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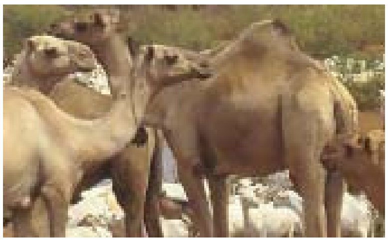

Building an International Legal Framework on Animal Genetic Resources

Can it help the drylands and food-insecure countries?

Ilse Köhler-Rollefson

League for Pastoral Peoples

LEAGUE FOR PASTORAL PEOPLES

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A herd of camels and goats in southern Somalia.
Photo: Wolfgang Bayer

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Contents

Summary

Animal genetic resources are essential for food security from at least two angles:

- As a means of utilizing marginal environments not suitable for crop cultivation.
- As building blocks for future livestock development that will enable animal producers to respond to changes in production circumstances and new consumer preferences.

Since the International Treaty on Plant Genetic Resources was signed, there have been moves to negotiate an equivalent agreement for animal genetic resources. According to FAO, one-third of the world's livestock breeds are endangered. So there is a strong rationale for a legal framework to create an appropriate context for the sustainable use of animal genetic resources.

Livestock breeds are linked to cultural diversity, and there is often a link between ethnic or social groups and specific breeds. For livestock (unlike plants), only *in situ* conservation (in the original production context) achieves all conservation goals. There is a consensus that *ex situ* conservation should be used only as a backup.

Scientists also agree that while animal genetic resources are subject to national sovereignty, regional and international co-operation is necessary. Breeds occur across borders, and market failures to conserve genetic diversity warrant public intervention. Market forces currently favour intensive or industrialized animal monocultures, while production systems that conserve genetic diversity are not rewarded for this service. The European experience with incentive payments demonstrates one way to support breed conservation.

Remote, arid and semi-arid areas have given rise to a disproportionately large number of different breeds, which also have a great degree of intra-breed diversity. Pastoral livestock production systems, in particular, inherently conserve genetic diversity. Many of the countries and regions that are richest in animal genetic resources are among the most food-insecure, while their pastoral populations are among the poorest and most vulnerable in the world. By conserving livestock genetic diversity, pastoralists provide a service to humanity that is currently not rewarded by market forces.

Supporting dryland communities through better infrastructure, services, animal health care, marketing opportunities and other interventions would make a significant contribution to both poverty alleviation and food security on one hand, as well as to the conservation and sustainable management of animal genetic resources.

An international legal framework on animal genetic resources would seek to create a level playing field between dryland production systems that conserve ge-

netic diversity, and intensive and industrialized systems that erode it.

In international negotiations, coalitions tend to form around specific issues to press for their interests. Dryland countries with pastoral populations and rich animal genetic resources could form such a bloc for negotiations on an international legal framework on animal genetic resources.

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Introduction

Environmental issues that have a global dimension need to be managed at a global level and in coordination between individual countries. Based on this recognition, the international community has agreed on a number of legal instruments and policy frameworks that apply to the entire world. Examples are the United Nations Framework Convention on Climate Change, the UN Convention to Combat Desertification, the UN Convention on Biological Diversity, and the Convention on International Trade in Endangered Species.[1]

The **International Treaty on Plant Genetic Resources for Food and Agriculture**[2] (the "Seed Treaty") is one such global instrument. It was negotiated as something of an afterthought to the Convention of Biological Diversity, because the Convention did not adequately address important questions. The Seed Treaty aims to maintain the plant genetic resources that countries need to feed their people, and to conserve genetic diversity for future generations. It was finalized in 2001 and has now been signed by more than 80 countries.

However, this treaty relates only to the major crop and fodder plants. It does not deal with the other component of agricultural biodiversity: our farm animals. An equivalent legal framework for animal genetic resources is still missing, although the issues at stake are of equal magnitude. In 2004, several developing countries took the lead to demand negotiations towards such a legal framework. But developed countries are still skirting this proposition.

This paper shows that a fair, comprehensive international legal framework on animal genetic resources is possible. Such a framework should contribute to global food security, and also benefit the populations of some of the world's most drought-stricken and food-insecure countries. For it happens that certain countries that are disadvantaged in all other ways – remote, with a harsh climate, without infrastructure – are exceptionally rich in animal genetic resources, much of it still unknown. These countries and their people play a vital role in conserving these important reservoirs of genetic diversity. A way needs to be found to acknowledge, support and reward this service, so they can continue to do so. Such a mechanism would be a significant contribution not only to these people's food security, but also to global wellbeing.

This paper calls for dryland countries that have pastoral populations and are rich in livestock genetic resources to form a coalition in negotiations for an international treaty. It offers arguments that negotiators can use when pressing their case.

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[1] UN Framework Convention on Climate Change, www.unfccc.int/resource/convkp.html; UN Convention to Combat Desertification, www.unccd.int; UN Convention on Biological Diversity, www.biodiv.org; Convention on International Trade in Endangered Species, www.cites.org

[2] International Treaty on Plant Genetic Resources for Food and Agriculture, www.fao.org/ag/cgrfa/itpgr.htm

Background

What are animal genetic resources?

The **Food and Agriculture** Organization of the United Nations (FAO) defines **farm animal genetic resources** as "those animal species that are used, or may be used, for the production of food and agriculture, and the populations within each of them. These populations within each species can be classified as wild and feral populations, landraces and primary populations, standardized breeds, selected lines, and any conserved genetic material".

Domestic animal diversity is the collective name for the whole spectrum of domesticated animal species and breeds, and the genetic information they contain.

Over millennia, humans have developed a cornucopia of breeds from a relatively small number of once-uniform wild species. Horse breeds include the tiny Shetland pony, the Thoroughbred racehorse and the massive Shire draft horse. Cattle range from the Spanish fighting bull, to Holstein-Friesian dairy cattle, to the Small East African Zebu.

The number of different breeds is often used as an indicator of domestic animal diversity. But that ignores the diversity within each breed. High-performance breeds have been intensively selected: the semen from a very few of the "best" males is used to inseminate huge numbers of females. So these breeds are much less diverse than the extensively kept breeds in traditional systems. The diversity in a population is an indicator of the potential room for genetic change.

Since the 1980s, FAO has been building a global database of the world's breeds to document and monitor domestic animal diversity. In 1999, 6379 breeds were

Farm animal genetic resources and other terms

Domesticated animal diversity The spectrum of genetic differences within each breed, across all breeds within each domestic animal species, and between the different animal species.

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

Breed A breed is a group of domestic animals of the same species that:

- Has identifiable **external characteristics** that distinguish it from other breeds. For example, black-and-white Holstein-Friesian cattle can easily be distinguished from brown-and-white Guernseys or white Charolais;

or

- Is accepted as a separate breed because it is **separated geographically or culturally** from groups of animals that look similar. Examples are Nguni cattle, Lesotho pony, Tswana sheep, and Boer goat.

registered in this Global Data Bank for Farm Animal Genetic Resources (Scherf, 2000).

Animal breeds: A legacy of cultural diversity

We have a huge range of breeds as a result of the interaction between different cultures or social groups, their animals, and the environment.

For individual breeds to evolve and to develop their distinct characteristics, animal populations have to be "reproductively isolated" (prevented from breeding with each other). That can happen in various ways. Geographical barriers are one. In very mountainous areas, for example, the animals in each valley may represent separate gene pools, each with their own distinct characteristics, so might be regarded as separate breeds. When people colonized new continents, they brought animals with them. They then selected those animals that adapted best to the new environment. Over generations, they developed a new breed, different from the parent stock.

Geographical barriers are not the only way to ensure reproductive isolation. One community or group of people may keep its animals separate from those of other groups. This is an important influence on the formation of breeds. Members of formal breed societies, for example, use for breeding only those animals that are registered in a common herdbook. But even without herdbooks, people often tend to exchange animals only within their community, so creating more-or-less closed gene pools, i.e. separate breeds. Traditional pastoral societies regard their animals to some extent as common property, rather than as belonging to individuals. They aim to pass their animals on from one generation to the next – through inheritance, dowry, bride wealth, birth presents, etc. – and avoid sharing them with outsiders. Ethnic groups are often associated with particular breeds: examples include the Borana cattle breed and the Rashaida camel.

Domestic animals have been shaped not only by their physical environment, but also by the cultures they are associated with. Individual cultures use animals in different ways, and have different ideals for what an animal should look like – so they select them for different traits. Some cultures prefer certain colours or patterns; others are particular about horn shapes. They also use animals in different ways. For example, the Somali regard camels mainly as a milk animal, and select their breeding animals accordingly. Others use camels only to pull carts and ploughs, so prefer larger, stronger animals.

In short, livestock genetic diversity is very much related to cultural diversity. In a good many cases, particular genetic resources are associated with distinct social or ethnic groups.

Why are animal genetic resources important for food security?

Animal genetic resources are important for food security on different levels.

- **To use marginal environments** that are unsuitable for cultivation. Extensive livestock husbandry and pastoralism are the only way to produce food in many of the world's harshest environments – deserts, steppes and mountains. Locally adapted breeds enable these vast areas to be used sustainably.
- As building blocks for **future livestock development.** Livestock keepers depend on animal genetic resources so they can adapt to changing conditions – climate change, shifts in consumer preferences,

"From a long-term point of view it is possible that concentration on high-yielding environmentally-sensitive breeds will create a serious problem for the sustainability of livestock production... It is possible that farmers will lose their ability to manipulate natural environmental conditions. If all environmentally tolerant breeds are lost in the interim, the level of livestock production could collapse." (Tisdell 2003:373)

or new diseases. There is no room for adaptation and adjustment if the livestock population is genetically uniform. Conserving animal genetic resources is just as important for long-term food security as the ability to produce lots of protein.

Why are breeds disappearing?

Individual breeds disappear when the husbandry system they are adapted to changes or is replaced (Hall, 1990). "Globalization" is a prime driver of this erosion. Traditional cultures and livelihoods are being replaced with western values and ways of life. Many governments began promoting crossbreeding or the replacement of indigenous breeds with high-performance exotics several decades ago. The current "**Livestock Revolution**" – the increased consumption of meat and other livestock products in the developing world, with its expansion of animal monocultures and industrialized production systems – further exacerbates the trend.

In many developing countries, there is another important cause of breed loss. Pastoralists in semi-arid areas are losing their livelihoods because their grazing areas are being used for other purposes: irrigated cropping, rainfed farming, nature reserves and wildlife parks (LPPS, 2004; Vivekanandan and Paulraj, 2002).

Why conserve farm animal genetic variability?

Opportunities to meet future market demand Rising incomes lead to rising demand for specialized foods generated by a diversification of animal production systems (Oldenbroek, 1999).

Insurance against future changes in production circumstances Rising human populations mean higher demand for food. That means increasing the use of drylands – which can be used effectively only for raising livestock. This is possible only by using breeds that are adapted to these conditions.

Present socioeconomic value Livestock breeds are a source of income for poor farmers. Losing them would deprive these people of their livelihoods.

Cultural and historical reasons Many breeds reflect the cultural and historical identity of the communities that developed them. Conserving the breed is necessary to maintain their cultural identity.

Ecological value Breed diversity enables people to exploit various ecological niches. For example, cattle breeds that are resistant to trypanosomosis are one of the few ways to produce meat and milk in large swathes of the tropics.

Other factors – drought, the loss of water supplies, restrictions on movement across borders, armed conflict – often confound these problems.

When pastoralists are forced to give up livestock keeping, their animal genetic resources also become extinct.

Status of animal genetic resources

According to FAO, about **1000 of the 6400 recognized breeds have become extinct** during the last 100 years. One-third of these died out between 1985 and 2000 (FAO, 2001).

Among the 5330 mammal breeds, 17% are already extinct, and another 29% are endangered. For poultry, only 4% of breeds are thought to be extinct, but a massive 61% are endangered.

How accurate are these data? It is hard to tell. They are based on information provided by individual countries. But many countries have never surveyed their breeds systematically. Many breeds may still be unrecognized – and some will become extinct even before they have been documented.

A case in point is India – a country well staffed with agricultural researchers, and which has instituted a special National Bureau of Animal Genetic Resources. But cursory field research by a local NGO in a limited area identified two distinct breeds that had escaped the attention of scientists: the Malvi camel, and the Nari cattle (Köhler-Rollefson and Rathore, 1996: Rathore and Köhler-Rollefson, 2002). Both these breeds are threatened.

On the other hand, the FAO database records breeds as "critical" or "endangered" as soon as the population in a country falls below a certain threshold. This includes recently imported, non-native breeds, which are inevitably present only in small numbers. For example, the list of critical and endangered sheep breeds in Germany includes the Soay sheep from Scotland, the Ungarisches Zackelschaf from Hungary, the Hampshire sheep from England, the Kamerun sheep from Cameroon, the Karakul sheep from Central Asia, and the Gotlaendisches Pelzschaf from Sweden. This artificially inflates the numbers of endangered breeds.

Despite these weaknesses, the FAO data are the most comprehensive available, and they are the only systematic effort to monitor the erosion of animal genetic resources. The utility of this global database could be improved if individual countries took their commitment seriously. They should conduct rigorous field surveys that take into account local and indigenous breed classifications and draw on indigenous knowledge about animal breeding.

FAO and governments working on a "State of the World" report that should give a better picture than existing statistics. This is expected to be published in 2007.

How to conserve livestock genetic diversity?

Genetic diversity is best upheld by conserving individual breeds. There are two ways to do this: *ex situ* and *in situ*.

- ***Ex situ*** conservation means keeping the genetic material outside its original production context. This can be in two forms: by **cryopreservation** (deep freezing) of genetic material (semen, oocytes, embryos, DNA), or as a **live population** in a zoo or on an experimental or show farm.
- ***In situ*** means in the original production environment. This can also be done in two ways: **on-farm** or "**community-based**".

"Genetic variation is best conserved on the species level by maintaining separate pure breeding populations rather than establishing large populations without reference to breed. This is because of the danger of market forces pushing large populations to be selected for a very narrow breeding goal abetted by reproductive techniques that allow individual animals or families to gain major influence on the genetic make-up of a population. The breed should thus be the key unit in conservation of animal genetic resources" (Ruane, 1999).

Advantages and disadvantages of conservation approaches

Ex situ

Cryopreservation is successful in some species (e.g., cattle), but technically difficult in others. Developing countries often lack the facilities and resources for cryopreservation. A drawback of conservation in a gene bank is that it does not uphold the breed's socioeconomic role, nor does it save its cultural and historical value, or its ecological role (Oldenbroek, 1999).

If breeds are conserved as a **live population** outside their natural habitats, then they may be in danger of inbreeding. Furthermore they are bound to gradually change their characteristics in adaptation to their new environment.

In situ

In situ conservation has usually meant keeping the animals on a government farm located in the production area. Such farms have several advantages: they maintain animals in the same general conditions as in their usual habitats, they enable highly qualified staff to manage the stocks, and they provide controlled conditions for breeding and research. But they also suffer from disadvantages from a conservation perspective: management by government staff on the farms is bound to be different from management by herders in the field; the animals may be spared just those challenges (migration, drought, disease) that force a breed to adapt; animal numbers may be too small to represent the full diversity of the breed; and the animals may become isolated from the wider gene pool. In addition, special farms are subject to uncertain long-term funding.

Community-based management has been hailed as a way of conserving animal genetic resources in developing countries. It combines the sustainable use of a breed with the empowerment of the rural people that keep it. While this concept holds considerable promise, projects have been rare so far and have attracted little donor support. There are however several successful examples of conservation projects in Europe which reflect the standards set for community based management.

Table 1. How do the different conservation techniques achieve the different conservation objectives?

Objective	Cryo-preservation	*Ex situ* live	*In situ*
Meet future insurance	✓	✓	✓
Socioeconomic value	×	×	✓
Research and education	✓	✓	✓
Cultural–historical value	×	⇘	✓
Ecological value	×	⇘	✓

✓ yes ⇘ poor × no

Source: Oldenbroek and Gandini (1999)

How to select breeds for conservation

In view of the large numbers of breeds that are considered endangered, there has been much discussion on how to set priorities. Criteria include the degree of endangered-ness, as well as specific adaptations, traits of economic importance, unique traits, cultural value, and genetic uniqueness (Tables 1 and 2).

Whose responsibility is it?

Legally, national governments have the responsibility for conserving farm animal genetic resources. All signatory countries of the Convention on Biological Diversity are committed to conserving their farm animal genetic resources as a component of their overall biological diversity. National sovereignty over genetic resources also comes with the obligation to conserve them. But many breeds are dispersed across several countries, so international cooperation is a must.

While conserving animal genetic resources is both a national and international responsibility, the conservation itself should occur in a decentralized manner.

Table 2. Relationship between selection criteria and conservation objectives

Selection criteria	Conservation objectives					
	Future market demands	Changes in production circumstances	Socio-economic value	Opportunity for research	Cultural–historical reasons	Ecological value
Adaptation	×	✓	✓	✓	×	✓
Traits of economic importance	✓	✓	✓	✓	×	×
Unique traits	✓	✓	✓	✓	×	×
Cultural historical value	✓	×	✓	×	✓	✓
Genetic uniqueness	✓	✓	×	✓	×	×

✓ yes × no

Adapted from Ruane (1999)

"Governments consequently have a role to play in preserving uneconomic species or breeds for future genetic research. Because the genetic value of the stock is likely to be a public good, any genetic storage program is not likely to pay for itself. Revenues will probably be less than costs. However, one could argue that the social benefits of future breeds could easily outweigh the costs if the programs are efficiently designed. The facility or organization that conserves the breed might not be able to reap the benefits, but society at large would enjoy them. There is consequently a good economic argument for establishing a government program to protect endangered domesticated breeds. Because the beneficiaries of this program are likely to be spread throughout the world there is every reason that this should be an international responsibility." (Mendelsohn 2003:506)

Who will pay for conservation?

The fact that so many animal genetic resources with possible commercial potential in the future are becoming extinct can be regarded as a "market failure". Market forces currently favour genetically uniform, intensive and industrialized livestock production systems. On the other hand, many of the extensive pastoral production systems in which animals are exposed to the elements (and that therefore conserve genetic diversity) are on the brink.

Livestock industries are able to externalize the costs for genetic erosion, while systems that conserve genetic diversity are not rewarded for their role. Thus a case can be made for subsidizing the latter through a genetic erosion tax imposed on the former.

"There is another important alternative to a centralized facility. It may prove more viable and less expensive to preserve animals in the very systems they were adapted to survive in. This suggests that the international effort be more of a program than a single laboratory. Farmers in locations around the world would be paid annually to sustain adequate populations of desired animals. This would protect the animals from unintended interbreeding, disperse the beneficiaries of the program widely, and keep costs down since the animals are best suited for where they exist now anyway" (Mendelsohn 2003:507).

Experiences from Europe

European Union regulations try to create uniform mechanisms and procedures across countries for conserving breeds. Incentive payments have halted breed decline (Gandini, 1999). In countries such as Germany, no breed has become extinct, due to the efforts of NGOs and a large number of societies for individual breeds. In the Mediterranean countries, especially Italy, France and Spain, keepers of rare breeds have been able to plug into a niche market for culinary specialities, and this has revived many endangered breeds.

Summary of main points

- Only *in situ* conservation achieves all conservation goals.
- While animal genetic resources are subject to national sovereignty, regional and international cooperation is necessary.
- Genetic diversity conserving production systems are currently not rewarded for this service.
- Incentive payments have been successful in conserving breeds in Europe.

Where are domestic animal diversity hotspots?

For wild species, there are certain biodiversity hotspots. About 70% of the world's wild biodiversity is contained in only 12 out of the approximately 170 countries[3] .

What about livestock genetic diversity? Are there also certain areas that are especially rich in animal genetic resources?

High density of breeds in remote and peripheral areas

In the early 1990s, Hall and Ruane (1993) correlated the number of breeds that had been reported in a country with human populations and land areas. They noted that peripheral and remote countries have the highest ratios of breeds per million people and concluded that remoteness can promote breed diversification.

According to their calculations, in Asia, it is Mongolia, Yemen and Oman that have the greatest concentrations of breeds (Table 3). In Africa, it is countries such as Botswana and Namibia, as well as those of the Sahel. Within large countries such as China and India, it is the peripheral provinces that maintain the largest numbers of breeds in relationship to the human population density.

[3] These so-called "megadiverse" countries include Australia, Brazil, China, Colombia, the Democratic Republic of the Congo, Ecuador, the United States, India, Indonesia, Madagascar, Mexico and Peru.

Why are drylands rich in animal genetic resources?

Hall and Ruane did not say why breed diversity was greater in some places than in others, and why "remoteness' appeared to be correlated with the number of breeds.

But if we recall what was said above about breed formation, and the correla-

Indigenous knowledge about animal breeding among pastoralists

Pastoralists apply a wide range of concepts and strategies in order to manipulate the genetic composition of their livestock holdings (Köhler-Rollefson, 2000). This is also known as "**indigenous knowledge about animal breeding**". 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.

How to measure livestock genetic diversity

Number of breeds

The number of breeds of a country or area, correlated to the human population density, has been used as a measure of diversity (Hall and Ruane, 1993).

Such calculations produce some interesting results. They show that remote areas have a high degree of diversity. But this approach fails to take into account the relative abundance of each breed.

Simpson index

When ecologists measure biological diversity, they take into account richness and evenness of species. Richness refers to the number of species (or other grouping, such as genus or breed). Evenness considers the relative abundance of species. A community dominated by one or two species is considered less diverse than one where several different species are similarly abundant.

	No. of individuals	
Breed	**Country 1**	**Country 2**
Holstein-Friesian	900	320
Brown Swiss	80	380
Gir	20	300
Total	**1000**	**1000**

In the above example, the two countries have the same number of animals and the same number of breeds. But Country 2 would be considered to have a more diverse cattle population than Country 1.

Genetic distancing

This involves estimating the genetic distances between two or more populations, using directly observed features or molecular characteristics. It is used to measure diversity in wild plants and animals, and to ensure conservation of a maximum amount of evolutionary history (Hall and Bradley, 1995).

There may be problems applying molecular genetic investigations to livestock breeds because many breeds are closely related and diverged from each other only recently, in evolutionary terms. The same caveat obtains for analysis of mitochondrial DNA (Hall and Bradley, 1995).

tion between cultural diversity and breed diversity, it becomes quite obvious why semi-arid and arid areas can be expected to be especially well endowed with animal genetic resources. Drylands are not conducive to crop cultivation, so have given rise to a multitude of pastoralist cultures. These cultures in turn have developed individual breeds to fit their specific ecological and cultural requirements.

Pastoralists and indigenous knowledge of animal breeding

The breeds that pastoralists have developed are very much a product of their indigenous knowledge. Pastoralists have developed extensive indigenous knowledge about animal breeding and astute ways of manipulating the genetic composition of their herds, out of the necessity to survive in their respective environments, and over many generations.

Breeding for diversity

"Cultivating" genetic diversity in livestock holdings appears to be an integral part of pastoral production systems. In order to minimize risks and to cover their various needs, pastoralists often herd a mix of species. They sometimes keep breeds with different productivity levels to protect themselves from drought and other problems, and so they can take advantage of years with abundant grazing. For instance, Raika sheep pastoralists in Rajasthan keep Boti sheep (which are extremely drought resistant but grow very slowly), together with Bhagli sheep (which can cope less well with adverse conditions, but are very productive in good years) (LPPS, 2003).

Pastoralists therefore do not have the concept of an "ideal animal" (Adams and Kaufmann, 2003), as exists in formal breeding societies. Rather, they aspire to

Table 3 Number of livestock breeds (all species) per million people

Africa

Country	No. of native breeds	Breeds per million people
Seychelles	1	14.9
Djibouti	1	10.0
Botswana	9	7.4
Namibia	9	6.9
Gambia	5	6.3
Guinea-Bissau	5	5.4
Mauritania	10	5.3
Somalia	20	3.2
Chad	16	3.0
Mali	21	2.7
Niger	15	2.1
Sudan	51	2.0
Senegal	14	2.0
Libya	7	1.7
Liberia	4	1.6
South Africa	46	1.6
Tunisia	13	1.5
Morocco	36	1.5
Togo	5	1.5
Swaziland	1	1.4
Lesotho	2	1.2
Cameroon	13	1.2
Benin	5	1.1
Kenya	24	1.1
Sierra Leone	4	1.0
Uganda	16	1.0
Angola	9	1.0
Burkina Faso	7	0.8
Zimbabwe	7	0.8
Algeria	16	0.7
Ethiopia	33	0.7
Malawi	4	0.5
Tanzania	14	0.6
Egypt	30	0.6
Ghana	6	0.4
Guinea	3	0.5
Madagascar	5	0.5
Zaire	13	0.4
Mozambique	6	0.4
Nigeria	32	0.3
Rwanda	2	0.3
Core d'Ivoire	2	0.2
Zambia	1	0.1

Asia

Country	No. of native breeds	Breeds per million people
Yemen	36	195.3
Mongolia	14	6.7
Oman	7	5.8
Bahrain	2	4.8
Bhutan	4	2.9
Israel	12	2.7
Lebanon	5	1.8
Afghanistan	22	1.4
Syria	16	1.4
Nepal	24	1.3
Turkey	55	1.0
Iran	55	1.0
Jordan	3	1.0
Saudi Arabia	11	1.0
Iraq	16	0.9
Pakistan	96	0.9
Cambodia	6	0.8
Sri Lanka	12	0.7
Laos	2	0.5
Malaysia	8	0.5
Cyprus	7	0.5
Vietnam	18	0.3
Philippines	17	0.3
China	236	0.2
India	171	0.2
Taiwan	4	0.2
Thailand	10	0.2
Japan	21	0.2
Indonesia	28	0.2
Bangladesh	17	0.2
Myanmar	6	0.2
North & South Korea	7	0.1

Source: Hall and Ruane (1993)

build up a herd composed of animals with different characteristics to prepare themselves for all eventualities and avoid risks.

Ritual needs can also enhance diversity. Different rituals and occasions (weddings, circumcisions, funerals, etc.) require animals with a specific colour, horn shape, or other characteristics.

Lack of infrastructure and remoteness

Extension services throughout the world tend to promote exotic breeds or crossbreeds. Because keeping these animals is regarded as progressive, and they dazzle with their high production outputs, pastoralists too may be tempted to acquire such animals. However, in many cases, these animals succumb to the next drought or epidemic, and they fail to reproduce. In Rajasthan, the desert state in western India, the Department of Animal Husbandry has for decades been fostering crossbreeding through artificial insemination. But even after 30 years, crossbred cows provide only about 1% of the State's milk yield. Similar results were obtained from the introduction of exotic Rambouillet and Merino sheep breeds.

Nepal is not an arid country, but also faces a severe climate and suffers from lack of infrastructure. Although cattle improvement programmes were started three decades ago, their impact has been limited to the peri-urban area. Some 95% of the cattle, more than 70% of the sheep and most of the goats are of local breeds (Tulachan, 1998).

In some countries in the former USSR, the loss of Soviet inputs and markets has led to a return to more traditional breeds and species: local fat-tailed sheep (which can forage better under the snow) and downy goats and meat horses instead of cattle (Kerven and Lunch, 1998).

It can be concluded that in areas with harsh environmental conditions, natural selection processes preclude the establishment of exotic or crossbred populations, so reducing the risk of genetic dilution. However, the lack of support for development in these areas could in the long run lead to the total loss of the pastoral and agropastoral systems in these areas, along with the animal diversity they support.

Summary of main points

- Remote, and arid and semi-arid areas have given rise to a large number of different breeds. These breeds have a great degree of intra-breed diversity.
- Pastoral livestock production systems inherently conserve genetic diversity.
- Intensive animal production is not possible in such ecological contexts.

Drylands

Drylands are areas where rainfall is very low and rates of evaporation are high. They cover about 40% of the world's land surface and 54% of the world's productive land. Drylands come in the form of plains, grasslands, savannas, steppes or pampas. They can be subdivided into hyper-arid, arid, semi-arid and dry subhumid ecosystems. The term "drylands" specifically excludes real deserts since these have very limited potential for productive use and are not permanently inhabited.

The world's drylands have a wide range of topography, elevation, temperature, geology, and biological conditions. But all drylands have something in common: their rainfall is low and very variable. Droughts are the rule rather than the exception, and differences between night and day temperatures are often very high.

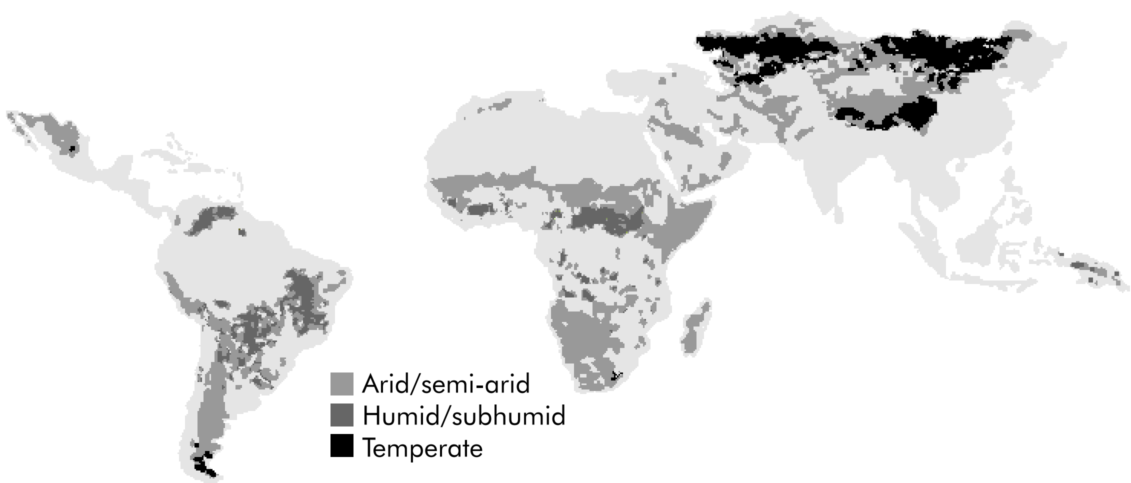
The plants and animals native to such areas have developed special adaptive traits to cope with such harsh environmental conditions. These traits are important in the context of global climate change.

People in drylands

More than 2 billion people live in drylands, and about 1 billion of them are rural poor (Dobie, 2001). A predominant livelihood strategy in drylands is pastoralism.

Food insecurity

Drought, together with other climatic exigencies, is the major cause for famine and food insecurity in the world, according to

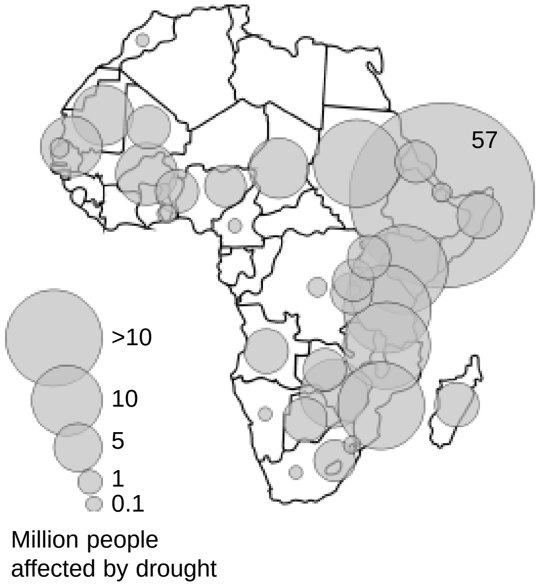


Where pastoralists are: Livestock-only, rangeland farming areas (adapted from ILRI)

FAO's *State of Food Insecurity in the World* study (FAO, 2003b). Strife and conflict are also important reasons.

According to this study, "traditional livestock production systems sustain some of the world's most vulnerable communities in some of its harshest environments."

FAO concludes that there is a need for emergency prevention and rehabilitation programmes to respond to the particular needs of livestock owners. Pastoral communities typically need different kinds of aid, over longer periods, than farmers who rely mainly on crops. When rains return after a drought, for example, farmers may require little more than seeds, fertilizer and one successful cropping season to get back on their feet. But pastoralists may need several years of assistance to weather the crisis, replenish their breeding stock and rebuild the herds that represent both their livelihoods and their life savings. In the long term, alternatives must be found for those whose livelihoods can no longer be sustained by nomadic herding



Source: UNDP/GRID Arandal

Drought and famine in Africa, 1971–2000

Drought has been the most common cause of food emergencies and has contributed to several famines in Africa over the past 30 years.

Livestock genetic diversity: The competitive advantage of drylands and harsh environments?

While FAO banks on emergency relief, others conclude differently. "The secrets are not in welfare and crisis management, but in establishing systems of governance and marketing that will provide incentives to people to work and invest in drylands" (Dobie, 2001).

Drylands suffer from many disadvantages and constraints. But they do have a competitive advantage in one area: they act as a reservoir for animal genetic resources, and for traits and fitness characteristics that have disappeared from breeds selected only for their production performance. Unfortunately, current market mechanisms do not reward this contribution of the pastoral peoples in drylands. So there is a rationale for public intervention to compensate for this market failure. An international legal framework on animal genetic resources could be a pillar of a governance system that would provide incentives for people in drylands.

Summary of main points

- Drylands are chronically food-insecure, and their populations are among the poorest and most vulnerable in the world.
- By conserving livestock genetic diversity, pastoralists provide a service to humanity that is currently not rewarded by market forces. An international legal framework on animal genetic resources could set up support and incentive mechanisms for pastoral production systems.

An international legal framework on animal genetic resources for food and agriculture[4]

Calls by developing countries for establishing an international legal framework on animal genetic resources are intensifying. The need for such a legally binding agreement was first formulated by the NGO/CSO forum during the World Food Summit in June 2002.

During the 3rd Session of the Intergovernmental Technical Working Group on Animal Genetic Resources in spring 2004, a number of developing countries, including Botswana, Uganda, and Kenya, proposed starting negotiations on an international treaty on animal genetic resources (FAO 2004).

At the Commission on Genetic Resources for Food and Agriculture in November 2004, the issue was picked up again. But countries of the North resisted, so further consideration was postponed until the First Report on the State of the World's Animal Genetic Resources is completed. That is expected only in 2007.

[4] There is no universally accepted term to refer to domesticated animal genetic resources. The argument against "farm animal genetic resources" is that not all livestock is kept on farms but rather raised by pastoralists. The term "animal genetic resources for food and agriculture", on the other hand, would also include fish – which need to be dealt with separately.

Arguments for a legal framework

We can take a cue from the "Seed Treaty" – the recently concluded International Treaty on Plant Genetic Resources for Food and Agriculture. An international framework on farm animal genetic resources would be a logical follow-up to this treaty. Developing countries have assembled the following arguments for crafting an equivalent treaty for animal genetic resources.

- **Animal genetic resources 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.
- **Domestic animal diversity is essential for future generations** to develop breeds adapted to largely unforeseeable ecological and economical scenarios. Farm animal genetic resources form the raw material that farmers depend on to adapt to changes 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 many 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 of humanity.

- **The conservation of animal genetic resources needs to be promoted** and much more awareness about the issue raised. For several decades, plant genetic resources have captured all the attention, and the term "agricultural biodiversity" has too often used to refer to plant genetic resources alone. Animal genetic resources have to do a considerable amount of catching up.
- **Biotechnology is advancing rapidly**, and huge sums are being channelled into studies of livestock genomes.[5] This is happening in a legal vacuum. Livestock holders risk losing their intellectual property rights, while biotechnology firms require a stable regulatory framework in which to operate. "Livestock Keepers' Rights", the equivalent to "Farmers' Rights" need to be fleshed out and recognized internationally.
- The Convention on Biological Diversity requires "**access and benefit-sharing**". It needs to be examined whether these concepts are applicable in any meaningful way to the situation of animal genetic resources.
- An international instrument is necessary to ensure **compliance with rules** that may be agreed.
- A legal instrument, and the negotiations leading up to it, could be a means of **leveraging funds** for the conservation of animal genetic resources.

[5] For instance, $ 53 million are being invested into the Bovine Genome Sequencing Project, a joint project of the US Department of Agriculture, the State of Texas, National Institute of Health, and several international institutions (Livestock International, Nov. 2004, p.4).

Contents of a legal framework on animal genetic resources

Some of the obvious requirements of a legal framework would include that it emphasize that animal genetic resources are of global concern, are essential for using marginal areas, and that secure access to them is vital for the rural poor.

The instrument should also point out the special significance of *in situ* conservation and acknowledge the critical role played by farmers and pastoralists in the sustainable management of domestic animal diversity.

Furthermore, NGOs insist that it should also seek to protect the livelihoods of communities that conserve animal genetic diversity by according them "Livestock Keepers' Rights", as equivalent to the "Farmers Rights" that are such an important aspect of the Seed Treaty.

However, an "Animal Treaty" should not just be an adaptation of the Seed Treaty, but should be developed explicitly for the specific requirements and characteristics of the livestock sector.

Differences between animal and plant genetic resources

There are important differences between plant and animal genetic resources. These will need to be reflected in the legal framework to be developed. Negotiations for the Seed Treaty were precipitated to a significant extent by the recognition that important *ex situ* collections were held by various institutions and countries, and that multilateral access to these collections is needed for the sake of global food security.

The "Seed Treaty"

The International Treaty on Plant Genetic Resources for Food and Agriculture, or "Seed Treaty", aims 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. The treaty is in harmony with the Convention on Biological Diversity.

Its main objectives are:

- The conservation and sustainable use of plant genetic resources for food and agriculture, and
- The fair and equitable sharing of benefits derived from their use for sustainable agriculture and food security.

The Seed Treaty also establishes the concept of "Farmers' Rights" (see the box below).

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 agricultural products, as well as increased long-term 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 future generations, because the Seed Treaty will help conserve the genetic diversity necessary to face unpredictable environmental changes, and future human needs.

For animal genetic resources, such collections do not exist on a similar scale. In contrast to seeds, animal genetic resources are much more difficult and expensive to store *ex situ*, in the form of semen and ova. For some species, such methods have not even been satisfactorily developed. Scientists tend to agree that the best way of saving animal genetic resources is by means of sustainable utilization in their original production environments. FAO also promotes this approach.

Farmers' Rights

The International Treaty on Plant Genetic Resources for Food and Agriculture recognizes "Farmers' Rights". These include the protection of traditional knowledge, and the right to participate equitably in benefit-sharing and in national decision-making about plant genetic resources.

This recognition is based on the enormous contributions that farming communities have made in the conservation, development and sustainable use of plant genetic resources. While all regions of the world have contributed, women, and people in the centres of origin or diversity of crops, have been particularly important.

The responsibility for implementing these rights rests with individual governments.

We can conclude that livestock-keeping communities, be it farmers or pastoralists, have a much more significant role to play in the conservation of animal genetic resources than is the case with plant genetic resources.

Livestock Keepers' Rights

In November 2003, representatives of indigenous livestock breeding communities met in Karen, Kenya. They issued a statement requesting FAO to start negotiations towards Livestock Keepers' Rights (Köhler-Rollefson and Wanyama, 2003).

The rights should include the following:

- The right to continue to use their knowledge on the conservation and sustainable use of animal genetic resources, without fears of its appropriation.

- The right to participate democratically in making decisions on matters related to the conservation and sustainable use of animal genetic resources.
- The right to access, save, use, exchange, sell their animal genetic resources for food and agriculture, unrestricted by Intellectual Property Rights and (modification through) genetic engineering technologies that may disrupt the integrity of these genetic resources.
- The right to have their breeds recognized as products of their communities and indigenous knowledge, and therefore remain in the public domain.
- The right to benefit equitably from the use of animal genetic resources in their own communities and by others.

The "Karen Commitment" on pastoralist/indigenous Livestock Keepers' Rights

Leaders of traditional livestock breeding and pastoral communities, government representatives, civil society organizations focusing on livestock genetic resources, academics and livestock researchers met in Karen, Kenya, in October 2003 to discuss the concept of "Livestock Keepers' Rights".

The conference was organized by the Intermediate Technology Development Group–East Africa (ITDG–EA) and the League for Pastoral Peoples. The participants issued the following statement.

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 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 animal genetic resources, without fear of its appropriation.
- Participate democratically in making decisions on matters related to the conservation and sustainable use of animal genetic resources.
- Access, save, use, exchange, sell their animal genetic resources, unrestricted by Intellectual Property Rights 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 animal genetic resources in their own communities and by others.

We call on 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 animal genetic resources by pastoralists, other livestock keeping communities and relevant public institutions.

Finally, we insist that animal genetic resources for food and agriculture be excluded from Intellectual Property Rights claims, and that there should be a moratorium on the release of genetically modified livestock until biosafety 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 animal genetic resources, vital to global food security and the environment.

See www.pastoralpeoples.org/docs/karen.pdf for the full proceedings of this conference.

Conclusions

Individual conservation programmes for all breeds are not feasible and realistic.

Community-based management is a promising way to conserve animal genetic resources

Dryland countries have a disproportionately high number of breeds. These breeds are endowed with important fitness and disease-resistance traits. Dryland countries are especially rich in animal genetic resources because of the rich traditional knowledge and sense of guardianship of pastoralist societies, their remoteness and lack of infrastructure, as well as the inability of high performance breeds to become established.

The drylands are also among the most **food-insecure** areas of the world. They witness frequent droughts and famines. Livestock-raising and pastoralism – using indigenous breeds – are among the few ways to use these areas in a sustainable way.

The conservation of a significant number of animal genetic resources and an important part of domestic animal diversity is linked to the survival of **traditional cultures** with a livestock-rearing identity.

Supporting dryland communities through better infrastructure, services, animal health care, marketing opportunities, and other interventions would make a significant contribution to both poverty alleviation and food security on one hand, as well as the conservation and sustainable management of animal genetic resources.

An **international legal framework** on animal genetic resources would seek to create a level playing field between dryland production systems that conserve genetic diversity, and intensive and industrialized systems that erode it.

Like the Like-Minded Countries?

Seventeen countries that are home to 70% of the world's "biological resources" have formed a group known as the **Like-Minded Megadiverse Countries**.

These countries include Bolivia, Brazil, China, Colombia, Costa Rica, Democratic Republic of Congo, Ecuador, India, Indonesia, Kenya, Madagascar, Malaysia, Mexico, Peru, the Philippines, South Africa, and Venezuela.

They are in the process of developing a common negotiating position towards developed countries, such as a 20% royalty of the revenue from any product developed from their biological resources (*Hindustan Times*, 9 January 2005, Business).

Dryland countries with pastoral populations and rich animal genetic resources could form a similar bloc of like-minded livestock-diverse countries in negotiations for an international legal framework on animal genetic resources.

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