

Editorial

# Conserving the Genetic Diversity of Domesticated Livestock

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**Abstract:** Domesticated animals live and produce in an environment influenced by both natural and human factors. These agricultural environments are important to maintain for human survival and also for their interactions with natural environments. Effective conservation of domesticated biodiversity can help to assure sustainable agricultural systems that minimize negative influences on natural environments. In addition, livestock biodiversity is a component of total biodiversity and for several species is the only remaining source of diversity because the wild ancestors are now extinct. Conservation of livestock biodiversity depends on cultural and biological approaches. Each of these has differential importance depending on the specific location of the genetic resource as well as the human culture in which it resides. Effective global conservation blends these in different measures to assure positive outcomes that succeed in securing the genetic resource as well as its contribution to human survival and well-being.

**Keywords:** conservation; domesticated livestock; breed

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The genetic diversity of domesticated animals is often overlooked as having a meaningful contribution to global biodiversity. Most observers consider that it is minimally important when compared to the importance of maintaining and conserving the biodiversity of wild environments. However, several factors point clearly to the importance of domesticated biodiversity.

One reason is that many of the ancestors of our domesticated animals are now extinct, or perched on the edge of extinction [1]. Among the extinct ancestors are horses, cattle, and dromedary camels. To lose the genetic diversity that provides for the vitality and viability of these species would lead to the elimination of an entire species, and this is certainly counter to wise management of the global ecosystem.

A second reason acknowledges the role that these animal populations play in human history and ongoing human survival [2]. While very different from wild organisms, domesticated species are the ones that play the most direct and obvious role in human survival. If these are managed wisely, they can contribute to sustainable agricultural systems that relieve pressure on wild ecosystems.

Conserving genetic resources of domesticated animals is a complicated task [2]. These animals function in human-defined and human-influenced spaces, and are subject to selection by both human and natural pressures. Successful conservation needs to account for both cultural and biological factors, and failure in either of these leads to failure in the final outcome.

The papers in this Special Issue reveal how varied and complicated this issue can become, and also illustrate the fact that a variety of approaches can contribute to successful outcomes. Some efforts rely on an approach based on the gross phenotype of the animals (Loja cattle [3], Patagonian sheep dog [4]). Much of the South African work emphasizes cultural connections between genetic resources and their host communities [5–9]. An approach based on molecular genetics is possible in some countries, most notably those with sufficient infrastructure and finances. Strategies based on such techniques

have been used in the Netherlands for cattle [10] and in several other countries for breeds of several species, all to good effect [11,12]. Strategies for long-term conservation involve cryopreservation, which is organized at both governmental and non-governmental levels [13–15]. The overarching organization of these efforts is also of great concern and can help to assure success [16].

Combining all of these components into a final successful outcome is challenging [17]. Not every technique is going to be available or realistic in every setting, and for that reason a diversity of approaches is important to document and consider with regard to the potential roles these can play in field situations. Past successes in many different parts of the world have been based on widely different procedures, and these can now be borrowed and used across different regions to inform and influence successful conservation efforts.

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