. The SADC countries, however, have even gone beyond the national boundaries by formulating a Regional Programme for the Management of Farm Animal Genetic Resources, which helps identify, characterize, conserve and improve farm animal genetic resources.

Being signatory states of most international agreements, the SADC countries have started the process to adjust their policies to the international requirements as defined by the Convention of Biological Diversity and the Global Strategy for the Management of Farm Animal Resources of FAO and their respective collaborative bodies and working groups.

At the beginning of this process of strategy development and policy adjustment urging questions were unanswered:

Three quarters of the farm animals in the SADC belong to smallholders



- What type of management is needed for the sustainable use and conservation of genetic resources for food and agriculture?
- What is the role of the local communities in management and decision taking? What types of incentives are needed to encourage measures of sustainable management?
- What political and legal framework should be set up to favour the sustainable use and conservation of AnGR?

In order to find answers to these and further questions and to facilitate decision making, experts from all SADC countries and international organizations met in a series of four workshops between 2001 and 2003:

The first workshop “**Community-based Management of Farm Animal Genetic Resources**” (Mbabane, Swaziland, 7-11 May, 2001) dealt with the role and importance of local communities in using, maintaining and improving local animal breeds.

The second workshop “**Incentive Measures for Sustainable Use and Conservation of Agrobiodiversity**” (Lusaka, Zambia, 11-14 September, 2001) looked at possibilities to enhance conservation and sustainable use of genetic resources for food and agriculture.

The third workshop “**Guidelines for the Development of Regional and National Policy on the Management of Farm Animal**

Genetic Resources” (Luanda, Angola, March, 2002) discussed the necessary elements of national and regional policies for safeguarding animal genetic resources.

The fourth workshop “**Policies, Approaches, Legal Frameworks**” (Maputo, Mozambique, 20-23 May, 2003) analyzed the national and international framework within which farm animal genetic resources have to be managed.

These workshops, which were organized and sponsored by SADC, CTA, FAO and GTZ, gave a unique opportunity for policy makers and legal, technical and development experts to exchange experience and discuss options for the sustainable use and conservation of GRFA in the SADC and - in the following - facilitated decision taking at all levels. HIVOS, IDRC, IPGRI, SADC, SIDA and SPGRC sponsored the Zambia workshop.

This publication of CTA, FAO and GTZ summarizes the results of the workshops, which were held in a specific region of the world, but the findings are relevant worldwide.

Presentations, papers and documentation of the workshops and further material is provided on a CD-ROM enclosed in this publication. We hope that the contents may also serve to guide others in their effort to secure the genetic resources and thus the possibilities for national and global future improvement of agricultural biodiversity and food production.

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Introduction

Farm Animal Genetic Resources: Backbone of Rural Livelihoods and Assets for National Economies

In the interest of food security and to satisfy the predicted growing demand for livestock products, the Southern African region faces the challenge of increasing the productivity of its livestock sector while simultaneously safeguarding its unique farm animal breeds which form the genetic basis for future livestock development.

The significance of livestock and AnGR for food security and trade in the SADC region

With about 60 % of the population in the SADC countries depending on livestock for all or parts of its livelihood, the significance of farm animals for the economy of the region is enormous. The livestock population of the Southern African region consisting of 41.5 million cattle, 46.2 million sheep, 26.2 million goats, 0.4 million pigs and 148.6 million poultry, contributes about 30 % of the total human protein and calorie requirements, in addition to fibre, skins, wool and mohair. Draught power and manure acting as fertilizer and fuel also form important components of the rural economy.

Livestock is calculated to contribute 38 % of the agricultural Gross Domestic Product (GDP) of the SADC region, but this official figure under-

values the significance of farm animals to rural peoples' livelihoods since it reflects cash sales only, but not milk for household consumption, provision of draught power and manure.

Impact of food security

Food security is a major concern in the countries of the SADC region since food production cannot keep up with population growth. The area is prone to frequent droughts and other natural disasters, and the trade in agricultural commodities is underdeveloped. Population growth forces more and more people to move into marginal land and leads to degradation of the natural resource base (Mugwara and Egziabher, 2002).

Stakeholders

There are at least three major groups of primary stakeholders for whom livestock is of economic importance:

Smallholders

More than 90 % of animal keepers in Southern Africa are classified as smallholders while 75 % of all farm animals in the SADC region are kept by rural communities and in the smallholder sector. Operating under conditions of resource constraints, smallholders usually pursue diverse livelihood strategies of which livestock forms a major and risk alleviating component. They try to satisfy their subsistence needs first, while marketing of products is of secondary importance, although it remains an important source of cash.

Everyday services of livestock such as providing draught power are often underestimated



For this group household food security and family welfare is the first priority. Several studies in Namibia, Botswana, South Africa and Zimbabwe show that meat and cash sales provide less than 25 % of annual benefits from livestock while milk, draught power, transport and manure account for more than 75 % (Shackleton et al., 2000). The products are usually sold on local markets, often at lower prices than through commercial outlets, therefore providing savings to rural customers.

The majority of the population in Southern Africa depends on communal lands and from the perspective of poverty alleviation; livestock provides an important avenue for accessing benefits from this natural resource.

Commercial farmers and exporters

Apart from smallholders, there are also large commercial farms and cooperatives supplying the bulk of the regional meat and dairy products, as well as providing employment. For instance, in South Africa there are 4,300 milk producers who employ about 60,000 farm workers and indirectly provide jobs to some 40,000 people.

South Africa is also a major exporter of wool and of cashmere. Besides, several of the SADC countries fulfil the international sanitary regulations set by the World Organisation for Animal Health (formerly Organisation of International Epizootics, OIE) and engage in a thriving export to the international meat market.

Trade in farm animal genetics

Southern Africa is a major player in the trade with farm animal genetic material. Since 1994 thousands of embryos have been exported from South Africa, Zimbabwe and other countries to Australia, Canada and Brazil. In addition, semen and live animals are sold to other African countries and Asia.

Social, cultural and ritual meaning of livestock

Yet, the significance of livestock transcends economic considerations and enters the social, cultural and ritual realm. Throughout the Southern African region, animals, especially cattle, are a means of reinforcing social ties and of sharing resources. Even non-livestock owners benefit, since they often receive gifts from owners in the form of meat, milk, or ploughing free of charge. Cattle owners also make dung available for free to be used as manure and sealant for floors and walls (Shackleton, 2000). Throughout the region, cattle are used as social currency to pay dowry or bride price (lobola); chicken are needed for certain healing rituals.

Role of livestock in rural livelihoods

Livestock plays an important role in rural livelihoods, especially in marginal ecological areas. They provide the following monetary and non-monetary benefits:

- Food, fibre, fertilizer and fuel
- Cash income through the sale of animals and their products
- Draught power for smallholder farm operations, and transportation
- Savings accounts
- Health and nutrition - source of protein especially for vulnerable groups (children, convalescents, pregnant and nursing women)
- Buffer against crop failure and other risks
- Environmental services - renewable source of fuel, thereby reducing need of fossil fuels and pressure on forests
- Employment - creating jobs by providing raw materials for agro-based industries
- A way to access and use common property resources
- Support for the social network and culture

What is domestic animal diversity and why conserve it?

Worldwide, farm animals belong to about 40 species that can be classified into almost 7,000 breeds. This “domestic animal diversity” or “farm animal diversity” is under threat. During the last 100 years some 1,000 of the world’s documented breeds have become extinct, 300 have disappeared during the last 15 years alone. Many more are threatened. The FAO warns that extinction is estimated to progress (this is an extrapolation and cannot really be proven) at the rate of 6 breeds per month. This renders domestic animal diversity one of the most endangered components of biodiversity.

Definitions

Farm animal genetic resources: those animal species that are used, or may be used, for the production of food and agriculture, and the populations within each of them.

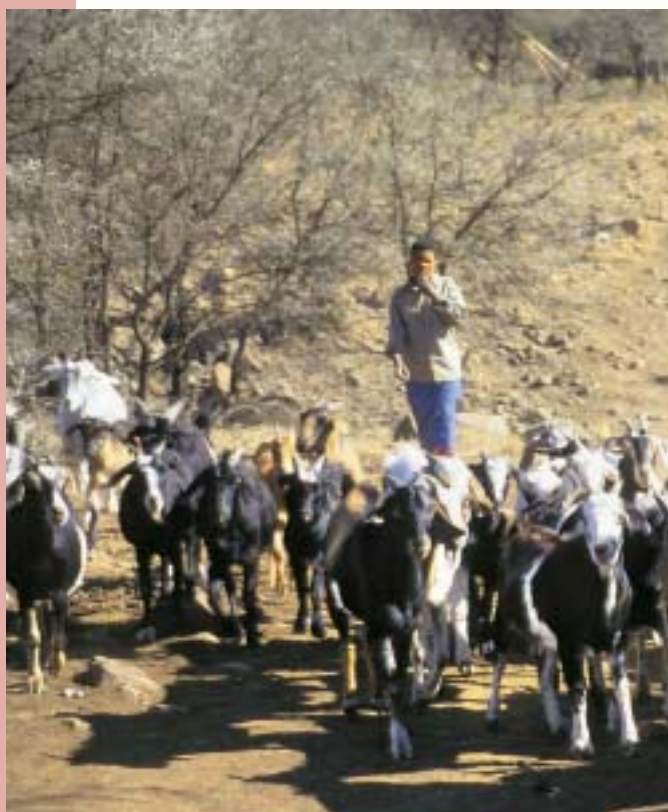
Domesticated animal diversity: the spectrum of genetic differences within each breed, and across all breeds within each domestic animal species, together with the species differences of interest for food and agriculture production.

Species are groups of animals that mate freely with each other and produce fertile offspring. Cattle, sheep, goats, donkeys, pigs, horses, chicken, ducks are all species.

Breeds are either a sub-specific group of domestic livestock with definable and identifiable external characteristics that enable it to be separated by visual appraisal from other similarly defined groups within the same species, or a group for which geographical and/or cultural separation from phenotypically similar groups has led to acceptance of its separate identity. Examples are Nguni cattle, Lesotho pony, Tswana sheep, and Boer goat.

Individual breeds vary with respect to the diversity contained within them. High performance breeds that have been subjected to intensive selection by using top-sires very widely, usually have a low degree of diversity compared with more extensively kept breeds in traditional systems. The amount of diversity in a population is an indicator of the potential room for genetic change.

This situation is mainly due to the promotion of a small number of high-performance breeds developed in Europe and Northern America. In the context of the intensification and industrialization of agriculture and animal husbandry, they were exported into the rest of the world. The locally developed breeds, on the other hand, were often regarded as less productive



Under Southern African rangeland conditions, indigenous breeds often have a competitive edge over exotic breeds

and therefore subjected to replacement and cross-breeding, or were totally neglected. Policies and development undermining the livelihoods of ethnic minorities keeping indigenous breeds - for instance through the establishment of nature and wildlife reserves in pastoral areas - are also a major factor. Conflicts and wars, as well as natural disasters contribute their share.

But in contrast to the exotic high performance breeds, the locally developed breeds have for many centuries, or even millennia, been subjected to the particular environmental conditions of the SADC region. As a result, they have adapted and represent particular combinations of genes which enable them to cope with local conditions, including food, water availability, climate and pests and diseases. This adaptive fitness is genetically complex and has developed over countless generations; it cannot be changed rapidly. It is the reason why, under the rangeland conditions of the Southern African region, indigenous breeds in many respects have a competitive edge over exotic breeds.

What are Animal Genetic Resources?

Farm animal genetic resources are all animal species, breeds/strains and populations used for food and agricultural production and their wild and semi-domesticated relatives. They encompass about 40 species of domesticated animals that have been diversified into more than 7,000 breeds during the 12,000 years since humans started farming and raising livestock and adapted to very diverse and specific challenges. According to the Food and Agriculture Organization, about one third of the documented breeds are threatened or have already become extinct (Scherf, 2000).

The present diversity of farm animal species and breeds composes the world's farm animal genetic resources and represents the building

blocks for all livestock development. It forms the raw material that farmers depend on to adapt to change in the natural environment and in production conditions, to cope with disease outbreaks and to respond to emerging market opportunities. If all livestock becomes uniform, there is no more potential for adjustment.

The present domestic animal diversity as represented in the multitude of our livestock breeds is the result of thousands of generations of rural communities manipulating their livestock populations according to the requirements of their environment, their subsistence needs and cultural concepts. It is a consequence of cultural diversity and represents a legacy that needs to be stewarded wisely for the future of all humankind.

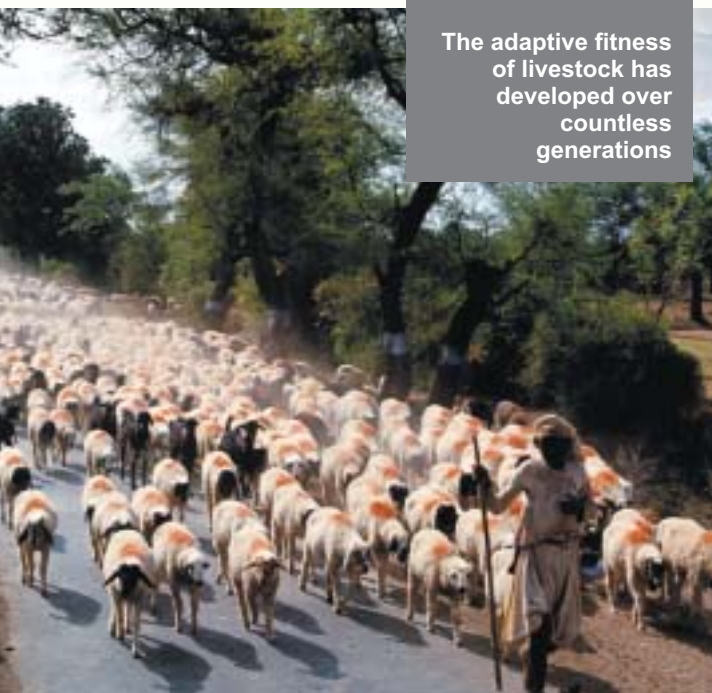
The countries composing the SADC region (currently these are Angola, Botswana, the Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zambia and Zimbabwe) recognize livestock as a critical component of their natural resource portfolio and as a means for making optimal use of the extensive grassland and semi-desert and desert areas of the region.

Farm animal genetic resources in the SADC region

The farm animal genetic resources of the SADC region range from exotic breeds kept in high input production systems to indigenous breeds kept by communities under more extensive conditions.

Sheep, goats, pigs and poultry belong mostly to indigenous breeds, while the proportion of indigenous cattle ranges from 50 % in Botswana to 99 % in Tanzania.





The adaptive fitness of livestock has developed over countless generations

Cattle was domesticated in Africa

Earlier it was believed that cattle were domesticated in the Near East and introduced to Africa in a domesticated state. Now molecular-genetic studies conducted by a team from the International Livestock Research Institute (ILRI) have confirmed the hypothesis of some archaeologists that a separate domestication centre existed in northeastern Africa from which the Sanga cattle originated about 10,000 years ago.

About two thousand years ago, in the Great Lakes region, an eastern Bantu core area developed where agriculture and pastoralism were practiced. From here cattle pastoralism spread southward on the eastern side of the continent eventually coming in contact with San hunter-gatherers in northern Botswana. From this interaction the Khoi Khoi herders of the western and southern Cape may have developed.

African cattle contain various degrees of Zebu blood, which originated in India and was probably introduced by the Arabs via sea-borne trade (Hanotte et al., 2002).

The ancestors of the present indigenous cattle, sheep and goat breeds came to Southern Africa between the 3rd and 7th century together with Bantu groups. Sheep seem to have been the earliest domesticated animals to enter the region from the north. Nguni cattle reached Zambia by 300 B.C. and Southern Africa (Botswana, Gauteng, Natal) by 300 A.D..

European farm animals were introduced into the region since the 16th and 17th centuries. They were always perceived as superior and in 1934, South Africa even passed an animal breeding act which proclaimed indigenous cattle as non-descript ("scrub") and empowered extension workers to castrate these animals (Bester et al., 2003).

Advantages of indigenous farm animal breeds

But indigenous livestock breeds have many unique characteristics. They are very fertile, have long productive lives, experience low mortality, are characterized by good feed conversion rates and low maintenance requirements, and blessed with tick resistance and tolerance to tick-borne diseases. They generally perform better than exotic breeds under low-input conditions, climatic stresses and especially during times of drought. Thus they provide many advantages especially to smallholders.

Furthermore, research conducted since the 1970s has demonstrated that, besides producing well in challenging environments, indigenous breeds also have the potential for higher production if provided with higher levels of input. By breeding the best of the locally adapted animals, farmers and pastoralists can achieve sustainable genetic improvements whose benefits can be reaped for generations to come without further investment.

Another point to consider is that, according to current models used for predicting climate changes, the arid and semi-arid areas in which

the SADC region falls, are likely to experience an increase in the frequency, severity and length of droughts as well as in ambient temperatures. Under such conditions, locally adapted breeds will have even more competitive advantages over exotic ones.

Example from Ethiopia

From 1989 until 1997 a dairy goat development programme was undertaken in Ethiopia that promoted the cross-breeding of indigenous Somali and Hararghe Highland goats with imported Anglo-Nubian goats. A survey of 158 households keeping cross-bred and indigenous goats evaluated the benefits that had accrued to participants in a holistic manner, i.e. taking into account marketable products, manure, assets, and security. Intra-household comparisons showed that the cross-bred goats were no better than the indigenous goats in terms of composite productivity indices. Instead it was shown that improved management increased the productivity of the indigenous goats to a similar level as that of the cross-bred goats. It was concluded that cross-breeding is inappropriate for subsistence producers (Ayalew et al., 2003).

Programme for farm animal genetic resources in the SADC region

This insight has led to a paradigm shift in approaches to livestock breeding and an increasing appreciation of the value of the indigenous

breeds. Furthermore, since 1995, SADC nations have become signatories to the Convention on Biological Diversity (CBD). This legally binding agreement obliges member countries “to conserve their biological diversity and sustainably use its components” and also pertains to domestic animal diversity. The CBD introduces a new set of rules, according each nation the sovereignty over its genetic resources and making it responsible for the development of national action strategies, plans and programmes for the conservation of biological diversity.

It was in this context that a SADC/FAO/UNDP programme for the management of farm animal genetic resources was initiated. This provided for establishment of a co-ordinating centre, a regional network and a project for the characterization and conservation of indigenous breeds. It also allowed for monitoring and inventorying breeds as well as capacity-building and policy formulation.

The SADC Programme for the Management of Farm Animal Genetic Resources

This programme has the goal of identifying, characterizing, conserving and improving farm animal genetic resources and thereby maintaining biological diversity as a means of creating more sustainable livestock production systems and hence improved food security, rural livelihoods and incomes.

The programme works with farmers and their organizations, policy makers, researchers and extension agents, suppliers of livestock services, the international community, including donors, partners and collaborators.

The thematic areas include: development and promotion of indigenous breeds, characterization and conservation of animal biodiversity, breed inventory and monitoring, information gathering, sharing, and dissemination, networking and advocacy, capacity-building, policy development.

Assessing the market value of local breeds has just begun



Potential for trade with farm animal genetic resources

It can be argued that the SADC region has a competitive advantage in producing farm animal genetic resources suitable for extensive livestock production. Over centuries and even millennia, the indigenous livestock of the area has had to cope with droughts, disease vectors and seasonal food shortages. This selection practiced over many years by herding communities in the context of local environmental constraints has thus provided modern animal breeders with a basis of good genetic material with which to breed for present day requirements.

Farm animal genetic resources originating from the SADC region are making a splash in the Australian and North American livestock industry because they provide high quality meat while being very disease resistant, fertile, manageable and able to cope with low-input conditions.

Damara sheep from Namibia

This long-legged breed originated with the Himba and Sjimba pastoralists who traded it with colonial farmers for copper wire and horses. Since it requires not more than minimum inputs, it became known as a “no-care” breed. After research revealed that it has not only adaptational strengths, but also good potential for meat production it has become popular with commercial farmers and its embryos are now sold to Australia where it has become the base for the new Meat Master breed (van Wielligh, 2003).

Tuli cattle from Zimbabwe

Tuli cattle are a yellow coloured Sanga breed from the lowveld region of southern Zimbabwe. For centuries, the Matabele, Bantu speaking people, had selected them for docility, good temperament and adaptation to the environ-



People's daily life: unimaginable without livestock and its products

ment. Then, in the 1940s, a South African animal breeder noticed that they seemed superior to other types of cattle in the area and purchased 20 cows and one bull from local people. A breeding station was established and the commercial potential of the breed soon became apparent, eventually leading to the formation of a Tuli breeding society in the 1960s. In 1979 the herd was moved to the Matopos Research Station, Zimbabwe. Subsequently, South African cattle breeders became aware of the potential of the breed and started importing it. High fertility, hardiness, adaptability and excellent beef qualities made the Tuli extremely popular in straight and cross-breeding programmes.

In 1988, a joint venture between the Commonwealth Scientific and Industrial Research Organization (CSIRO), an Australian government agency, and a consortium of Australian producers collected Tuli embryos from Zimbabwe and took them to Cocos Island in 1988 where they were implanted into



International exchange may help people discover new, marketable values of their breed

surrogate dams. In 1990, live calves landed in Australia. CSIRO anticipated that the introduction of these breeds could lift national beef production by up to 30 percent.

By 1994, Tuli embryos set a new world record price at an embryo sale in Australia in 1994, while 2-3 year old Tuli bulls also experienced heavy demand from America. A trial of several breeds at Clay Centre in Nebraska, USA, showed that Tuli had the juiciest meat and was second to the Angus for marbling.

Boer goat from South Africa

The Boer goat is widely regarded as the best meat goat breed in the world. In the early 1990s, some farmers tapped into the export market and sold Boer goat embryos, semen and live animals. Subsequently Boer Goat Breeders Societies sprung up in Australia and America, and in America a doe was sold for \$ 80,000 at an auction (Roets et al., 2003).

The role of the Food and Agriculture Organization of the United Nations (FAO)

In its endeavour to secure its farm animal genetic resources, the SADC region is supported by the Food and Agriculture Organization (FAO) that has been given the mandate of establishing the Global Programme for the Management of Farm Animal Genetic Resources by its member nations.

The Global Strategy for the Management of Farm Animal Genetic Resources

Management of farm animal genetic resources comprises understanding, using, developing, maintaining, and accessing them. Successful management is technically and operationally challenging.

Under the CBD, countries have sovereignty over their genetic resources, but also the responsibility to manage them sustainably. With respect to animal genetic resources, this also pertains to breeds that are currently not of economic interest.

In order to assist countries to take effective management actions to develop, use and halt the erosion of their animal genetic resources, the FAO has been requested by its member countries to establish a Global Strategy for the Management of Farm Animal Genetic Resources.

The Global Strategy offers countries a comprehensive framework for advancing the sustainable development, conservation, characterization and access to farm animal genetic resources, comprising:

- an intergovernmental mechanism for direct government involvement and policy development,
- a country-based global infrastructure to help countries cost-effectively plan, implement and maintain national strategies for the management of animal genetic resources,
- a technical programme aimed at supporting effective action at the country level in the sustainable intensification, conservation, characterization and access to Animal Genetic Resources, and,
- a reporting and evaluation system to guide the Strategy's implementation, facilitate collaboration, coordination and policy development and maximize the cost-effectiveness of activities.

Key activities include the establishment of national focal points and national coordinators, training and support for these coordinators, establishment of regional focal points to provide back-up to national focal points, and development of primary and secondary guidelines for each area of animal genetic resources management.

A communication and information tool called the Domestic Animal Diversity Information System (DAD-IS at <http://www.fao.org/dad-is/>) has been developed by the FAO for the implementation of the Global Strategy. The objective of DAD-IS is to assist countries and country networks, by providing extensive searchable databases, tools, guidelines, a library, links and contacts for the better management of all animal genetic resources used in food and agriculture.

Commission on Genetic Resources for Food and Agriculture

The FAO also hosts the Commission on Genetic Resources for Food and Agriculture (CGRFA), which is a permanent forum where governments discuss and negotiate matters

relevant to genetic resources for food and agriculture. The main objectives of the CGRFA are to ensure the conservation and sustainable utilization of genetic resources for food and agriculture, as well as the fair and equitable sharing of benefits derived from their use, for present and future generations. The Commission aims to reach international consensus on areas of global interest, through negotiations.

The Commission was originally established by the FAO Conference (Resolution 9/83) in 1983 as the Commission on Plant Genetic Resources, to deal with issues related to plant genetic resources. In 1995, its mandate was broadened (Resolution 3/95), to cover all components of agro-biodiversity of relevance to food and agriculture (although forest genetic resources and fish genetic resources are yet to be considered). The Commission was then renamed the Commission on Genetic Resources for Food and Agriculture. At present 164 countries and the European Community are members of the CGRFA. Membership is open to all FAO members and associate members, upon request.



In keeping up the functions and diversity of their stock smallholders need assistance from national agencies

In May 1997, the CGRFA established the 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. The members of the Working Group are elected every two years, during the regular sessions of the CGRFA in a regionally balanced manner.

During its first session, in September 1998, the ITWG-AnGR discussed the further development of the Global Strategy and recommended that the FAO coordinate the development of the first report on the State of the World's Animal Genetic Resources (SoW-AnGR) to provide an assessment of the state of farm animal genetic resources as well as of individual countries' AnGR programmes. Countries were also asked to nominate National Focal Points, and, where appropriate, Regional Focal Points.

The second session of the ITWG-AnGR, held in September 2000, evaluated the progress of the Global Strategy at the various levels and developed an extensive set of recommendations, accepted guidelines for country reports, and specified the process and timetable for the first report of the State of the World's Animal Genetic Resources.

Role of the CBD Secretariat

The Secretariat of the Convention on Biological Diversity (CBD) also has adopted a programme of work relating to agricultural biodiversity. This encompasses:

- Country-driven assessments of the status and trends of agricultural biodiversity
- Identification and promotion of adaptive management practices, technologies and related policy and incentive measures
- Promoting the participation and strengthening capacities of farmers and other stakeholders in the sustainable management of agricultural biodiversity
- Support to coordinated and integrated national policies, strategies, programmes and action plans.

Training and awareness raising at all levels is needed

The realization of the advantages of indigenous breeds and their emerging economic potential, as well as awareness about the threats they face, make clear that a reorientation in animal breeding is urgently needed. Education and training materials have previously been biased in favour of exotic breeds and this attitude now has to be reversed among all stakeholders including farmers and farm service organizations, extension services, researchers, educators, non-governmental organizations, administrators and policy makers.

The importance of agricultural biodiversity should be instilled already at the primary level. Students at colleges, universities and agricultural training institutes need to be exposed to the subject in order to effect a change of attitudes among future researchers, policy makers and extension workers. Public awareness also must be raised through special initiatives.

An exemplary initiative in this respect was taken by a South African NGO, the Farm Animal Trust (FACT), which published a catalogue of South Africa's local and indigenous breeds. Illustrated with colour photos of all breeds, it provides information on production environments and on value-added traits, as well as contact addresses of breed societies and breeders. This book was distributed locally, regionally and globally and is being used as a reference tool in schools and universities.



Community-based Management of Farm Animal Genetic Resources

Workshop held in Mbabane, Swaziland
7-11 May, 2001

Several organizations, including FAO, GTZ, CTA, SADC and SACCAR organized a workshop on “Community-based Management of Animal Genetic Resources” at the request of national coordinators and other stakeholders who realized the importance of rural communities for the sustainable management of animal genetic resources as well as the need for their active involvement in projects. They felt that support to communities to manage their resources could fulfil the dual purpose of contributing to poverty alleviation while also actively stemming the erosion of domestic animal diversity.

Community-based Management of Animal Genetic Resources represents a new concept in rural development as well as an innovative approach to *in situ* conservation. Since practical experiences with this approach are very limited, a central goal of the workshop was to reach a common understanding of this concept as well as its potential and constraints. The workshop also laid the foundation for a networking mechanism among the various actors.

Definitions

• Management of AnGR

Management encompasses all technical, policy, and logistical operations involved in understanding (characterization), using and developing (utilization), maintaining (conservation), accessing and sharing the benefits of animal genetic resources.

• Community

Communities are defined as groups of people bound together by social, cultural and economic relations based on shared interests and living in a well-defined area. Although there may be differences between sub-groups and individuals, their interest in cooperation outweighs conflicting interests and binds them together to pursue their shared interests.

• Community-based organization

An entity formed or recognized by a community to represent the community's interests and to implement, on behalf of the community, agreed management decisions.



Despite differences between individuals, the shared interests of a community make its members stick closely together

“Local”, “traditional” and “indigenous” are terms frequently used for describing communities, however their meaning is rather vague. “Local” just refers to the community of a particular area but does not necessarily imply that this community is indigenous or native.

“Indigenous” has different meanings in different countries and contexts; sometimes, but not always it refers to the earliest or original community in an area. For this reason, the Convention on Biological Diversity makes use of the phrase “communities embodying traditional lifestyles”.

Community-based management of Animal Genetic Resources is defined as a system of AnGR and ecosystem management in which the community is responsible for decisions on defining, prioritizing and implementing actions on all aspects of conservation and sustainable use of AnGR.

● Breed

The breed concept originated in Europe during the 18th century. In the developed world, breeds are recognized as “intra-specific” groups that share certain characteristics that set them apart from other groups and there are formal organisations for each breed. In the developing world there are few formal organizations but distinct strains or breeds have developed due to a combination of traditional breeding objectives and cultural or geographic separation. Populations for which the original owners have a name should be accorded breed identity.

● Conservation of farm animal genetic resources

This term refers to all human activities including strategies, plans, policies and actions undertaken to ensure that the diversity of farm animal genetic resources is being maintained to contribute to food and agriculture production and productivity, now and in the future.

● *In situ* conservation of farm animal genetic diversity

In situ conservation encompasses all measures to maintain live animal breeding populations, including those involved in active breeding



Rural communities and farm animal resources are interdependent and cannot be separated

programmes in the agro-ecosystem where they either developed or are now normally found, together with husbandry activities that are undertaken to ensure the continued contribution of these resources to sustainable food and agricultural production.

● *Ex situ* conservation of farm animal genetic diversity

Ex situ conservation entails the conservation of genetic materials within living animals but out of the environment in which it developed (*ex situ in vivo*) or external to the living animal in an artificial environment, usually under cryogenic conditions (*ex situ in vitro*).

● Open nucleus breeding project

These are group breeding schemes in which the participating breeders contribute their best females to a separate “nucleus” herd where they are mated with the best available male animals. Replacement stock is then redistributed to the farmers. The systematic breeding of the best females with the best males results in a higher rate of breed of selection and breed improvement than would be possible in individual herds.

Domestic animal diversity is the product of communities

Rural communities and farm animal genetic resources are interdependent and can not be separated. The different breeds that we know today have developed as a result of the interaction between communities, their animals, and the environment. Breeds are shaped by local environmental conditions combined with the breeding strategies of traditional communities. The differentiation of livestock species into breeds that has taken place since domestication is thus the outcome of many different communities managing livestock in many different habitats and ecological niches, and shaping its genetic composition according to the requirements of the environment, their production system and their personal preferences or breeding goals.

Breed diversity appears to be especially high in peripheral and remote areas. It has been noted that in Asia and in Africa, semi-arid or arid countries such as Mongolia, Yemen, Oman, and those of the Sahel, Botswana and Namibia have the greatest proportional diversity of breeds (Hall and Ruan, 1993).

Charles Darwin: Variations of Animals and Plants

The link between cultural diversity and breed diversity in Southern Africa was already noted by Charles Darwin in his volume on "the variations of animals and plants under domestication", published in 1868:

"At the present day various travelers have noticed the differences in the breeds in Southern Africa. Sir Andrew Smith several years ago remarked to me that the cattle possessed by the different tribes of Caffres, though living near each other under the same latitude and in the same kind of country, yet differed, and he expressed much surprise at the fact. Mr. Andersson has described the

Damara, Bechuana, and Namaqua cattle; and he informs me in a letter that the cattle north of Lake Ngami are likewise different, as Mr. Galton has heard is also the case with the cattle of Benguela. The Namaqua cattle in size and shape nearly resemble European cattle, and have short stout horns and large hoofs. The Damara cattle are very peculiar, being big-boned, with slender legs, and small hard feet; their tails are adorned with a tuft of long bushy hair nearly touching the ground, and their horns are extraordinarily large. The Bechuana cattle have even larger horns, and there is now a skull in London with the two horns 8 ft. 8-1/4 in. long, as measured in a straight line from tip to tip, and no less than 13 ft. 5 in. as measured along their curvature! Mr. Andersson in his letter to me says that, though he will not venture to describe the differences between the breeds belonging to the many different sub-tribes, yet such certainly exist, as shown by the wonderful facility with which the natives discriminate them."

Traditional communities as custodians of indigenous breeds

Communities that are still attached to their traditional cultural and social practices, and/or inhabit remote areas far from cities, modern cultural influences, and the market economy, are most likely to maintain and conserve indigenous breeds in a "pure" state. For them, animals fulfil religious, ritual and subsistence purposes; hence they conserve genetic characters that were not selected for in modern breeding programmes.

An impressive example concerns the Muturu cattle from Southern Nigeria. Although this breed produces barely enough milk to nurture its calf, it fulfils important ritual and medicinal purposes. Some ethnic groups consider it as sacred and belonging to local deities, while others keep it in a semi-feral state and hunt individual animals for sacrifices. The scarce milk is extracted by medicine men and used in the preparation of local remedies. At funeral

ceremonies, one or more Muturu oxen are slaughtered; their skin is used for covering the corpse and the meat eaten at the death feast. The Muturu breed has some interesting genetic traits, such as tolerance to ticks and trypanosomiasis (Rege, 2003).

Community breeding systems

Communities have different types of social organizations and accordingly have different breeding systems. In the SADC region, communities can be distinguished into smallholders and pastoralists.

Smallholder sector

Many of the originally pastoral communities of Southern Africa have turned into smallholders. Former colonial and apartheid regimes concentrated indigenous communities into limited and marginal lands, creating a heavy dependence on migrant remittances and the formal economy (Shakleton et al., 2000). Because their livestock holdings are small, there is very little, if any room for selection within the flocks and herds of smallholders. Therefore they heavily depend on

formal and informal exchange mechanisms for access to new genetic material.

Four strategies can be distinguished:

(i) acquisition of animals of new breeds or species to diversify household income, (ii) opportunistic (non-selective) breeding of small stock (chicken and goats), (iii) selective breeding of large stock (by keeping a communal bull or communal grazing), and (IV) selective breeding for commercial purposes. An example for the latter is Karakul pelt production in Namibia which was carried out not only by commercial ventures, but also by smallholders.

Smallholders generally prefer to keep animals that require only low levels of input, as represented by indigenous breeds. However, many of them have been impelled by extension messages and market forces to opt for cross-breeding. Because keeping a dairy cow with exotic blood is promoted as progressive by extension agencies, many farmers aspire to own one. Often this turns out to be a wrong decision for them, since they can not afford or provide the necessary high inputs such animals need in order to thrive.



Smallholders keep animals that require low levels of input. But many have been impelled by extension agencies to cross their indigenous animals with demanding exotic breeds (above)

Table: Breeding objectives among smallholders (Bayer et al., 2003)

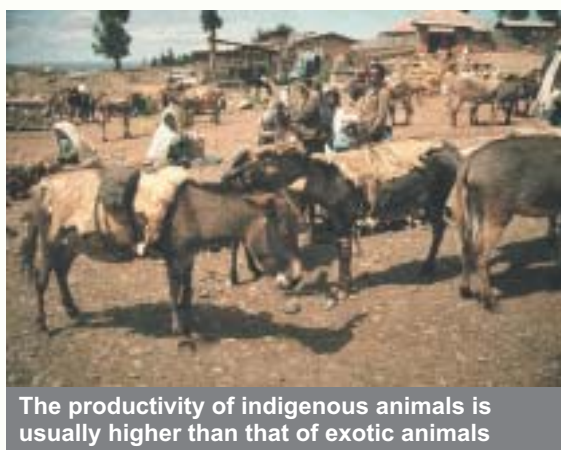
Function	Species	Desired characteristics	Breeding objectives
Production of meat	Almost all species of domestic animals, with local preferences for, or aversions to certain species (e.g. pigs, rabbits)	Animals should grow and reproduce well, but also be able to cope with feed shortages and should be disease resistant. Good mothering ability	Growth on available forage, disease resistance, good fertility, ease of calving/lambing, good mothering ability
Milk production	Cattle, goats	Animals should produce milk from basic ration and should not demand too many concentrates. When dry, they should be hardy, disease-resistant, strong and docile	Optimal milk yield, strongly independent of infrastructure and input supply. Good fertility
Provision of draught power	Cattle, donkeys	They should provide draught power appropriate to farm size and be easy to handle. When not needed they should survive on low quality forage, be hardy and disease resistant, strong and docile	Strength and docile character
Saving account/capital	Cattle, sheep, goats, poultry, pigs	Animals should be hardy and easy to care for	Survival under local conditions, disease resistance
Guards	Dogs, turkeys, geese	Animals should be aggressive to strangers, but calm with people well known	Behavioural characteristics
Manure	Cattle, small ruminants, pigs and donkeys. Poultry	Where manure is important, ability to use low-quality forage	Survival under minimum care
Social value/prestige	Depends on local custom - mostly cattle, but also horses, goats, chicken	Animals need to conform with local ideals (e.g. colour)	Locally important characteristics (colour, horn shape, etc.)

In smallholder, as well as in pastoral communities, breeding goals are far more multi-faceted than in intensive production systems and encompass many aspects other than high productivity. This is illustrated in the table above.

Pastoralists

Pastoralists are people who keep animals on natural graze and for whom animal breeding is economically and culturally dominant. Pastoral societies inhabit marginal areas characterized by low and unreliable rainfall or situated at high altitudes and therefore not suitable for crop cultivation. The elaborate breeding strategies of pastoralists result in animals that are not only able to survive and reproduce in hostile environments, but are also fairly productive. Because they largely represent closed gene

pools, these animals can be very distinct and their distribution range corresponds with that of ethnic groups.



The productivity of indigenous animals is usually higher than that of exotic animals



Pastoralists like to own animals of different species

The Concept of Community-based Management of Animal Genetic Resources (CBMAnGR)

Pastoral societies have especially rich indigenous knowledge systems about animal breeding (Köhler-Rollefson, 2003).

Indigenous knowledge about animal breeding

Indigenous knowledge about animal breeding and breeds refers to the knowledge that traditionally animal breeding communities apply to manipulate the genetic composition of their livestock holdings (Köhler-Rollefson, 2000).

It includes the following components:

- Cultural concepts about how to use an animal
- Local preferences for certain characteristics, such as colour, size, or behavioural patterns
- Selection practices for certain qualities (castration, culling, offspring testing)
- Pedigree-keeping
- Social restrictions on selling animals that lead to closed gene-pools.

Interestingly, pastoralists often do not have the concept of an “ideal animal” (Adams und Kaufmann, 2003), as it exists in a formalized breeding society. Rather they thrive to own a mix of animals with different characteristics to prepare for all eventualities and avoid risks. This observation indicates that conservation of diversity is an integral part of pastoral genetic resource management. Nevertheless, pastoralists usually have a certain list of criteria by which they select animals used for breeding.

CBMAnGR integrates the livelihood needs of local communities with the need for conserving biodiversity in its “natural habitats”. Therefore it is perceived as offering a win-win situation. Since breeds are manifestations of the way in which communities have managed their AnGR, their conservation is best achieved in these surroundings. It can also be inferred that these communities have a vested interest in all the natural resources on which their livelihoods depend and this includes AnGR. Since they own them and have developed a deep understanding of them, they are best placed to manage these resources and they also have the most to lose. As long as they are given proper support and incentives they will continue to manage them.

The concept is influenced or even based on community-based natural resource management (CBNRM). This conservation approach dates back to the late 1980s when it was realized that most conservation projects, especially those for wildlife, alienated rural communities from the resources on which they subsisted. Top-down approaches and attitudes led to conflicts between conservation agencies and communities, resulting in further decline of natural resources. It was then recognized that rural communities have to be considered as partners and collaborators and that conservation needs are served best if communities are strengthened and empowered to manage their own resources.

Key success factors in CBNRM are broad consultation and participation, taking time for generating trust, building capacity for implementation, ensuring that benefits, including

cash income, return to the community. The creation of a legal entity or community-based organization is also strongly recommended.

Cornerstones of CBMAAnGR

CBMAAnGR interventions require certain elements to be successful. These critical success factors include:

- The goals must be specific and realistic
- Participatory approaches must be adopted
- Indigenous knowledge and values need to be integral parts of the project design
- Good communication skills and strategies are essential
- Institutional support must be available
- The skill level of the stakeholders must be sufficient
- The overall policy framework in which the project is embedded must be enabling and supportive
- Marketing opportunities have to be available or created
- Animal genetic resources must be appropriate, valued, and integrated with the ecosystem
- Intellectual property rights have to be kept in mind
- Monitoring and evaluation must be part of the procedure.

Diagramme: Conceptual Framework for CBMAAnGR Interventions



Best practices for CBMAAnGR

Implementing a CBMAAnGR project in the true sense of the word requires very skilful guidance on the part of the responsible organization. Besides the community, all other actors having a stake in the issue, such as researchers, NGOs, community leaders, extension agents, policy makers and politicians, the private sector, veterinary services, and donors also need to be involved. A flexible time frame is required, so adequate resources and funds should be ensured before embarking on the project.

Most communities are not homogeneous, and therefore efforts must be made that the con-

Table: Hindering Factors for Participation

Hindering Factors/Constraints	Strategies
High initial cost	<ul style="list-style-type: none"> ● Raise awareness of donors, government and NGOs about importance of AnGRs ● Contribution by communities ● Spreading responsibilities ● Co-financing
Time consuming	<ul style="list-style-type: none"> ● Clarifying objectives and aims ● Effective communication
Disputes among stakeholders	<ul style="list-style-type: none"> ● Defining roles ● Having a written protocol ● Allowing for flexibility ● Transparency and accountability
Preconceived ideas of stakeholders	<ul style="list-style-type: none"> ● Clear understanding of project objectives
New area for which methodologies and capacities first need to be developed	<ul style="list-style-type: none"> ● Learning from successful community-based resource management projects ● Research and development of new methodologies ● Training in new methodologies
Lack of political will/political interference	<ul style="list-style-type: none"> ● Awareness of roles of politicians
Land tenure and conflicting view on land use	<ul style="list-style-type: none"> ● Negotiations and by-laws for land use
Different expectations of stakeholders	<ul style="list-style-type: none"> ● Awareness
Lack of capacity in participatory approaches	<ul style="list-style-type: none"> ● Capacity-building

and aim of the project. Only then will it be possible to generate a real sense of ownership among the community (see chart p.19).

Economic valuation of AnGR

Because there are many breeds at risk and only limited resources available for their conservation, it is necessary to set priorities.

Establishing economic values for animal genetic resources can help

cerns of all sub-groups are equally considered and that representatives of all groups are included in the committees. The different wealth groups can be identified through participatory techniques and on the basis of criteria such as level of food security, species and numbers of livestock, household assets and income. Traditional authority structures also have to be recognized and it may require strong facilitation to prevent that the well-to-do groups dominate meetings.

Unfortunately participatory extension approaches (PEA) and participatory technology development (PTD) have rarely been applied to animal husbandry so far. But success factors for achieving good participation include good communication skills, the recognition and utilization of indigenous knowledge (IK), taking time for building mutual trust and enabling the community to fully understand the objectives

to make such policy and management decisions. Such valuation can support decisions with respect to resource allocation between biodiversity conservation and other socially valuable endeavours or between various types of conservation, research and development.

It can also assist with determining the nature of economic incentives and institutional arrangements for livestock keepers.

Examples for the use of AnGR valuation could include justification of budget allocations by government planners or conservationists for conservation, calculating compensation for farmers who keep rare breeds and benefit-sharing arrangements (Drucker, 2003).

The total economic value that can be given to a genetic resource is composed of:

- direct use values - benefits from actual use, such as sale of milk, meat, hides, etc.

- indirect use value - refers to eco-system functions
- option value - is derived from the value of safeguarding an asset for the option of using it in the future
- bequest value - measures the benefit from knowing that others might benefit from an asset in the future
- existence value - is derived from the satisfaction of knowing that a particular asset exists (e.g. blue whale or tiger).

Biodiversity and genetic resources clearly generate economic values that are not rewarded in the market place. The market even provides incentives against genetic resource conservation and in favour of economic activities that erode such resources. For instance there are often subsidies for commercial livestock production and exports supporting use of high performance breeds.

Breed improvement

Breeds are dynamic rather than static entities whose nature and composition undergoes continual change, depending on the needs and priorities of the breeders. This is why the concept of “sustainable management” is preferred to the concept of conservation, which

implies that a breed should remain the same and be frozen in time. With increasing market integration, many breeds can survive only if they remain or become competitive. Hence there is need for their improvement by selection. As long as this selection is undertaken not out of context, but within the constraints of the actual production system, it will not result in the loss of the survival traits and fitness traits that make these breeds so attractive in the first place.

Community-Initiative for Goat Improvement in Kathekani, Kenya

Due to market forces, the Akamba people from Kathekani, situated in the drought prone drylands of Eastern Kenya, decided to improve the economics of their goat husbandry. Goats are culturally and socially very important for the Akamba who use them as dowry payments, for sacrificial purposes and witch doctor payments, as a mark of hospitality, and expression of prestige.

The predominant goat breed in Kathekani is the East African goat which is very resistant to drought and diseases such as trypanosomiasis and pasteurellosis, but has a very low growth rate. By contrast, the Galla goat from northern Kenya grows much faster and has a high milk yield, although these advantages are coupled with requirements for better feeding.

Breeds are dynamic rather than static entities whose composition follows the needs and priorities of the breeder



Nevertheless, the Kathekani farmers opted for cross-breeding their local stock with Galla goats. For this purpose they have formed nine groups with an average of 15 members. All members commit themselves to castrate or cull their low performing goats and to put up a housing structure for their remaining animals. They then use a Galla buck for breeding that is rotated among the group members.

Other parts of the procedure include sharing of expenditure for purchase of the Galla buck and keeping of records. Some of the observed constraints include the limited availability of pastures, especially during drought, a low level of literacy hindering record keeping, and lack of a well defined breeding strategy, i.e. no experience to which degree Galla blood is appropriate and sustainable (Njoro, 2003).

Community-based Promotion of Rural Poultry Diversity in Malawi

In Malawi, 80 % of rural households keep indigenous poultry, mostly chicken, but also pigeons and ducks. Usually women and children take care of the poultry in a free-range system. Over 60 % of the rural population is food insecure and the per-person annual protein consumption is about half the African average.

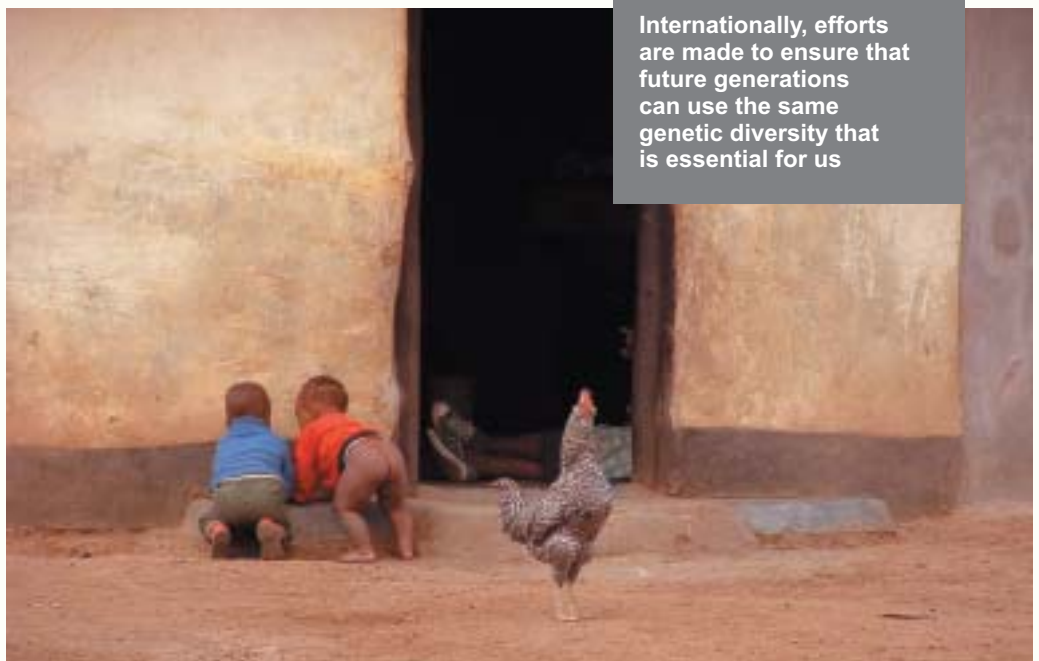
As a result there is high maternal mortality and 50 % of the children are undernourished.

Increasing rural poultry production is regarded as an important option for raising food security.

Government efforts of achieving this by cross-breeding with Black Australorp chicken have not had promising results because they are not well suited for village scavenging conditions. Embarking on an alternative strategy, the University of Malawi is undertaking a community-based project for food self-sufficiency by promoting and improving indigenous chicken.

The project has set up open-nucleus breeding centres that are managed by a committee of farmers. The purpose is to identify birds with above average performance, to use them as breeding stock, and then to distribute the offspring through the traditional stock-sharing system.

The project is in its beginning stage, but it has already become evident that the breeding activities have to be supplemented by animal health interventions, such as vaccination against Newcastle disease which is a major cause of losses (Gondwe et al., 2003).



Internationally, efforts are made to ensure that future generations can use the same genetic diversity that is essential for us

Example of a CBMANGR project: Basotho Mare Camps

A project by the Lesotho government to conserve the Basotho pony has adopted a community-based approach. This distinct horse breed is a descendant of the first “Cape horses” that were introduced to Lesotho since the 17th century and then subjected to natural selection in the harsh mountain terrain. It was recognized as a breed around 1850 and its characteristics include the ability to cope with temperature extremes and low-quality grazing, thick-walled hooves for moving around in steep areas and a special gait called tripling.

The Basotho pony is appreciated for reliable transportation in mountain areas and has also become popular in the trekking business. The breed reached its peak by the end of the 19th century and was much in demand for export to Kenya and Southern African countries. Large numbers, including many stallions, were sold to both sides in the Anglo-Boer war and this depleted it of some of its best stock. Diseases and cross-breeding further combined to a rapid decline of its population and by the 1950s it was already almost extinct.

In the late 1970s, a project of the Lesotho government initiated “mare camps” which are communally owned pieces of land that are exclusively used for horse-breeding by designated groups. The National Stud made pure-bred stallions available to these breeding groups for use during the breeding season (Lekota, 2003).

Open-nucleus breeding projects for Djallonke sheep in Ivory Coast

Since the 1972-73 Sahelian drought that eliminated much of the Ivory Coast's livestock resources, livestock development has become



Sheep are an important species. Many breeds have been created to enable optimal survival and production under specific environmental conditions

a priority. Efforts have centred on the Djallonke sheep, which is a small thin-tailed hair breed, distributed widely in the humid and savannah zones of West and Central Africa. This breed can live and reproduce in tsetse-infested areas, is able to tolerate trypanosomiasis and regarded superior with respect to taste and carcass characteristics by comparison with other regional breeds.

A national sheep centre was set up which developed an improved variety of the Djallonke sheep for distribution to farmers. Other initiatives included the provision of technical assistance to sheep producers and the creation of a state farm for commercial sheep production based on the utilization of *Stylosanthes hamata* cover crop in cassava cropping systems.

The breed improvement proceeds by means of an open-nucleus scheme with selection based on individual performance. It includes an on-farm preselection phase, an on-station first selection phase, an on-station final selection phase and finally distribution of selected rams to farmers. About 14,000 breeding ewes on 170 smallholder farms were involved in the selection process. Over 15 years, more than 1000 first category rams and 2000 second category rams have been produced, and demand by far exceeds supply.

The farmers were keen to participate as long as inputs - vaccines against PPR (Peste Petits Ruminants) and Pasteurellosis, and fencing materials - were available at subsidized rates.

But when the government reduced its financial contribution, many farmers gave up, although others continued demonstrating eagerness to

use new improved management techniques.

Raising Djallonke sheep is regarded as a modern and profitable enterprise and has become a cultural habit. This is reflected in the establishment of several sheep and mutton producer associations (Yapi-Gnaoré, et al., 2003).

Recommendations from the CBMAnGR workshop in Swaziland

- Promote participatory AnGR management based on local knowledge and resources for enhancing capacity in animal breeding, development and conservation.
- Bring the importance of CBMAnGR to the attention of the FAO during the next meeting of the Commission on Genetic Resources.
- Formulate policies to support CBMAnGR in the region.
- Develop policies on the rights of local communities, farmers and breeders and the regulation of access and benefit-sharing of FAnGR.
- Ensure that proper mechanisms are put in place for research and development of CBMAnGR.
- Conduct economic valuation surveys and investigate and develop markets for animals and animal products.

Incentive Measures for Sustainable Use and Conservation of Agro-biodiversity

Workshop held in Lusaka, Zambia
11-14 September, 2003

Article 11 of the Convention on Biological Diversity stipulates that 'Each contracting party shall as far as possible and as appropriate, adopt economically and socially sound measures that act as incentives for the conservation and sustainable use of components of biological diversity.'

Various organizations, including SPGRC, IDRC, HIVOS, IPGRI, SIDA, CTA, and GTZ organized a workshop with the goal of arriving at a common understanding of incentives for agricultural biodiversity, the state of the art of using incentives, opportunities and constraints of incentives in agrobiodiversity enhancement, and establishing a follow-up plan for testing incentive mechanisms.

What are incentives?

The Convention on Biological Diversity (CBD) defines incentives as specific inducements designed and implemented to influence stakeholders to conserve biological diversity or to use its components in a sustainable manner.

Signatories of the CBD are obliged to implement this principle into practice. Yet, presently disincentives for farmers and livestock keepers to keep indigenous breeds still appear to predominate.

Many governments and development agencies continue to promote exotic or cross-bred animals and to subsidize the necessary inputs. On the other hand, actors in traditional production systems, especially pastoralists, often face an unsupportive policy environment and encroachment on their grazing lands.

Providing communities with appropriate incentives for keeping indigenous breeds may be a more effective and efficient way of ensuring conservation and sustainable use than specific projects and it is believed that "if communities have incentives and are given proper tools for management of AnGR they can effectively organize themselves and take appropriate conservation actions".

Incentives can be situated at different levels and target different issues. They can address the farmer, marketing, policy, public awareness and education/training (see the table below).

Table: Types and Examples of Incentives (Almekinders, 2002)

Type of incentive	Positive incentive	Negative incentive
	(economic, legal or institutional measure designed to encourage beneficial activities)	(measure that induces unsustainable behaviour that reduces agro-biodiversity)
Direct incentive (directly encourages a stakeholder to use and conserve agrobiodiversity)	<ul style="list-style-type: none"> ● direct payment for keeping local breeds ● rewards for maintaining diversity ● improved access to high quality breeding animals ● access to credit for keeping local breeds 	<ul style="list-style-type: none"> ● illegal status of local breeds ● non-acceptance of local animals by buyers and by processors (carcass or wool standards) ● SPS standards preventing export
Indirect incentive (induces changes in the agro-ecological or socio-economical or political environment of a stakeholder which affects use and conservation of agrobiodiversity)	<ul style="list-style-type: none"> ● legislation that ensures access to grazing areas ● development of food chains for: <ul style="list-style-type: none"> - processing into specialty products - labelling - collective marketing 	<ul style="list-style-type: none"> ● alienation of grazing land and communal pastures ● promotion of cross-breeding through development agencies and by government ● subsidies for veterinary inputs (dipping) ● access to credit linked to use of improved breeds

Farmer level incentives

Incentives at this level include:

● Secure land rights for pastoralists

Without a sufficient pasture base, pastoralists and landless livestock keepers will not be in a position to maintain indigenous animal genetic resources. Guaranteed access to grazing grounds would provide a major incentive for conservation of important AnGR.

● Compensation

Compensation can be given to a certain percentage of livestock keepers for keeping/breeding breeds for which there is little economic incentive, such as draught cattle breeds.

● Recognition of local breeds and related indigenous knowledge

Often breeds recognized as distinct by communities themselves are not even scientifically documented or evaluated. Validation of indigenous knowledge by means of systematic documentation of the breeding strategies and practices of particular communities as well as the particular traits of their breeds from the perspective of the community could help project local breeds.

● Community register

Establishment of a community register of breeds developed and stewarded by local communities.

● Animal competitions and awards

Holding an animal competition will reinforce interest in local breeds. Communities and individuals who are conserving an endangered breed will be encouraged if they receive awards and honours.

● Breeding societies

Support for breeding societies can be an important incentive that contributes to highlighting a breed and to capacity-building of breeders. In the SADC region, South Africa has taken the lead in supporting breeding societies.

Breeding Societies' Structure in South Africa

The **Livestock Improvement Act, 1977** recognizes breeding societies and holds them responsible for the collective interest of their members. In 2001, there were 61 breeding societies that marketed certified genetic material. For 48 other breeds no societies exist, but animals are directly registered in the South African Stud Book.

The **South Africa Stud Book** is an association of almost 60 livestock breeders' societies. Its aims are to encourage breeding, to keep records of pedigrees and performance, to act as a mouthpiece for the stud-breeding industry, to render technical and advisory services, and to promote the export of animals, semen, ova or embryos.

In addition there is the **Farm Animal Conservation Trust (FACT)** that has been modelled on the Rare Breeds Survival Trust in the United Kingdom and on Rare Breeds International. FACT has produced posters, an information booklet and also organizes shows and breed sales (Ramsey, 2002).





Conventional and unconventional species may have potential for niche markets

Market level incentives

Development of niche markets

The conservation of indigenous breeds can be linked with the development of “organic animal husbandry”. This requires institutional support for certification of output, development of market channels, generation of consumer demand and facilitating post harvest processing and branding.

Many examples of the successful development of niche markets for specialty products from local breeds exist in Europe. Examples include Aubrac and Emilian Reggiano cattle for specialty cheeses and Majorcan black pig and Sambucana sheep for sausage and branded meat.

Policy incentives

● Value-adding

Value can be added to genetic resources by increasing their sustainable utilization through characterization, domestication, participatory breeding, quality enhancement, product development and labelling, and thereby increasing income for farmers. Also, awareness among communities about possible value-addition has to be generated, followed by support for farmers to engage in small-scale entrepreneurial activities and making credit facilities available.

● Financial Support

At the national level, policies can be devised for financial incentives for breeding and raising local traditional livestock; promotion and support of the marketing of products from local traditional livestock production; provision of the necessary infrastructure supportive to local livestock production.

● Services

Provision of a better access to animal health care for local livestock production by farmers and indigenous communities could contribute to better economic returns from indigenous breeds.

● Rights and Recognition

Secure land titles for farmers and indigenous communities, as well as assured land access rights for pastoralists and an effective prohibition of encroachment on traditional pasture land could stabilize rural livelihoods and support their custodial role of indigenous breeds.

The rights of pastoralists and smallholder farmers as custodians of agricultural biodiversity could be recognized through a legislative framework.

● Legislation

Legislation at the national level for regulating access and benefit-sharing and the harmonization of such frameworks at regional level based on the African customary law in line with the OAU model legislation could strengthen local livestock breeders.

At the international level, a legal framework for Pastoralists/Indigenous Livestock Breeders' Rights, paralleling the Farmers' Rights of the International Treaty on Plant Genetic Resources for Food and Agriculture could provide major support and contribute to having the breeds of pastoralists and indigenous livestock keepers recognized as global benefits.

Education/Training incentives

A change of attitudes by researchers, policy makers and extension workers towards traditional livestock keepers and their breeds is very important. Pastoralists' and farmers' knowledge, innovations and practices must be integrated into research and extension.

Even the curricula at all levels of general schooling should be changed to give emphasis to agricultural biodiversity and the importance of indigenous cultures for its sustainable use.

Public awareness about agro-biodiversity must be raised through targeted initiatives.

Example: Adding value to Nguni cattle

The Nguni cattle of South Africa is an African taurine breed with a slight admixture of zebu blood that reached the region together with southward migrating pastoralists in about 300 A.D. After white settlers arrived with exotic cattle, the Nguni cattle was long perceived as inferior because of smaller carcass size, non-uniform colour pattern and lack of information on its production potential. Even the people who had originally kept this breed started cross-

breeding or keeping exotic cattle. Then research in the 1980s revealed that the Nguni breed is very tick-tolerant, can maintain its condition during seasonal food shortages, can obtain optimal nutritional value from the available forage, is a good walker, and very docile. It therefore offers many advantages to smallholders.

The Animal Improvement Institute therefore initiated a project to reintroduce the breed to selected communities by providing 35 selected Nguni bulls, combined with training and infrastructural support (Bester et al., 2003).



A herd of South African, tick-tolerant Nguni cattle

Table: Adding Value to Nguni Cattle (Ramsey, 2002)

Trait	Links	Added value
Adaptability	Direct link with fertility, feed utilization	Minimum care breed
Fertility	Cow productivity; production per unit area	Cost-effective production
Temperament	Cow productivity, fertility	Link to fertility, meat quality
Ease of calving	Skeletal structure – sloping rump	Link to cow productivity and industrial crossing
Parasite tolerance	Adaptability, fertility, cow productivity, hide quality, grooming behaviour	Cost-effective production; better quality hides; meat marketing (no dips)
Disease tolerance	Adaptability	Cost-effective production; meat marketing (no drug residues)
Meat quality	Early maturing type; crossbreeding potential	Top quality beef - potential for branded beef market Link to custom of breeding for feedlots
Colour pattern	Short hair covering; symmetric patterning	Market hides and products – hair on hides sell well
Hide quality	Parasite tolerance	Unblemished thin hides - ideal for upholsters

Policies, Approaches, Legal Frameworks¹

Workshops held in Luanda, Angola, March, 2002 and Maputo, Mozambique, May 20 to 23, 2003

The sustainable use of AnGR is influenced by policy contexts, regulatory measures and legal frameworks at the country, regional and international level. At the national level, there are agricultural and livestock policies, including Animal Breeding and Dairy Acts, as well as zoo-sanitary and quarantine regulations.

Breed associations, herd books and studbooks may also be the subject of legislation and regulation. In addition, macro-economic interventions, regulatory and pricing policies, investment policies (e.g. infrastructure development), and especially institutional policies governing property rights and land tenure, may also impact on the conservation and sustainable use of indigenous breeds. The development of guidelines for regional and national policies on the management of farm animal genetic resources was the subject of a workshop held in Luanda, Angola.

At the international level, there are an increasing number of conventions and trade agreements that oblige all countries including those of the SADC region to develop appropriate legal instruments for the protection of biodiversity and of intellectual property rights (IPR).

Rapid developments with respect to biotechnology demand that countries take positions and guard their interests. Movements of livestock and animal genetic resources between countries and continents are subject to zoo-sanitary regulations of the World Organisation for Animal Health. The Codex Alimentarius has established international animal product standards, while opportunities for labelling or branding animal products as organic are opening up.

A workshop organized jointly by the SADC Secretariat, FAO, GTZ, UNDP and CTA, was held in Maputo to analyze the specific needs of the livestock sector in Southern Africa and to explore the jungle of the existing regulatory and legal frameworks.

¹ This chapter is a synthesis of the workshops "Guidelines for the Development of a Regional and National Policy on the Management of Farm Animal Genetic Resources" (Luanda, Angola, 2002), and "Policies, Approaches, Legal Frameworks" (Maputo, Mozambique, 2003).

Policy contexts, regulatory measures and legal frameworks all contribute to getting sustainable management of FAnGR in gear



National Policies

In most countries of the SADC region, livestock policies are embedded in the National Agricultural Policies that in turn are components of National Economic Development Policies. Tanzania and Zimbabwe are in the process of building separate livestock policies.

Livestock policies

Livestock policies should fulfil the following requirements:

- Recognize the role of indigenous breeds and local farming systems for conservation of farm animal diversity
- Recognize that different ecological zones require different livestock management policies
- Support not only the conservation but also the improvement of farm animal genetic resources
- Provide for capacity-building of livestock keepers as well as livestock professionals
- Regulate export and import, establishing protocols for the guidance of donors and NGOs when importing exotic breeds
- Embrace participatory approaches and place emphasis on them
- Concern with education and awareness raising about both indigenous and exotic breeds
- Make special provisions for indigenous FAnGR in the animal diseases acts.



Animal Breeding Act of Uganda

After extensive consultations, which included traditional leaders, Uganda legislated an Animal Breeding Act to replace its former "Branding Stock Act" from 1918. This new Act came into force in December 2002. It places the responsibility for the registration and certification of all breeds on the Ministry that is given the mandate to establish a system of record keeping and registering and regulating animal breeders. It also sets up a National Animal Genetic Resources Centre and Data Bank charged with guarding national interests in animal breeding, with training technicians and farmers, and with fostering and encouraging breed societies and breeders associations.

Conservation of indigenous breeds

Various policy options exist for supporting the conservation of indigenous livestock breeds, mainly by creating a level playing field with exotic breeds. These include:

- Information, training and capacity-building for farmers, pastoralists and other indigenous livestock breeding communities
- Financial incentives for breeding and raising local livestock breeds
- Promotion and support of marketing of the products from local livestock breeds
- Provision of infrastructure (for instance processing facilities for wool or milk) supportive to local livestock production by farmers and indigenous communities
- Security of land titles and/or land use rights for farmers, pastoralists and other indigenous livestock breeding communities
- Effective prohibition of, and measures against, encroachment on traditional pasture land.

Regulation of cross-breeding

Cross-breeding with exotic breeds clearly is a major factor contributing to the erosion of locally adapted AnGR. On the other hand, national economies and many farmers depend on them; because of their higher milk and growth rates they have a place in the livestock production systems of the SADC region. In order to minimize the impact of high performance breeds on local genetic resources, appropriate policies need to be into place. Many farmers are not aware of the disadvantages of cross-breeding, such as the need for higher inputs, and of its long-term genetic impacts. Choice of breeds is often based more on fad and fashion than on sound scientific and economic considerations. Furthermore, there are often no institutional arrangements to monitor and backstop cross-breeding programmes.

The following recommendations can be made:

- Exotic AnGR should be used strategically and only after their advantage over local genetic resources under the conditions of the respective production environment has been evaluated.
- Genetic Impact Assessments should be carried out to determine the potential impact of exotic AnGR on the local population. Compatibility with local land tenure systems (common access to resources) should be examined. Such methodologies for genetic impact assessment still need to be developed.
- A regulatory mechanism for the imports of exotic AnGR to allow for better monitoring of their demand and use should be put into place. A separate import permit system which considers the national breeding policy and adaptability to the local environment is advisable.
- Appropriate extension messages should be developed so that farmers understand the

negative effects of indiscriminate and uncontrolled cross-breeding on local AnGR.

Regulation of export of genetic material from SADC countries

Export of genetic material may have advantages but also carries risk. Some parties argue that foreign demand will contribute to conservation of a breed by providing an incentive for breeding it. Others feel that it may lead to its depletion. Still others believe that export of genetic material without intellectual property protection will lead to competition from other countries.

Some livestock genetics clearly represent highly desired commodities and have enormous potential for export. Especially South Africa has developed a thriving market exporting indigenous genetics. But once breeding populations have been established in other countries, the demand often decreases. For the Tuli cattle, breeding societies are operating in the US, diminishing the need to import animals from South Africa. Another example concerns the Boer goats, for which there is an increasing demand abroad and breeding societies have



Export of genetic material may have benefits but also carries risk (flock of Karakul sheep)

been set up in several countries. The South African goat industry is now looking for ways of protecting its interests. Already they have registered a trademark for the "South African Boer goat" and are now exploring further options for intellectual property protection (Roets et al., 2003).

How can it be prevented that other countries capture this market, maybe by establishing their own breeding programmes or maybe even by patenting? Historically, animal breeders have always been hesitant to part with breeding stock, especially female animals, and would part only with their inferior stock. But with advances in biotechnology and the opportunity of patenting selected genetic sequences, new legal frameworks may be needed.

Problems of exporting genetics from a businessperson's perspective

In the early 1990s, veterinary protocols for the export of semen, embryos and live animals from South Africa were developed. In the absence of further regulations, breeders took the opportunity to make their own deals with foreign buyers. Although there was initially much demand for genetic material from South Africa, problems have developed and demand seems to have decreased. Some breeders exported sub-standard animals, which reverberated on the business as a whole. Therefore animal recording and performance testing facilities should be improved. Recipient countries have no standardized veterinary protocols, or sometimes none at all, which means that they need to be negotiated - in other cases, unnecessary tests are required. Private entrepreneurs also have difficulties competing against para-statal and non-government organizations (Campher, 2003).

Policies on biotechnology

Livestock production provides a wide field for biotechnology, especially reproductive technol-

ogy. Some of these techniques have been employed for a long time, although few of them are fully utilized in the SADC region. They include artificial insemination, embryo transfer, embryo cryopreservation, *in vitro* embryo production, sexing semen and embryos, genetic finger printing, rDNA in disease diagnosis, embryo splitting, growth hormones, cloning, feed fortification, vaccine production and genetic engineering.

Except for artificial insemination, use of these reproductive technologies is confined to research institutions. Their application can have both positive and negative impacts on AnGR, and to date these possible effects have not been discussed and analyzed sufficiently.

Embryo transfer, embryo splitting and especially cloning erode genetic diversity by propagating genetically similar or even uniform material. Undesirable genes can also be promoted more widely through these techniques. Furthermore livestock produced with the help of such biotechnology has much higher cost, so poor farmers would not be able to participate or compete.

The possible positive applications of these tools include storage of semen and embryos for conservation purposes and exchange of genetic material over long distances.

International legal frameworks

At the international level, there are several legal instruments relevant to animal genetic resource management and to which the SADC countries are signatories.

Convention on Biological Diversity (CBD)

The Convention on Biological Diversity was negotiated at the occasion of the UN Confer-

ence on Environment and Development (UNCED) in Rio de Janeiro in June, 1992, and came into force in December 1993. It is a legally binding framework that has as objectives the conservation of biological diversity, the sustainable use of components of biological diversity and the fair and equitable sharing of benefits arising from the utilization of genetic resources.

It confirms the sovereignty of states over their genetic resources, stresses the importance of *in situ* conservation and stipulates that access to resources is to be granted on mutually agreed terms and subject to prior informed consent of the contracting party and fair and equitable sharing of the research and development results and commercial benefits. The CBD recognizes the central role of indigenous and local communities in biodiversity conservation through their traditional and sustainable practices and knowledge systems.

In its article 8j the CBD commits its contracting parties to, subject to national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional

lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovation and practices and encourage the equitable sharing of benefits arising from the utilization of such knowledge, innovations and practices.

Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of Benefits arising from their Utilization

In Article 15 of the CBD, parties agree to “take legislative, administrative or policy measures, as appropriate...with the aim of sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources”. The Bonn Guidelines were adopted by the Conference of the Parties to the CBD in April 2002, with the aim of helping countries achieve this objective. They are entirely voluntary and they provide guidance to



Although donkeys are not highly regarded, they are used for transport, particularly in remote areas

governments in the structuring of national and regional legislation and mechanisms to ensure fair access to, and sharing of benefits from genetic resources. To allow revision as experience is gained, a good degree of flexibility is built into the guidelines.

The Bonn Guidelines provide a precise set of options for:

- Developing procedures for access and benefit-sharing
- Clarifying the relationship with traditional knowledge
- Written agreements before collecting any genetic resources
- Prior Informed Consent (PIC) of the national government of the country of origin
- Prior Informed Consent for access to genetic resources of the “traditional knowledge” of an indigenous community.

The Bonn Guidelines enumerate in detail the types of provisions that could form part of a contractual arrangement:

- the specification of uses
- the continuation of customary uses over genetic resources
- the possibilities of joint ownership of intellectual property rights
- the existence of confidentiality clauses and sharing of benefits from commercial and other utilization of genetic resources including derivatives.

Prior Informed Consent (PIC)

This principle is of importance for livestock breeding communities whose animal genetic resources are of potential scientific and commercial interest. According to the Bonn Guidelines, the following recommendations can be deduced:

- (I.) Prior informed consent for taking samples from animal genetic resources should be given by the “competent national authority”. This authority in turn should make sure that relevant lower levels of government and the livestock breeding community have the right to consent to or refuse the decision. In order to ensure involvement of the local communities they should either be members in the competent authority or there must be a procedural rule for their consultation on a case-by-case basis.
- (II.) No access should be possible to animal genetic resources without arrangements for sharing of benefits from the use of these resources.
- (III.) For the granting of intellectual property rights involving animal genetic resources, the origin of the genetic resources must be disclosed and it must be certified that existing benefit-sharing arrangements are being honoured.

Who grants prior informed consent?

Participants of the Luanda Workshop concluded the following:

It is absolutely essential that countries establish who has the legal rights to which AnGR in the country, whether it is the state, a farmer organization or a specific indigenous community. This understanding will give a clear indication of who has the right to grant prior informed consent to outside parties. In Southern Africa where some breeds or types may be regarded as national assets, the state may have legal rights over these genetic resources. In other cases, farmer organizations and indigenous communities who have had specific responsibilities to the genetic resources may have the legal rights, hence they would legitimately have the right to grant prior informed consent.

The role of the government in regulating access to AnGR must be clarified, i.e.,

whether it will act as an observer or play an active part in each access agreement. Where prior informed consent has to be sought from indigenous farming communities, the government may also consider providing support to such communities to negotiate the terms and conditions of access and benefit-sharing.

World Intellectual Property Organization (WIPO)

The mandate of WIPO is to ensure the worldwide protection of the rights of creators and owners of intellectual property and to ensure their recognition and reward for their ingenuity.

WIPO has set up an Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore which deals with intellectual property issues that arise in the context of access to genetic resources and benefit-sharing, protection of traditional knowledge with or without respect to genetic resources, and protection of expressions of folklore. WIPO is currently working on the worldwide standardization of patent law.

Biosafety protocol to the CBD

The Cartagena Protocol on Biosafety to the Convention on Biological Diversity was adopted by the Conference of the Parties to the Convention on 29th January, 2000 and entered into force on 11th September, 2003. In the SADC region it has been ratified by South Africa and Mauritius and signed by Namibia, Seychelles and Zimbabwe.

The biosafety protocol seeks to protect biological diversity from the potential risks posed by living modified organisms resulting from biotechnology. In the livestock sector these include genetically modified animals, modified rumen microflora, and vaccines and growth promoters developed from recombinant DNA technology. The biosafety protocol applies to the transboundary movement, transit, handling and use of all living modified organisms that may have adverse affects on the conservation and sustainable use of biological diversity, also taking into account risks to human health. It establishes an advanced information agreement (AIA) procedure for ensuring that countries are provided with the information neces-



Securing property rights in international trade could trigger profit for local keepers, too

sary to make informed decisions before agreeing to the import of such organisms. It also sets out the “Precautionary Principle” which states that lack of scientific certainty about the potential effects justifies decisions against import.

SADC perspective on biosafety issues

Currently, no major threats from the application of animal biotechnology have been identified in the SADC region. However, in the future threats are likely to arise from biotechnology emanating from genetically modified organisms (GMOs) in FAnGR.

The issues related to the development, introduction and utilization of GMOs are:

- Safe introduction of GMOs in to the country
- Research and development work with GMOs
- Release of GMOs for commercial use
- Risk assessment and surveillance in the use of GMOs in order to monitor potential threats
- Contained use of GMOs and type of appropriate containment facilities
- Public awareness.

In order to provide safety guidelines in the development and use of GMOs, it is necessary to formulate a Biosafety Act, which establishes a Biosafety Board or a National Committee for Biosafety Regulations that is mandated with designing a GMO bill.

Biosafety guidelines should be incorporated in the GMO bill to regulate biosafety practice and to advise governments on all aspects concerning development, production and use of GMOs. The OAU has developed a draft model national legislation on safety in biotechnology.

TRIPs Agreement

SADC countries are also members of the World Trade Organization (WTO) and therefore have to conform with the agreement on Trade Related Intellectual Property Rights (TRIPs). The TRIPs Agreement is an annex to the Marrakesh Agreement establishing the World Trade Organization that was signed on 15th April, 1994.

The TRIPs Agreement obliges all member states to develop minimum standards for the protection of intellectual property rights and a mechanism for enforcement. It requires them to make patents available for inventions of products and processes in all fields of technology.

According to TRIPs Article 27.3(b), members may exclude from patentability:

Plants and animals other than micro-organisms, and essentially biological processes for the production of plants and animals other than non-biological and micro-biological processes. However, Members shall provide for the protection of plant varieties either by patents or provisions of this sub-paragraph shall be reviewed four years after the entry into force of the WTO Agreement.

Developing countries have had until 2000 to pass laws in this direction, and least-developed countries (LDCs) until 2006.

Contrary to the CBD, TRIPs does not require prior informed consent or benefit-sharing, nor protection of indigenous and local knowledge.

WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS)

Sanitary measures deal with human and animal health, phyto-sanitary measures with plants. They apply to domestically produced food or local animal and plant diseases, as well as to

products coming from other countries. This agreement restricts the use of unjustified sanitary and phyto-sanitary measures for the purpose of trade protection and accords each government the sovereign right to provide the level of health protection it deems appropriate. It also ensures that sovereign rights are not used for purposes of protectionism.



In Africa there is a particularly strong nexus between biological resources and livelihoods

OIE standard setting instruments under the SPS

The World Organisation for Animal Health (OIE, formerly: Organisation of International Epizootics) is an intergovernmental organization created by the International Agreement of 25th January, 1924, signed by 28 countries. In May 2003, the OIE totalled 164 member countries.

The OIE is the standard setting body for animal health. Its mandate is to guarantee the transparency of the animal health situation worldwide. To this end the OIE collects, analyzes and disseminates veterinary information. It also provides expertise and promotes international solidarity for the control of animal diseases. It can have implications for animal genetic resources as it determines options for import and export.

Its Terrestrial Animal Health Code provides standards for the collection and processing of semen, embryos and ova, as well as the transportation and quarantining of animals.

Codex Alimentarius

The Codex Alimentarius (<http://www.codexalimentarius.net/>) is a collection of food standards

compiled by the Codex Alimentarius Commission (CAC). The CAC is a joint body of the Food and Agriculture Organization and the World Health Organization (WHO). The Codex Alimentarius currently covers 237 food standards and also includes codes of practice, limits for pesticide residues and evaluations of additives and veterinary drugs. The main aims of the Codex are to protect the health of consumers and to facilitate the international food trade through harmonization of science based standards. The Codex is referred to in the World Trade Organization's Sanitary and Phytosanitary Agreement as a basis for what food standards are acceptable in international trade.

The OAU Model Law for the protection of the rights of communities, farmers and breeders and for the regulation of access to biological resources

The African Model law was developed to suit the specific situation in Africa where the interconnectedness between biological resources and the livelihoods of communities is especially strong and both mutually reinforce each other.

It provides a blueprint for the protection of the rights of communities as stipulated in the CBD and also fulfils the requirements of the TRIPs agreement for the development of *sui generis* laws as alternative to having to subject plants and animals to patenting. The African Model Law was officially adopted by the OAU Ministerial Session in 1999.

The specific objectives of this legislation are to:

- recognize, protect and support the inalienable rights of local communities including farming communities over their biological resources, knowledge and technologies
- recognize and protect the rights of breeders
- provide an appropriate system of access to biological resources, community knowledge and technologies subject to the prior informed consent of the State and the concerned local communities; promote appropriate mechanisms for a fair and equitable sharing of benefits arising from the use of biological resources, knowledge and technologies;
- ensure the effective participation of concerned communities, with a particular focus on women, in making decisions as regards the distribution of benefits which may derive from the use of their biological resources, knowledge and technologies
- promote and encourage the building of national and grassroots scientific and technological capacity relevant to the conservation and sustainable use of biological resources
- provide appropriate institutional mechanisms for the effective implementation and enforcement of the rights of local communities, including farming communities and breeders, and the conditions of access to biological resources, community knowledge and technologies.

According to the OAU Model Law, patents over life forms and biological processes are not recognized and cannot be applied for.

Current Situation in the SADC Countries

Presently very few SADC countries have translated the above international frameworks and regional agreements into national policies, legislation, strategies and action plans. While all countries have zoo-sanitary measures in place (relating to imports, exports, movement, etc.), only a few of them have animal health acts/regulations with specific provisions on animal genetic resources. Some countries also have animal improvement acts that contain provisions on the collection, registration and use of animal genetic resources. With respect to biodiversity strategies and action plans, these are also still being developed in most countries.



Most SADC countries still want a coordinated strategy to protect their genetic resources

Since different bodies deal with different aspects of the legislation, the situation is not very transparent and often un-coordinated. So far no country has adapted the OAU Model law to suit its own needs. Import and export regulations also need to be revised to minimize indiscriminate imports of exotic breeds and regulate the export of indigenous germ-plasm.

Harmonization at regional level

A harmonization at regional (SADC) level would be beneficial, but could only be undertaken after

an analysis of existing policies and the departments and organizations that are charged with the development and implementation of these policies.

Issues that should be considered for harmonization across the SADC region include veterinary standards (disease control), trade protocols for import and export, access and benefit-sharing (some AnGR occur across several countries), identification systems, adaptation of international frameworks to the regional context, environmental quality assurance, regional capacity-building in law and policy making, and uniform quality standards for animal products, genetic materials, and animal feeds.

This process would need to be driven by the SADC Secretariat with involvement of all stakeholders (legal experts, technical experts, business, civil society, farmers associations and relevant organizations). The secretariat would have to mobilize resources, provide direct assistance through a legal and expert team, supervise implementation and undertake efforts to include other African countries.

Is there need for an international treaty on farm animal genetic resources?

Since an International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) was adopted by the FAO Conference in November, 2001 after seven years of debate, the logical question is whether a similar treaty for farm animal genetic resources is required and should be negotiated.

Background of the ITPGRFA

The purpose of the ITPGRFA or "Plant Treaty" which is in harmony with the Convention on Biological Diversity, is to ensure the continued availability of the plant genetic resources that countries will need to feed their people and to conserve for future generations the genetic

diversity that is essential for food and agriculture.

Its main objectives are (1) the conservation and sustainable use of plant genetic resources for food and agriculture, (2) the fair and equitable sharing of benefits derived from their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security.

Notably, the Plant Treaty also establishes the concept of "Farmers' Rights" by recognizing the enormous contribution that farmers and their communities have made and continue to make to the conservation and development of plant genetic resources. Farmers' Rights include the protection of traditional knowledge, and the right to participate equitably in benefit-sharing and in national decision-making about plant genetic resources. It gives governments the responsibility for implementing these rights.

The treaty is believed to benefit all stakeholders in many ways:

- Farmers and their communities, through Farmers' Rights
- Consumers, because of a greater variety of foods, and of agriculture products, as well as increased food security
- The scientific community, through access to the plant genetic resources crucial for research and plant breeding
- International Agricultural Research Centres, whose collections the Plant Treaty puts on a safe and long-term legal footing
- Both the public and private sectors, which are assured access to a wide range of genetic diversity for agricultural development
- The environment, and humankind, as the Treaty will help conserve the genetic diversity necessary to face unpredictable environmental changes and future generations' needs.

Some differences between farm animal and plant genetic resources

There are certain differences between plant and animal genetic resources for food and agriculture that would need to be taken into account when drafting the treaty:

- Crop and farm animals differ in population dynamics, with the latter having lower multiplication rates and longer reproduction periods.
- The number of breeds is much lower, compared with the number of crop varieties.
- For animals, *in situ* conservation is the only real option. While plant seeds can be stored fairly easily, *ex situ* storage of animal semen and embryos requires fairly advanced and costly technology and for some species is just not feasible at this point of time.
- There are no international gene banks for animal genetic resources and only very few national gene banks, unlike the situation with plant genetic resources.

- The new biotechnology procedures that are being developed are useful mainly for northern high input systems.

- Many important livestock genetic resources are associated with sylvo-pastoral systems that can not be conserved *ex situ*.

- Traditional AnGR management is also much less explored and documented.

Elements of a possible international treaty on animal genetic resources

In a possible treaty, it would be emphasized that animal genetic resources are of a global concern, are essential for using marginal areas and vital to ensure the sustainable livelihoods of the rural poor. Such a legal instrument would point out the linkages between animal genetic diversity and cultural diversity, acknowledging the critical role played by local communities in *in situ* conservation. It would represent a tool for protecting and respecting the indigenous knowledge of traditional livestock breeding



communities, while recognizing existing instruments and on-going programmes. A set of guiding principles would be included.

Additional elements would include the following:

- Regime for conservation and sustainable use of animal genetic resources, including breeding/crossbreeding
- Regime for germplasm exchange, including mechanisms of access and benefit-sharing
- Capacity-building at all levels
- Livestock keepers rights, including access to rangelands
- Regime for research and development
- Institutional arrangements (support mechanisms: networking, the Global Strategy on Management of Farm Animal Genetic Resources, DAD-IS)
- Funding mechanisms.

Some arguments for an international treaty on farm animal genetic resources

An International Treaty on Farm Animal Genetic Resources is needed because:

- AnGR are a global concern. They are essential to achieve food security and to ensure sustainable livelihoods, especially in marginal areas. Their use is interlinked with the environment and other types of biodiversity
- Access and benefit-sharing need to be regulated
- Conservation of AnGR needs to be promoted and awareness about the issue raised
- Livestock Keepers' Rights need to be recognized internationally
- An international instrument is necessary to ensure compliance
- An international funding strategy is also very important.

Livestock keepers' rights

The ITPGRFA recognizes "Farmers' Rights" based on the enormous contributions that local farming communities, especially their women members, of all regions of the world, particularly those in the centres of origin or diversity of crops and other agrobiodiversity, have made in the conservation, development and sustainable use of plant genetic resources. Farmers' Rights include the protection of traditional knowledge, and the right to participate equitably in benefit-sharing and in national decision-making about plant genetic resources.

There is a consensus among scientists that, contrary to plant genetic resources, AnGR can only be conserved through utilization. Conservation therefore requires

the active support of the farming and pastoral communities who own and utilize these animals. It can therefore be argued that with respect to AnGR there is an even greater need to acknowledge and reward the role of livestock keepers, by according them "Livestock Keepers' Rights".

In October, 2003, representatives of livestock-keeping communities from around the world met in Karen (Kenya) and discussed the subject of "Livestock Keepers' Rights". The results are summarized in the "Karen Commitment", an appeal to governments and international organizations to acknowledge the role of pastoralists and other communities in developing and conserving domestic animal diversity (p. 45).

Some arguments against an animal treaty

Additional regulations on access and the free flow of genetic materials might impede research, because they could prevent private companies from investing in gene technological research.

Public institutions on the other hand are chronically underfunded.

More debate and information needs to be acquired before the need for, and the components of, appropriate legal and regulatory frameworks for AnGR can be identified and discussed.



Monitoring the influx of foreign genes is vital
(Holstein cattle on a farm in South Africa)

The nature of global gene flows should be examined. The rapid expansion of highly improved livestock during the 20th century was due to the free market. North to south gene flow has often been sponsored by northern business interests or development agencies and involved germplasm not well adapted to local conditions.

The results have been mixed. Movements of livestock germplasm from south to north have been rare in comparison to movements in other directions, and in most cases the economic benefits to both north and south have probably been small. A detailed evaluation of the net cost and benefits of global flows of livestock germplasm, and prediction of potential future benefits would be a valuable input to international debates on how to address legal and regulatory issues related to livestock germplasm.

Although AnGR conservation tends to take place *in situ*, production systems are subject to change. In some cases such changes are a result of preferences reflecting the natural evolution of developing economies and markets, while in other cases production systems, breed choice and preferences have been distorted by local, national and international policies.

Such policy-induced distortions may be a greater factor in the loss of AnGR diversity than absence of a framework within which AnGR exchange takes place (Drucker et al., 2003).

Recommendations and Conclusions from the Maputo Workshop

Recommendations

- A task force should be established to finalize and adopt draft guidelines on a policy and legal framework for AnGR, considering the outcome of the workshop.
- The OAU Model law should be adopted as a basis for the development of national *sui generis* legislations.
- The SADC region should work towards the development of the International Treaty on Farm Animal Genetic Resources as the instrument to enhance food security, sustainable livelihoods and rural development along the lines with ITPGRFA.
- The SADC region should develop a common position on AnGR to be presented at international fora, especially the Commission on Genetic Resource for Food and Agriculture of the FAO.
- The SADC Secretariat should submit the statement of intent on implementation of these recommendations to the SADC Council of Ministers and to the Conference of African Ministers of Agriculture.
- The SADC Secretariat should submit the workshop report as information document to the 3rd Session of the Intergovernmental Technical Working Group on AnGR.

Conclusions

Indigenous knowledge

The characterization of Farm Animal Genetic Resources should not be restricted to phenotypic characteristics, but place more emphasis on historical, cultural and livelihood aspects. In the case of indigenous breeds, there should be

reference to the communities that have created them. Indigenous Knowledge (selection criteria, myths of origin, social exchange mechanisms and cultural significance) must also be documented.

The role of indigenous knowledge and pastoralism with respect to the conservation of farm animal diversity should also be considered in national legal frameworks.

Breeding programmes

- Continuous genetic improvement of local livestock breeds, combined with the creation of added market value and demand for these breeds is the only sustainable option for conservation.
- Animal identification and performance testing are essential elements of genetic improvement programmes.
- Breeding strategies/programmes should take into account different agro-ecological zones.
- A genetic impact assessment for cross-breeding or replacement should be part of the national policy.
- The development of technologies relevant for breeding and conservation should be encouraged.

Intellectual property rights

Legal provisions to protect the rights of the SADC countries to their farm animal genetic



resources need to take into account the patent system obtaining in other countries. This requires building legislative and institutional capacity. A *sui generis* system needs to be developed to protect the IPR of livestock keepers and breeders of indigenous breeds. Protection of breeds by trademarks or by herdbook registration (across borders) should be considered on a case-by-case basis. The African Model Law provides a good blueprint and countries should look into adapting the model law to national legislation. This could be facilitated through the SADC Secretariat.

The exchange of genetic material between farmers and breeders, within and between communities, countries and regions is of great importance for the development of livestock. Property protection must not hinder the exchange of genetic material, but the possibility that genes may be subject to patenting in other countries has to be taken into account.

Biotechnological developments, especially those with respect to genetic modification, need to be anticipated and analyzed concerning their implications for the sustainable use of AnGR.

International frameworks

On the regional level, there is a need for coordinated and strong delegations participating in on-going negotiations, such as:

- the WIPO Standing Committee on Patent Law
- the Intergovernmental Committee on Genetic Resources, Traditional Knowledge and Folklore at WIPO
- the TRIPs Council
- the Commission on Genetic Resources for Food and Agriculture.



Summary

The SADC region is exceptionally well endowed with farm animal genetic resources which form the basis for rural people's livelihoods, but in some cases are also very much in demand internationally. Examples include the Boer goat, Damara sheep, and Tuli cattle. The competitive advantages of the SADC farm animal genetic resources concern their adaptability, disease resistance, ease of management, fertility and meat quality. However, there is very little awareness about these national assets among politicians and the general public, and the contribution of livestock to the economy is undervalued.

Pastoral communities and their traditional practices of animal genetic resource management have over many centuries laid the foundation for the development of Southern Africa's indigenous breeds. The sustainable use and conservation of these breeds in the future is not possible without the involvement of communities. But due to selective promotion of exotic breeds over many decades, many rural people have now switched to cross-breeds or exotics.

A reorientation of training and teaching acknowledging the strengths of indigenous breeds is therefore urgently needed.

Governments also need to institute appropriate incentives to encourage the keeping of indigenous breeds and develop policies to monitor and regulate the import and use of exotic breeds.

Since many farm animal genetic resources occur across country boundaries, and in order to make use of collective strength, there is an urgent need for the SADC countries to harmonize their legal instruments.

There is need for more discussion on the implications of advances in genetic engineering and international intellectual property legislation for safeguarding farm animal genetic resources. The SADC countries intend to adapt the African Model Law to their specific requirements in order to protect the interest of their communities and establish a *sui generis* system as demanded by TRIPs. They also support negotiation of an International Treaty on Animal Genetic Resources for Food and Agriculture as a process that will raise the profile of farm animal genetic resources and serve to clarify many of the outstanding questions. The nature of the exchange of genetic material between different countries and regions, and the impact of that genetic material on production should be examined.



The Karen Commitment

As part of the follow-up process to the Maputo Workshop, two NGOs, Intermediate Technology Development Group-East Africa (ITDG-EA) and the League for Pastoral Peoples organized a workshop in Karen (Kenya) from 27-30 October, 2003, to discuss the concept of "Livestock Keepers' Rights" with primary stakeholders.

The conference participants who included predominantly leaders of traditional livestock breeding and pastoral communities, but also government representatives, civil society organizations with a focus on livestock genetic resources, academics and livestock researchers, issued the following statement:

"Karen Commitment" on Pastoralist/Indigenous Livestock Keepers' Rights

We call on governments and relevant international bodies to commit themselves to the formal recognition of the historical and current contribution of pastoralists and pastoralism to food and livelihood security, environmental services and domestic animal diversity.

We also demand that they recognize the contributions of pastoralists and other livestock keepers, over millennia, to the conservation and sustainable use of animal genetic resources for food and agriculture (AnGRFA) including associated species and the genes they contain.

Furthermore, we insist that there is international legally binding recognition of inalienable Livestock Keepers' Rights and the rights of their communities to:

- *continue to use their knowledge concerning the conservation and sustainable use of AnGRFA, without fears of its appropriation*
- *participate democratically in making decisions on matters related to the conservation and sustainable use of AnGRFA*
- *access, save, use, exchange, sell their AnGRFA, unrestricted by Intellectual Property Rights (IPRs) and [modification through] genetic engineering technologies*

that we believe will disrupt the integrity of these genetic resources

- *have their breeds recognized as products of their communities and Indigenous Knowledge and therefore remain in the public domain*
- *benefit equitably from the use of AnGRFA in their own communities and by others.*

We call on the FAO to start negotiating such a legally binding agreement, without delay, ensuring that it will be in harmony with the Convention on Biological Diversity.

We further call on the FAO to develop a Global Plan for the conservation and sustainable use of AnGRFA by pastoralists, other livestock keeping communities and relevant public institutions.

Finally, we insist that AnGRFA be excluded from Intellectual Property Rights claims and that there should be a moratorium on the release of genetically modified livestock until bio-safety is proven, in accordance with the Precautionary Principle. We call on relevant institutions concerned with food, agriculture, trade, intellectual property and animal research to provide assurances and such legal protection as is necessary to sustain the free flow and integrity of AnGRFA, vital to global food security and the environment.

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Bushmen on the hunt for bovines. Domestication has added a thoroughly new dimension to the use of these animals

Abbreviations

AI	Artificial Insemination
AIA	Advanced Information Agreement
AGAP	Animal Production Service
AnGR	Animal Genetic Resources
AnGRFA	Animal Genetic Resources for Food and Agriculture
CAC	Codex Alimentarius Commission
CBD	UN Convention on Biological Diversity
CBMAnGR	Community-Based Management of Animal Genetic Resources
CGRFA	Commission on Genetic Resources for Food and Agriculture
CTA	Technical Centre for Agricultural and Rural Co-operation
DAD-IS	Domestic Animal Diversity Information System (http://www.fao.org/dad-is/)
FACT	Farm Animal Conservation Trust
FAnGR	Farm Animal Genetic Resources
FAO	Food and Agriculture Organization of the United Nations
GMO	Genetically Modified Organism
GRFA	Genetic Resources for Food and Agriculture
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HIVOS	Humanist Institute for Development Co-operation
IDRC	International Development and Research Centre
IK	Indigenous Knowledge
ILRI	International Livestock Research Institute
IPGRI	International Plant Genetic Resources Institute
IPR	Intellectual Property Rights
ITDG-EA	Intermediate Technology Development Group - East Africa
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
ITWG-AnGR	Intergovernmental Technical Working Group for Animal Genetic Resources
LDC	Least Developed Countries
NGO/CSO	Non-Governmental Organization/Civil Society Organization
OAU	Organization of African Unity
OIE	World Organisation for Animal Health (Organisation of International Epizootics)
PIC	Prior Informed Consent
PEA	Participatory Extension Approaches
PPR	Peste Petits Ruminants
PTD	Participatory Technology Development
SACCAR	Southern Africa Centre for Co-operation in Agricultural Research and Training
SADC	Southern African Development Community
SIDA	Swedish International Development Co-operation Agency
SoW-AnGR	State of the World's Animal Genetic Resources
SPGRC	SADC Plant Genetic Resource Centre
SPS	Sanitary and Phytosanitary Standards
TRIPs	Trade Related Intellectual Property Rights
UNCED	UN Conference on Environment and Development
UNDP	United Nations Development Programme
WHO	World Health Organization
WIPO	World Intellectual Property Organization of the United Nations
WTO	World Trade Organization

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The Federal Ministry for Economic Cooperation and Development of Germany (BMZ) is responsible for the planning and implementation of the German government's development policy. Its tasks focus on:

- Helping to shape global frameworks.
- Developing bilateral and multilateral promotion strategies and supporting the development programmes and projects of partner countries.
- Promoting the development work of non-governmental organizations.
- Monitoring and evaluating fund utilization.

The BMZ has a staff of just under 600 including part-timers. About 80 per cent are employed at the Ministry's headquarters in Bonn, and the remaining 20 per cent at its Berlin office.

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The Technical Centre for Agricultural and Rural Cooperation (CTA) was established in 1983 under the Lomé Convention between the ACP (African, Caribbean and Pacific) Group of States and the European Union Member States. Since 2000, it has operated within the framework of the ACP-EC Cotonou Agreement. CTA's tasks are to develop and provide services that improve access to information for

agricultural and rural development, and to strengthen the capacity of ACP countries to produce, acquire, exchange and utilize information in this area. CTA's programmes are designed to: provide a wide range of information products and services and enhance awareness of relevant information sources; promote the integrated use of appropriate communication channels and intensify contacts and information exchange (particularly intra-ACP); and develop ACP capacity to generate and manage agricultural information and to formulate ICM strategies, including those relevant to science and technology. CTA's work incorporates new developments in methodologies and cross-cutting issues such as gender and social capital.

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The Food and Agriculture Organization of the United Nations (FAO) was founded in 1945 with a mandate to raise levels of nutrition and standards of living, to improve agricultural productivity, and to better the condition of rural populations.

Today, FAO is one of the largest specialized agencies in the United Nations system and the lead agency for agriculture, forestry, fisheries and rural development. An intergovernmental organization, FAO has 187 member countries plus one member organization, the European Community.

Since its inception, FAO has worked to alleviate poverty and hunger by promoting agricultural development, improved nutrition and the pursuit of food security - defined as the access of all people at all times to the food they

need for an active and healthy life.

A specific priority of the Organization is encouraging sustainable agriculture and rural development, a long-term strategy for increasing food production and food security while conserving and managing natural resources. The aim is to meet the needs of both present and future generations by promoting development that does not degrade the environment and is technically appropriate, economically viable and socially acceptable.

FAO's Animal Production and Health Division is entrusted with FAO's programme on animal production, animal health and related information and policy work. FAO has the global mandate to develop the Global Strategy for the Management of Farm Animal Genetic Resources and specifically the first country-driven Report on the State of the World's Animal Genetic Resources. Breeds of domesticated farm animal species are the primary biological capital for livestock development, food security and sustainable rural development. Yet, the value of the vast majority of animal genetic resources is poorly understood. Development in the 20th century has concentrated on a very small number of breeds worldwide, frequently without due consideration to the local production environment forces impacting on a breed's ability to survive, reproduce and produce. The management of this biological capital has been neglected resulting into substantive erosion. This trend is likely to accelerate with the massive increase in demand for livestock products - the Livestock Revolution. The use and development of livestock breeds, and the conservation of valuable breeds of little current interest to farmers must be substantially upgraded for future food security and sustainable rural development. Sustainable utilization, development and conservation are critical and complementary technical elements. A range of rapidly developing molecular and reproductive bio-technologies also has important implications for AnGR management.

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The Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH is a government-owned corporation for international cooperation with worldwide operations. GTZ's aim is to positively shape the political, economic, ecological and social development in our partner countries, thereby improving people's living conditions and prospects. Through the services it provides, GTZ supports complex development and reform processes and contributes to global sustainable development.

The GTZ was founded in 1975 as a corporation under private law. The German Federal Ministry for Economic Cooperation and Development (BMZ) is its main financing organization. GTZ also undertakes commissions for other government departments, for governments of other countries, for international clients such as the European Commission, the United Nations or the World Bank, as well as for private-sector corporations. The GTZ operates on a public-benefit basis. Any surpluses are exclusively rechannelled into its own development cooperation projects.

The organization has more than 10,000 employees in around 130 countries of Africa, Asia, Latin America, in the Eastern European countries in transition and the New Independent States. Around 8,500 are locally-contracted nationals ("national personnel"). The GTZ maintains its own field offices in 63 countries. Some 1,000 people are employed at Head Office in Eschborn near Frankfurt am Main.

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Contents of CD (attached)

I. Workshop Documentations

Community-based Management of Farm Animal Genetic Resources Mbabane, Swaziland, 7-11 May, 2001

Incentive Measures, Lusaka, Zambia, 11-14 September, 2001

Development of Regional and National Policy, Luanda, Angola, March, 2002

Policies, Approaches, Legal Frameworks, Maputo, Mozambique, 20-23 May, 2003

II. FAO Material

Executive Brief. The Global Strategy for the Management of Farm Animal Genetic Resources.

Overlooked and at Risk - Farm Animal Diversity

Domestic Animal Diversity: Arising Needs - Strategy Adopted (Poster)

Definition of Key Terms Used in the Management of Farm Animal Genetic Resources

Preparation of the First Report on the State of the World's Animal Genetic Resources - Guidelines for the preparation of country reports

Primary Guidelines for Development of National Farm Animal Genetic Resources Management Plans.

Secondary Guidelines. Management of Small Populations at Risk.

Secondary Guidelines. Animal recording for Medium-Production Environments.

Realising Sustainable Breeding Programmes in Livestock Production. Recommendations Developed at 7th WCGALP in Montpellier, France

The Economics of Farm Animal Genetic Resource Conservation and Sustainable Use. What Have We learned? Background Paper Prepared for ITWG-AnGR:3.

Country posters: Angola, Mauritius, Mozambique, Zambia, Zimbabwe

III. International Regulations and Legal Frameworks

International Treaty on Plant Genetic Resources

UN-Convention on Biological Diversity

OAU Model Law

WTO-Sanitary and Phytosanitary Agreement

Bonn Guidelines

Cartagena Protocol

TRIPs

IV. Other documents

Indigenous Knowledge about Animal Breeding and Breeds

The Karen Commitment. Proceedings on an International Meeting of Livestock Breeding Communities

Genebanks and the Conservation of Farm Animal Genetic Resources, ed. Kor Oldenbroek, DLO Institute for Animal Science and Health, Lelystad, The Netherlands, 1999



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