

# Animal genetic resources (AnGR) in Mozambique

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**Abstract.** Mozambique is a country on the eastern coast of Southern Africa, where livestock plays an important role in the agriculture sector, due to its contribution to socio-economic development and poverty reduction. Given the variations in climate, soil fertility, rainfall pattern and altitude among the different areas, the country is divided into ten agroecological regions, each one with its own characteristic production systems and livestock breeds. In the family sector, livestock is mostly composed of indigenous breeds: Landim cattle, goats, pigs and chicken, Angoni and Bovino de Tete cattle breeds and Pafuri goat. In order to restore the quantity and quality of the genetic resources of indigenous breeds and promote their conservation and sustainable use, the country is carrying out several actions and activities, including public awareness campaigns about the importance of indigenous breeds and the need for their conservation, inclusion of AnGR issues in the curriculum of universities and agricultural colleges, characterization of AnGR collection and conservation of semen from native bulls.

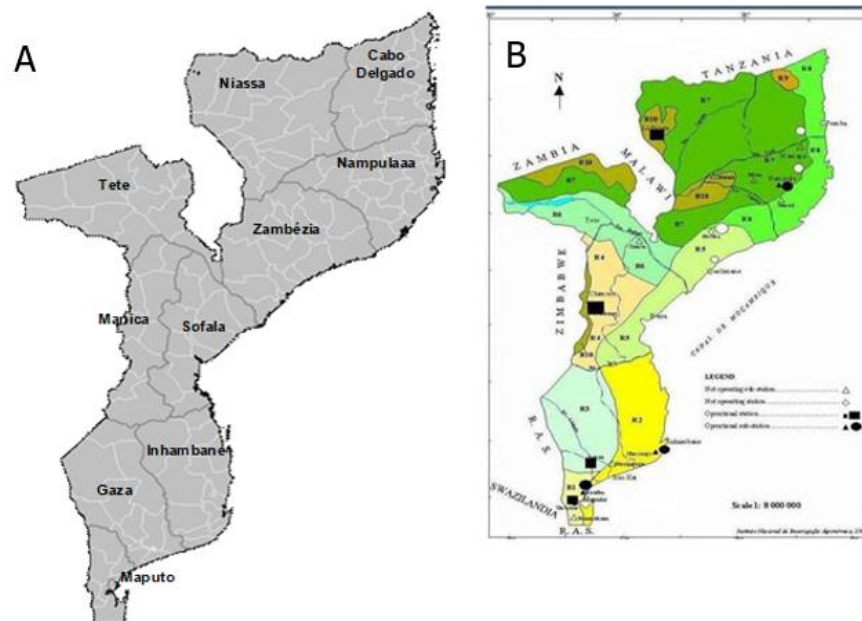
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## 1. Introduction

Mozambique is a country on the eastern coast of Southern Africa which shares borders with: Tanzania to the north; Malawi and Zambia to the northwest; Zimbabwe to the West, South Africa; Swaziland to the south (Figure 1A). On the East, the section of the Indian Ocean called the Mozambique Channel. It has an area of 801,590 km<sup>2</sup> and about 2,000,000 habitants, distributed in 11 provinces, namely Maputo City, Maputo, Gaza, Inhambane, Sofala, Manica, Tete, Zambézia, Nampula, Cabo Delgado and Niassa. The capital of Mozambique is Maputo and Portuguese is the official language.

The average annual temperature ranges between 20°C and 25°C with two main seasons: rainy/warm season, lasting from November to March, and dry/cool season from April to October [1]. Mean annual rainfall ranges from 350 mm near the Mozambique/Zimbabwe/South Africa border to 2,000 mm in the highlands of Zambezia. In north of the Rio Save, the rainfall is more concentrated with a long dry season, except in parts of the coast. The rainfall in the south of this region is less concentrated in distribution and winter rains can be encountered in areas closer to the coast [2]. Given the variations among the different areas, the country is divided into ten agroecological regions, each one with its own characteristics of production systems and livestock (Figure 1B).





**Figure 1.** Map of Mozambique (A) and its ten agroecological regions (B).

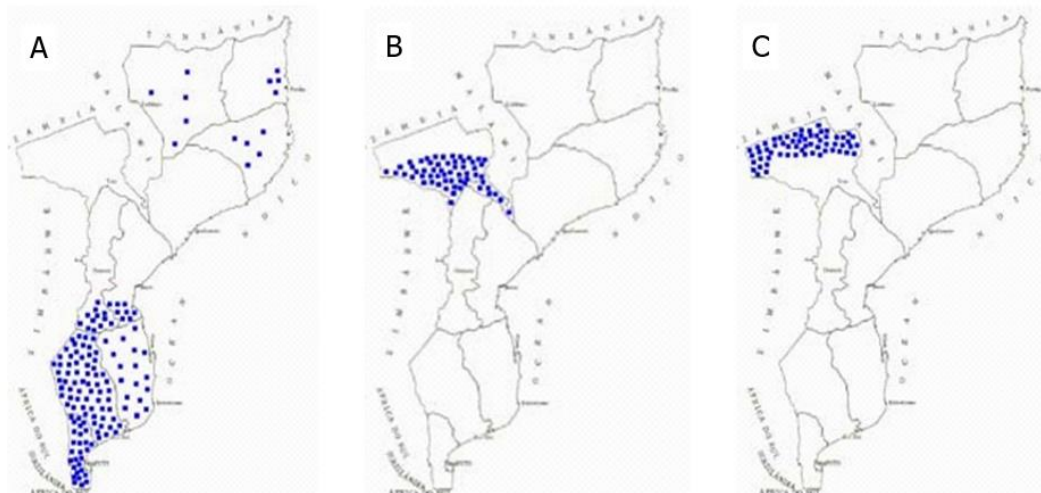
Livestock plays an important role in the agriculture sector, due to its contribution to the socio-economic development and therefore to poverty reduction. In the family sector, livestock is mostly composed of indigenous breeds of animals, with some degree of mixture with exotic blood. The indigenous breeds are mostly seen as inferior breeds as a result of unsuitable nutritional, sanitary and reproductive management practice [3]. This review paper describes the indigenous breeds in Mozambique, demonstrates their benefits for smallholders' farmers and demonstrates the importance of conserving the Animal Genetic Resources (AnGR) in Mozambique.

## 2. Characterization of indigenous breeds

The Mozambican breeds have been bred since their origin under natural conditions, with low levels of artificial selection. As a consequence, these breeds have been adapted to indigenous environmental conditions and are resistant to a number of endemic subtropical diseases. However, extensive crossbreeding, replacement with exotic breeds, and social and environmental disasters have placed these indigenous bovines at risk of extinction [4,5]. Most native breeds are named as Landim, which in the South of Mozambique means Indigenous or Local. This name may vary according to the regions and different native languages spoken throughout the country, as in the North (Nampula) native chicken is called Macua. The native breeds of cattle in Mozambique are Landim, Bovino de Tete and Angoni. The Landim breed is based in the southern lowland areas, Tete breed in the Tete province and Angoni in highlands of Tete as shown in the maps (Figure 2) [3].

### 2.1. Landim cattle

The Landim accounts for more than 70% of the national cattle herd. It is successfully used for meat production, due to its high calving and weaning rates associated with a relatively good dressing percentage, which can reach up to 51–57% with supplementary feeding during the dry season, at 3 to 4 years old. The Landim is small to medium-sized breed and adapts well to harsh environments like drought and forage seasonality. It has low nutrient requirements for maintenance and excellent walking ability in search of grazing and water and tolerant to extreme temperatures (Figure 3A). It is resistant to ticks (*Rhipicephalus* sp.), tick-borne diseases (*Anaplasma* sp. and *Babesia* sp.) and gastrointestinal nematode parasites [6,7].



**Figure 2.** Distribution of native breeds of cattle in Mozambique. (A) Landim. (B) Bovino de Tete. (C) Angoni. Source: FAO.



**Figure 3.** Native breeds of cattle in Mozambique. (A) Landim. (B) Bovino de Tete. (C) Angoni. The source of photographs A and B are FAO, C is from Vernooij [3].

### 2.2. Bovino de Tete

Bovino de Tete is morphologically similar to the Landim but smaller in size and with a larger hump and lateral black horns (Figure 3B). Its carcass can yield 85–110 kg depending on the season. Due to its long adaptation to the low rainfall areas and the high temperatures, Bovino de Tete have great ability to survive in a very harsh environment and produce meat as well as draught power. Bovino de Tete represents almost 20% of the national cattle population and is mostly concentrated in the lowland areas of Tete province, in the southern part, in the arid and semi-arid lowland areas of the province [3].

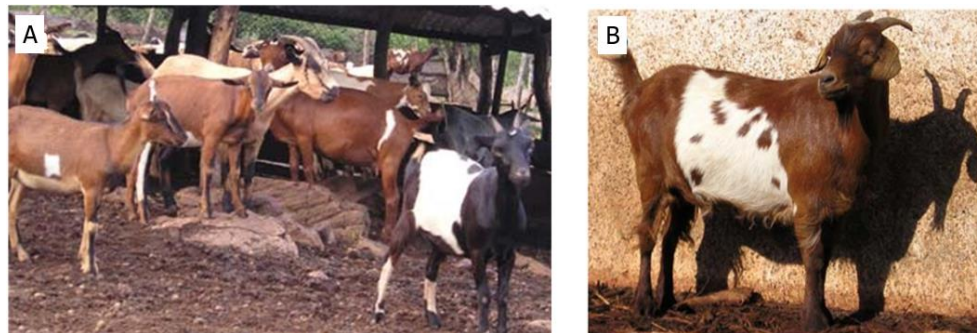
### 2.3. Angoni

The Angoni cattle are concentrated in the highlands of Tete Province bordering with Zambia and Malawi. It is found in the Angonia plateau, Marávia, Macanga, Fingué and Zumbo, the border with Zambia. It constitutes about 8% of the national cattle herd. The main purpose of this breed is meat production, but it is occasionally used for draught (pulling of carts) and milk production. It is the smallest native cattle breed in size, but the males can weigh up to 730 kg (Figure 3C). Angoni is very resistant to diseases like *Theillaria* in its original environment [4,7].

### 2.4. Goats and sheep

The Landim goat is the main breed, spread throughout the country with small variations in size and adaptation to harsh conditions (Figure 4A). In Tete province, they look bigger and with a higher fertility rate than in the south of Mozambique. Smallest goats are found in Nampula province and the biggest in Tete regions. The Pafuri goat is bigger and a typical of transhumance system in Gaza

province, where it is milked during the drier periods of the year (Figure 4B). As with other species, the Landim sheep is the most common in the country. The ratio of sheep to goats vary from 1:4 to 1:10 depending on the area, but sheep are mostly used for traditional and religious ceremonies [8].



**Figure 4.** Native goats in Mozambique. (A) Landim. (B) Pafuri. Source: FAO.

### 3. Management of animal genetic resources (AnGR) in Mozambique

Factors, such as war, shortages of infrastructure, funds and expertise, have contributed to the reduction of productivity of indigenous breeds. Due to these concerns and the need to bridge the huge productivity gaps in developing countries like Mozambique, the production systems is experiencing rapid changes. Indigenous livestock genetic resources, which constitute the largest proportion of livestock in the country, are increasingly being eroded through poorly planned crossbreeding and breed replacements. Their unique genetic attributes, especially those responsible for adaptation, might be lost under such condition.

The country has ratified the Global Plan of Actions (GPA) for the management of AnGR, and several steps have been taken and continued to be monitored to ensure its implementation. It mandated The Institute of Agricultural Research of Mozambique through the Center for Genetic Resources and Assisted Reproduction to identify, develop and test the feasibility of breeding programs and technologies in order to increase the availability of high genetic merit animals, with emphasis on native breeds. They are implemented via the following actions and activities:

- a. *Restoration of genetic superiority of indigenous breeds, particularly cattle.* This is achieved by backcrossing existing diluted cows with semen from pure-bred animals.
- b. *Crossbreeding and selection studies to develop efficient animals for the production sector.* This is performed on pure native and pure exotic breeds to improve certain traits in the native breeds (dairy and beef) within native breed selection to develop specialized animals, e.g. Landim dairy cows, native beef steers and Landim layers. The Center for Genetic Resources and Assisted Reproduction provides good quality semen, artificial insemination services and the selection of animals of high genetic value for exchange or commercialization between interested breeders.
- c. *Revision and update of laws and regulations.* Current laws and regulations dated from the colonial period, therefore there is a need to update to adequately reflect the real current situation of the country. In this context, the animal health regulation has been revised and updated in 2017, which incorporate mainstreaming of AnGR into existing laws and regulations. Most existing laws are weak on issues related to conservation and sustainable use of native breeds, and AnGR focus mainly on raising livestock, improving animal health, access to veterinary services, and identify the strengths and the major shortcomings of sectors that need to be addressed.
- d. *Survey and monitoring of AnGR.* The current statistics only cover up to species level and there is no breed information, which makes it difficult for their sustainable use. Therefore, the country is:
  - Putting efforts in capturing information on the breeds of the animals for the inclusion of the information on the coming census.



- Entering data into the Domestic Animal Diversity Information System (DAD-IS) database, a database coordinated by FAO and managed in each country by national coordinators for AnGR.
- e. *Performance evaluation of AnGR*. Awareness campaigns are on place to promote animal identification and to implement a national recording scheme to enable identification of superior indigenous breeding stock.
- f. *Livestock infrastructures*. Rehabilitation of infrastructures for conservation and management of AnGR, such as sanitary infrastructures like tanks for “carracid” baths and treatment aisles and productive management infrastructures like booths for the dynamization of breeding programs where the breeders will be based.
- g. *Capacity building of Mozambican staff for the management of AnGR*. Through assistance and collaboration with partners, there is a program to strengthen the capacity of veterinary services, increasing their coverage in communities through extensive training of veterinary technicians at various levels and the availability of means of work. There are also programs for the improvement of the cold chains in veterinary services for the conservation and distribution of biological products (vaccines and semen), and also revision and updating of veterinary legislation.
- h. *In situ and ex situ conservation of AnGR*. Semen collection of Landim cattle breed and dissemination of information about the importance and superiority of native breeds in the tropics, particularly towards climate changing.

#### 4. Concluding remarks

The genetic diversity of indigenous breeds represents unique resource and opportunity when there is increased demand for livestock products. It is the country’s responsibility to make full use of and benefit from it. In the case of Mozambique, awareness of the significance of conservation and sustainable use of AnGR is often limited at the policy level. Such limitations do contribute to the current lack of adequate characterization of indigenous breeds and lower consideration of AnGR in policy decisions. The public sector investment in AnGR development has also declined. Consequently, less attention is paid to breed improvement activities.

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