The state of capacities in animal genetic resources management

- Institutional and technical capacity needs to be reinforced in developing countries.

- Better education in the field of animal genetic resources management is required.

- Greater international cooperation would improve the management of shared genetic resources.

- Many countries face difficulties in establishing structured breeding programmes, and many opt for importing exotic genetic resources.

- *In vivo* and *in vitro* conservation programmes are lacking in many countries where there are significant threats to valuable resources.

- Access to reproductive biotechnologies is limited in many developing countries.

- But the use of these technologies should be carefully assessed in terms of effects on genetic diversity, and socio-economic outcomes.

- Legal and policy frameworks for the management of animal genetic resources need to be adapted and strengthened.

Effective management of animal genetic resources requires strong institutions, adequate technical facilities and well-trained personnel. The 148 Country Reports used in the preparation of this part of *The State of the World's Animal Genetic Resources for Food and Agriculture* provide details of the state of capacity at the national level, and the roles of networks and institutions at regional and global levels. They also provide many examples of initiatives taken in the field of animal genetic resources management, problems encountered and recommendations for the future. The following synthesis of information from the Country Reports provides an overview of the state of capacity, highlighting significant regional differences, specific weaknesses and lessons learned.

Institutions and stakeholders

This section assesses the state of stakeholder involvement and institutional capacity (infrastructure, research and knowledge, and policy development and implementation) in the management of animal genetic resources at national and regional levels. Organizations and networks with a potential role in regional and international cooperation are also identified. Figure 9 provides an overview of the state of institutional capacity in the various regions of the world.

Coordination among stakeholders at national level is essential for effective management of a country's animal genetic resources. National Coordinating Committees – officially appointed bodies established as part of *The State of the World's Animal Genetic Resources for Food and Agriculture* reporting process – are key structures in this respect, but there are, sometimes, problems with their sustainability. These problems frequently stem from a lack of resources, which, in turn, often results from a lack of awareness among policy-makers of the significance of animal genetic resources. Links between officially appointed country-level institutions and the various stakeholders active in managing animal genetic resources are often limited. For example, the process of preparing the Country Reports on the state of animal genetic resources was largely accomplished by individuals from governmental or scientific backgrounds. Participation by non-governmental organizations (NGOs) and commercial operators proved more difficult to achieve. Private companies are highly active in the use of animal genetic resources and are often well organized at national and international levels. However, their involvement in national programmes tends to be limited, as their interest is focused on a narrow range of breeds. Local capacity (e.g. clearly defined and well-monitored responsibilities for local stakeholders, and the integration of local organizations in the national policy arena) is also weak in many countries (stronger involvement of NGOs and local stakeholders is found in northern and western Europe, and to some extent in the South and Central America subregions).

Institutions of the national agricultural research systems played a leading role in the Country Report preparation process. However, many Country Reports note with regret that these institutes are rarely involved in research related to animal genetic resources, and interest in the topic is often limited to isolated departments that lack adequate financial resources. There is little specialization in the field of use and conservation of animal genetic resources. Research often remains remote from local needs and indigenous knowledge, and is not well linked to the policy level.

Awareness of the value of animal genetic diversity is essential to raising the political profile of the topic and bringing about appropriate institutional change. In most countries, much remains to be done if these goals are to be achieved. Although awareness is growing among some stakeholders, it has rarely filtered through to the policy level, as can be seen from the limited numbers of policies and legal frameworks that have been developed and implemented to date.

Cooperation should be a logical consequence of shared resources. The Country Reports often mention regional cooperation as a necessity, and express a willingness to participate in such arrangements. Strong regional and subregional networks are important to ensure ongoing improvements in the management of animal genetic resources. However, there are few examples of concrete activities. In Europe and the Caucasus, networks at the governmental and non-governmental levels exist, and there is an established regional focal point for animal genetic resources. However, in other regions the situation is less favourable. The possibility of countries with stronger capacity playing an initiating or supporting role within a subregion or region needs to be further explored.

Structured breeding programmes

Structured breeding programmes provide a key means to increase production levels and product quality, increase productivity and cost efficiency, maintain genetic diversity and support the conservation and sustainable utilization of specific breeds. However, throughout much of the developing world the impact of such programmes is very limited. Most Country Reports from Africa and Asia, for example, indicate that, where programmes exist, only a small proportion of breeds are included and that the active breeding population is small. Figure 10 shows the regional distribution of breeding programmes for important international livestock species.

In some parts of the world such as western Europe and the Americas, successful breeding programmes based on the involvement of individual breeders have been established. These programmes were established on the basis of sound organizational structures and government-backed support services. It is unlikely that such a pattern of organization will easily emerge elsewhere in the absence of public-sector support, particularly for livestock populations kept under low external input conditions.

Many countries have implemented programmes based on government-owned nucleus farms (particularly in the case of ruminants). However, the effectiveness of these programmes has been limited by a lack of interaction with livestock owners, and by the priority given to research rather than development objectives.

Policy decisions in this field are not straightforward. The cost of breeding activities, the level and nature of competition, and the international availability of suitable breeding material need to be considered. Many governments have decided to rely on imported genetic material for breed development, especially in the poultry and pig sectors. Cooperation in breeding activities between countries with similar production conditions, as occurs in Europe, is an opportunity to share costs and make programmes more sustainable.
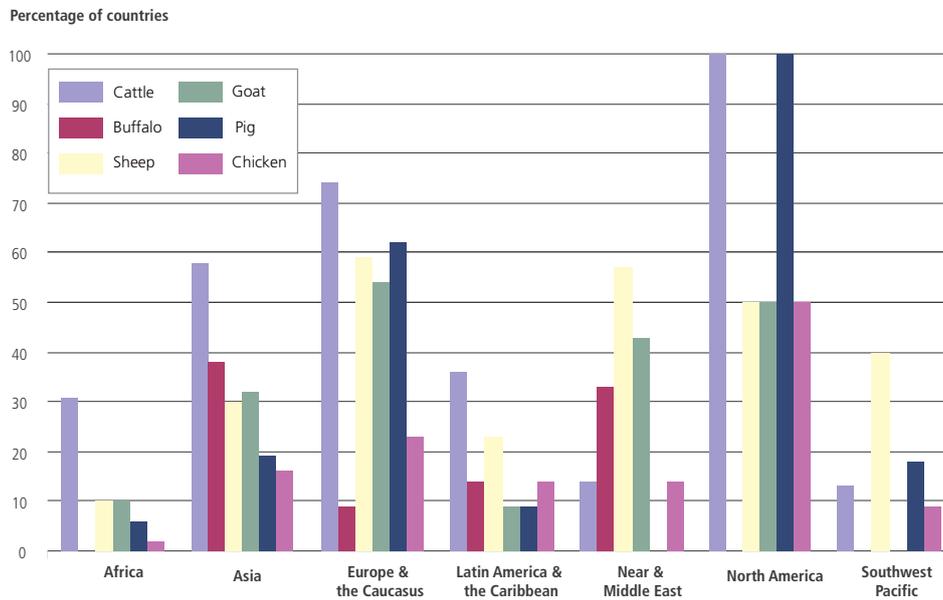
Conservation programmes

Threats to the continued existence of animal genetic resources justify conservation measures. Conservation programmes are most urgently required where valuable genetic resources are in

FIGURE 9
State of institutions – regional comparison
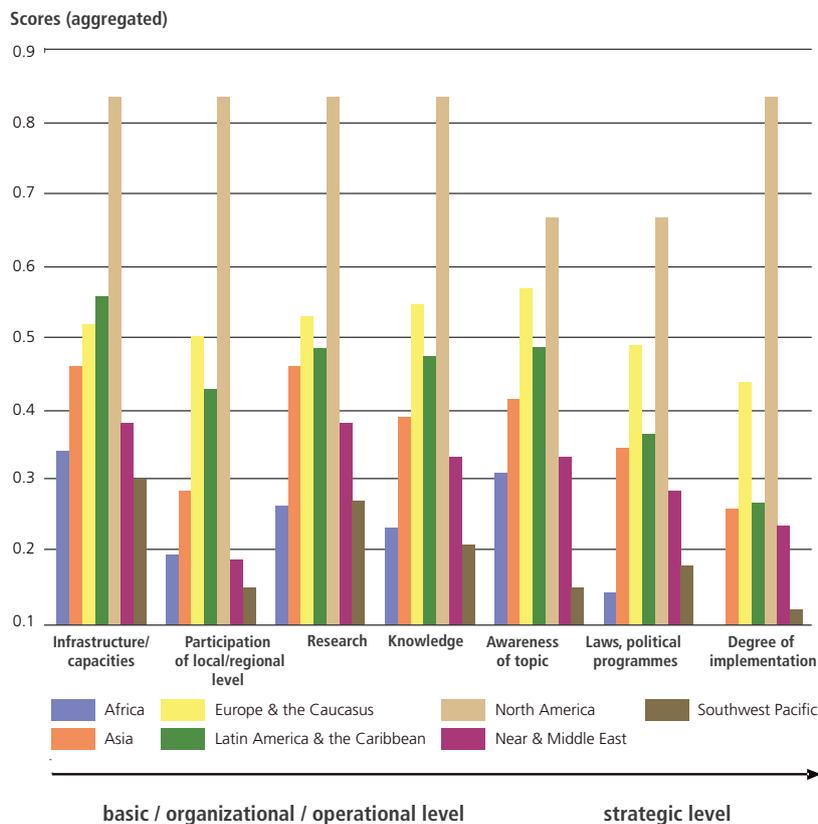
For each thematic area countries were scored 0 (none), + (little), ++ (medium) or +++ (high), based on the information provided in the Country Reports. Scores were then aggregated at regional level. The maximum score (achieved if all the countries in region scored "+++" is equal to 1, and the minimum score (if all the countries in a region scored "0") is equal to 0.

FIGURE 10

Regional distribution of structured breeding activities for the main livestock species

Figures refer to programmes mentioned in the Country Reports and only to countries that report the presence of the respective species.

danger of being lost. A number of approaches to conservation are available, including a range of *in vivo* methods (zoos, farm parks, protected areas, and payments or other support measures for livestock keepers who maintain animals in their normal production environments), as well as *in vitro* conservation of genetic material in liquid nitrogen.

Assessing the effectiveness of such measures requires detailed information on the breeds included in the programmes, the size and structure of the populations involved, the mating schemes practised and, in the case of *in vitro* programmes, the quantity and type of genetic material stored (semen, embryos, oocytes or tissue DNA). Information provided in the Country

FIGURE 11

Regional distribution of conservation programmes

Reports provides a broad overview of the global distribution of conservation programmes. However, the data required for a thorough assessment of conservation needs and priority actions remain largely unavailable.

Many countries (48 percent) report no *in vivo* conservation programmes. An even greater proportion (63 percent) report that they have no *in vitro* programmes. The situation is variable from region to region. Conservation measures are much more widespread in Europe and the Caucasus and in North America than in other regions (Figure 11).

The Country Reports clearly indicate that many groups of stakeholders are involved or potentially involved in breed conservation: national governments, universities and research institutes, breeders' associations, NGOs, breeding companies, farmers (including hobby farmers) and herders. Cooperation should be encouraged and complementarities exploited. Specific support should be provided where needed. For example, hobby breeders and NGOs are often enthusiastic supporters of rare breeds, but may require education in the genetic management of small populations.

Overall, the Country Report analysis suggests that a substantial enhancement of global capacity for conservation, with new institutional models and collaboration among public institutions and between public institutions and private farmers, is required if current threats to animal genetic resources are to be adequately addressed. International and regional collaboration has a key role to play in the implementation of gene banking and other conservation measures for transboundary breeds. Cooperation would be facilitated if agreed protocols (e.g. for zoosanitary requirements) could be

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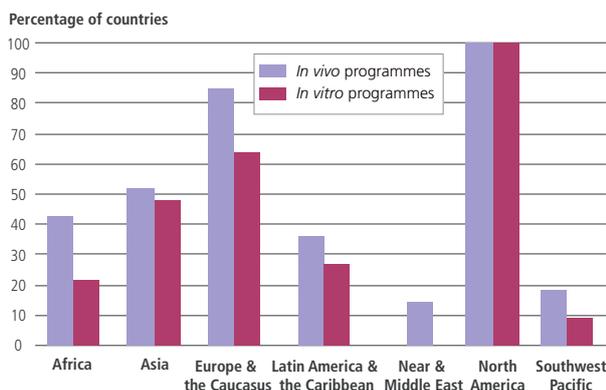
established for *in vitro* conservation programmes that operate on an international scale.

Use of reproductive biotechnologies

Artificial insemination and embryo transfer have had a major impact on livestock breeding in developed countries. These technologies speed up genetic progress, reduce the risk of disease transmission and expand the number of animals that can be bred from a superior parent. The availability of these technologies varies greatly from country to country and between regions. Capacity is generally much weaker in developing countries than in regions such as Europe and the Caucasus and North America. Where reproductive technologies are used in developing countries, it is often as a means of disseminating exotic genetic material.

Many Country Reports from the developing world express a desire to expand the use of these technologies because of their potential contribution to meeting demands for increased output of animal products. However, there is also a growing recognition that their indiscriminate use, in particular of artificial insemination, can pose a threat to indigenous genetic resources. Socio-economic impacts also need to be considered. On the one hand, affordability and access have to be addressed so that poorer livestock keepers are not excluded from options that might enable them to increase the productivity of their animals. On the other, there is a need to ensure that biotechnology use does not promote the indiscriminate dissemination of genetic material that is poorly adapted to smallholder systems.

Legal frameworks

Animal genetic resources management is influenced by legal frameworks at both national and international levels. In some cases, bilateral agreements or regional frameworks are important. The European Union, in particular, has a large body of relevant legislation.

The main international framework for biodiversity is the Convention on Biological Diversity (CBD). The CBD recognizes the specific nature of agricultural biodiversity, and that it has specific problems that call for specific solutions. In this context, it should be noted that wild genetic resources and agricultural genetic resources require different and sometimes conflicting strategies. In order to secure appropriate prioritization for animal genetic resources, international agreements and policies specifically designed to harmonize strategies for the sustainable use and conservation of these resources may be required.

Several other international legal frameworks affect the management of animal genetic resources. The field of animal health is generally the most highly regulated aspect of livestock production. At the international level, the World Trade Organization (WTO) Agreement on Sanitary and Phytosanitary Measures recognizes the World Organisation for Animal Health as the standard-setting authority for animal health matters in the context of international trade. The importance of access to international markets often motivates rigorous disease control regulations at national (or regional) level. Compulsory culling measures imposed in the event of epidemics can pose a threat to rare breed populations. Regulations in the European Union have, in recent years, begun to take account of this threat, but it is a matter of concern that throughout much of the world little attention is paid to animal genetic resources in policies and legal frameworks for disease control.

The prospect of greater exertion of intellectual property rights in the field of animal breeding and genetics is attracting considerable interest and controversy. Patents covering genes and markers associated with a range of economically important traits have been granted in several livestock species. Many ethical and legal questions remain to be resolved, and the extent of the impacts that intellectual property rights are likely to have on the management of animal genetic resources is not yet clear. However, the potential implications both for genetic resource diversity and for equity require that careful attention be paid to the issue. It should, however, be noted that under Article 27.3(b) of the WTO's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), countries are not obliged to grant patents on animals.

The Country Reports indicate great diversity in terms of the extent and nature of national legislation and policies for the management of animal genetic resources. Universal recommendations are not appropriate; provisions need to be adapted to the specific requirements and capacities of the country in question. However, it is clear that, in many countries, inadequate regulatory frameworks hamper the effective management of animal genetic resources. Legislation specifically aimed at promoting and regulating breed conservation is rare outside developed regions. Nonetheless, there are some examples of developing countries that have, in recent years, taken steps to introduce such measures. The availability of resources to implement the programmes envisaged, however, sometimes remains an obstacle.

Structured genetic improvement programmes require systems for animal identification, registration and performance recording. Identification and registration are also important for many other reasons (e.g. disease control, traceability, and administration of conservation programmes). Legal regulation can help to strengthen compliance with these requirements and ensure the availability of consistent and dependable information on which to base decisions. Many developing countries report the need for improved regulation in this field.

Many other aspects of legislation and policy affect the development of livestock production systems and the management of animal genetic resources. Small-scale farmers and pastoralists are the custodians of much of the world's animal genetic diversity. Ensuring that they are not denied the opportunity to continue performing this role will often require giving attention to policies and legal frameworks, such as those that affect access to land and water resources.