



**Food and Agriculture
Organization of the
United Nations**

COMMISSION ON
GENETIC RESOURCES
FOR FOOD AND
AGRICULTURE



THE SECOND REPORT
ON THE STATE
OF THE WORLD'S

ANIMAL GENETIC RESOURCES FOR FOOD AND AGRICULTURE

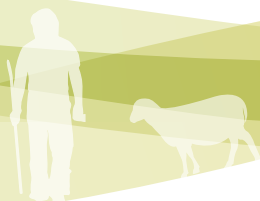
in brief

FAO COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE
ASSESSMENTS • 2015





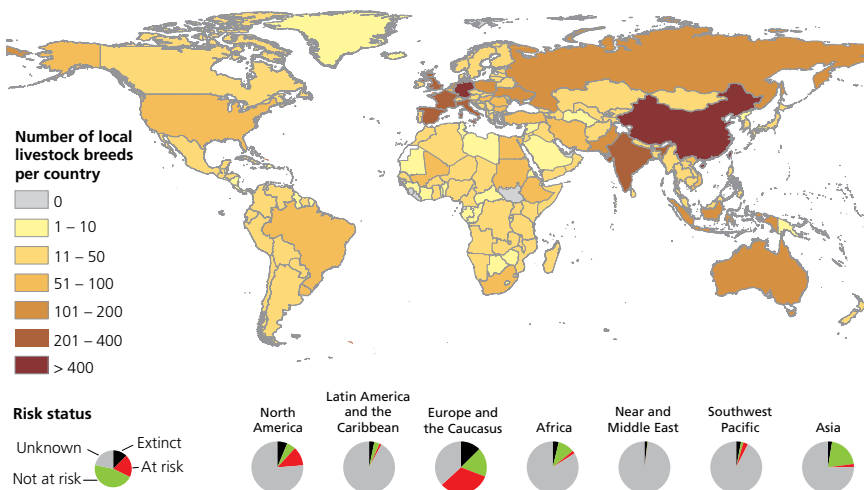
*Sustainably managing livestock diversity for
food and agriculture*



Introduction

Diverse animal genetic resources provide adaptability and resilience in the face of climate change, emerging diseases, pressures on feed and water supplies and shifting market demands. However, these resources are often poorly managed and under threat. Efforts to promote their sustainable use, development and conservation need to be stepped up urgently.

Livestock diversity around the world



DID YOU KNOW?

- Cattle were first domesticated more than 10 000 years ago.
- There are more than 1 500 different sheep breeds in the world.
- Over 600 million poor people depend on livestock-related activities for their livelihoods.



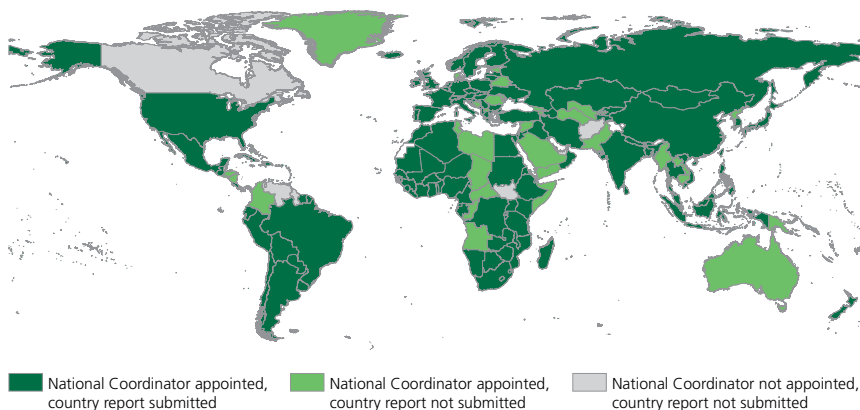
About the report

The report provides a comprehensive assessment of livestock biodiversity and its management. It sets out the latest available information on:

- The state of livestock diversity
- Trends in the livestock sector
- The state of capacity to manage animal genetic resources
- The state of the art in animal genetic resources management
- Needs and challenges in animal genetic resources management

The report draws on information provided in 129 country reports, 15 reports from international organizations, 4 reports from regional focal points and networks for animal genetic resources, and inputs from 150 individual authors and reviewers, as well as breed-related data from FAO's Domestic Animal Diversity Information System (DAD-IS). It serves as an update of the first report on *The State of the World's Animal Genetic Resources for Food and Agriculture*, published in 2007, and focuses particularly on developments since the first report was prepared.

Participation in the reporting process



Genetic diversity underpins use, development, resilience and capacity to adapt

Livestock contribute in many ways to livelihoods, food security, rural development, cultural life and environmental management. They can be kept in a wide variety of production environments, including in areas where crops cannot be grown. Diverse roles and diverse conditions give rise to the need for a range of different species and breeds and a pool of genetic diversity within each breed. Diversity helps to make livestock production systems more resilient to shocks. It enables livestock populations to adapt to changing environmental conditions and provides the raw material for breeding programmes aimed at improving productivity and meeting the needs of livestock keepers, consumers and society at large.

What needs to be done?

Knowledge of animal genetic resources and their production environments needs to be improved, including knowledge of:

- the roles of different types of livestock in the supply of goods and services, particularly their roles in the livelihoods of poor people;
- the impact of different types of livestock and types of livestock keeping on ecosystem functions; and
- the adaptive characteristics of individual breeds – ability to cope well with extremes of temperature, restricted water supply, poor-quality feed, rough terrain, high elevations and other challenging aspects of the production environment.



Yakutian cattle – an amazing breed that is well adapted to subarctic conditions and can endure temperatures as low as -60 °C



Llamas – the main source of food and income for herders on the harsh semi-arid pastures of the High Andes

DID YOU KNOW?

- Up to 2 billion people in developing countries rely on animals for draught power and transport.
- Animal manure supplies some 15 percent of the nutrients applied as crop fertilizers worldwide.
- Grazing livestock are increasingly used in the management of wildlife habitats and landscapes.

Economic, social, cultural, technical and policy factors are driving livestock-sector trends that affect the management of animal genetic resources



The changes that have affected the global livestock sector over recent decades have had major impacts on animal genetic resources and their management. Many countries report that they expect these effects to be even greater in the coming years than they have been in the recent past. Growth in demand for animal-source food continues to create major challenges for the sustainable use of animal genetic resources. South Asia and Africa are projected to become the main centres of growth in meat and milk consumption. These are very resource-constrained regions that are home to many small-scale livestock keepers and pastoralists and to a diverse range of animal genetic resources.

Drivers of change in animal genetic resources management

Demand for livestock products		Climate	
Marketing infrastructure and access		Changes to grazing land and other natural resources	
Retailing		Disease	
Imports of animal products		Economic, livelihood and lifestyle factors	
Exports of animal products		Replacement of livestock functions	
Policy factors		Technology	

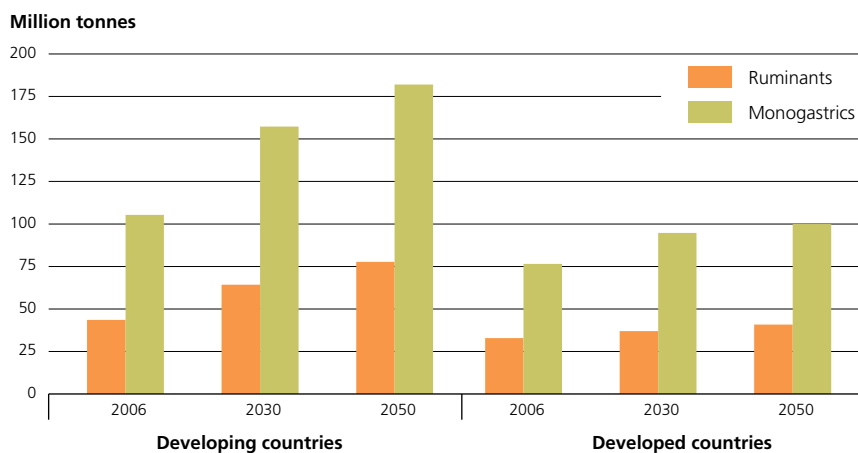
Magnitude of impact

	High
	Moderate
	Low

Predicted trends in impact

	Increasing
	Continuing

Meat production trends



What needs to be done?

Livestock-sector trends and their potential effects on animal genetic resources management need to be identified and monitored more effectively, so that action can be taken to ensure that livestock populations are able to meet the demands placed on them and that a diverse portfolio of genetic diversity is maintained.

DID YOU KNOW?

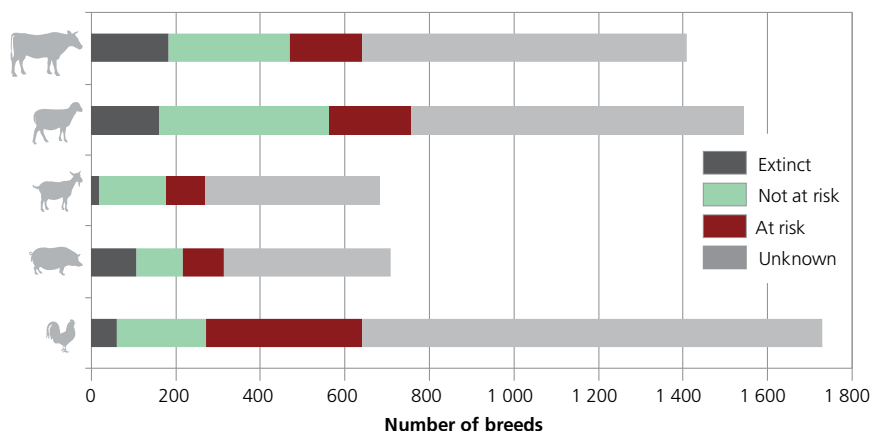
- Demand for milk in developing countries is predicted to increase by 46 percent by 2050 and demand for meat by 76 percent.
- International trade in germplasm and live breeding animals is increasing and consists mainly of flows between developed countries and from developed to developing countries.

Genetic diversity remains under threat

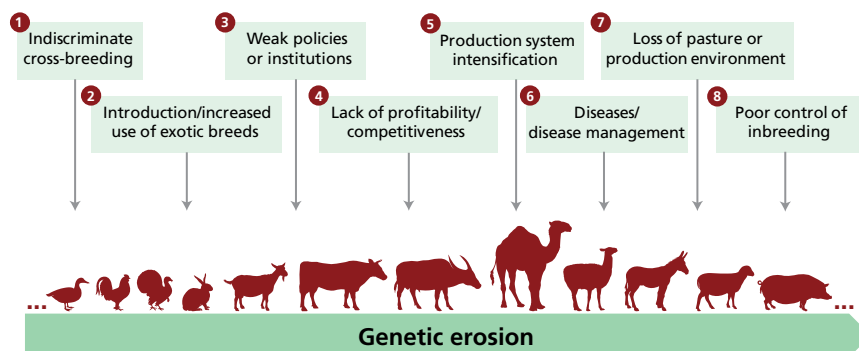
The proportion of the world's livestock breeds classified as being at risk of extinction increased from 15 percent to 17 percent between 2005 and 2014. A further 58 percent of breeds are classified as being of unknown risk status because no recent population data are available. The number of breeds classified as at risk is therefore likely to be an underestimate. Monitoring of population trends is a prerequisite for prompt and effective action to protect breeds from extinction. Erosion of within-breed diversity can be a problem even in breeds whose total population size remains large.

Action to prevent genetic erosion and extinction will be more effective if the factors that drive them are well understood. While there is broad agreement among stakeholders regarding the range of factors that constitute potential threats to animal genetic resources, the magnitude of these threats and the ways in which they combine to affect particular breeds in particular circumstances are often unclear.

Status of the world's livestock breeds



Top 8 reported threats to animal genetic resources



What needs to be done?

Monitoring of trends in the size, structure and distribution of breed populations needs to be improved, as a basis for identifying breeds that are at risk of extinction and prioritizing conservation activities.

Threats to animal genetic resources need to be better identified and their potential effects better assessed, so that action can be taken to combat them or minimize the risk they pose to diversity.

DID YOU KNOW?

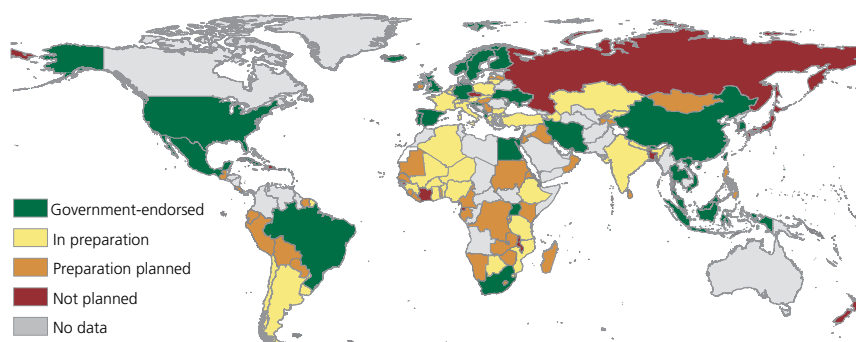
- 99 breeds are reported to have become extinct between 2000 and 2014.
- 85 percent of local breeds from non-OECD countries are of unknown risk status because of a lack of population data.
- From a total of 8 774 reported breeds within 38 livestock species, 7 718 are local breeds (reported by one country only) and only 1 056 are transboundary breeds.

Capacity in animal genetic resources management still needs to be strengthened



Many countries report that their capacities in animal genetic resources management have improved since 2007 when the Global Plan of Action for Animal Genetic Resources was adopted. However, many weaknesses remain, particularly in developing regions. Many countries note that improvements are constrained by a lack of financial resources.

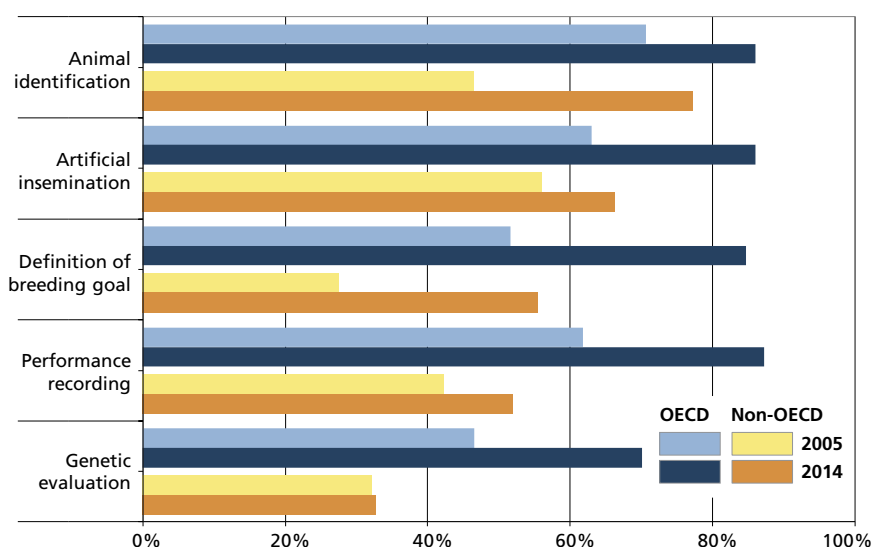
Status of national strategy and action plans for animal genetic resources



One hundred and twelve countries report that they have prepared, are in the process of preparing or are planning to prepare national strategies and action plans for animal genetic resources. Internationally, the importance of genetic resources for food and agriculture, including animal genetic resources, has been highlighted in several major initiatives and agreements, including the Convention on Biological Diversity's Strategic Plan for Biodiversity 2011–2020 and Aichi Targets, and the post-2015 Sustainable Development Goals.

Establishing effective and sustainable breeding programmes is a challenging task that involves a number of different elements. Many countries report that they have made progress in terms of putting these elements in place, for example in establishing of animal identification and registration schemes. However, coherent genetic improvement programmes are often lacking, and even where programmes exist they often operate on a limited scale. A lack of adequate organizational structures for the involvement of livestock keepers and breeders in the planning and implementation of breeding activities often inhibits the establishment of more effective programmes.

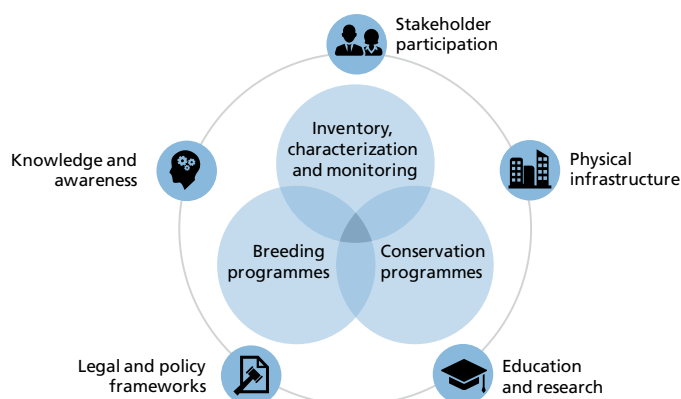
Progress in the implementation of breeding tools in cattle



Conservation strategies that involve both *in situ* measures (supporting the maintenance of livestock populations in their usual production environments) and cryo-conservation (storage of frozen genetic material) are widely regarded as the optimal means of protecting threatened breeds from extinction. *In vitro* gene banks have been established by 64 countries and a further 41 countries are planning to do so. However, many of these gene banks are in the early stages of development and most collections have gaps in their breed coverage. Countries report a diverse range of different *in situ* conservation activities. For example, the development of niche markets for speciality products as a means of increasing the profitability of potentially threatened breeds is becoming more common. However, in many countries the coverage and effectiveness of *in situ* programmes need to be greatly strengthened.



Capacities required for animal genetic resource management



What needs to be done?

Institutional frameworks for animal genetic resources management need to be strengthened, including mechanisms that allow for better communications among stakeholders and facilitate the participation of livestock keepers in the planning and implementation of policies and programmes.

Awareness, education, training and research need to be improved in all areas of animal genetic resources management, including in the emerging fields of access and benefit sharing, ecosystem services and climate change adaptation and mitigation.

Breeding strategies and programmes need to be strengthened, so as to enable full advantage to be taken of available genetic diversity and ensure that livestock populations are well matched to their production environments and to societal needs.

Conservation programmes need to be expanded and diversified, where possible combining support for the ongoing use of breeds in their usual production environments with the maintenance of backup collections of genetic material.

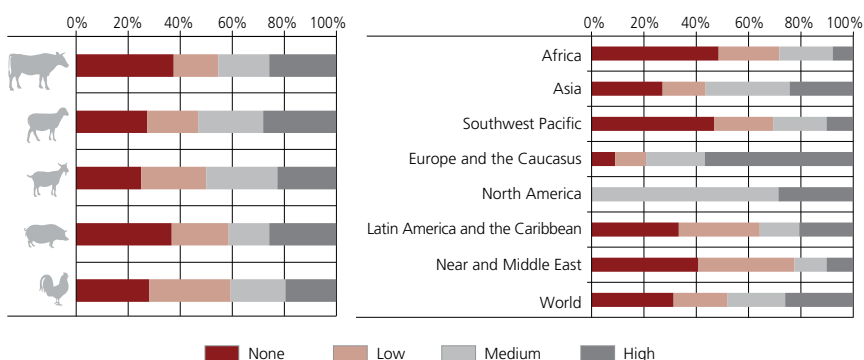
Countries that have not yet developed a national strategy and action plan should consider doing so, as a means of translating the provisions of the Global Plan of Action for Animal Genetic Resources into well-targeted activities at country level. In many countries, National Focal Points for the Management of Animal Genetic Resources also need to be strengthened.

International cooperation in animal genetic resources management needs to be improved at both global and regional levels.

Emerging technologies are creating new opportunities and challenges in animal genetic resources management

The most dramatic technological advances in recent years have been in the field of genomics. These developments have helped to unravel the genetic basis of heritable traits and increased the efficacy of some breeding programmes. However, benefits have largely been restricted to a limited number of breeds that are widely used internationally and raised in high-input systems. Potential to use genomic tools is influenced by a variety of factors, but lack of data on animals' phenotypes (their characteristics and performance) and pedigrees is a key constraint. Increasing the collection of these data is of critical importance, not only for the effective use of genomics, but for any type of genetic improvement or conservation programme.

State of phenotypic characterization



What needs to be done?

If the potential benefits of using genomic technologies are to be realized more widely, there is a need to develop performance and pedigree recording programmes that can be implemented in local conditions. This should be complemented by efforts to raise livestock keepers' awareness of the benefits of genetic improvement programmes and to strengthen their capacity to collect and use data.

The public and private sectors should cooperate to establish infrastructure for the distribution of improved germplasm and efficient markets for the inputs and outputs of livestock production.

The Commission on Genetic Resources for Food and Agriculture

With its 178 member countries, the Commission on Genetic Resources for Food and Agriculture offers an intergovernmental forum where global consensus can be reached on policies relevant to biodiversity for food and agriculture. The main objective of the Commission is to ensure the conservation and sustainable use of genetic resources for food and agriculture and the fair and equitable sharing of benefits derived from their use, for present and future generations.

Its work focuses on developing and overseeing the implementation of policies and supporting initiatives that raise awareness and seek to solve emerging problems. It guides the preparation of periodic global assessments of the status and trends of genetic diversity, the threats facing genetic diversity and the measures being taken to promote its conservation and sustainable use. The Commission also negotiates global action plans, codes of conduct and other instruments relevant to the conservation and sustainable use of genetic resources for food and agriculture.





PHOTO CREDITS *(from top left to bottom right)*

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Key findings

1. Livestock diversity facilitates the adaptation of production systems to future challenges and is a source of resilience in the face of greater climatic variability.
2. The roles and values of animal genetic resources remain diverse, particularly in the livelihoods of poor people.
3. The adaptations of specific species and breeds to specific environmental challenges need to be better understood.
4. The impact of many livestock-sector trends on animal genetic resources and their management is increasing.
5. The world's livestock diversity remains at risk.
6. The assessment of threats to animal genetic resources needs to be improved.
7. Institutional frameworks for the management of animal genetic resources need to be strengthened.
8. Establishing and sustaining effective livestock breeding programmes remains challenging in many countries, particularly in the low-input production systems of the developing world.
9. Conservation programmes for animal genetic resources have become more widespread, but their coverage remains patchy.
10. Emerging technologies are creating new opportunities and challenges in animal genetic resources management.
11. Livestock diversity and the sustainable management of animal genetic resources are acquiring a greater foothold on policy agendas.

Full report at <http://www.fao.org/3/a-i4787e/index.html>

E-book version at <http://www.fao.org/publications/e-book-collection/en/>

Implementing the Global Plan of Action for Animal Genetic Resources at
<http://www.fao.org/ag/angr.html>

