COMMUNITY-BASED MANAGEMENT OF ANIMAL GENETIC RESOURCES

Proceedings of the workshop held
in Mbabane, Swaziland,
7–11 May 2001

Managing Agrobiodiversity in Rural Areas
undp gtz CTA

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Contents

Foreword by the Organizers

The workshop was a first step in developing a conceptual framework for community-based management of animal genetic resources (CBMAnGR). This concept is based on the assumption that farmers are the custodians of farm animal genetic resources (AnGR) and are therefore best placed to manage these resources. CBMAnGR is an approach that integrates the livelihood needs of local communities (food security and poverty alleviation) and the call of the Convention on Biological Diversity (CBD) to conserve biodiversity in its "natural habitats" through sustainable use.

Objectives of the workshop were to:

- Elaborate recommendations to policy-makers, donors, non-governmental organizations (NGOs) and other relevant actors of the Southern African Development Community (SADC) region with regard to community-based *in situ* conservation;
- Develop strategic elements for *in situ* conservation of AnGR at the political, institutional and communal level of the management of agricultural biodiversity;
- Strengthen networking on AnGR in the SADC region and further the harmonization of AnGR-related national policies and strategies.

The workshop was planned and organized by the SADC/FAO/United Nations Development Programme (UNDP) project, "Management of Farm Animal Genetic Resources in the SADC Region", the Southern Africa Centre for Cooperation in Agricultural Research and Training (SACCAR), SADC Livestock Coordination in Botswana and German Technical Cooperation (GTZ), through the project "Managing Agrobiodiversity in Rural Areas". The Department of Veterinary and Livestock Services of the Kingdom of Swaziland hosted the workshop.

The workshop provided an opportunity for scientists, extensionists and representatives of NGOs from the SADC region to meet colleagues in other countries and exchange experiences and ideas. The participants were highly motivated and created a momentum for further developing and implementing the concept of CBMAnGR. The achieved results and recommendations provide input to SADC processes dealing with AnGR management and will be brought to the FAO and CBD processes for consideration. A recommendation was made to formulate policies for the support of CBMAnGR in the SADC region. The next steps will be the publication of the papers and case studies, and the outputs of the theme groups established.

We wish to thank all participants for their valuable contributions, the Ministry of Agriculture of the Kingdom of Swaziland for hosting the workshop, and various organizations for providing funds.

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Smallholders and Community-Based Management of Farm Animal Genetic Resources

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Abstract

In this paper, it is argued that smallholder farming is just as rational as large-scale farming, but subsistence rather than production for markets is of greater importance. Smallholder farms are often multisectoral, animals have multiple functions, and enterprises are often severely resource constrained. A review of productivity assessment presents different approaches (productivity per animal, per unit weight of dam, per unit of available forage, multifunctionality and productivity) and concludes that there is no established methodology to assess multifunctional productivity. An attempt to relate the different functions to breeding objectives showed that, for some functions, such as manure production, mere survival of the animals is of prime importance and that breeding objectives depend on the mix of functions. Four approaches to managing animal genetic resources are outlined: 1) the acquisition of new breeds or species, which depends strongly on outside supply; 2) opportunistic breeding, where nature and consumption habits act as selection pressures; 3) deliberate breeding of large stock, where reproduction may be more important than selective breeding; and 4) selective breeding for particular markets, where the market demands can change rapidly. It is concluded that management of AnGR needs to be seen in the wider context of livelihood systems, that marketing tools, such as carcass grading, need to take adaptation to the environment into account, and that the possibilities to market smallholder livestock as a speciality need to be explored.

Introduction

The first question that needs to be answered is: why a keynote address on smallholders when another keynote deals with "community-based management of animal genetic resources, with special reference to pastoralists" (Köhler-Rollefson, this volume)?

One reason is the great importance of smallholders. In southern Africa more than 90 percent of animal keepers are classified as smallholders. Another reason is that smallholders have to work under specific circumstances, which differ from those of pastoralists, whose management of AnGR is well documented by Köhler-Rollefson. Smallholders by definition do not rely exclusively or predominantly on livestock and therefore have to organize the management of AnGR in a different way. A third reason is that, right from the beginning of agricultural science in the early nineteenth century, agricultural science and smallholders had a rather ambivalent relationship. This ambivalent relationship is still evident in policy documents in southern Africa and does not facilitate meaningful support for smallholders by extensionists and agricultural scientists. In recent years, great progress has been made in some countries such as Zimbabwe with respect to supporting smallholders, but approaches such as the participatory extension approaches (PEA) or participatory technology development (PTD) concentrate on soil and water conservation and crop variety development. Animal husbandry is hardly tackled.

To be sure, smallholder farming should not be glorified. It is appreciated that smallholders have a harsh life and that their importance will decrease if there is a broad increase of the standard of living of people in a country. In times of economic crisis, however, the importance of smallholder agriculture increases, as shown recently in Eastern Europe and the former Soviet Union. Supporting smallholder agriculture may not increase food production for export markets to the same extent as large-scale commercial farming, but smallholder agriculture plays an important role in giving rural people access to food, and its continuous neglect can have severe negative social consequences.

In this paper we discuss:

- the characteristics of smallholder farming systems;
- the functions of animal husbandry in smallholdings;
- problems with measuring animal productivity under smallholder conditions;
- the strategies of smallholders for managing AnGR; and
- conclusions with respect to AnGR projects and programmes in smallholder areas.

Smallholder farming systems

Personal experience reveals that some extensionists, policy-makers and animal scientists in southern Africa still are convinced that smallholder subsistence-oriented animal husbandry is backward and unproductive, that the traditional farmers are irrational and that their way of animal farming has to be replaced by modern, intensive, market-oriented production systems.

Ascertained through various social, anthropological and economic studies of smallholder farmers in many parts of the world, it is now widely accepted that:

- Smallholder farmers are not less efficient than modern dairy farmers or ranchers in using natural resources, including AnGR. However, their aims are not to produce as much as possible for the market and to maximize profits. Smallholders rather aim at meeting the needs of their social group, above all, to ensure subsistence. Often they try to achieve this by keeping a multispecies herd. For example, specialization in chicken fattening or dairy farming is reasonable for them only if the production risks are low and if the family's needs can easily be met on the market.
- The household economy of smallholders is often multisectoral and the farm income is supplemented by income from handicrafts, trade, wage labour, remittances or pensions. Family members are bound to help relatives and neighbours in need, and can expect the same in return. The demands of such a social security network on the farm family's time and resources may prevent specialization, e.g. in cattle fattening.
- Smallholder farmers often live in marginal areas with poor infrastructure and difficult access to the market; therefore, external inputs such as feed or fertilizer are more expensive than in more easily accessible areas.
- Smallholder farming is, almost by definition, strongly resource-constrained. Feeding and breeding strategies have to take these constraints into account.
- Animals are often multifunctional. Besides producing food (milk, meat, eggs) or raw material (wool, hair, skins) and generating cash income, other functions of livestock keeping include:
  - providing draught power and transport;
  - providing manure as fertilizer, building material or fuel;
  - controlling insects, snakes and other pests;
  - providing a means of saving;
  - fulfilling social obligations.

Livestock can contribute to group identity or prestige, as shown in the cowboy culture of the North American West, the dairy culture in the European Alps, sheep and goat milk producers in the Mediterranean countries or traditional pastoralists, agropastoralists or smallholders in Africa. With respect to sociocultural functions, the Thanksgiving Turkey in the United States, the St Martins' Goose in Germany and the various social functions in African societies for which livestock is needed can be listed.

The typical smallholder does not exist. Smallholders and their breeding strategies depend not only on natural and socio-economic conditions, but also on the abilities and interests of the members of a farming family. Therefore, a great variability among smallholder farmers with respect to animal breeding, even within a single village, can be expected.

Assessing productivity of smallholder animal husbandry – a contribution to breed evaluation and breeding objectives

Practising animal breeders have always made productivity assessments of their animals. "Scientific" animal breeding started about 200 years ago, when animal breeders, concerned with the "poor quality" of breeding stock, sought ways to improve the performance per animal and became part of the then emerging agricultural sciences. This meant that meat-producing animals were bred to grow more quickly. The idea was that faster-growing animals would use a greater part of feed for production and less for their maintenance requirements. In many ways, this approach still prevails in intensive modern agriculture (see, e.g., Arthus-Bertrand and Raveneau, 1994) and there are still many animal breeders who like large animals, despite the problems that arise with dystochia, susceptibility to stress, imbalance of muscle and skeleton growth, high nutrient and veterinary requirements, and poor meat quality.

Some 50 or 60 years ago, Bosma in South Africa pointed out that smaller animals can be equally and sometimes even more productive than large animals, if productivity is calculated not per animal but rather per 100 kg live weight of the mother. This argument was in favour of smaller breeds. Fertility and mortality were found to be the main determining factors for productivity measured in this way. In the late 1970s, the International Livestock Centre for Africa (ILCA, now part of ILRI, the International Livestock Research Institute) developed a three-stage productivity index based on a model for meat (beef) production in a ranching system (ILCA, 1990). It was first claimed that weaned calf weight was a good indicator for total herd productivity and then the weaning weight was calculated per potential mother, per kg post-partum weight of the mother, and finally per kg metabolic weight of the mother ($kg^{0.75}$).

When these methods were applied under village conditions in herds kept by smallholders or pastoralists, it was soon realized that this comparison was not fair, since animals on a ranch are rarely milked, whereas milk can be an important part of the diet of smallholder or pastoral families. ILCA therefore modified the productivity index and converted milk offtake into calf weight. Then an intense debate started about which factors to use: does a calf need 11 kg of milk in order to put on an extra kg of live weight, or does it need only 8 kg? Should we take into account that a calf growing 1 kg per day needs one day of milk to cover maintenance requirements, whereas a calf growing 200 g per day uses up 5 days of milk for maintenance to gain a kg of live weight? Or should we calculate the nutritive value of meat and milk produced per mother or per herd and express it as total food production?

These arguments were never completely resolved, and perhaps for good reasons. It depends whether one wants to compare "biological" productivity (breed comparison as a basis for a breeding strategy), which requires a standard procedure, or whether one wants to compare livestock systems, which requires the accommodation of differences resulting from different strategies for managing and using livestock. In Botswana, de Ridder and Wagenaar (1986) compared smallholder mixed farming with ranching and found that smallholder cattle keeping is more productive, not only per hectare but also per cow. This is because smallholders use their cattle not only to produce meat and animals for sale, but also to produce milk and draught power and operate at a higher stocking rate than ranches.

Another approach to assessing animal productivity is to look not at productivity per animal, but rather at productivity per unit of forage. In conventional high-production systems, the nutritional needs of the animals are calculated, and then feed of the required quality and quantity is obtained. But what if feed resources are limited? This approach is followed by pasture and range scientists, e.g. when discussing carrying capacity of the pasture, and it was hypothesized for cut-and-carry systems by the Animal Production Systems Group at Wageningen Agricultural University in the Netherlands (e.g. Zemmelink, 1980; Zemmelink, Brouwer and Subagiyo, 1992; Bayer and Zemmelink, 1998). The reasoning for optimal production from limited feed resources goes as follows: at low stocking rate or when forage is abundant, animals tend to select the best parts of the forage only, and the feed intake and animal production are high. However, when the number of animals is low, overall production is also low. When more animals are kept, the animals eat more forage of lower quality, so that the performance per animal will be lower. If, for example, in the first case, only the best 10 percent of the forage is used and then the number of animals is doubled, then the performance per animal will decrease to 90 percent of the previous level but, because there are more animals, the overall production will be substantially higher.

A further increase in animal numbers will lead to a fairly linear decrease in performance per animal, whereas – in graphic terms – the performance per hectare or overall production follows a parabolic curve. The peak of that curve indicates the optimal production per hectare, in the case of grazing animals, or the optimal level of forage use, in the case of cut-and-carry systems.

In grazing systems, the optimal production of beef per hectare is achieved at a stocking rate that allows only half of the maximum live-weight gain possible per animal (Jones and Sandland, 1974). In other words, if a steer can gain 150 kg/year at a very low stocking rate, that same animal will gain only 75 kg/year at the optimal production per hectare. The individual animal may look thinner, but the overall production is greater with several thin animals than a few fat animals.

In the case of cut-and-carry forage, Zemmelink, Brouwer and Subagiyo (1992) presented an example from a smallholder cattle system in Indonesia. The optimal production for live-weight gain was achieved when the best 33 percent of the available forage was used. The maximum gain per animal that could be achieved was 450 g/day, whereas the gain at optimal forage use was roughly 250 g/day. When a second function – manure output – was included in the calculations, the optimal level of live-weight gain and manure production was achieved when 70 percent of the available forage was used. At this level of utilization, the daily gains per animal went down to 100 g.

The genotype of the animal was not considered in this research, but it is clear that the ideal genotype for a low degree of forage utilization and high daily weight gain would be quite different from the ideal genotype for a high degree of forage utilization and low daily gain. Productivity studies that incorporate multiple functions of animals are still rare, and even more rare are those studies that take the consequences of multiple functions into account when discussing the type of animal that fits best into such systems. An exception is the recently published thesis of Workneh Ayalew (2000).

Functions of animal keeping and related breeding objectives

As already pointed out, animals in smallholder farming have more functions than to produce food and raw material. For many families growing crops on marginal land and for specific types of crops, manure can be very important. For the purpose of manure production, mostly large animals (cattle, donkeys) are used. Animals don't need to grow fast, but they need to be able to survive on often poor-quality forage. If draught is an important function (provided primarily by cattle and donkeys), animals need to have sufficient power during the time they are used for traction but, at other times of the year, they only need to survive but not necessarily grow. To fulfil the function of savings account and capital formation (all animal species), it is important that the type of animal being kept does not require much management input or veterinary care and can be kept at low cost. If an important function is to produce food for the family, the choice of animal and breed will depend, among other things, on infrastructure. If no refrigeration is available, it is advantageous for a smallholder family to keep different sizes of animals for different purposes. A chicken is enough for a normal family meal (or perhaps two chickens or a goose or turkey for a large family). For larger gatherings, a local pig or sheep or goat may be large enough. Only for special occasions, such as a wedding, funeral or graduation ceremony, would an ox be slaughtered. Otherwise, there would be too much wastage.

Smallholders are not averse to selling livestock if they need cash. However, to be able to understand how production for sale fits into smallholder livestock systems, it is important to understand local markets. If chickens are fattened purely for sale, i.e. on a commercial scale, a farmer with access only to the local market will find it difficult to sell 300–400 birds within a short period. It is better to take an approach that allows more staggered marketing in smaller quantities and, for this, it may be more appropriate to keep chickens that can brood, preferably also under extensive free-ranging conditions. Chicken breeds used as commercial broilers, which have the potential to grow faster than local chickens, will not show their potential under such conditions. In other words, they are usually poorly suited to smallholder animal production systems.

Numerous other functions of livestock may be specific to particular areas. In South Africa, for example, some smallholders keep geese as "watchdogs". For this purpose, different traits are required than fast growth. For social or cultural purposes, chickens, goats or cattle of a particular colour may be required. These are rational, non-commercial objectives that are reflected in smallholder practices of animal breeding. The functions of animals and the related breeding objectives can change with circumstances. Close to urban areas or major roads, free-ranging animals may become a less attractive proposition and stall keeping may offer opportunities (e.g. better control of animals) and create new constraints that need to be addressed, such as higher labour requirements, more organizational inputs to obtain feed, higher animal concentrations and higher incidence of certain parasites (worms, fleas, lice).

In smallholder farming areas – given the often poor quality or seasonally low quantity of feed, the high disease pressure, the poor infrastructure and the high costs of veterinary services and other external inputs – the animals need to be adapted to the environment and capable of coping with sometimes very adverse and low-input conditions. When the merits and demerits of breeds are assessed, these conditions must be taken into account – and not the high performance of certain breeds under intensive production conditions, where animal disease, feed quality and other environmental factors can be controlled. This reasoning should also have a strong bearing on breeding objectives and organization. A summary of functions, desired characteristics and breeding objectives is given in Table 1.

If the multifunctionality of animals for smallholders is accepted as valid, questions that should be pursued further are:

- What are the consequences for breeding objectives and for the requirements for the organization of breeding operations?
- How can the multiple objectives of animal keeping be measured/evaluated/expressed as a productivity index, so that they can be translated into breeding objectives?
- How can policy-makers be influenced to accept subsistence as a valuable aim for animal keeping?

Breeding management strategies

With respect to breeding management, it appears reasonable to start by trying to understand the present practices rather than prescribing a scheme from above. Unfortunately, smallholder breeding practices have not been described to any great extent in the literature. This stands in contrast to commercial breeding plans or, to a lesser degree, the animal-breeding practices of traditional pastoralists. Some pastoralists keep herds that are so large that they can select breeding stock from within the herd and often favour particular breeds (see Köhler-Rollefson, this volume). In contrast, smallholders with their much smaller flocks or herds rely heavily on formal or informal exchange and transfer of breeding stock or genetic material between households, villages, government farms and their animal enterprise, or between the commercial and communal sector.

The following smallholder strategies for the management of AnGR by smallholders can be distinguished:

- acquisition of new animal breeds or species;
- opportunistic extensive breeding, mostly of small stock;
- selective breeding, mostly of large stock;
- selective breeding of livestock for more commercial purposes.

Table 1. Functions of animals, desired characteristics and breeding objectives

Function	Animal species	Desired characteristics of animals	Breeding objectives
Production of meat	Almost all species of domestic animals, with local preferences for, or aversions to certain species (pigs)	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 survive on low-quality forage	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 and should 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 need to be aggressive to strangers, but calm with people well known	Behavioural characteristics
Manure	Cattle, small ruminants, pigs and donkeys. Poultry if kept in confinement	Where manure is important, ability to use low-quality forage	Survival under minimum care
Social value/prestige	Depends on local custom, mostly cattle, in some parts also horses and other species (goats, chickens)	Animals need to conform with local ideals (e.g. colour)	Locally important characteristics (colour, horn shape, etc.)

Acquisition of new animal breeds or species

On occasion, smallholders take up the keeping of new animal breeds or species. Examples are turkeys, rabbits, geese, introduced pigs or more traditional animals such as cattle, which they had not kept previously. They may introduce these animals into their farm as more speculative ventures for the market, to produce food for the household, as “watchdogs” or as a hobby and for pleasure. The keeping of these new animals may last for only a limited period of time, or may increase towards a more sustainable enterprise. Within any given village, such species are not common, at least initially.

Acquisition of new animals is normally the activity of an individual, who obtains the animals from a commercial breeder or a government farm. A prerequisite for the sustainability of such a venture is that appropriate types of animals remain available. A good example could be observed near Pieterburg (South Africa), where a woman had started turkey keeping about two years ago (Bayer, 2000). She had bought a pair of birds from different origins and now has about 20 birds. She is aware of the danger of inbreeding and, when the birds show signs of increased incidence of deformation or reduced thriftiness, she will buy new birds. She can proceed with this system as long as a landrace of turkeys is available and not only the overly heavy commercial birds bred for intensive systems. Trying out new animal species is an innovative venture, although innovations are more likely to be in the field of animal husbandry rather than animal breeding. The lady herds her turkeys on to green pastures, so that they get different types of food. Green turkey feed comes also from the greengrocer in town, where her husband (who works in town) collects leftover leaves and waste.

Starting to keep new animal breeds or species is a form of speculation, which can lead to economic success but also poses some risks, like any speculation. As a development activity in smallholder systems, such an approach should not be ruled out, but it must be kept in mind that, with the numbers of animals kept in smallholdings being so small, the management of genetic resources depends on an outside supply of animals, from either government farms or commercial suppliers. If these sources fail, it is difficult to imagine that these ventures will survive.

Opportunistic extensive breeding of small stock

Small stock such as chickens or goats are often kept as a low-input savings account and occasional source of food. They may also have a social function related to some cultural ceremonies, for which a particular type of animal is required. Nevertheless, breeding is often done in a rather opportunistic way, with little selection for higher growth rates or more eggs. Breeding is rarely deliberately controlled.

When the West African dwarf goats in rural areas of central Nigeria were studied, it was found that the flocks kept by the farmers (on average, five animals per household) contained hardly any entire males above one year of age, even though at birth and up to three months of age the sex ratio was balanced (Bayer, 1986). Sires were the very young males (aged six to nine months). Animals were frequently sold or slaughtered for food, and heavier young males were preferred. As adult males of these dwarf goats can have a very strong smell, they are not particularly popular. This practice served as a selection against fast growth but, at the same time, for early sexual maturity. As the son mates with mother and sister, our initial suspicion was that inbreeding would be a problem. As it turned out, frequent exchange of animals through buying and selling, gifts and transfers associated with marriages minimized this problem. Furthermore, after the cereal harvest, the animals were allowed to roam freely in the village area and this also gave a good chance for the small flocks of each household to mix. In this extensive system, mortality among young stock is high. This maintains a high degree of breed adaptation to a harsh and low-input environment.

In the case of chickens, cocks may be selected according to colours and, on occasion, smallholders will buy larger commercial cocks and cross them with the local chickens. However, because these cross-bred chickens are more susceptible to disease and have higher feed requirements, they usually do not survive for long under extensive free-ranging conditions.

In some areas, goats are milked and can be small and fairly efficient milk producers. Dairy goat keeping is often women's business. The experience with cross-breeding of indigenous x commercial dairy goats, such as the Saanen goat, is sobering. Although cross-bred goats can – under improved management – produce substantially more milk than indigenous goats, the problems posed to smallholders by the higher feed requirements, higher disease susceptibility and scarcity of appropriate bucks are not easily solved. Rischkowsky (1996) reports on the failure of such a goat cross-breeding scheme in Malawi and Workneh Ayalew (2000) indicates that total net benefits (taking into account not only production of milk and meat but also other factors such as risks) are greater for indigenous goats under improved management than for cross-bred goats in Ethiopia.

For extensive keeping of small stock, promising interventions are not so much on the breeding side but rather on measures to increase survival of young stock, e.g. by somewhat improved shelter for chickens, by vaccination against some diseases (Newcastle disease in chickens, for instance, and peste des petits ruminants in goats) and by improving forage supply. These measures will have a much bigger impact on total productivity of livestock than improved breeds. Breeding activities will become beneficial only when animal health problems are solved and forage is available in sufficient quantity and quality.

Selective breeding of large stock

Large stock in southern Africa can be more or less equated with cattle. Camels or buffaloes, which are of great importance in other parts of the world, are almost completely absent, and horses are a special case for breeding. Donkeys – although they are very useful throughout southern Africa – are generally left to themselves for breeding. A stallion may be castrated only if he becomes a nuisance.

Cattle have a multitude of functions, which differ in their importance from site to site. Breeding objectives will differ accordingly. Cattle serve as a savings account – the large bills of livestock currency; they produce manure, provide draught power, are sold for income, are important for culture, provide meat and milk as food and skins and leather as raw materials.

Many peoples in southern Africa have a pastoral or agropastoral past and the ideal is that each kraal has its own bull. In the past, bulls were selected from within the herd. The bride price (*lobola*) is a way of exchanging genetic materials between herds. If herds are below the optimal size for a bull, it is not uncommon to use bulls not only for breeding but also for draught purposes. During a recent visit to the Eastern Cape Province (South Africa), a close look at an “ox-team” of six ploughing animals revealed that there were three bulls, one was a cow and only two were, in fact, oxen. This practice used to be common among smallholders in parts of Europe. In parts of India, bulls are castrated only after they have spent one season in the yoke (Bayer, 1994).

Another way of organizing reproduction, especially if herds are too small to make it worthwhile to keep a bull for breeding purposes only, is to practise communal grazing. If some of the herds with bulls graze together with herds without bulls, the bulls will not miss a cow in heat. Sending out bulls to communal grazing can be an act of good will towards poorer neighbours. Another way is the use of artificial insemination (AI), but this is restricted to dairy animals, as the semen are from bulls selected for progeny with high milk yields. Interviews with farmers in communal areas in South Africa indicated that they had only just begun to keep dairy cows or that this was an intention rather than a reality. Although AI is currently not used to any great extent, the discussions with farmers showed that they were well aware of these possibilities.

In western and central Europe, smallholder animal husbandry was important until the 1950s and it is still important in eastern Europe. Here, people developed a range of possibilities to manage their livestock and breeding. Where people kept livestock as a sideline, e.g. in mining areas, a village herd was formed and the village herder – a respected person – was obliged to keep a bull or buck or ram, depending on the species being kept, and had the right to charge for successful mating. Now, the village herds and herders in western Europe have a value only as keepers of tradition and can contribute to the tourism value of the area. In eastern Europe, however, for example in Bulgaria, this practice was revived after the collapse of the centrally planned economies. Here, sheep and goats are the prime species for village-level herding and breeding.

In some countries, a few farmers in a village keep a bull and charge for its services. In the foothills of the Himalayas in northern India, where buffaloes are kept as dairy animals (Bayer, 1994), the keepers of buffalo bulls are landless people. In some villages, in return for supplying the services of their bulls at a moderate rate, they gain free access to feed and pastures for their animals. In other villages, they charge somewhat more but have no privileged access to feed and pastures. The venture is economical only if the bulls can depreciate over a long time, say six to eight years. If it is desired to use a bull for a shorter period, e.g. to avoid inbreeding, there is a strong argument for subsidies. In Germany, a township or village council was required by law to ensure that a town or village bull or buck was available for the farmers. When AI became more popular, many township councils opted for subsidies of AI.

In some densely populated areas, important functions of large stock are to provide manure and draught power (and milk, as a source of regular income or revenue from cattle keeping). In many cases in Europe, the small-scale farmers were so short of resources that they usually did not raise the offspring of their cattle. In parts of Germany, this was the case until the early 1960s. Calves – male and female – were sold at about six weeks of age as young vealers. Replacement stock was bought on markets in better-endowed areas. Smallholders in northern India are using the same system today. In southern Africa, communal farmers frequently buy in stock from commercial farms.

What kind of breeding strategies can be developed under such circumstances? None. Farmers have to be opportunistic and cannot be choosy. Cattle that are bought in should be reasonably priced, they should not be too demanding with respect to feed and veterinary care, but they must also fulfil other functions, including providing prestige. Many farmers are well aware of the numerous functions of their animals and the need to bring in animals that are adapted to the local conditions. However, role models still have an important influence on their decision-making about selection of breeds. If the role model is that a "modern" farmer keeps a good dairy cow, farmers in some areas still try to keep "modern" animals (i.e. of potentially high-yielding breeds), although they are aware of the difficulties of keeping such cows.

Selective breeding of livestock for commercial purposes

Smallholders also appreciate their livestock for its commercial value. In some countries markets are more informal, and farmers sell to other farmers or primarily to consumers. Other markets are highly regulated, commercial farms dominate formal markets, but smallholders in Namibia, South Africa or Botswana can participate, provided that the products meet market requirements. Increasing the participation of smallholders in formal markets is an expressed policy, for example, in South Africa.

Examples for involvement of smallholders in commercial markets are cattle and small-stock auctions for export, the much-supported small-scale poultry enterprises in South Africa, and Karakul pelt production and wool.

Breeding strategies for such enterprises differ very little from those on commercial farms. In the case of poultry, chicks are bought from commercial suppliers; in the case of cattle, sheep and goats for meat, the bucks, rams or bulls come from studs or nucleus herds and the types of animals have to meet market demands. Generally, large-framed animals are favoured and those large-framed animals usually have higher nutrient requirements and are more susceptible to disease and stress than smaller-framed indigenous breeds. As long as the animal classification system favours the larger-framed animals, it is rational that smallholders try to keep these animals if they have commercial ambitions.

The usefulness of some commercial ventures should be questioned. The whims of the world market are unpredictable. In the 1970s, Namibian commercial and smallholder farmers together could sell some 4.5 million Karakul pelts annually. The sales are now down to about 200 000 pelts (Karakul Breeders' Society of Namibia, 2000).

In the case of poultry, there are economies of scale and commercial farms, producing 100 000 broilers a year, can buy feed and animals more cheaply. An enterprise producing 300 broilers in one round will not be able to compete with these large enterprises on the urban market. For a village market, 300 birds within a week or so are far too many. It is therefore doubtful whether such an enterprise would be economically viable. Here, niches have to be sought where smallholders have a comparative advantage, such as a market for special products on the urban market, or smallholders have to be content with the local village markets.

Some important questions in this context are:

- Not all breeding strategies are equally suited for outside support. Which criteria are necessary to decide on suitable outside support for breeding? What kind of support may have higher priority than support for breeding operations for which scenarios?
- Indigenous knowledge is the backbone of the present animal-breeding practices. However, especially in South Africa and Namibia, "modern" commercial animal breeding has a strong influence on breeding practices among smallholders. How can the two knowledge systems be combined to the advantage of smallholders?
- With respect to commercial ventures there are economies of scale and ventures such as broiler production in large-scale enterprises near large markets (cities) have an advantage. Which are possible criteria to determine a comparative advantage for smallholders? Which support is necessary?

Conclusions for development activities related to AnGR

As the situations of smallholders are very diverse, meaningful interventions will vary accordingly. The guiding principle should be that we should always try to think from the viewpoint of the customers. This approach will probably contribute more to food security than trying to follow national policy targets, such as more production for export. The world market for animal products is very volatile and risky. The generally low-risk horizon of smallholders must be taken into account when designing interventions in community-based management of farm animal resources.

The current breeding strategies and breeding objectives of the smallholders should be clear before support is given to any specific type of breeding operation or suggestions are made for improvement. Extensionists and farmers should understand the consequences of changes in breeding operations or breeding objectives. With due caution, the following types of intervention for different settings and strategies among smallholder livestock keepers are suggested:

- The introduction of new animal species is generally not a major thrust in improving animal husbandry. The main direction in this intervention should be to identify suppliers of appropriate breeding stock. If the keeping of a particular species is rare among smallholders, they need access to a commercial supplier of a landrace type of animal. If the keeping of a species becomes more widespread, an interchange of breeding stock between villages and even regions becomes a viable option. However, advice on livestock husbandry, such as disease prevention, better feeding or appropriate animal housing, may be more effective in improving the economic outcome of the operation than breeding interventions.
- In the case of extensive small-stock keeping, the potential benefits of breeding interventions are minimal. Before improving breeding practices, animal health measures (such as vaccination against Newcastle disease in the case of chickens) and some improved and strategic feeding to increase the survival rate of young stock are better options. Once these improvements are made, the management of hardy breeds may face a new challenge: that of intellectual property rights (IPRs), as breeding firms are eager to identify adaptive traits of animals and may go to the extent of not only using but also patenting them. Here, development organizations should be very concerned and defend the IPRs of local farmers.
- With respect to commercially oriented small stock, the market risks need to be realistically assessed. Development organizations could give some support by helping to open up new markets.

- The keeping of large stock under smallholder management will not decrease in importance in the near future. It is not a particular breed that should be promoted, but rather hardy and adapted animals, which may be of different breeds in different areas. Because animals adapted to the local environmental conditions can be kept without or with minimal tick control and can normally cope with intestinal parasites and some diseases, acaricides, anthelmintics and other chemicals are not necessary. However, the wider implications of giving up dipping need to be considered and this may require a change in national or provincial policy. Where small herds predominate, a bull-sharing scheme could be developed; here, European experience could offer some ideas. However, care should be taken not to disturb already existing breeding arrangements developed by smallholders.

In summary, it is necessary first to gain an understanding of the breeding objectives and practices of smallholder livestock keepers. Interventions that have a bearing on community-based management of farm animal genetic resources cannot be confined to issues of breeding and have to fit into the wider livelihood systems of smallholders.

As we have seen, inappropriate role models can misguide farmers into choosing breeds that are not appropriate for the local conditions – conditions that they cannot influence to any great extent. Interventions are conceivable on different levels. On the level of policy, the carcass grading system needs to be critically examined, as the present system favours large, fast-growing animals. Furthermore, animals adapted to a harsh environment can normally manage without the use of acaricides or anthelmintics. These animals would be classified as “organic” in industrialized countries. Encouraging smallholders to keep breeds adapted to local conditions thus offers a chance for entry into an attractive niche market, if – at the same time – good marketing support is provided. These possibilities should be further explored. On the community level, better cooperation between farmers could be sought with respect to the keeping of sires to provide breeding services. Above all, before suggesting changes, the present systems of managing farm animal genetic resources should be better understood. The understanding of the indigenous livestock systems in southern Africa is still very much at the beginning, particularly in countries with a large commercial sector.

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Community-Based Management of Animal Genetic Resources – with Special Reference to Pastoralists

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Abstract

This paper places AnGR management into an overall social and historical context. After summarizing the reasons for the current revival of interest in indigenous breeds, the different processes and social contexts that have led to the development of domestic animal diversity are elaborated upon. Several breed definitions are evaluated with respect to their appropriateness in the context of developing countries. An overview of traditional practices for managing AnGR among pastoral communities is presented and the significance of social and ritual practices for breed conservation is emphasized. The reasons for maintaining local genetic resources are enumerated, including the fact that they represent the best bet for the exploitation of marginal environments and display very site-specific adaptations. Possible incentives for communities to maintain their breeds are discussed, as well as experiences with the marketing of speciality products from local breeds. This is followed by suggested practical steps for implementing a community-based conservation project. The concept of "pastoralists' rights" is discussed and attention is given to the need for legal safeguards against biopiracy. Recommendations include the adoption of a livelihoods approach towards conservation, the direct involvement of communities in all projects that concern them, support to intermediary non-governmental organizations (NGOs), the control of animal industries, and the establishment of a policy forum on AnGR and intellectual property questions.

Introduction

Local or indigenous livestock breeds play an important, even crucial role for sustainable rural livelihoods and the utilization of marginal ecological areas. Besides providing a wide variety of products, they yield important non-monetary benefits by enabling poor and landless people to access and utilize communally owned grazing areas, by producing dung that is vital to sustain intensive crop cultivation, by being a component of indigenous rituals and social exchange systems, and by representing a mobile bank account that can be cashed in at times of need. They thus form an essential component of sustainable rural livelihoods.

For many decades these indigenous animal genetic resources were perceived as unproductive and inherently inferior to high-performance or improved breeds and, as a consequence, they were subjected to cross-breeding or even replacement with exotic breeds. As a result of this and various other factors, the number of indigenous livestock breeds has declined rapidly during the twentieth century. About one-third of the more than 7 000 livestock breeds (including poultry) registered in the FAO global database are regarded as threatened by extinction (Scherf, 2000).

The revival of interest in these local animal genetic resources can be attributed to the following factors:

1. There is a growing number of comparative studies indicating that, within the context of their respective production systems, local breeds may be able to compete with improved breeds, even with regard to productivity (Intercooperation, 2000; Kebede, 2000).
2. Local breeds harbour genes for resistance against diseases, which are needed for maintaining the viability of animal production systems in northern countries.
3. With the wild ancestors of most domesticated animal species being extinct, genetic diversity within domesticated species – necessary for providing opportunity for selection and adaptation to change – is vested mostly with traditional breeds.

4. In the context of "sustainable livelihood" approaches to development, local livestock is an important contributor to rural welfare and poverty alleviation (Anderson, 2000).

The aim of this report is to elaborate on the role of traditional pastoral and farming communities in the management of domestic animal diversity and to suggest possible avenues for the conservation of animal genetic resources by means of sustainable use in community contexts.

Origin of domestic animal diversity and of livestock breeds

The approximately 7 000 officially catalogued livestock breeds have been developed out of less than 20 wild species within a span of 10 000 years, beginning with the first domestication of sheep and goats at around 8 000 years BC in the Near East. This enormous diversification has been driven by the following processes.

1. The introduction of domesticated species into new habitats: by taking animals into new environments and ecological niches, humans subjected animals to selection for adaptability to new sets of ecological factors and created new "ecotypes".
2. In addition, human societies manipulated their animals genetically by subjecting them to different sociocultural breeding regimes and economic utilization patterns, practising selection depending on their cultural preferences and needs.
3. Furthermore, some human societies and cultures tended to monopolize their animals. Animals were not exchanged at random – they changed ownership only *within* the community. Often animal-exchange networks corresponded to an endogamous human group or ethnic group, so that individual breeds evolved in tandem with each ethnic group.

What is a breed?

"Especially in Africa, livestock breeds … are known by the same name in different places, but often look quite different from one place to another. Conversely, there are breeds that look alike but have different names in different places" (ILRI, 1996).

The term "breed" is escaping a clear definition. Commonly, it is defined as a "phenotypically distinct group of animals within a species", or "animals that, through selection and breeding, have come to resemble one another and pass these traits uniformly to their offspring" (Breeds of Livestock – Oklahoma State University, see Web site). However, the criterion of "looking alike" can be problematic, as the above quotation shows.

Some definitions therefore focus on the breeders' perception. "A breed is a group of domestic animals, termed such by common consent of the breeders … a term which arose among breeders of livestock, created, one might say, for their own use, and no one is warranted in assigning to this word a scientific definition and in calling the breeders wrong when they deviate from the formulated definition. It is their word and the breeders' common usage is what we must accept as the correct definition" (Jay Lush, *The Genetics of Populations*, quoted on the Oklahoma State University Web site).

A definition that applies a combination of social and ecological criteria is the following: "A domestic animal population may be regarded as a breed, if the animals fulfil the criteria of (i) being subjected to a common utilization pattern, (ii) sharing a common habitat/distribution area, (iii) representing largely a closed gene pool, and (iv) being regarded as distinct by their breeders" (Köhler-Rollefson, 1997).

Traditional systems for managing animal genetic resources

"Each form of genetic management of an animal population corresponds to a specific organizational pattern of livestock breeders" (Casabianca and Vallerand, 1994).

Different sociocultural regimes and structures manage animal genetic resources differently and result in different types of breeds. The following three types of traditional socio-economic contexts for farm-animal breeding can be distinguished:

– **Farmers/smallholders.** They keep animals integrated with crop cultivation. For farmers/smallholders, livestock is necessary to provide draught power and dung as fertilizer. It also represents a means of converting or adding value to agricultural by-products. Because for farmers livestock is secondary for crop cultivation, and they often keep only small numbers of animals, they have not always developed elaborate structures and institutions for systematic breeding and for safeguarding their genetic resources. This may result in breeds that are in the real sense "ecotypes", shaped by local ecologies rather than purposeful human genetic manipulation, and that are not always very distinct.

– **Central authorities.** States, kingdoms and fiefdoms often require secure access to high-quality domestic animals, usually for warfare. Because they are able to invest sufficient resources in structures for breed improvement, performance recording and selection, superior and well-defined breeds can result. Examples include most of the German horse breeds (e.g. Trakehner), which were developed by kings and other rulers for the purpose of warfare, the Amrit Mahal cattle (Amrit Mahal means department of milk) established by the rulers of Mysore State (India), and some of the Indian camel breeds developed by maharajas for warfare (e.g. the Bikaneri and Alwar camel breeds).

– **Pastoralists.** As people "who keep animals on natural graze and for whom animal breeding is economically and culturally dominant", pastoralists usually have a highly complex indigenous knowledge system in regard to animal breeding. They inhabit marginal areas characterized by low and unreliable rainfall or situated at high altitudes. 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 under the given constraints. Because they largely present closed gene pools, these animals can be very distinct and their distribution range corresponds with that of ethnic groups.

Pastoral breeds are often viewed as genetically superior by farmers (George, 1985). Because pastoralists keep animals under conditions very close to those obtaining in the wild and without much protection against the elements and climatic extremes, their breeds may carry fitness traits of potential interest for maintaining the vitality of high-performance breeds.

Indigenous animal genetic resource management by pastoral communities

The geographical distribution of breeds provides evidence that pastoralism is associated with a relatively high degree of animal genetic diversity. Peripheral and remote areas – the typical habitat of pastoralists – have been noted to have disproportionately large numbers of breeds. "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. In China and India, border states and provinces which have harsh terrain have the greatest breeds-to-people ratios" (Hall and Ruane, 1993).

Some of the aspects of indigenous knowledge responsible for the distinctness of pastoral breeds include:

– **Communal ownership resulting in closed gene pools.** Many pastoral communities have strict rules against the sale of animals, especially female stock, outside the community. Livestock changes ownership only within the community or social network, on occasions such as marriage, childbirth, circumcision or other lifecycle stages. While there is an obligation to lend animals to poor members of the community over periods that may span generations, individuals do not have the right to sell their breeding stock to outsiders. For pastoralists, animals are the equivalent of land to cultivators: capital or heritage that is passed on from one generation to the next. This attitude results in relatively closed gene pools and is why pastoral breeds are often very distinct.

– **Institutions for managing genetic composition of breeds.** In Zambia, cattle keepers in the Western Province are perceived by outsiders as not engaging in any purposeful measures for improving their stock. Yet, sociological research has revealed that traditional farmers actually manipulate the genetic composition in a variety of ways. Animals are selected for size, strength, colour, shape of the horns, parentage and character; castration is delayed until it becomes obvious whether the bull possesses the desired characteristics. Farmers practise *mafisa* – giving female animals on long-term loans to friends who may reap the benefits during the caretaking arrangement. Placing a female in another herd prevents inbreeding and is done in the expectation that it will be served by better bulls (Beerling, 1986).

– **Pedigree-keeping.** One aspect of indigenous animal genetic resource management that reflects parallels with herd-book societies is mental record-keeping of animals' pedigrees. In general, pastoralists attach great importance to the ancestry of their animals and memorize it in great detail. The practices of camel pastoralists have been meticulously documented (Köhler-Rollefson, 1995). The Maasai conceive their cattle herds as being composed of "houses" or matrilineages; all animals descended from one particular cow are grouped together and given the same name (Galaty, 1989). Many pastoralists also see parallels between their own ancestry and that of their herds.

– **Adaptation to hostile environments.** Pastoralists actively pursue adaptation of animals to hostile environments. In Nigeria, "ruminant livestock is kept by both pastoralists and village producers, but pastoralists play a major role in both developing and spreading breeds. Being mobile producers, they bring new breeding stock to the markets for selling and must respond more rapidly to changing environmental conditions to remain viable. Fulbe pastoralists, who are constantly exploring new ecological zones and management strategies, also have their own breeding goals. One of the clearest of these is the gradual introduction of preferred breeds into areas of abundant vegetation previously considered unsafe. This is usually undertaken by programmes of cross-breeding and intensive management of high-risk individuals. The result has been the continued survival of zebu herds in high-humidity zones" (Blench, 1999a).

Loss of breed diversity

The process of breed diversification, which was earlier sustained by the fact that domesticated animals were subjected to diverse cultural regimes in an infinite variety of environments, is now in reversal, entailing a loss of domestic animal diversity that is estimated at two breeds per week by FAO. The factors driving this process of breed homogenization can be summarized as:

– **Pressure to adopt improved breeds and standardized production and breeding systems.** Governments and extension personnel with formal training in animal science promote the adoption of high-performance breeds and management of animals according to scientific principles and in intensive production systems. Because breeds are rated only from the perspective of their performance and their productivity with regard to one particular product (usually meat and milk) in the prevailing animal production paradigm, there is little appreciation of the adaptability traits of indigenous breeds.

– **Loss of traditional livelihoods and cultural diversity.** Many indigenous communities are forced to abandon their traditional patterns of livestock keeping because of a lack of (grazing) resources resulting from the encroachment of agriculture, the establishment of wildlife reserves, or population pressure. Some of the most valuable and interesting animal genetic resources (with regard to fitness and behavioural traits) are kept by traditional communities. The young people from these ethnic groups often are no longer attracted to herding and prefer to wander into the cities to seek employment. In the Raika caste, which represents the largest pastoral community in western India, young women now start to refuse to marry men who are involved in herding. Adoption of western values and abandonment of traditional rituals, customs and livelihoods inevitably also results in the loss of distinct breeds.

Examples of ritual and social practices contributing to conservation

The trypanotolerant Muturu cattle breed was once widely distributed across Africa's Sahelian zone, but was replaced by Zebu cattle. Resistant to ticks and environmental stress and able to subsist on scant vegetation, Muturu cattle were kept mostly for ritual purposes by chiefs and elders, and were used in the ceremonial cycle rather than sold on the market (Blench, 1999a). The breed has survived because these animals are still sacred for many communities and their milk is widely used for medicinal purposes (Adebambo, 1994).

In southern India, an important incentive for preserving the local Malaimadu cattle – kept mostly for dung production and to increase the fertility of improved breeds – is the ritual custom of *jallicuttu* (bull running), practised during *Pongal*, the three-day harvest festival. Businessmen take pride in spending huge sums of money for the purchase of fierce bulls.

Reasons for maintaining local genetic resources

Best bet for exploiting marginal environments

Local livestock remains the best option for exploiting or utilizing the marginal environments – such as deserts, steppes, mountains – which account for two-thirds of the world's land surface. The vegetation of this huge area can only be digested by ruminant animals and, because they are able to perform better under non-optimal conditions, long-adapted local breeds have the edge over high-performance breeds. While cross-breeding with exotic breeds may have positive effects in better-endowed environments without shortages of fodder and water, it has usually not fulfilled expectations in more marginal areas. Despite being a major focus of animal husbandry programmes, cross-breeding for better dairy cows has not always had a beneficial effect on the livelihoods of smallholders. India owes its enormous rise in milk output to buffaloes, not to cross-bred cows (Rangnekar, 2000).

Specificness of adaptions

Often the adaptation of local breeds is very specific and attuned to certain types of vegetation. Breeds may look outwardly the same and be adapted to the same kind of climatic regimes, but still differ in the way they are able to support themselves on local plants. This was the experience of restocking programmes for pastoralists in northern Kenya (P. Mulvany, personal communication). In Nigeria, it is also observed that breed distribution is strongly linked to the preference of individual breeds for different types of feed and that breed distribution changes as the overall environment of Nigeria evolves (Blench, 1999a). Other important adaptive traits include trypanotolerance, tolerance to worms and other parasites, salt tolerance, the ability to cover long distances and the ability to slow down the metabolism.

Independence from outside inputs and imports

In contrast to improved stock, local livestock is independent of outside inputs in terms of feed and care. Successful maintenance of improved or cross-bred breeds requires a certain level of inputs, from feeding (cereals and concentrate) to housing and health care. If such high inputs are not sustained, then the improved animals die, fail to produce, or become uneconomic. For instance, in Cuba and during the recent financial crisis in Southeast Asia, lack of foreign exchange to purchase cereal animal feed resulted in the collapse of intensive poultry and pig production, leading to a search for indigenous animal breeds that can be kept on locally available feedstuffs.

An example from South Africa

The local Nguni cattle breed was perceived as unproductive and farmers were induced to accept modern breeding packages, which included cross-breeding with exotics and modern animal health care (dips and other veterinary drugs). When the input supply broke down in the wake of the political changes in the early 1990s, the cross-bred cows could no longer perform economically. By that time, white farmers who had realized the advantages of the disease-resistant Nguni were the only ones who still maintained the breed. Now there are aid programmes to resupply poor farmers with Nguni stock (Blench, 1999b).

Raising productivity impacts adaptation

Raising productivity appears to impact the ability to cope with local conditions, as is illustrated by the example of the Orma Boran cattle. This breed is owned by the Orma people in the Tana River District, descendants of the Oromo who migrated there from the Boran area in Ethiopia between 1400 and 1500. Their cattle have thus been exposed to tsetse over several centuries. In trials, the Orma Boran cattle have been shown to be much more resistant to the tsetse fly than the improved Kenya Boran breed, which was selected on the basis of body weight. Under higher tsetse challenge, the Orma Boran grow faster than the improved Kenya Boran (Rowlands, 1995).

Women's preference

Women very often prefer traditional breeds to improved ones, because they require fewer inputs, are less prone to disease and therefore do not create any additional worry. Projects in Ecuador to propagate larger and improved guinea pigs from Peru for generating additional income met with very little interest and response, because women did not want to have another burden on top of their household workload and were not really interested in selling guinea pigs anyway (Archetti, 1997).

Maintenance of rural income opportunities

Medium performance of local breeds also ensures rural employment. In Europe, the enormous rise in productivity of livestock may be a contributing factor to the current agricultural scenario where family farms are no longer viable and rural income opportunities disappear rapidly. A priori, this model does not seem appropriate for developing countries with their high levels of unemployment.

Incentives for community-based conservation through utilization

The most promising option for maintaining domestic animal diversity is to support, and provide incentives for, local communities to continue herding and husbanding their animal genetic resources in their respective ecological contexts, but with the opportunity to develop by responding to or taking advantage of changing marketing and macroeconomic situations. Such an approach suggests a win-win situation where conservation of domestic animal diversity can go hand-in-hand with the creation or maintenance of rural income opportunities. For such a strategy to succeed, a number of microlevel and macrolevel conditions have to be met.

Recognition of local breeds and related indigenous knowledge

Interdisciplinary research, validating indigenous knowledge through systematic documentation of the breeding practices and strategies of particular communities as well as the particular traits of their breeds, should be encouraged. Genetic impact statements based on surveys of local breed concepts and existing breeding institutions (such as community bulls) should be a standard component of all rural development practices. Special breeds should be given official recognition as national assets.

Secure land rights for pastoralists

Without a sufficient pasture base, pastoralists and landless livestock keepers will not be in a position to maintain indigenous AnGR, therefore guaranteed access to grazing grounds is an absolute prerequisite for conservation.

Pastoral breeds are global benefits

Because the wild ancestors of most domesticated animals are either extinct or on the verge of extinction, animals kept under the harsh conditions of pastoral systems are the main reservoir for genetic traits relating to disease and drought resistance, vitality and good reproductive capacity. Pastoral breeds hence represent global benefits and their loss can be considered in global terms, comparable perhaps with the situation regarding the tropical rain forests. A strong argument can be made for entitling countries with pastoral populations, which are usually least-developed countries, to receive incentives to maintain these global benefits.

Enhancing the attraction of livestock keeping

Herding animals often carries the stigma of being a backward profession. Making livestock keeping a more attractive proposition for youths from pastoral/rural backgrounds – by providing training that builds on traditional knowledge, concepts and values, but also includes appropriate modern technologies – is an avenue that should be explored.

Breeding societies

Support for breeding societies is seen as an important step in community-based conservation. Breeding societies can certainly fulfil important functions, such as information dissemination, exchange of animals and lobbying for brand names. However, the moulding of such societies exclusively along established lines, where fixed breed characteristics (such as colour, size, shape of the tail and ears) become the focus of breeding and are imposed on the population, should be avoided. The selection criteria that are at work in traditional low-input production systems (hardiness, disease and drought resistance) must never be compromised at the expense of adherence to narrow phenotypical characteristics.

Creation of marketing opportunities

Creating a demand for the products of local livestock breeds represents one of the best incentives for their conservation.

Niche markets/specialty products

Consumer demand and willingness to pay for higher-quality products is a prerequisite for niche marketing to be successful, since the comparatively lower productivity of local breeds must be compensated for by extra income (Lemke, 2000).

Regionally typical food products

In Europe there are a rising number of examples where demand for regionally typical food products has turned the conservation of local breeds into a commercially viable undertaking. In southwest France, for instance, the Centre for Conservation of a Regional Biological Inheritance in the Midi-Pyrenees pursues such a goal with respect to the Gascon Pig (Audiot and Flamant, 1994). Other European examples include:

- ***Aubrac Cattle.*** The Aubrac cattle breed and its products are an important component of a more comprehensive programme to revitalize the rural economy in the Aubrac region of southern France. The traditional cheese made from the milk of this breed had almost been forgotten, but was revived and an Appellation d'Origine Controlée (AOC – label of origin) has been applied for. (The brand names of many French cheeses are protected and they can be made using only a particular breed.) The meat of this breed is already marketed under a special protected label.

- ***Majorcan Black Pig.*** The Majorcan Black Pig is the only autochthonous pig breed from Majorca (Spain). After introduction of intensive production systems and foreign breeds in the 1960s, its population started to decline. In the 1980s a group of 89 farmers formed a breeding association and started pushing for a special label for local sausage (*sobrasada*) made exclusively from meat of this breed. In 1994 the Spanish Government created a registered trademark for this product (Jaume and Alfonso, 2000).
- ***Sambucana Sheep.*** The Sambucana sheep from the Stura Valley in northern Italy was on the verge of extinction in the 1980s as a result of cross-breeding with rams of the higher-yielding Biella breed. However, the cross-breeds were not able to negotiate the steep terrain and cope with the cold climate, which led to the abandonment of pastures and overgrowth of old paths. A consortium was set up to save the breed. A special brand name for guaranteed Sambucana meat was set up by the Italian Industry Ministry Board (Luparia, 2000).

Need for market linkages

It will be more difficult to repeat the European model in developing countries. The experience concerning the Vietnamese I-pig, which is the subject of a conservation programme, was that farmers lauded this breed for its better meat quality, but consumers in nearby villages and towns preferred to buy the fatter, cheaper meat. Only in the capital and larger cities is it possible to find customers willing to pay a higher price for higher-quality meat, but marketing mechanisms to reach this clientele do not currently exist (Lemke, 2000).

Opportunity for the organic food market

Considering that they are kept under natural conditions, indigenous breeds would seem especially well suited to provide products for the market in organic foods.

- *Organically grown chicken in the Philippines*. Integrated and Participatory Agriculture Research (IPAR), a Philippine NGO, is promoting organic poultry production using local breeds as an alternative form of livelihood for poor farmers (Barsomo, 2000).
- *"Natural" buffalo milk*. An NGO in Uttar Pradesh (India) has launched a campaign that advertises the milk of transhumant Van Gujjars buffalo pastoralists as "natural", setting it apart from the "synthetic" milk produced by farmers who feed their cattle with urea supplements and use drugs (oxytocin) to milk out their animals.

Export production

Although interest among and demand by consumers from the developed countries in products of indigenous AnGR is conceivable, current import regulations and International Office of Epizootics (OIE) requirements are stacked against it. For instance, long-standing efforts by Mauretania to export camel milk as a health food to the European Union market have so far been unsuccessful.

Implementation of a community-based conservation programme: practical steps

Community projects for the conservation of animal breeds can be conducted according to the same principles that are applied to other resources (forest, pasture, crops, etc.). The following steps were suggested at a recent workshop held in Udaipur/Sadri (India) on the subject of local livestock breeds for sustainable rural livelihoods (see Local Livestock for Empowerment of Rural People [LIFE] Web site):

1. **Documentation/appraisal,** including:
   - **participatory appraisal** of the advantages and disadvantages of the local breed;
   - **research** into the factors that have led to its decline, such as:
     - lack of a market or access to it;
     - lack of a resource base because of the encroachment of agriculture (nature conservation projects, etc.);
     - legal restrictions (sometimes cross-breeding is enforced and use of indigenous bulls is prohibited);
     - lack of income opportunities and lack of interest of younger generations; and
     - lack of competitiveness with improved breeds;
2. **Survey** for indigenous breeding institutions (e.g. community bulls, castration, ritual protection);
3. **Analysis of limiting factors** and identification of a strategy for overcoming them;
4. **Setting of objectives** in multistakeholder meetings and consultations to agree on respective commitments, financing plan, time frame, plan of action and monitoring and evaluation (M&E) procedures;
5. **Awareness generation** in order to distribute the knowledge of the value and significance of the breed, rally the support of as many community members as possible and sensitize government organizations;
6. **Formation of an independent local institution**/organization with legal status to serve as a focus and executive agency for conservation activities. It should be composed largely of community members. This will require mobilization and leadership development;
7. **Training and capacity-building** in order to ensure that the new organization and the community will be able to pursue conservation after the end of the project and outside inputs;
8. **Overcoming constraints**, i.e.:
   - securing of a resource base through negotiations, advocacy and facilitation;
   - development of markets or marketing channels for specialty products, through a market survey, research on processing methods, product launch, building up of a distribution network; and
   - negotiation of subsidies from government or other sources;
9. **Impact assessment** through participatory evaluation and exit of the project staff.

The following factors have been identified as contributing to sustainability of a conservation programme (adapted from Lemke, 2000):

- The farmers are owners of the breed and benefit from it.
- The animal owners have a sense of responsibility for the breed.
- The animals are utilizing the farmers' own feed/fodder.
- Maintenance is labour-intensive and not capital-intensive.
- The breed is part of the traditional culture and contributes to the keepers' identity and self-respect.
- The breed and its requirements are well understood.
- The implementing organization is stable.
- The project has government support.
- The project has the support of other organizations, such as NGOs.

- The project is self-administered by the community.
- The animal keepers are involved in management decisions.
- Keeping of the breeds is economically worthwhile.

Developing the genetic resources of communities

The local breeds or populations kept by communities may be endowed with genetic traits of interest to animal breeders in other areas (including the north) and therefore with commercial potential. These traits may not be immediately apparent or present in all individuals. Therefore there is a need for systematic screening, preferably involving participatory methods building on indigenous knowledge:

- In the Highlands of Chiapas (Mexico), the extensive expertise of Tzotzil Indian shepherdesses in evaluating animals for fleece characteristics according to their indigenous knowledge is an important aspect of a genetic improvement programme for Chiapas sheep (Perezgrovas, 1999).
- In Bolivia, a systematic search for desirable characteristics found that the local Ayapaya llama kept by the Wallat'ani community in the highlands had better fibre quality than the lowland llama and this now forms the basis of breeding activities to develop the Ayapaya ecotype further for the benefit of the local community (Valle Zárate, 1999).
- Systematic evaluation of guinea pig strains revealed that local lines were better than exotic ones with respect to number of offspring born and weaned and total weight (Valle Zárate, 1999).

Aid to develop local breeds must be combined with efforts to empower local communities so that they will also receive commercial and other benefits from the unique genetic resources that they are nurturing.

Pastoralists' rights and legal safeguards against biopiracy

The international debate on access to and benefit-sharing of genetic resources has so far focused exclusively on plants. With the inputs of a large number of NGOs, an International Undertaking on Plant Genetic Resources has been drafted that provides rights for farmers in return for their contribution to plant breeding. The situation with regard to AnGR has not been the subject of discussion, although it is not only different but also more pertinent. Animal breeders, and especially pastoralists, have much more of a "collective identity", because a breed, as discussed above, is often the product of communal institutions. Many animal breeds are associated with particular indigenous communities or ethnic groups whose identity is linked to those breeds and who regard themselves very much as their proprietors or even guardians. Moreover, they have developed elaborate social mechanisms to share these resources equitably within the community while preventing or limiting the access of outsiders to them. Thus, a much clearer case can be made for the "collective rights" of pastoralists than for traditional plant breeders.

Some of the animal genetic resources owned by indigenous communities have already been recognized as being of great interest to livestock producers elsewhere. Their qualities/genetic traits could vastly increase the efficiency even of industrialized animal production systems. One example is provided by the Red Maasai sheep, which is endowed with genetic resistance to internal parasites. This trait is of great interest to commercial sheep farmers in the North (particularly Australia and New Zealand, but also elsewhere), since helminths can no longer be combated with anthelmintic drugs (they have become immune to them). The prospect of the genetic sequence related to helminth resistance being identified by scientists raises the question of the ownership of this information and of the genes.

For reasons of fairness, appropriate intellectual property rights (IPR) regimes need to be developed to ensure that some benefits reach the communities who have developed and stewarded these AnGR for generations under difficult circumstances. The exact nature and scope of such benefits – which could be grazing rights, animal health care or monetary benefits – is an issue that warrants discussion involving all stakeholders. The implications of this issue for future global food security, the national interests of the countries involved and the livelihoods and right to self-determination of indigenous groups are enormous. Therefore, discussion and evaluation need to take place before policy options can be developed and formally instituted.

Recommendations

Adoption of a livelihoods approach towards AnGR

AnGR conservation must be approached holistically and not pursued as an isolated intervention. The link and interconnectedness between the sustainable management of domestic animal diversity and traditional livelihoods of indigenous people, especially pastoralists, needs to be made more apparent, for instance by commissioning research studies on indigenous knowledge about animal breeding. The Convention on Biodiversity entitles communities that keep rare genetic resources to assistance and benefits. It thus renders community-based AnGR conservation a tool and means for livelihood support to such communities.

Direct involvement of communities in conservation

Communities that have developed livestock breeds with unique genetic properties must become directly involved in decision-making, planning and implementation of projects. They need to be provided with legal support and assistance for intellectual property issues and should be entitled to subsidies for their role in protecting environments and landscapes by maintaining low-input breeds instead of switching to more profitable high-input and high-residue production systems (Valle Zárate, 1999).

Support to intermediary NGOs

In order to reach indigenous communities and to establish linkages between them and the national bodies responsible for domestic animal diversity, intermediary NGOs are necessary and play a crucial role. Financial support and capacity-building must be extended to appropriately qualified rural development NGOs so that they can assist indigenous communities in conservation/development and facilitate interaction between them and scientists, bureaucrats and policy-makers. One NGO-based initiative is the LIFE Network/Movement for Peoples' Conservation of Domestic Animal Diversity, which approved the Sadri Declaration (see appendix) at a recent workshop in India (see LIFE Web site).

Control of the expansion of animal industries

It is predicted that the consumption of meat and milk in developing countries will rise exponentially until 2020 and that this demand will be met by the expansion of industrialized livestock production into these countries (IFPRI, 2000). If unchecked, this so-called "livestock revolution" will have negative consequences for all marginal livestock keepers and also for domestic animal diversity. The rush by livestock companies to become established in the opening markets of the developing countries must be stopped (Blair, 1994), or the effects will be drastic, especially on pig, poultry and cattle genetic diversity.

Policy forum on AnGR and intellectual property

There is a definite need for a special forum that stimulates and facilitates discussion of AnGR and IPR issues. Although the scope of the FAO Commission on Genetic Resources for Food and Agriculture (CGRFA) was expanded in 1995 to include livestock, its Intergovernmental Technical Working Group (ITWG), which is composed of government representatives and is without representatives of southern NGOs, has not considered this question. Yet, appropriate policies safeguarding the interests of all stakeholders are urgently needed.

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Web sites

Breeds of Livestock – Oklahoma State University: www.ansi.okstate.edu/breeds
German Agency for Technical Cooperation (GTZ) – Agrobiodiversity in Rural Areas: www.gtz.de/agrobiodiv
International Food Policy Research Institute (IFPRI): www.cgiar/ifpri
International Livestock Research Institute (ILRI): www.cgiar.org/ilri/products
LIFE: www.lifeinitiative.org/index.htm
FAO, Domestic animal Diversity Information System: www.fao.org/dad-is

Appendix

Sadri Declaration

being recommendations passed by the participants of the International Conference + Workshop on Local Livestock Breeds for Sustainable Rural Livelihoods

Udaipur and Sadri, 1–4 November 2000

Acknowledging the diverse roles of indigenous animal breeds for sustainable rural livelihoods in India (for food security, soil fertility, draught power, as social and cultural asset, source of income and saving etc.), especially in marginal areas,

being conscious of the threat to domestic animal diversity (due to government policies, economic pressures, increasing poverty, cultural erosion, etc., and

concerned about the lack of awareness in all spheres of stakeholders,

We recommend:

1. Policy changes concerning:
- access to resources (grazing, water...);
- changes in emphasis in the curriculum for veterinary and animal husbandry scientists, extension workers, etc. (more emphasis on biodiversity, conservation of indigenous breeds);
- breeding policy reviews through consultative processes involving all stakeholders;
- formulation of land use plans that guarantee land use/rights for indigenous breeds and indigenous livestock keepers.

2. Concerted actions by NGOs, CBOs and communities, including:
- networking, documentation, awareness raising and dissemination of information about the situation and advantages of indigenous breeds;
- improvement of marketing (niches) for the products of indigenous breeds;
- developing of local institutions and breeding organizations.

3. Changing/expanding research on the needs of poor livestock keepers towards achieving:
- improved economic situation of livestock keepers;
- legal recognition of indigenous breeds as national assets;
- maintenance of Indian domestic animal diversity (DAD) for the benefit of future generations.

Defining Livestock Breeds in the Context of Community-Based Management of Farm Animal Genetic Resources

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Abstract

The concept of a breed, in which all the members have a pedigree tracing their ancestry, was developed primarily in western Europe during the eighteenth century. Today, in the developed world, breeds are recognized as distinct intraspecific groups, the members of which share particular characteristics, which distinguish them from other such groups, and formal organizations usually exist for each breed or breed group. The term breed as a formal designation has little meaning outside areas of Western influence, where pedigree recording is often non-existent. Nonetheless, even under these circumstances, there exist strains or "types", which owe their continuing distinct identity to a combination of traditional "breeding objectives" and geographical and/or cultural separation by the communities that own them. This paper discusses the concept of livestock breeds in the context of community-based management of farm animal genetic resources in developing countries. It is pointed out that elaborate traditional systems of population identification by local communities exist, and that these "uniquely identified and named" populations, the equivalent of "breeds" in Western agriculture, are important basic units of diversity assessment and conservation. In many instances, the local environment, culture and values of communities are reflected in the key traits and/or functions of the livestock "breeds". These may range from such complex traits as adaptation to local environmental stresses, to functions such as traction or products such as milk or wool and simple traits such as presence and size of horns or humps. Behind these traits are the breeding practices and other indigenous knowledge systems that have been applied for the maintenance of these populations, and the genetic diversity that they represent. The paper concludes that the concept of breed (or equivalent concepts within species) serves an important purpose in that it links products/functions to a group of animals that share a common genetic background. To the extent that conservation of agricultural diversity needs to be linked to utilization, and given that the concept of breeds as aggregate or "package" of traits is a manifestation of the environment and community values and goals, breeds represent the single most important unit of analysis in the context of conservation and use of livestock diversity. Moreover, they must be considered as such in developing strategies for the sustainable management of livestock diversity at the community level.

Introduction

There are two broad approaches through which farm animal genetic resources (AnGR) can be conserved: *ex situ* and *in situ.* The *ex situ* approach to conservation includes methods such as cryopreservation and live-animal conservation in designated localities, e.g. government farms. *In situ* conservation, also referred to as "on-farm conservation", can be defined as "the continuous husbandry of a diverse set of populations by farmers in the agro-ecosystems where an animal population/breed/strain has evolved". On-farm conservation encompasses entire agro-ecosystems, including immediately useful species (of crops, forages, agroforestry species, other animal species) that form part of the system. There is a wide range of objectives that may underpin an on-farm conservation programme. These may include the following:

- to conserve the processes of evolution and adaptation of animal populations to their environments;
- to conserve diversity at all levels – ecosystem, species and within species (breeds and genes);
- to integrate farmers (mixed farmers, pastoralists) into a national AnGR system;

- to conserve ecosystem services that are critical to the functioning of the Earth's life-support system (maintaining soil-forming processes, reducing chemical pollution, restricting the spread of animal and plant diseases, etc.);
- to improve the livelihood of resource-poor farmers through economic and social development – e.g. combining on-farm conservation with development of local infrastructure, or increasing access by farmers to useful locally relevant animal and plant (forage) germplasm;
- to develop systems to make conserved material (e.g. semen for local use) or conditions easily accessible to farmers.

There are several advantages of *in situ* conservation of AnGR. One advantage is that it conserves both the genetic material and the processes that give rise to the diversity. Blackburn *et al*. (1996) have provided examples that illustrate the fact that those traditional breeds with a history of interaction with wildlife evolve an interlocking pattern of vegetation exploitation so that the pasture can support a maximum of biomass. Thus, adapted indigenous breeds can be co-conserved with wild species, maximizing system output sustainably. Long-term sustainability of breeding efforts may depend on the continued availability of the genetic variation that can be maintained and further developed by the herders themselves using their own management practices. Moreover, because the technology for cryopreservation of AnGR is only well-developed for a handful of livestock species, conservation of most livestock species will, of necessity, continue to depend on live animals. In almost all cases, interventions supporting continued evolution (in response to changes in the production system) is cheaper and more effective for AnGR conservation on-farm. In the case of *ex situ* approaches, there would need to be regeneration and exposure to the environment followed by sampling and preservation of a subset. Referring to the situation in plant genetic resources conservation, Brush (1991) has pointed out that "long-term sustainability of breeding efforts may depend on continued availability of larger amounts of germplasm than can be effectively stored off-site". Rephrased in the context of AnGR, conserved animal material in *ex situ* systems is more likely to be utilized in emergency restoration but is much less likely to find use in long-term animal improvement programmes.

Unfortunately, *in situ* conservation also has some drawbacks. The first one is that the same factors that allow for dynamic, holistic, agro-ecosystem conservation may serve to threaten the security of breeds/strains. For example, genetic erosion can still occur as a result of unforeseen circumstances such as war and natural disasters. Moreover, social and economic change may either foster or hinder on-farm AnGR conservation over time. Indeed, one of the challenges of *in situ* conservation research is to evaluate how economic development is affecting farmer maintenance of diversity so as to take account of this process in the implementation of conservation programmes. Because each of the two broad conservation approaches has its merits and demerits, there is need for an "integrated conservation approach" that combines a range of available *ex situ* and *in situ* options.

Community-based management and *in situ* conservation of AnGR

Why community-based conservation? The fact that the role of community-based conservation has received increasing attention derives from the realization that most creative and productive activities of individuals or groups in society take place in communities. Communities and citizens' groups provide the easiest means for people to take socially valuable action as well as to express their concerns. When they are properly empowered and informed, communities can contribute to decisions that affect them and play an indispensable part in creating a sustainable society (IUCN/UNEP/WWF, 1991). As local communities have a vested interest in all the natural resources (including AnGR) on which their livelihoods depend, and have the most to lose in the event of loss of these resources, they are best placed to conserve them. Moreover, they have a better understanding than any other group of what it takes to manage their traditional resources sustainably.

What is the meaning of community? During the international negotiations that produced the Convention on Biological Diversity (CBD), such phrases as “indigenous people”, “indigenous knowledge” and “traditional knowledge” were often used in reference to local or traditional “communities”, but the definition of some of these terms remains problematic. The term “indigenous” is particularly problematic because it has different meanings in different parts of the world. “Local communities” is really a broad term that has no connotation of “nativity”, but refers generally to people who, at a particular point in time, have common interests and live in a defined geographical area, rural or urban, within a broader society. Thus, when the concept of “indigenous people” is broadened to include local communities, “embodying *traditional* lifestyles”, it forms the basis for a broad and strong alliance of those peoples who still “live close to the Earth” (IUCN/UNEP/WWF, 1991). These peoples embody the wisdom of generations that have practised the sustainable lifestyles that environmentalists and conservationists promulgate. Thus, “community-based” management of AnGR refers to a system of AnGR and ecosystem management in which the AnGR keepers are responsible for the decisions on definition, priority setting and the implementation of all aspects of conservation and sustainable use of the AnGR. The community does not have to be “indigenous” in its strictest definition, neither should the lifestyles remain strictly traditional. Indeed, the dynamic processes that characterize the evolution of agricultural systems necessitate that the communities should themselves also be dynamic in their aspirations and strategies for managing their livelihoods. Community-based development approaches recognize, and respond appropriately to, the dynamism of the systems involved.

As defined above, *in situ* conservation is the management of viable populations (by farmers) in the agro-ecosystems where they have developed their distinctive properties. Thus, “*in situ* conservation” and “community-based management” of AnGR are conceptually similar. However, there are subtle, but significant differences. “Conservation of AnGR” has been defined (FAO, 1992) as the sum of all actions involved in the management of AnGR, such that these resources are best used to meet immediate and short-term requirements for food and agriculture, and remain available to meet possible longer-term needs. “Management of AnGR” is the combined set of actions by which a sample, or the whole, of an animal population is subjected to a process of genetic and/or environmental manipulation with the aim of sustaining, utilizing, restoring, enhancing and characterizing the quality and/or quantity of the AnGR and their products (food, fibre, draught animal power, etc.). From this definition, it is clear that “management” of AnGR encompasses all activities that ensure that the population is dynamic and is responsive to changes in the physical and sociocultural environment. “Management” also includes improving the understanding of the AnGR, i.e. characterizing and documenting the resources. Sustainable management includes those actions (including policy) that ensure that the AnGR meet present needs while also retaining their genetic integrity so as to be available for longer-term needs.

Whereas it is difficult to imagine an *in situ* conservation programme that does not involve local communities, “community-based management” emphasizes the involvement of communities, but does not necessarily rule out the use of *ex situ* approaches as complements to *in situ* options. Moreover, it is possible to have an *in situ* conservation programme in which a *selected* number of farmers are involved as individuals, e.g. through incentive schemes, but without collective community involvement. Of course, such programmes may have less probability of success than “community-based *in situ* AnGR management” programmes. A good example of a community-based programme for AnGR management with an *ex situ* component might be the open-nucleus breeding approach involving farmers and a nucleus herd, with or without use of modern reproductive biotechnologies such as artificial insemination and embryo transfer.

What is a breed in the current context?

The concept of a breed, in which all members have a pedigree tracing their ancestry, was developed primarily in western Europe during the eighteenth century. Today, in the developed world, breeds are recognized as distinct intraspecific groups, the members of which share particular characteristics that distinguish them from other such groups, and formal organizations usually exist for each breed or breed group. In its strictest sense, a breed designates a closed or partially closed population – mating pairs are drawn only from within the population and relationships among individuals are documented. Members of a breed have developed under the same selection pressures and share common ancestry. In reality, breeds are dynamic. To be successful they must constantly change in response to changes in societal needs as reflected in market demand. The change is achieved through selective breeding and "injection" of bloodlines from other breeds. However, for a population to retain its identity as a breed, there has to be less gene flow from outside relative to mating among members of the breed.

As has been pointed out, even in developing tropical regions of the world, where the term breed as a formal designation often has little meaning, there exist distinct strains or "types" that owe their identity to either geographical or cultural separation, the latter being the result of long-term artificial breeding by local communities. Livestock populations, developed in different sociocultural, ecological or geographical settings, will become genetically distinct as a result of genetic drift and differential selection pressures, natural and artificial, provided they have also been, to a considerable extent, reproductively isolated from other populations developed under different conditions. Thus, the indigenous livestock from different regions of the world should probably be assumed a priori to represent different "breeds". It seems clear that populations with different adaptation characteristics or possessing unique physiological characteristics should be recognized as different breeds. This distinction should be drawn even if the populations are shown to be relatively closely related based upon measures of genetic distance.

The *World Watch List for Domestic Animal Diversity* (WWL-DAD) prepared by FAO (2000) has defined a breed as: either a homogenous, subspecific 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 homogenous group for which geographical separation from phenotypically similar groups has led to general acceptance of its separate identity.

When breed identity is documented through pedigree records, one can presumably document the time of genetic isolation and thereby place some boundaries on likely distinctiveness between candidate breeds. However, only a relatively small proportion of the world's livestock is listed in herd-books. When potential "breeds" are physiologically similar and have overlapping and often large ranges, we should probably then utilize measures of genetic relatedness to help sort out breed distinctions. Thus, if we have basically similar animals across a wide area (e.g. fat-tailed sheep in Africa), with little phenotypic variation among populations and little reproductive isolation between adjacent populations, estimates of genetic distances among populations at the extremes of the range may be very helpful in assigning estimates of genetic uniqueness and, more important, in assigning conservation priorities relative to other populations. Where herd-books exist that appear to document genetic uniqueness among breeds, measures of genetic distance can supplement this information in situations where breeds appear otherwise quite similar.

Thus, we work at two levels. First there are the populations that are clearly distinct and unique, based on adaptations and physiology. There are degrees of "distinctiveness", but either a group of knowledgeable breeders and scientists or a good discriminate analysis should be able to pick these out. Next come the populations that are not so easily distinguished, and whose genetic uniqueness must be determined. It is at this level that "breed" distinctions become a challenge, requiring a combination of genetic and cultural distinctions. With or without genetic data, we should accept the cultural definition as being valid and try to gather information from the local communities that may explain whatever results we obtain from genetic studies. This is basically the approach taken by the

AnGR programme of the International Livestock Research Institute (ILRI) to recognize breeds when the owners suggest that they are distinct (for example, through on-farm surveys), and to proceed to attempt to acquire objective measures of genetic relatedness. In making these distinctions among breeds and in accordance with the above analysis, especially when several apparently similar breeds are found in the same area, a population can be accorded a breed identity when groups of farmers in the area can be identified who: i) claim to be raising animals of a distinct type; ii) can reliably recognize that type; iii) exchange germplasm only with other breeders dedicated to holding animals of the same type; and iv) indicate that such breeding programmes have been going on for many generations.

The making of breeds in traditional systems

Social and cultural contexts of breeds or strains

In order to appreciate the role that traditional communities can play in conservation and management of AnGR, it is important to understand the sociocultural underpinnings of breed development. Social institutions and cultural traditions provide the context that determines the animal management choices available to farmers. Indeed, social and cultural forces are often the most important factors in diversifying livestock (and livestock production systems) and in developing breeds. Social and cultural factors influencing the decisions a farmer makes include traditional practices, local ways of life or the ethnic or community identity to which the farmer belongs. The value of a breed in the lifestyle or identity of a particular social group is what encourages its maintenance. Breeds may have specific, unique traits valued by the community that are not obtained from other "exotic" animal populations. Breeds may also be valued because of their place in local traditions – e.g. for their use in religious or other cultural ceremonies or because they provide products valued in traditional meals or medicinal practices requiring specific qualities. Rege, Aboagye and Tawah (1994) have described the unique role of the Muturu breed of cattle in southern Nigeria. Although the breed is not usually milked because the modest milk yield is just sufficient for the calf, milk is extracted by traditional doctors for medicinal preparations. The animals and their hides are used mainly for ritual sacrifices and ceremonies, particularly funerals. When a pagan dies, for example, one or more Muturu oxen are sacrificed and the corpse is rolled up in the hides of the slaughtered animals, while the meat forms part of the ceremonial feast. In Igboland, the Muturu were traditionally considered as sacred (*juju* cattle) and were the property of local deities or were dedicated to the shrine. Among the Koma people, the Muturu is kept as a semi-feral population. Individual animals needed for sacrifice have to be hunted down. Ticks are not removed as these are considered harmless to the Muturu. All these complex traditional practices and beliefs have important implications for the present-day genetic diversity in the Muturu.

Social organization and institutions in a community can influence farmers' access to, and management of, household and community-level resources, affecting their action regarding the farm animal genetic diversity. For example, land tenure and ownership systems vary between and within communities in terms of private or communal ownership, equitability of distribution, size and number of parcels of household land, and intrahousehold access to land. A farmer's landholdings and how they are distributed, their sizes and quality may influence decisions about breed choices and allocation of land area among breeds. In the central highlands of Kenya, for example, it was the introduction of individual ownership of land in the 1950s and 1960s and the accompanying fencing that promoted the successful replacement of indigenous livestock breeds with exotic dairy cattle germplasm, which required strict disease control and hence minimal animal movement. Today, even the "roadside grazing system" practised by the landless is characterized by cross-bred cattle.

Traditional breeding goals and objectives

In comparing the evolution of Western agriculture with that of developing countries, one often encounters the statement that the animal (and crop) genotypes (breeds, strains, landraces) currently found in developing regions are predominantly a result of natural selection, while those in developed countries are a product of "many generations of artificial selection". But this is a misconception. For centuries, farmers in the traditional sector everywhere in the world have used phenotypic features – physical characteristics, measures of yield, product quality, adaptive attributes, etc. to identify and select their breeds, strains or landraces. In livestock, these selection criteria may take a wide range of forms and are usually linked to the genetic diversity of the breed. They are used by farmers to distinguish and identify breeds/strains and are commonly the basis for farmers' culling decisions. The Fulbe clan, the Uda'en, after which the Uda sheep, a Sahelian breed of West Africa, is named, provides a good example. Individual Uda flock-owners go great lengths to maintain bloodlines based on certain desired traits.

Because these phenotypic characteristics are used to identify or distinguish breeds, they are often the basis for the names farmers give to specific animal types or strains, usually within a range of animals of a particular type or breed owned by the broader community. Thus, the large diversity of coat colour patterns in the Nguni cattle of southern Africa is classified by the Nguni herders into an elaborate system of names, each referring to a set of colour combinations. Phenotypic characteristics are also used in designating preferred or valued traits and as "criteria" for making selection decisions to achieve selection "goals".

Evidence for the existence of distinct animal types or breeds in traditional African society and links of these animal types to ethnic communities is provided in these statements in the writings of Charles Darwin (1868):

> At the present day various travellers 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. Anderson 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.

Breed as a unit of genetic diversity

Recognizing the names farmers give to animal populations is important because the "farmer-named population" is the unit that farmers manage and use as basis for selection decisions. The name or description of a population as used by the farmer may not only be related to physical characteristic(s), but could also relate to the original source of the breeding material. Both names and traits that define these names may also be related to the biological performance: egg production, size, shape, colour, milk yield or quality, aspects of adaptation, etc. Farmers perceive these attributes at various stages of the animals' growth and development. Clearly, the set of traits that farmers use to identify a "breed" may be complex and are always deeply embedded in the culture and tradition of the community. To the extent that phenotypic characters are expressions of genetic characters at the level of transcribed genes or recessive alleles, phenotypic diversity (maintained by farmers) and genetic diversity can be seen as being equivalent views of the level at which diversity value resides. Any attempt aimed at "improving" or conserving the breed has to understand these complexities, which must be taken into account when developing the intervention strategies.

As has been pointed out above, breeding objectives are implemented at the breed (or equivalent) level. Formation of breeds is also aided by environmental factors. It is the differentiation of livestock species into breeds that has been responsible for the creation of populations adapted to specific environments and used for specific functions/products. Consequently, the breed represents the most important unit in genetic diversity assessment and conservation. For example, research to date suggests that between-breed variation accounts for about 50 percent of the total genetic variation in livestock species (FAO, 2000).

Consistency in names of breeds/strains

Farmers may or may not be consistent in naming and describing breeds or strains. It may happen that even within a village or community, different clans or families have different names for what is essentially the same breed or strain. As has been pointed out, this may be because of differences in valued traits, functions or other phenotypic characteristics or use of names linked to the origin of the germplasm, separately or in combination with valued characteristics. To the extent that these are important not only in understanding the evolutionary history of the genetic diversity in the breed, but also as an input in formulating management strategies that are relevant to the communities, it is crucial that any discrepancy in names be discussed and reasons for differences understood.

It is very interesting that, in Africa, at the broad (national and/or sub-regional) levels, present day “breed” names, assigned principally by scientists, tend to have geographical connotations or to be associated with names of tribes or ethnic communities. Examples include the Boran cattle, Mashona cattle, Nguni cattle, Gala goat and Somali sheep. Whereas this “naming system”, principally an external construct, provides a useful analytical basis for broader environmental and cultural links to animal diversity, it oversimplifies the situation and ignores potentially important subtleties at local levels that could provide insights into the historical breeding systems that have shaped existing genetic diversity. Thus, any study aiming to understand breeds, as they exist today, must include on-farm surveys designed in such a way that the indigenous knowledge by local communities can be captured, analysed and subsequently used in designing AnGR management initiatives. To assume, for example, that the sheep distributed in the whole of coastal West and Central Africa and currently lumped together under one name – the Djallonké – are a single breed, would be to ignore the existence of local traditional animal-breeding culture across these countries and to suggest that, at some historical period, there existed a super-regional sheep-breeding programme! Granted, the natural environment of the subhumid and humid zones has exerted some (strong) selective pressure to produce sheep of similar characteristics. Nonetheless, the influence of local environments and, most important, the artificial breeding efforts of the diverse communities that own the “Djallonké” must be considered.

Other facets of community involvement

Agro-ecosystem influences on animal genetic diversity

Agro-ecosystems provide the ingredients for the evolution of animal genetic resources and the emergence of strains and breeds. This occurs through provision of stresses as well as opportunities. The responsible agro-ecosystem variables include such abiotic factors as temperature, relative humidity, rainfall and soils, and biotic factors such as parasites, pathogens and vegetation. As managers of these factors, the farmers are, as discussed above, an important biotic component of the system. Stochastic changes in these factors, temporally and spatially, from the micro-environmental to the ecological scale, do occur. These are the forces that drive the genetic changes, leading to the emergence of animal subpopulations that are adapted to the particular conditions of their immediate ecogeographic setting, and contributing to the formation of strains/breeds. An understanding of these interactions is crucial to the “on-farm conservation” of indigenous AnGR.

Community involvement in agro-ecosystem characterization

Understanding farmers’ systems of classification for the different aspects of their ecosystems may provide insights into the processes fostering conservation of animal diversity. In many ways, the farmers’ classification will coincide with the scientific ecological classification as they also principally use climatic and physical (e.g. landform and vegetation) variables. However, farmers may also classify ecological features based on their historical and cultural significance (Martin, 1995) and these may have important implications for the understanding of the overall system. Farmers' ecological classification systems may serve as an indication, to the researcher or development agent, of which features are particularly important in the agro-ecosystem in relation to the range of animal breeds or strains being maintained and how these features might be incorporated in the design of sustainable programmes for the management of AnGR.

Conclusion

Programmes for the "development" of the livestock sector in Africa and, indeed, many developing regions of the world have, until recently, focused on the introduction of exotic livestock breeds. In the absence of objective and credible data at production-system level, impressionist accounts of indigenous breeds suggested to development agencies, including government agricultural extension, that indigenous breeds had low productivity compared with European breeds. Little attention was given to the economics of production under the harsh conditions and minimal inputs. Moreover, occasional "successful" farms or government stations evaluated on the basis of short-term performance, and usually based on (often subsidized) economically unrealistic management practices, seemed to validate such strategies (Dunbar, 1970). Save for a few exceptions – high-input farms in Kenya and in some countries in southern Africa, supplying urban markets with relatively developed infrastructure – imported breeds have largely been a failure in Africa. Fortunately, there now seems to be a realization of the need to refocus attention, not only on indigenous breeds, but also on indigenous knowledge.

From a livelihoods perspective, it can be said that the sectoral approaches to agricultural development have, to date, generally ignored the substantial natural and social capital accumulated over millennia by traditional livestock keepers (Blench, 1999). The conclusion that development should draw on this capital is only now slowly being reached. Unfortunately, while this realization has led to a paradigm shift among technicians and national planners at some levels in many countries, there is still an urgent need for considerably more knowledge about indigenous livestock breeds, their ecological adaptations and their productivity under traditional management. Some work has been initiated at national, subregional and continental levels and information is slowly being accumulated, principally on cattle and, to some extent, sheep and goats. The situation is much more dismal for indigenous pigs, camels, chickens and other poultry species. Be it research to improve understanding of indigenous breeds, or initiatives to develop programmes for their sustainable management, community involvement is the route to success. In crop agriculture, participatory plant breeding is now generally accepted and widely applied in numerous developing countries. Livestock development remains primarily driven by imported technological packages (e.g. artificial insemination, exotic germplasm) and very limited involvement of communities in their implementation. This has to change.

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Intergovernmental Mechanisms in the Global Management of Animal Genetic Resources

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Abstract

Since the early 1960s, FAO has provided assistance to countries to identify their animal genetic resources and develop conservation strategies. However, only in 1990, upon recommendation of the FAO Council, was the first comprehensive global programme for the sustainable management of animal genetic resources initiated. This programme, based on recommendations of experts and subsequently adopted by FAO's governing bodies, developed in 1993 into a Global Strategy for the Management of Animal Genetic Resources. The signing of Agenda 21 and the ratification of the Convention on Biological Diversity (CBD) further supported and enhanced the development of the Global Strategy. In 1995, the mandate of the Commission on Plant Genetic Resources was broadened to address other genetic resources of importance for food and agriculture, beginning with animal genetic resources. In 1996, the contribution of animal genetic resources to food security and rural development as well as their importance for further development of the Global Strategy were recognized, both by the World Food Summit and the Third Conference of Parties to the CBD.

In 1997, on request of the FAO Conference, the Director-General established an Ad Hoc Group of Experts to prepare for the further work of an Intergovernmental Technical Working Group on Animal Genetic Resources for Food and Agriculture (ITWG-AnGR). The Ad Hoc Group stressed the importance of establishing a strong intergovernmental mechanism to facilitate and promote better management of animal genetic resources at global, regional and national levels. Following these recommendations, the ITWG-AnGR was established as a subsidiary body to the Commission on Genetic Resources for Food and Agriculture at its seventh session, in May 1997, with a mandate to provide recommendations on the further development of the Global Strategy. The Working Group is regionally balanced and consists of 27 member countries, elected at each regular session of the Commission and expected to serve until the next regular session.

During its first session, which took place on 8–10 September 1998, the ITWG-AnGR considered proposals for further development of the Global Strategy. In their recommendations, the ITWG-AnGR requested that FAO continue to shape the framework more clearly, further develop constituent elements of the strategy and continue to provide core budgetary support, while all stakeholders sought to mobilize extra-budgetary support for conservation and sustainable utilization of AnGR. It was also recommended that FAO coordinate the development of the *First Report on the State of the World's Animal Genetic Resources*, which would provide an assessment of countries' AnGR programmes and the state of farm animal genetic resources. At the same time countries were invited to identify National Focal Points/Coordinators urgently and, where appropriate, Regional Focal Points.

The second session of the ITWG-AnGR, on 4–6 September 2000, considered the progress in developing and implementing the Global Strategy at global, regional and national levels, focusing on the preparation for the report on the state of the world's animal genetic resources. The Working Group stressed the need for a country-driven approach in the development of the report, which should be based on official Country Reports and would provide a foundation for the better use, development and conservation of AnGR at country and regional levels. The Working Group developed an extensive set of recommendations and accepted proposed guidelines for country report preparation, together with a process and timetable for the development of the *First Report on the State of the World's Animal Genetic Resources*.

Introduction

Animal genetic resources have been contributing to food and agriculture for more than 12 000 years, providing the human population with a wide range of food products, along with fibre, fertilizer for crops, manure for fuel and draught power. In addition, animal genetic resources frequently reduce farmers' risk exposure, generate employment and contribute to rural development. It is estimated that, directly or indirectly, domestic animals contribute 30–40 percent of the total value of food and agriculture production. In the course of the development of diverse human societies, livestock became a very important cultural element and is essential in maintaining many traditional lifestyles.

Farmers and breeders have been using animal genetic diversity effectively to develop breeds and varieties that were suitable for local environmental conditions and provided for different human needs and wants. The domestication process and breeding under different environments has resulted in over 6 000 identified breeds developed within about 40 animal species. The total diversity of animal genetic resources available to farmers makes it possible for humans to survive in a wide range of production environments, from hot-humid tropics to arid deserts and cold, severe mountainous regions. Genetic diversity also supported livestock adaptation to many limiting environmental factors, such as diseases, parasites, wide variations in the availability and quality of food and water, and extreme temperatures.

AnGR at international fora

International awareness of the essential role of animal genetic resources in food and agriculture is gradually increasing. Agricultural biological diversity has been discussed by the conferences of the Parties to the Convention on Biological Diversity. At the second conference, in 1995, by Decision II/15 the Parties recognized the special nature of agricultural biodiversity, its distinctive features and problems needing distinctive solutions. The major discussion on agrobiodiversity took place at the Third Conference of the Parties in Buenos Aires, in 1996, where by Decision III/11, Parties decided to develop a programme of work on agricultural biological diversity. Moreover, Parties strongly endorsed the further development of the FAO Global Strategy for the Management of Farm Animal Genetic Resources and supported the development of inventories, which would lead to a better understanding of the status of farm animal genetic resources and the measures necessary for their conservation and sustainable utilization.

In 1996, the contribution of animal genetic resources to food security, poverty alleviation and rural development was recognized by the World Food Summit.

The Fifth Conference of the Parties to the Convention on Biological Diversity, in 2000, by Decision V/5 endorsed a multi-year work programme on agricultural biological diversity, which included four programme elements, namely: i) assessments, ii) adaptive management, iii) capacity-building and iv) mainstreaming. The need to build upon existing international plans of action, programmes, and strategies that have been agreed by countries in the implementation of the work programme has been endorsed by Parties, which specifically noted the role of the Global Strategy for the Management of Farm Animal Genetic Resources.

The Commission on Sustainable Development, developing Agenda 21, strongly emphasized the importance of promoting sustainable agriculture and rural development (SARD), and underlined the essential need to ensure the conservation and sustainable use of genetic resources in achieving sustainable agriculture. At its eighth session, in 2000, the Commission on Sustainable Development adopted a decision on sustainable agriculture and rural development, which, *inter alia*, urged governments to "implement and actively contribute to the further development of the Global Strategy for the Management of Farm Animal Genetic Resources". Sustainable agriculture will also be an important agenda item for the next Word Summit on Sustainable Development (Rio+10).

FAO involvement in AnGR management global programme and establishment of the intergovernmental mechanism

Since the early 1960s, FAO has been providing assistance to countries to identify their animal genetic resources and develop conservation strategies. However, only in 1990, upon recommendation of the FAO Council, was the first comprehensive global programme for the sustainable management of animal genetic resources initiated. This programme, based on recommendations of experts and subsequently adopted by FAO's governing bodies, developed in

1993 into a Global Strategy for the Management of Animal Genetic Resources. The signing of Agenda 21 and the ratification of the Convention on Biological Diversity further supported and enhanced the development of the Global Strategy.

The major step, however, was taken only in 1995, when by decision of the FAO Conference, the mandate of the Commission on Plant Genetic Resources was broadened to address other genetic resources of importance for food and agriculture, beginning with animal genetic resources. According to its Statutes, adopted by Resolution 1/110 of the FAO Council, the Commission on Genetic Resources for Food and Agriculture (CGRFA) "shall have a coordinating role and shall deal with policy, sectoral and cross-sectoral matters related to the conservation and sustainable use of genetic resources of relevance for food and agriculture". The Statutes include the following provision: "The Commission may establish an intergovernmental technical sectoral working group, with appropriate geographical balance, to assist in the areas of: plant, animal, forestry and fisheries genetic resources". At present, the CGRFA is the largest FAO Commission, with over 160 Member Nations and the European Community.

In 1997, on request of the FAO Conference, the Director-General established an Ad Hoc Group of Experts, to prepare for the further work of an Intergovernmental Technical Working Group on Animal Genetic Resources for Food and Agriculture (ITWG-AnGR). The Ad Hoc Group stressed the importance of establishing a strong intergovernmental mechanism to facilitate and promote better management of animal genetic resources at global, regional and national levels. Following these recommendations, the ITWG-AnGR was established as a subsidiary body to the Commission on Genetic Resources for Food and Agriculture at its seventh session, in May 1997, with a mandate to provide recommendations on the further development of the Global Strategy. The Working Group is regionally balanced and consists of 27 member countries, which are elected at each regular session of the Commission and are expected to serve until the next regular session.

The Global Strategy for management of farm animal genetic resources

The Global Strategy has been designed to provide a comprehensive framework for the management of farm animal genetic resources. It consists of four interrelated components, each composed of several elements. The major components are: an *Intergovernmental Mechanism* to ensure direct government involvement and continuity of policy advice and support; a *Planning and Implementation Infrastructure*, providing the enabling framework for country action and regional and global support; a *Technical Programme of Work*, aimed at supporting the effective management of animal genetic resources at country level; and a *Reporting and Evaluation* component, to provide the critical data and information required for guidance, cost-effective planning and action, and progress evaluation in implementation of the Global Strategy.

The first component, the *Intergovernmental Mechanism*, is essential to ensure governmental and stakeholder involvement in the further development and the implementation and monitoring of the Global Strategy. The Commission on Genetic Resources for Food and Agriculture has such a role, being responsible for providing government guidance to the FAO Secretariat in the area of AnGR. The preparatory work and the conduct of the Commission's activities are funded from Regular Programme budget sources.

The key component of the Global Strategy is the *Country-based Planning and Implementation Infrastructure,* which includes five structural elements:

- The Global Focal Point at FAO Headquarters leads the planning, development and implementation of the overall strategy; develops and maintains the information and communication systems; oversees preparation of guidelines; coordinates activity among the regions; prepares reports and meeting documents; facilitates policy discussions; identifies training, education and technology transfer needs; develops programme and project proposals; and mobilizes donor resources.

- Regional Focal Points facilitate regional communications; provide technical assistance and leadership; coordinate training, research and planning activities among countries; initiate development of regional policies; assist in identifying project priorities and proposals; and interact with government agencies, donors, research institutions and non-governmental organizations.
- National Focal Points lead, facilitate and coordinate country activities; identify capacity-building needs; develop project proposals; assist with the development and implementation of country policy; and interface with the range of country stakeholders, including the country focus for biological diversity, and with the Regional Focal Point and the Global Focal Point.
- The Donor and Stakeholder Involvement Mechanism is meant to mobilize the range of stakeholders, providing broad-based support for the Global Strategy. The Global Focal Point seeks to ensure stakeholder involvement in all major aspects of the Global Strategy, using a variety of communication means. The Stakeholder mechanism provides additional opportunity for non-governmental contributions.
- The Domestic Animal Diversity Information System (DAD-IS) functions as the clearing house mechanism for the Global Strategy. It is a widely available and easily accessible global data and information system. Development and use of such a global facility makes it possible to share data and information among countries effectively. DAD-IS is an advanced communication and information tool that allows rapid and cost-effective distribution of guidelines, reports and meeting documents; in addition, it provides a mechanism to exchange views and address specific information requests, by linking breeders, scientists and policy-makers. A key feature is the DAD-IS breeds database, which provides the basis of the Early Warning System for Animal Genetic Resources and makes it possible to produce the World Watch List for Domestic Animal Diversity, the third edition being released in December 2000.

A *Technical Programme of Work* covers several elements: national management plans for animal genetic resources, sustainable intensification, characterization, conservation, communication, and emergency plans and response. To support the implementation of the Technical Programme of Work at country level, FAO has developed a series of guidelines that provide an effective means to identify various technical issues and offer options for their solution. Beyond primary guidelines, focused on the development of national farm animal genetic resources management plans, there are several secondary guidelines, addressing various aspects of AnGR management, such as measurement of domestic animal diversity (MoDAD), sustainable intensification of AnGR (including animal recording and improvement in low- and medium-input production systems), breeding strategies development, and management of small populations at risk.

The final component, *Reporting and Evaluation*, provides for reporting on the status of animal genetic resources, together with monitoring and evaluation of progress in the implementation of the Global Strategy. The most important element here is the *First Report on the State of the World's Animal Genetic Resources*; the findings of the report will guide further development of the Global Strategy and follow-up action.

There are also two cross-cutting areas that contribute to implementation of all four components of the Global Strategy, namely *Capacity-building* and *Technical Assistance.*

Capacity-building includes: training and education; technology transfer; guidelines development; research; data and information management; and communication and coordination. Technical assistance is provided by an FAO cadre of experts and through various experts' meetings. Guidance is provided by the Informal Panel of Experts and implemented using advanced data and information software.

The first session of the Intergovernmental Technical Working Group on Animal Genetic Resources for Food and Agriculture

The Members of the ITWG-AnGR, elected at the 7th Session of the CGRFA, included:

- Africa: Botswana, Cameroon, Madagascar, Niger, Tunisia;
- Asia: China, India, Indonesia, Japan, Malaysia;
- Europe: Denmark, Israel, Italy, The Netherlands, Poland;
- Latin America and the Caribbean: Argentina, Bolivia, Brazil, Uruguay, Venezuela;
- Near East: Egypt, Iran, Sudan;
- North America: Canada, United States of America; and
- Southwest Pacific: New Zealand, Samoa.

During its first session, which took place in Rome on 8–10 September 1998, the Working Group considered proposals for further development of the Global Strategy and initiation of the *First Report on the State of the World's Animal Genetic Resources*. Participants in the first session of the ITWG-AnGR included 23 member countries, 37 observer countries and representatives of UN agencies and international organizations such as: the World Intellectual Property Organization (WIPO), the European Association for Animal Production (EAAP), the Indian Council for Agricultural Research (ICAR), Safeguard for Agricultural Varieties in Europe (SAVE), the World Association for Animal Production (WAAP), the International Centre for Agricultural Research in the Dry Areas (ICARDA), the International Livestock Research Institute (ILRI) and the International Plant Genetic Resources Institute (IPGRI). As AnGR was discussed for the first time at the intergovernmental meeting, there were many basic questions and policy issues to consider, and these became a focus for the deliberations of the Working Group.

Recognizing the contribution of many ongoing national, bilateral, regional and multilateral development programmes and activities to the objectives of the Global Strategy, and the involvement of many national, regional and global organizations in the development, use and conservation of AnGR, the Working Group stressed the need to create synergy and promote the optimal utilization of human, financial and other resources through an overview of activities and mechanisms for promoting cooperation and collaboration.

The Working Group stressed the importance of drawing upon expertise already available in different regions and ensuring the participation of experts from all regions in further development of the Global Strategy. The need to involve local, regional and international governmental and non-governmental organizations, including breeders' organizations and the private sector, was underlined in order to encourage the involvement of all stakeholders in AnGR. The Working Group stressed the role of effective communication in increasing understanding and public awareness of the many roles and values of AnGR and their contribution to world agricultural production, poverty alleviation and rural development.

Noting that AnGR are not uniformly distributed, the Working Group recognized that developing countries with high farm animal diversity should be given special attention, in a regionally balanced manner, in setting priorities for international assistance.

While discussing technical issues, the Working Group highlighted the need to examine the relationship between the loss of AnGR and environmental degradation, and the need to better integrate livestock and crop systems in order to achieve the sustainable use of agro-ecosystems, emphasizing the value of locally adapted resources in the wide variety of production environments. At the same time, the Working Group stressed the need to share experience, through the case studies, on positive and negative impacts of AnGR management, underlining the need for extensive evaluation of the impact of exotic genetic resources. The Working Group also emphasized that

AnGR should be better characterized, maintained and developed in order to provide countries and farmers with flexibility in a variety of production environments. Such characterization should also cover underutilized species and their potential contribution to food and agriculture.

The recommendations the Working Group provided for the Commission on Genetic Resources for Food and Agriculture were most comprehensive, and requested:

> (i) that FAO continue to shape more clearly the framework and further develop constituent elements of this global strategy for the management of farm animal genetic resources, and continue to provide core budgetary support, and that all stakeholders seek to mobilize extra-budgetary support, from all sources, for conservation and sustainable utilization of AnGR;
>
> (ii) that countries that had not already done so urgently identify National Focal Points/ Coordinators and, where appropriate, Regional Focal Points; and
>
> (iii) that FAO coordinate the development of a country-driven *Report on the State of the World's Animal Genetic Resources* that could provide an assessment of countries' animal genetic resources programmes and the state of farm animal genetic resources.

While discussing the preparation of the *First Report on the State of the World's Animal Genetic Resources* (SoW-AnGR) the Working Group also agreed on the preparation of guidelines in consultation with countries, to be used for collecting and assembling existing data and information, and supported further the development of DAD-IS to assist the reporting process.

The recommendations of the ITWG-AnGR were endorsed by the FAO Committee on Agriculture (January 1999), the CGRFA (April 1999) and finally, in November 1999, the FAO Council. At its 8th Regular Session in April 1999, the CGRFA endorsed the recommendations of the ITWG-AnGR, agreed that the SoW-AnGR process should be consultative and cost-effective and noted an urgent need for guidelines to assist the country report preparation. At the same time, the Commission requested that the guidelines be developed in consultation with countries and reviewed by the ITWG-AnGR.

The second session of the Intergovernmental Technical Working Group on Animal Genetic Resources for Food and Agriculture

The Members of the ITWG-AnGR elected at the 8th Regular Session of the CGRFA were as follows:

- Africa: Botswana, the Republic of the Congo, Madagascar, Mali, Tunisia;
- Asia: China, India, Indonesia, Japan, Malaysia;
- Europe: Denmark, France, The Netherlands, Poland, Slovenia;
- Latin America and Caribbean: Argentina, Bolivia, Brazil, Uruguay, Venezuela;
- Near East: Egypt, Iran, Sudan;
- North America: Canada, United States of America; and
- Southwest Pacific: New Zealand, Samoa.

The second session of the ITWG-AnGR, on 4–6 September 2000, considered the progress in developing and implementing the Global Strategy at global, regional and national levels, focusing on the preparation for the *First Report on the State of the World's Animal Genetic Resources*. Twenty-three out of 27 member countries attended the session, together with 33 observer countries and representatives of eight UN agencies and NGOs.

In its deliberations, the Working Group underlined the importance of animal genetic resources to poverty alleviation, food security, rural development and sustainable use of natural resources and the importance of sustainable AnGR management for the implementation of the Convention on Biological Diversity. Recognizing countries' sovereignty over their genetic resources, the Working

Group noted that food security was a global responsibility, and that donor support was crucial to assist developing countries in improving the management of their AnGR for present and future use.

The Working Group expressed concern about the rapid loss of AnGR, the various aspects of this loss and the absence of an early warning system and response mechanism. The Working Group also drew attention to the importance of a better understanding of the level of endangerment, not only at country level but also at regional and global levels, and indicated that the development of such modalities within the Global Strategy would support a priority-setting process at all levels. Stressing the need for enhancement of the economic valuation of AnGR, the Working Group recognized the importance of this valuation, both for better understanding of many roles and values of AnGR and for setting conservation priorities. Appreciating the progress already made in advancing and implementing the Global Strategy, the Working Group provided many detailed suggestions for its further development.

The Working Group stressed the importance of the first SoW-AnGR report and the need to base it on Country Reports, in order to provide a foundation for the better use, development and conservation of animal genetic resources at country and regional levels. The Working Group accepted draft guidelines and the proposed timeline for the completion of the Country Reports for the SoW-AnGR report, noting that this timeline depended on securing extra-budgetary financial resources and building capacity at the country and regional level, and on the development of country reporting tools within DAD-IS.

The Working Group observed that a report on the strategic priorities for action would be prepared for consideration by the Working Group and the CGRFA in 2003. The report would provide a valuable opportunity to increase the awareness of the roles and values of AnGR, expose gaps, identify issues and priorities, and enable early follow-up actions.

The Working Group, requesting countries to enhance efforts to develop national strategies and action plans for animal genetic resources, provided an extensive set of recommendations to address the preparation of the SoW-AnGR report and to further the development of the Global Strategy and the future work of the Working Group. These recommendations would be presented to the CGRFA at its 9th Regular Session, to be held at the end of 2001.

Recommendations

addressing the preparation of the first report on the state of the world's animal genetic resources

- that countries that have not done so urgently identify National Focal Points;
- that countries, donors, stakeholders and FAO increase efforts to mobilize the resources, including financial resources, to prepare Country Reports, build capacity to prepare the first SoW-AnGR report and implement priority follow-up actions;
- that FAO encourage all members to initiate and support preparation of their Country Reports;
- that FAO finalize the Guidelines for Developing Country Reports;
- that FAO enhance efforts to advance the establishment of Regional Focal Points and other networks, to support implementation of the Global Strategy and facilitate preparation of Country Reports;
- that animal genetic resources continue to be a priority area in the FAO Programme of Work and Budget and should be a high priority for donor support;
- that FAO continue to develop the module of DAD-IS that will support country preparation of Country Reports;
- that FAO enhance the dialogue with other international organizations, to determine opportunities for their involvement and contribution to the SoW-AnGR;

addressing the future development of the Global Strategy

- that FAO develop approaches, procedures and tools to further assist countries on economic valuation and genetic development of locally adapted genetic resources;
- that FAO investigate, in partnership with donor and recipient countries, guidelines to plan best livestock programmes;
- that FAO identify options for establishing a country-driven early warning and emergency response mechanism for the AnGR most at risk;
- that FAO identify ways to enhance AnGR characterization studies in the light of new and emerging technologies;
- that FAO continue to enhance technical support to countries and regions;
- that FAO continue to provide adequate support to maintain and further develop DAD-IS;
- that FAO coordinate the preparation of an assessment of the impact of current rapid loss of AnGR on food security, rural development and sustainable livelihoods;
- that FAO consider convening a panel of biotechnology experts in Animal Sciences to assess the potential use of existing and emerging technologies and methodologies for the cost-effective conservation of AnGR;

addressing future meetings of the Working Group

- that the ITWG-AnGR meet in 2002, to review the progress in the development of the *First Report on the State of the World's Animal Genetic Resources*;
- that the ITWG-AnGR meet in 2003, to assist the CGRFA to establish the final content and form of the *First Report on the State of the World's Animal Genetic Resources.*

Conclusions

The interest in and commitment to improving the management of animal genetic resources within FAO and the global community is greater than ever before. The major initiative, to prepare a country-driven report on the state of the world's animal genetic resources, was recognized as contributing to achieving objectives of the Convention on Biological Diversity and, in particular, the implementation of its Work Programme on Agricultural Biological Diversity. The preparation of strategic Country Reports should initiate in-depth discussion on the state of and capacities for AnGR management at country level and support identification of national priorities.

The process of country report preparation was foreseen as participatory and consultative, with contributions from and involvement of all stakeholders, and the report will have the status of an official government document.

The needs and priorities in the area of capacity-building identified in Country Reports will contribute to the establishment of regional priorities that will be recognized in a strategic priority action report, to be completed in 2003 and considered by the 10th Regular Session of the CGRFA. The preparation of the report on SoW-AnGR provides an opportunity not to be missed, both in developing and developed countries, facilitating a broad discussion and initiation of action focused on the enhancement of sustainable management of AnGR.