1. Animal genetic resources and sustainable development

Animal genetic resources are considered to be all species, breeds and lines of cultural, scientific and economic importance that ensure the present and future needs of human society and agriculture.

Animal genetic resources are usually considered genetically unique populations, together with their direct, wild ancestors, which have arisen through domestication processes within individual animal species and are currently used for food production and agriculture.

Why are animal genetic resources important and why do they need to be conserved? It is already clear from the previous slides that they need to be conserved, particularly because they are the basis of animal production and are, therefore, a resource for food production as well as for agriculture. Increased demand for food of animal origin is also an important factor. If we want to ensure food production, we have to have sufficient animal genetic resources that are well-adapted to the production environment. But they may not always be sufficiently competitive with globally distributed breeds in terms of their performance. Such breeds, however, have a unique gene pool and are often considered part of the cultural or national heritage. In the context of the conservation of animal genetic resources, it should also be mentioned that the occurrence of bacterial or viral diseases, which spread rapidly, can significantly reduce the size of their populations. The following slides will go through each of these points in more detail.

Even if 40 species of domesticated animals are used in food and agriculture, some contribute more to food production than others. According to statistics from 2018, up to 97% of global meat production was produced by only 8 species, only 4 species produced 100% of milk production, and in the case of egg production, chickens accounted for up to 93% of global production. However, within each livestock species, different breeds are distinguished. In 2020, the Food and Agriculture Organisation registered a total of 8719 livestock breeds, of which 6% are now considered extinct that means they have no living males and females or genetic material stored in a gene bank. In addition, up to 26% of breeds are considered to be at risk of extinction. 13% of breeds are not at risk of extinction. But also important is the fact that for 55% of the breeds the endangered status is currently unknown that means in the future, such breeds and populations need to be monitored to get a more accurate view of the status of animal genetic resources.

The figure shows the predicted increase in production and consumption of poultry, beef, pig and sheep meat from 2019-2021 to 2031 according to the Organization for Economic Cooperation and Development. In general, global consumption of food of animal origin is expected to increase by 14% by 2030 compared to the period from 2018 to 2023, due to both population growth and increase in income. The increase is predicted to occur mainly in lower and middle income countries. However, this increase needs to be covered by sufficient number of animal genetic resources.

Local populations of animal genetic resources occurring only in a particular geographical region are genetically unique because they contain specific genotypes in their gene pool that control their typical phenotypic traits and characteristics compared to other populations. These genotypes distinguish them from other breeds. The fact that such populations are often closed

and do not exchange genes with other populations or breeds means that they have a relatively large genetic distance from other breeds.

Regarding animal genetic resources, it is also necessary to mention the concept of preservation or conservation. Conservation of animal genetic resources means their use and development for food production and agriculture in a sustainable way. In many cases, these are mainly animal genetic resources that already have a high degree of adaptability to the production environment, for which genetic principles are applied that will facilitate their sustainable development as well as the subsequent sustainable intensification of production systems.

Conservation of animal genetic resources means, in other words, preserving the diversity of livestock genetic resources in order to contribute to the production and productivity of food and agriculture not only now but also in the future. Conservation applies to all human activities, including the development of strategies, programmes and policy and legislative action. Conservation genetics is an essential component in the development of conservation strategies for animal genetic resources. This is not only the theoretical but also the practical part of genetics, which refers to the conservation of species as dynamic parts capable of evolving and adapting to their environment so as to minimise the risk of their loss. Conservation genetics includes several disciplines such as ecology, molecular biology, population genetics, mathematical modelling and other theoretical and applied sciences.

So how to preserve animal genetic resources? In terms of conservation, there are two approaches, in situ and ex situ conservation. In the case of in situ conservation, we are talking about conserving animal genetic resources in the native environment to which they are well adapted or in an environment that is similar to their native environment. This term can therefore be used to refer to all measures to conserve populations of animal genetic resources, including those involved in active breeding programmes in different agroecosystems. The aim of in situ conservation is to ensure that animal genetic resources contribute to sustainable food and agricultural production not only now but especially in the future.

Ex situ conservation of animal genetic resources means the preservation of genetic material by means of live animals outside their native environment (ex situ in vivo), or the preservation of genetic material in an artificial environment, usually under cryogenic conditions, e.g. cryopreservation of sperm, oocytes, embryos, cells or tissues (ex situ in vitro). In this case, for example, gene banks. A gene bank is a physical location for the storage of samples of well-identified genetic material in the form of live animals or genetic material, i.e. in situ (e.g. a group of dams and sires, a herd) or ex situ (stored insemination doses, oocytes, embryos, cells or tissues). In Slovakia, a gene bank for animal genetic resources is located in Lužianky.

The following two slides summarise the regulations and activities related to the conservation of animal genetic resources. The FAO is one of the most important organisations from this point of view. Even if discussions about animal genetic resources took place before then, the first major conference was the United Nations Conference on Environment and Development, during which the Convention on Biological Diversity was adopted. This was followed by the adoption of the Global Strategy for the Management of Animal Genetic Resources in 1993 and the Rome Declaration on the Conservation and Sustainable use in 1996. In 2000, the Cartagena Protocol was accepted, dealing with biosafety from the perspective of genetically modified organisms. Currently, the conservation of animal genetic resources is managed by several strategies. Among the most important are the Global Plan of Action for Animal Genetic

Resources adopted in 2007, the Nagoya Protocol agreed in 2010, the Strategic Plan for Biodiversity 2011-2020 and the Sustainable Development Goals under the 2030 Agenda.

At European Union level, these include the European Biodiversity Strategy, the European Green Deal, the EU's Common Agricultural Policy and the EU's Rural Development Policy.

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