



AFRICAN UNION  
**INTERAFRICAN BUREAU  
FOR ANIMAL RESOURCES**



# CHARACTERIZATION, INVENTORY AND MONITORING: THE GAME CHANGERS TO SUSTAINABLE UTILIZATION AND CONSERVATION OF ANIMAL GENETIC RESOURCES IN AFRICA



## KEY MESSAGES

- *Existing AnGR are important for food and nutritional security and poverty eradication: Documenting National AnGR is worth investing in continuously*
- *Characterization is a good tool for informed and better utilization of AnGR (crossbreeding, ABS, Selection)*
- *Inventory and Monitoring enables the assessment of levels and types of threats and therefore informs proper management and conservation strategies*

## INTRODUCTION

Considering the fact that Africa have large reserves of AnGR, the stark poverty among livestock keeper's points to the fact that these resources have not been extensively developed and utilized. The challenge is the perceived production superiority of the exotic animal resources over local AnGR and the persistent drive of many African governments to support importation of these exotic breeds. Despite the possession of ecological and economically beneficial traits, the bare fact is there is a continual conscious drive by stakeholders at all levels to implement rapid-results oriented breed improvement programmes, especially crossbreeding, with the primary aim of improving the indigenous breeds. However, the key issue to ponder is what is considered as success? Could short-term results of high productivity favorable from a socio-economic view point be considered "successful" as compared to the consequent long-term losses of indigenous adaptive traits?

African countries have documented losses of their indigenous populations through rampant crossbreeding and breed replacement activities. Characterizing the AnGR for their attributes and taking inventory of their numbers are prerequisites to selective breeding. Characterizing and taking inventory of AnGR are integral components of the management of genetic resources. According to the First and Second State of the World's Animal Genetic Resources for Food and Agriculture reports, documentation on the actual population size for over two-thirds of African breed populations was found missing. The lack of this vital information places Africa's rich AnGR diversity at risk, as decline in numbers of indigenous populations may remain undetected and result in the complete loss of ecologically-important traits or entire local animal populations. Evidence elsewhere where characterization, inventory and monitoring of AnGR have been consistently and comprehensively been undertaken demonstrates that the three activities (characterization, inventory, monitoring) have led to knowledge on breed characteristics, and have thus guided their utilization and development. These have also shed light on the actual value of the breeds including, adaptive traits. Diligent characterization, inventory and monitoring have established AnGR status and trends and prompted where conservation activities were necessary. Availability of such information, and results from the analyses and the

interpretation from the information have often provided new dimensions to policy makers, who have to make decisions on AnGR development, protection and trade. Data available for Africa indicate several bottlenecks to the ready access and use of such information. Current issues and factors driving the need for characterization, inventory and monitoring of AnGR, and their linkages with other management practices in the domain of animal genetic resources are presented in the paragraphs below.

## **POLICY RELATED ISSUES**

Among issues raised concerning characterization, inventory and monitoring involving local AnGR are:

- Globally, the geographical distribution of most breeds is poorly documented and this has continued to slow down the process of effective management of AnGR. This remains so despite the emphasis placed by the FAO guidelines for phenotypic characterization and stress the importance of collection of geographical information to be used to map out the spatial distribution of AnGR. In reference to Africa, spatial distribution and location of many livestock species remains relatively poorly documented and many domestic animal populations are not geo-referenced. The availability of this information would contribute towards a better understanding of socio-economic and biophysical environments, a combination of key features that could present an opportunity to predict changing livestock systems.
- The need for regular taking of inventory and monitoring of AnGR is considered crucial. Through these activities, knowledge of the population size, structure and trends, spatial distribution, breed characteristics, cross-border genetic linkages, breed production environments and AnGR threats can be documented. The lack of functional monitoring and early warning systems in Africa has resulted to poor knowledge on the trends of animal populations. Currently, most African member states integrate the collection of data on AnGR within National Human Census. The information collected is often not exhaustive and not fully representative of the actual AnGR status. Most countries rely on livestock population estimates which often are not a true reflection of the population status of the AnGR on the ground, hence possibly contributing to the poor response in the management of endangered animal populations. In addition, the long interval between one human census and another, ten years in most countries, is not considered suitable for effective monitoring of AnGR populations. In developed countries other tenable approaches such as keeping herd books that effectively monitor AnGR have been adopted. The lack of/poor application of checks that contribute towards preventing the loss of these valuable AnGR that are the economic backbone and bread basket for many in rural Africa has resulted in adverse consequences.
- The lack of or inadequate resources presents itself in technical incapacity, financial constraints and infrastructure deficiency.

- a. Technical incapacity** – The evident lack of specialized technical capacities within African member states has continued to slow AnGR characterization and monitoring efforts. Some of the tools in use are skill-specific and due to the evident lack of skilled personnel within the African continent, the extensive use of characterization tools continues to lag behind. Case in point, Sudan established a molecular lab but the lack of skilled manpower has turned the facility into a white elephant. The lack of trained personnel in Africa especially in relation to the molecular characterization tools, large-scale genotyping, genome analysis is evident;
- b. Financial constraints-** The lack of available funds within national governments has resulted to irregular inventorization of AnGR within African states. Considering that livestock census is an expensive activity, most governments have not been in a position to fund this activity regularly. This has resulted to of the misrepresentation of the actual state of AnGR in the respective countries. In most countries there are no budgets allocated for the upgrading of national research laboratories with modern technologies, often these national bodies depend on donations of equipment from developed countries or governments attempt to purchase some equipment that more often than not is mediocre;
- c. Infrastructure deficiency-** There is a lack of established and functional laboratories or centers of excellence. There are no regional training hubs that are equipped with state-of-the-art equipment. As a consequence African scientists are unable to undertake cutting edge research and acquire relevant skills.
- Breed level data is lacking in most African Countries with most activities undertaken aimed at species-wise statistics while breed-wise data remains largely unavailable. In Western and Eastern Africa, cattle breeds such as the Lagune and Ethiopian highland zebu have no accurate breed inventories. Some observed technical shortcomings (ascertainment bias) with the novel molecular tools have also contributed significantly to inconclusive characterization of African breeds. The low representation of African breed genomes during the development of genotyping tools has been the main contributor to this shortcoming. Of the 150 indigenous African cattle breeds that have been named, the majority remain largely uncharacterized.
  - Africa is home to a wide diversity of Animal genetic resources, whose genetic architecture has been shaped by environment and human selection. However, these very resources face loss or dilution of their valuable traits due to an increased shift of focus to perceived economically beneficial animals as opposed to an ecologically fit one<sup>14</sup>. There has been an increase in active breed replacement and crossbreeding to the detriment of the indigenous animal population. This however has been driven by the rampant lack of awareness by the rural livestock keeper. Most of the adaptive traits that are well-suited to the effects of climate change have not been highlighted and emphasis placed on their importance for the future generations.

- Currently most African member states integrate the collection of data on AnGR within National Census. Often the data gathered is not representative of the actual AnGR status due to use of less detailed piggy-back surveys. According to FAO, Africa documented a total of 33 and 10 breeds that are extinct and endangered respectively. Approximately 517 mammalian and 210 avian breeds in Africa have their risk-status unknown due to the lack of operational inventory and monitoring systems. Developed countries have made herd books and other records available electronically with regular updates. Some African Countries such as Namibia - Namibia Stud Breeders Association (NSBA) and South Africa - SA Studbook have attempted to monitor specifically the stud animals (registered animals). This unfortunately is not the situation in other parts of Africa where record keeping is still not well implemented and most governments do not allocate any national funds towards this undertaking.
- Often small-holder livestock keepers compete with the commercial sector in the same market pool. Unfortunately, market forces dictate prices and direction of breeding programmers, thus favoring crossbreds and exotic breeds. There is a clearly biased grading system that favors the exotic breeds, thus resulting in the un-competitiveness of the indigenous breeds products. In addition, the evident lack of awareness of the economic benefits that the indigenous AnGR possess has resulted in their low utilization, for example, the increased importation of Girolando instead of Azawak.
- State sovereignty over genetic resources and benefit-sharing is a core principle of the United Nations Convention on Biological Diversity (CBD). Genetic material movement across the globe should be without impediment but favorable caveats should be put in place to prevent the loss of these very resources by the originators. However, due to the lack of available or adequate information on the genetic potential of African AnGR, the continent continues to encounter losses of their AnGR including indigenous knowledge.

## LESSONS LEARNT ON EXTENT OF CHARACTERIZATION UNDERTAKEN IN AFRICAN COUNTRIES

In 2014/2015, AU-IBAR undertook a study among 42 of the AU Member States (MS) on the status and development of their animal genetic resources (AnGR). The Study was part of a broader programme whose goal was to get Member States to be effectively involved in the sustainable utilization of AnGR, and to carry out their functions in ways that ensure food security and improved livelihoods. From the results of the studies recently carried out on AnGR by AU-IBAR, and from the other observations made in some few countries in Africa relative to loss of some breeds, due to the absence of proper inventory and monitoring, it has emerged that indeed the extent of characterization and the progress made from the lower levels of characterization to higher levels, both have been low. Experiences from outside of the continent show that diligent applications of characterization, inventory and

monitoring indeed aided the improvement in AnGR development. Given the low financial support to these activities and similar inadequate capacity in several countries, as well as inadequate laboratories and other facilities, only significant investments in Africa to overcome the inadequacies can the three activities be game changers in Africa in respect with successful AnGR development and protection.

As part of the Study, information was sought from MS on:

### **The current state of characterization**

In the AU-IBAR Survey on AnGR in which Member States were asked to describe the state of characterization of AnGR in their countries, and to report on progress made in the previous 10-20 years, most of the countries reported on the state of characterization of AnGR. For cattle, 32 (81%) countries reported to have had characterization taken place. Of this, 19 had only done the basic breed surveys, 6 each had done the advanced breed surveys and the quantitative characterization, respectively. Only 3 countries (Algeria, Togo, Burundi) reported to have done the molecular characterization, and further one country (Algeria) having undertaken economic valuation for cattle, sheep and goats. Only one country (Togo) reported having started stage 7 of evaluation of breeds and crosses for use in particular production systems, in the case of Togo, sheep and goats.

For sheep, 22 or 65% of countries had undertaken the basic breed surveys, 6 accomplished advanced breed surveys, 5 had undertaken quantitative characterization. In the case of goats, 17 or (50%) of countries had done the basic breed surveys, 6 and 9 had undertaken quantitative and molecular, respectively. For pigs, 19 of the 42 countries did not provide information. Of the 23 that provided information, 14 or 61% of countries had undertaken the basic breed surveys, five (5) and three (3) had undertaken the advanced breed surveys and quantitative characterization, respectively. In the case of poultry 16 (38%) of countries did not provide information. Thirteen (13), 5, 6 and 2 had undertaken the basic breed surveys, advanced breed surveys, quantitative, and molecular characterization, respectively.

### **Progress made in characterization of breeds**

In terms of progress made in characterization of breeds in the past 10 to 20 years, twenty-one (21) or 50% of countries did not provide information on progress made on characterization of breeds/species. Of the 21 that provided information, 17 or 81% of countries noted progress had been made in the past 10-20 years. In general, most countries did not indicate whether they had undertaken the last stages of characterization, that is, Stage 6 and 7, being monitoring and early warning, and evaluation of breeds and crosses for use in particular production systems, respectively.

## **Dilution of indigenous breeds on their inherent desirable traits (adaptive and productive)**

The compilation of the observations from those surveys showed that there have been numerous reported cases of the loss and /or dilution of the indigenous breeds in Africa. These included the Lesotho indigenous short hair goat strain has been diluted through generations of crossing with Mohair goats and its characteristics have essentially disappeared; the loss of adaptive traits such as trypanotolerance in the Namchi breed of Central Africa due to increased zebu influence<sup>15</sup>; dilution of the Red Maasai breed with the Dorper in East Africa; in Malawi exotic dairy breeds replacing the local Malawi zebu leaving the latter neglected and the fear of its eventual loss<sup>16</sup>. Other assessments found inadequate investments in improvement and conservation of local AnGR due to the lack of ring-fenced budget allocations for animal genetic resources by national governments.

## **SETTING THE POLICY AGENDA**

The Agenda setting for policy discussions, formulation and the communication of the policies should consider are:

### **Characterization, inventory and monitoring tools**

Improve and efficiently apply characterization, inventory and monitoring tools across the African continent with a view to enhance benefits from investments in AnGR.

### **Pursue better utilization and more competitive AnGR**

Member States should be well informed and made aware of the benefits of their Animal Genetic Resources. This knowledge and awareness should result in better utilization of these resources, such as used in selection programmes geared towards improving the buffalo in Egypt. Characterization should further provide information that will guide livestock keepers in matching genotypes with the environments. Pursuing better utilization approaches should ensure livestock keepers make informed decisions on breed selection in existing production systems.

### **Increase farm and animal resources productivity and seek better prices**

Characterization is critical to selection and breeding programmes. Applying characterization prior to breeding programmes will lead to improved productivity and ultimately increased yields. Increasing the productivity of traditional breeds is also an incentive for livestock keepers to retain these breeds and fetch better prices.

### **Pursue improved livelihoods and sustainable environmental health**

Animal Genetic resources can be a safety net for the poor and is an important contributor to food security in all of the African countries. Most African countries that have observed the due process in terms of effectively and regularly characterizing, inventorizing and

monitoring their AnGR have reaped enormous benefits e.g. Kenya- Boran, Zimbabwe-Tuli amongst others. Better management of these animal resources has also contributed significantly to reduced environmental degradation of the continent land resources.

## **POLICY OPTIONS AND RECOMMENDATIONS**

Policy options to resolve some of the outstanding issues and making characterization, inventory and monitoring of AnGR necessary adjuncts to successful animal genetic improvement programmes in African include:

- African Governments take bold decisions to loosen the purse strings on AnGR. In other words, National Governments should make conscious efforts to increase budgetary allocations towards characterization, inventory and monitoring activities geared towards protecting the heritage of the continent – African Animal Genetic Resources, from threats and extinction.
- African Governments through their Ministries and Agencies responsible for the development and utilization of AnGR should take the bold steps to embrace new technologies, innovate and experiment with novel techniques. In pursuance of this, concerted and harmonized moves should be taken by all member states to adopt and domesticate the newly developed Animal Genetics Resources Characterization, Inventory and monitoring tool (AnGR-CIM) tool for Africa. This is a customized tool developed by Africans for African AnGR. Additionally, governments should increase their financial support to the training of skilled personnel in new technologies and techniques to support characterization and monitoring of AnGR.
- African Governments and their Regional Integrating and Economic blocks (RECs) should boldly embrace the old adage of “Unity is strength” and jointly promote regional and continental institutional collaboration and co-operation through creating enabling environments at all stakeholder levels.
- Member States Governments through their Ministries and Agencies responsible for the development and protection of AnGR should fast-track the formulation of comprehensive policies, Acts and legislation that will support characterization, inventory and monitoring of AnGR.
- As a matter of urgency African Governments should beat the proverbial war drum announcing the loss of African Animal Genetic Resources to extinction, and subsequently promote advocacy and awareness raising campaigns to highlight the importance of AnGR, the essence of characterization and monitoring to policy makers and various stakeholders.

## ACKNOWLEDGEMENTS

Many persons have contributed to the preparation of this document through their constructive feedback and suggestions. These inputs provided a vital contribution to the planning and completion of this policy brief. AU-IBAR wishes to thank them for their interest and support.

This policy brief was made possible through financial support provided by the European Union (EU) funded Project “**Strengthening the Capacity of African Countries to Conservation and Sustainable Utilisation of African Animal Genetic Resources**”. The contents are the sole responsibility of the authors and under no circumstances should be regarded as reflecting the position of the European Union.

Copies of this policy brief are available on the following websites: [www.au-ibar.org](http://www.au-ibar.org)



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