

Regional Report on Animal Genetic Resources: North America



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Introduction

This report is one of a series of regional and subregional reports prepared as part of the Annex to *The State of the World's Animal Genetic Resources for Food and Agriculture*. The North America region comprises Canada and the United States of America.

The livestock industry in North America is of significant agricultural importance. In Canada and the United States of America, farm gate livestock receipts are approximately 44 percent and 50 percent of total agricultural revenue, respectively. The primary livestock species contributing to the farm gate receipts are: cattle, pigs, chickens, turkeys, sheep and goats. Across the region extensive, mixed crop-livestock and industrial production systems are utilized for livestock production. Within each of the production systems, management practices and breed utilization are similar in both the countries of the region. Much of this similarity is due to the similarity between environments, and the cross-border marketing of livestock products which encourages product uniformity.



North American genetic resources

Almost all animal genetic resources were either imported or are the result of crossing imported genotypes. While one might infer from this that within-breed diversity is relatively small, this is probably not the case. A significant number of livestock breeds have been present in North America for over 100 years, and in some instances breeds have been in North America for over 400 years. As a result of different production systems, mutation and genetic drift, North American breeds could be very different from their counterparts in the country of origin. Two examples demonstrate this point: the North American Holstein, which has been exported globally; and Hereford cattle, in which research has demonstrated that most of the Herefords in the United Kingdom currently have Canadian Hereford ancestors. In the United States of America, the sheep industry has emphasized increasing growth rates, mature size and prolificacy. Such emphasis has altered the performance of sheep raised in different environments, suggesting the development of genetically diverse subpopulations.

In addition to the global breeds mentioned above, there are significant numbers of rare/minor breeds located throughout North America. Many of these breeds have not had consistent selection pressure placed upon them; therefore, natural selection and drift have undoubtedly contributed to the divergence of the genotype from that of the original population.

For cattle, there are great similarities between the production systems and genotypes used across the region. The primary difference between the region's two countries is that in the Gulf Coast region of the United States of America *Bos indicus* breeds are utilized either as pure-breeds or as cross-breeds with *Bos taurus* breeds.

Genetic exchange between the two countries is such that some of the farm animal populations could be considered to be single populations. This is most extreme in the case of industrial chickens and turkeys, which are selected by a very small number of companies that supply commercial birds throughout the world. Populations of dairy and beef cattle are separate but intertwined, and the main breeds are connected genetically, to varying degrees, to populations in other parts of the world. Aims and programmes for pig genetics may be different between the two countries, but there is a move towards internationalization of pig breeding following the pattern of the poultry industry, which may result in a reduction of pig genetic resources.

Genetic resource issues

Both countries have developed a set of priority issues, which include:

Canada:

- education and promotion of conservation with public, industry and government;
- information management;
- research on useful conservation technologies; and
- a system of rescue networks.

United States of America:

- development of the National Animal Germplasm Program;
- increasing industry awareness and action;
- quantification of breed-level genetic diversity; and
- mainstreaming genetic diversity issues in other federal programmes.

Management of genetic resources

Both countries are industrially developed and use advanced breeding and selection techniques involving extensive record keeping for most breeds of livestock. Breeding and selection programmes are supported by active research programmes.

NORTH AMERICA

The number of producers is decreasing in both countries. At the same time, the number of animals per unit is increasing, as is industry dependence upon one or two breeds or lines for production. Within the pure-bred livestock industry, there has been a reduction in the number of people breeding pure-bred livestock for long periods of time. This situation has long-term ramifications for genetic diversity, as it reduces potential sources of genetic diversity for future breeders entering the business and underscores the need for cryopreserved collections of germplasm.

Both countries are in the process of developing gene banks. Elements of common interest include:

- *ex situ* conservation of germplasm for all breeds, not just those that are classified as rare or endangered;
- sampling methods to capture genetic diversity across and within breeds;
- provision of back-up storage of genetic material (built-in redundancy);
- establishment of categories of collected material, based on ownership, disease status or other criteria; and
- collaborative development of conservation and related technologies.

Ownership, access and use of genetic resources

The region has well-established laws on the ownership and exchange of livestock genetic resources. As a result, no further action is needed in this area. Access is controlled by the livestock owner and benefits/prices are determined by the market, which responds to supply and demand pressures. There is open exchange of genetic resources across the border in the region, and this type of market-driven exchange has significantly benefited the livestock sector of both countries. Therefore, there is neither need nor demand for additional international instruments to control trade and/or benefit-sharing of animal genetic resources. The success of this region's genetic-resource exchange may well serve as a model for other regions.



Strategic priorities for genetic resource actions in North America

- Develop a regional database for genetic resource management;
- develop cryopreserved collections of breeds;
- increase levels of private and public in situ conservation;
- improve quantification of within and between-breed diversity;
- develop protocols for cryopreservation;
- increase industry involvement; and
- promote and encourage market-driven international exchange of animal genetic resources.