



Farm animal genetic resources: technical considerations for policy-makers concerning conservation and use

Introduction

Regulations concerning the conservation and use of genetic resources are of vital interest to the global community. In developing effective regulatory regimes, however, it is important that practical considerations on how different types of genetic resources are conserved and used be addressed.

A previous SGRP policy brief (January 2006) highlighted technical information concerning plant genetic resources for food and agriculture (PGRFA) to be considered when developing access and benefit-sharing (ABS) regimes. This brief highlights technical issues relating to farm animal genetic resources (FAnGR) that inform the need for a nuanced approach to the development of policies and regulatory frameworks for the conservation and sustainable use of FAnGR, including for ABS.

The brief examines the existing state of knowledge concerning: the contribution of FAnGR to people's livelihoods within the context of different systems; evidence of losses of FAnGR; international 'flows' of FAnGR; and global patterns of investment in research and conservation of FAnGR. It also addresses opportunities to address gaps in information and take advantage of policy developments in other international fora, particularly the Commission on Genetic Resources for Food and Agriculture (CGRFA) of the FAO and the International Technical Conference on Animal Genetic Resources (ITC) to be held in 2007. It highlights the importance of the support of the Eighth Conference of the Parties (COP 8) to the CBD for the work of the CGRFA on FAnGR and for the ITC. Policy-makers should take advantage of these processes to ensure the development of appropriate approaches for FAnGR. It is essential, therefore, that COP, and the Working Group on ABS, fully take into account the work of the CGRFA, with special emphasis on the Commission's FAnGR-related activities, as well as the outcome of the ITC.

The contribution of FAnGR to people's livelihoods

Farm animal genetic resources (FAnGR) include all animal species, breeds and strains (and their

wild relatives) that are of economic, scientific and cultural interest to humankind in terms of food and agricultural production for the present or in the future.¹ The term is frequently used as shorthand to refer to the approximately 40 species of animals (including approximately 10 000 breeds or strains) that have been domesticated or semi-domesticated during the past 12 000 years and that contribute to agricultural production.² Very few wild relatives of these 40 species still survive.

Domestic animals supply 30% of total human requirements for food and agriculture.³ Seventy per cent of the world's rural poor depend on livestock as a critical component of their livelihoods.⁴ The role of livestock in livelihoods and the potential role and value of indigenous FAnGR varies among production systems. In livestock systems that are more amenable to human control, feeding, health care and FAnGR can be readily manipulated to increase productivity and incomes. In more marginal systems, disease resistance, drought tolerance and other adaptive traits are of greater importance. In these systems livestock have diverse livelihood functions, both economic and social—including as assets to be accumulated for savings and insurance, in strategies for diversifying livelihood options for food security and in meeting the socio-cultural roles and obligations of their owners.⁵

The relative importance of different genetic traits varies between these two systems at the extreme. In livestock systems that can be easily controlled, genes for productivity are highly valued and direct introductions or cross-breeding with more-productive animals are favoured to provide rapid productivity gains. Given rising demand for livestock and livestock products, there are strong market incentives to improve overall productivity and the efficiency of production. In more marginal systems in which livestock have co-evolved with environmental circumstances over millennia, retention of adaptive attributes and introduction of genes to increase resilience to environmental and disease risks are critical. In the range of livestock systems encountered in developing countries, it

is critical to understand how different FAnGR are valued under different system circumstances.

Threats to FAnGR diversity

Rates of erosion

There is a lack of information on losses of FAnGR in developing countries. For the most part, the genetic traits of most livestock populations in developing countries have not yet been adequately characterized. The most visible evidence of changing FAnGR diversity is changing breed composition. However, there is poor empirical evidence of how many breeds there once were, how many breeds there are now and how breed composition has evolved over time. This is compounded by the definitional difficulty—at least at the technical level—of what really constitutes a breed, especially in developing countries. What is clear is that most breed, strain or population diversity exists in developing countries and that a substantial proportion of newly identified populations are being ‘tagged’ as endangered. It is estimated that approximately 16% of breeds were lost over the last century.⁶ A further 22% of mammalian breeds and 48% of avian breeds are at risk of becoming extinct in the near future, and the rate of extinction is accelerating.⁷ Of the livestock breeds known to exist today, 70% are in developing countries.⁸

Even more difficult to assess and more important to avoid is the loss of key gene variation and genetic traits. In rapidly intensifying livestock systems, the pace of genetic change is great and the potential for loss of gene diversity greatest. As the pressures for short-term productivity gains predominate in such systems, there are few incentives to preserve adaptive genetic traits in intensive livestock systems. Understanding such system–genetic diversity dynamics will be a critical component of identifying hot spots of loss of genetic diversity and priority hot-spots for livestock conservation. Such understanding will inform the development of strategies that can be applied to facilitate the co-evolution of FAnGR with production systems in ways that respond to human livelihood needs while minimizing loss of (unique) diversity.

Factors influencing the loss of genetic diversity

A number of factors that influence the loss of indigenous FAnGR have been listed.^{9,10} These include technical, institutional and policy issues. One important driver of the loss of genetic diversity has been the interest of governments, development donors and livestock keepers to improve livestock productivity in the short-term. This has led to large-scale introductions of exotic breeds and germplasm from developed countries to local production systems in developing countries. Often, the supply of exotic germplasm is underwritten by the governments of the germplasm-importing (developing) countries, the governments of breed-exporting (developed) countries and international development agencies. As a result, the germplasm is introduced into developing countries at significantly less than market costs, creating indirect incentives for the spread of that material. The erosion of genetic diversity is often further compounded by lack of organization and management of breeding schemes, leading to uncontrolled genetic mixing. In this case, unregulated introductions of exotic genetic resources into countries are the problem, not unregulated access to local genetic resources by foreigners.

To improve FAnGR policies and investment decisions, empirical evidence of the values of local breeds and the trade-offs between short-term and long-term economic incentives are needed. In cases where economic incentives for livestock keepers to preserve indigenous FAnGR are weak, this needs to be understood and alternative mechanisms such as the payment for environmental services introduced if the global community wishes to conserve FAnGR diversity.

International ‘flows’ of FAnGR

Most of the approximately 40 animal species relied upon worldwide today were domesticated between 10 000 and 12 000 years ago in areas of the world now occupied by developing countries. Many species were domesticated in more than one domestication event, independently, in different parts of the world, at different times. Over the ensuing millennia, these domesticated species

spread around the world following patterns of human migration, trade, exploration and colonization. Breeds of many species resulting from distinct domestication events were brought together and mixed in later years. As a result, today African cattle show the genetic influences of the centres of domestication in the Near East and the Indian subcontinent. European cattle were introduced to Africa by colonialists and have subsequently mixed widely with local breeds. African cattle’s genetic influence is found in breeds in Spain, Portugal and throughout South America. Another particularly illustrative example of the international pedigrees and flows of FAnGR is chicken. All indigenous chicken from Europe, Africa, Melanesia, Japan, Korea, North, South and Central America were originally introduced from South and/or South-East Asia. Many of the high-producing broilers and egg-layers that were bred in the last 100 years in developed countries are now spread all over the world.

Relatively little information exists with respect to recent global flows of livestock germplasm. What does exist, however, is consistent with the issues highlighted above concerning the causes of erosion of FAnGR and is outlined below.

North–South: There have been extensive movements of livestock germplasm from developed to developing countries. Most of this movement has been in the form of highly specialized breeds, in the form of live animals and/or semen to be used in cross-breeding, usually supported by public sector subsidies. Recently, there have been wholesale transfers of intensive poultry and pig production systems to developing countries, often with the producer (developing) country acquiring young poultry or swine each year from suppliers in developed countries.¹¹

South–North: Movements of livestock germplasm from developing to developed countries have been relatively rare in recent years. There are few well documented cases—one notable exception is the importation, development and re-export of the African Boran and Tuli cattle breeds. In most documented cases the economic benefits to both the supplier and the recipient appear to have been small.

South–South: There is already considerable exchange of livestock germplasm between developing countries. For example, most West African countries are seeing continuous introgression of zebu genes into their native taurine populations in response to market demands for larger animals and environmental changes. It is hoped that developing countries will soon be able to undertake more systematic cross-breeding and within-breed selection¹² to obtain livestock better suited to their physical and social environments as well as to their production and marketing requirements. Developing countries' national agricultural research systems require access to as wide a range of livestock genetic diversity as possible to facilitate this work.

North–North: There are extensive livestock gene flows between developed countries; they take place in a relatively free market managed by livestock breeding companies, cooperatives and individual breeders. Such flows have driven the rapid development of highly improved livestock adapted to intensively managed systems in developed countries.

Initiatives and policies—national and international—intended to regulate the exchange of FAnGR, including ABS, have to consider not only the scope of current flows of FAnGR but also, even more importantly, what future trends are likely to be and their implications for the different parties.

Investment in research and conservation of FAnGR

Research in support of sustainable conservation and utilization of livestock germplasm is costly and requires long-term investment. The potential for making a profit by selling improved livestock germplasm in the South is very limited. In the North there is little demand for the traits of indigenous livestock that make them valuable in the South. Northern businesses show little interest in southern livestock genetic resources; it is therefore unlikely that access fees for FAnGR would be able to make significant contributions to the costs of conservation and sustainable use in the South.

International and national public investment is required if we are to

Over the five years from 1987 to 2001, Germany exported 13.6 million samples of bull semen, 70% to other developed countries, 16% to developing countries and 14% to unknown destinations. Germany currently exports approximately 500 000 live cattle and 1 million samples of bull semen each year. Germany accounts for only approximately 7% of the global trade in live cattle. Australia, Canada, France, Mexico and Poland together supply approximately 50%.

Between 1995 and 1996, Australia, Canada, the Netherlands and New Zealand supplied 140 000 doses of deep-frozen Holstein Friesian, Jersey and Australian Milking Zebu semen to Sri Lanka.

Source: Mathias and Mundy (2005)¹¹.

understand what FAnGR diversity is being lost and to support conservation efforts. However, levels of international and national public investment are already extremely low. The total annual budget for global activities related to FAnGR across the 15 Future Harvest Centres supported by the Consultative Group on International Agricultural Research (CGIAR) is just US\$3 million; staff working on plant genetic resources issues outnumber those working on FAnGR by a ratio of 9:1. Development cooperation funding for livestock development in general, and animal genetic resources in particular, has traditionally been much lower than for plant genetic resources and has further declined considerably in recent years. So, despite increasing demand for, and commitment to, sustainable management of FAnGR within developing countries, financial support is increasingly difficult to find. Policy-makers must be careful to develop regulatory frameworks that pragmatically consider the constraints and investments required for research to provide empirical evidence for FAnGR conservation and use decisions.

Opportunities to fill important information gaps and take advantage of policy developments in other international fora

This brief has emphasized the need for more information about the uses and values of FAnGR as a basis for sound policy-making. Recognizing this need, in 1999 the CGRFA gave FAO a mandate to develop a Global Strategy for the Management of Farm Animal Genetic Resources. The Global Strategy provides

an international framework for assisting countries in policy development and a means to provide technical support for actions within countries concerning sustainable intensification, conservation, characterization of and access to FAnGR. The Commission also gave FAO the mandate to coordinate a country-driven process to prepare the first report on the State of the World's Animal Genetic Resources (SoW-AnGR). To date, FAO has received and is synthesizing 170 country reports. The first draft of the SoW-AnGR will be considered by the CGRFA in 2006; it will be the subject of the First International Technical Conference on Animal Genetic Resources to be held in Interlaken, Switzerland, in September 2007, where it will be finalized. The report and the Conference are critically important for the world community to gain more insight into scientific and institutional issues relating to FAnGR. The Conference of the Parties to the CBD recognized their importance in Decision VI/5, stating that it "Welcomes the process initiated by the Food and Agriculture Organization of the United Nations for the preparation of the first Report on the State of World's Animal Genetic Resources" and "invites Parties, other Governments, the financial mechanism and funding organizations to participate fully in the preparatory process for the [Report] and implement follow-up actions identified through the process that will contribute to conservation, sustainable use, access and benefit-sharing of animal genetic resources for food and agriculture".

Policy-makers need to take these processes into consideration. To that end, the

Conference of the Parties to the CBD and the Working Group on ABS will need to take fully into account the work of the CGRFA and the outcomes of the ITC. These initiatives are too politically important and conceptually interlinked to be conducted in isolation.

Endnotes

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