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International cooperation to improve forage supply in grasslands in Kenya and Tanzania

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Key words: international project; participatory strategies; livestock production; pasture management; Arid and Semiarid Lands.

Abstract:
Grasslands and savannas cover a significant area of the earth and are home to much biodiversity and livestock, including cows, goats, sheep, and other animals. Livestock production in these ecosystems is characterized by a low supply of forage mainly due to advanced erosion processes, overgrazing, shrub invasion, lack of availability of quality grass seeds and the concomitant decline of palatable species. The purpose of this paper is to describe the exchanges and highlight the potential for collaboration for the construction of knowledge, in science and technology, focused on livestock production in the arid and semi-arid zones (ASALs) of Kenya and Tanzania. Between 2017 and 2022, a bilateral technical cooperation project promoted by the Argentine Fund for International Cooperation (FO.AR) was carried out called: "Improvement of livestock production in arid and semi-arid areas of Kenya". The activities of this project focused on the participatory identification of the main constraints affecting smallholder livestock production. The project involved Kenyan researchers, extension workers, national and county government livestock officials, and livestock producers. Since 2020, different Tanzanian institutions (Ministries) have resumed their relationships with Argentine cooperation agencies to participate in several training proposals to improve the supply of forage for livestock systems in Kenya and Tanzania. During the project, six missions were carried out, four from Argentina to Kenya and two from Kenya to Argentina, in addition to participatory workshops for the identification of constraints and proposals for strategies to address these constraints. The German government, which has a presence in the two African countries, had shown interest in these activities and in 2022 a new project was approved: "Strengthening capacity building to improve smallholder farming livestock systems and contribute to agri-food sustainability in Kenya and Tanzania". This project is financed by Germany and is executed by the following institutions: Kenyan Ministry of Agriculture, Livestock, Fisheries and Cooperatives, Tanzania Ministry of Livestock and Fisheries, Argentine Agency for International Cooperation and White Helmets Humanitarian Assistance (National Directorate of International Cooperation), Ministry of Foreign Affairs, International Trade and Worship; Ministry of Agriculture, Livestock and Fisheries; the National Institute of Agricultural Technology (INTA), the Tanzania Livestock Research Institute (TALIRI) and the Kenya Agriculture and Livestock Research Organization (KALRO) and livestock producer organizations at provincial and/or municipal (county) levels.

Introduction

Savannas and grasslands occupy a fifth of the earth's land surface witha large human population, and livestock and wild herbivores inhabit these biomes. Grasslands are known as seedbeds for the ancestors of cereal crops and the domestication of cattle, donkeys, goats, and sheep. Grasslands have been largely considered as a carbon reserve (Curtin and Western, 2005) and are highly dynamic ecosystems because of variable rainfall, soil nutrient levels, fire and herbivory (Rutherford et al., 2012). Grassland states vary from sites with a range condition with ample herbaceous cover, perennial grasses and scattered trees to states with a poor cover of annual grasses, absence of perennial and palatable grasses, a high proportion of bare soil and/or often bush encroached (Rutherford et al., 2012).

In arid and semi-arid lands (ASALs), where the climate is less suitable for crops, pastoralism is the main livestock system and occurs in 40% of Africa's terrestrial area (ILRI, 2021). Pastoralism contributes between 10 and 44% of the gross domestic product (GDP) of African countries with approximately 1.3 billion people benefiting from the livestock value chain. Also, over 75% of cattle herds in Kenya and 90% in Tanzania are kept by pastoralists who supply the bulk of meat consumed in those countries (Nyariki and Amwata 2019). Cattle production of small farmers in ASALs in Kenya and Tanzania and Arid and Semiarid Chaco regions in Argentina present common production and social features, for example, the lack of forage, the loss of native palatable grasses and forbs, the increasing area of bare ground, and bush encroachment caused mainly by overgrazing, deforestation and rainfall variability (Mureithi et al.2015).

The trajectories of knowledge development, including tacit and scientific knowledge, when shared, allows an accelerated knowledge growth amongst all the actors involved, facilitating learning about strategies to overcome common constraints. The approach focuses on the "win-win" strategy, where everyone learns from each other's experience.

In 2017, an international cooperation strategy began with the aim of improving livestock production which includes two stages, a first that reached until 2023, linking Argentina and Kenya, in a project founded by the Argentinian Fund for International Cooperation, with the main objective of exchanging experiences in research and extension, technology transfer and training in grazing management and animal nutrition contributing to security and food sovereignty, while taking care of the available natural resources.

At the end of 2023, a second stage in cooperation began with the start of a second project, founded by the German International Cooperation Agency (GiZ), linking Argentina, Kenya and Tanzania, with the main objective of strengthening the technical capacity necessary to increase meat and milk production in livestock systems of smallholder farming.

Methods

The methodology consists of:

1) International missions where key people visited INTA Agricultural Experimental Stations (EEAs), research centrs of the Kenyan Agriculture and Livestock Research Organization (KALRO), research centres of the Tanzanian Livestock Research Organization (TALIRI), farms, companies producing fodder, pasture seeds, balanced feed and companies for the manufacture and maintenance of agricultural machinery and tools..

2) Face-to-face workshops with farmers, researchers, extensionists and public policy decision-makers, to identify constraints and challenges of livestock production systems and identify strategies to overcome them.

3) Virtual workshops with researchers and extension workers from the countries involved working cooperatively dealing with specific topics of livestock production of ASALs aimed at sharing technological proposals.

4) Meetings with public policy decision-makers in the field of livestock production of ASALs.

5) Implementation of demonstration plots with appropriate technologies for forage management.

Results

From 2017 to 2023, a first cooperative project was carried out between Argentina and Kenya, seven missions were carried out, four from Argentina to Kenya and three from Kenya to Argentina. Visits to KALRO, farms, machinery workshops and enterprises dedicated to produce balanced foods were made in Kenya. During the visits to Argentina, EEAs (spell out) and Research Institutes of INTA and private farms were visited. In addition, both during the visits to Kenya and Argentina, meetings were held with public officials from the livestock areas of the provinces and counties visited. These exchanges aimed to know and understand the challenges of the livestock producers of the ASALs, the technological developments of the science and technology institutions aimed at overcoming these challenges and the strategies developed by the private sector.

Two participatory workshops were held, the first in 2019 in Isiolo city in Kenya, to identify the main restrictions, opportunities and solutions that arise in livestock production in the ASALs of Kenya. Thirty-seven people participated and they identified the following restrictions: overgrazing, high stocking rate, bush encroachment, land degradation and land use change, non-implementation of grazing management plans, droughts and water scarcity, inadequate water harvesting structures, deforestation, weak connection between extension services and research activities, inadequate marketing information system, insecurity, competition for resources and poor intercounty linkages.

A second workshop was held in the frame of the GiZ founded project during November 2024 in Arusha city in Tanzania, to identify the main appropriate technologies to promote the improvement of the forage supply for pastoralists' and smallholders' livestock systems in the arid and semi-arid areas of Tanzania. Twenty-seven people participated. The methodology implemented was a foresight analysis and it was discussed that the main technologies should be oriented towards well defined land ownership by individuals, groups or company, developing of climate-smart approach technologies, effective invasive species strategy control, effective control of soil erosion, increased production of pasture seed and the development of water infrastructure for livestock.

Two virtual workshops were held with broad participation of researchers and extension workers discussing and analysing strategies to improve livestock systems in the ASALs of Kenya and in the Arid Chaco region of Argentina. Seven INTA research centres in Argentina in different provinces, three KALRO research centres in Kenya and the International Livestock Research Institute(ILRI) in Nairobi, and two Tanzanian Livestock Research Institutes in Tanzania were visited during the virtual workshops.

The design of two experimental-demonstration plots and its location were defined in the last mission made in November 2024 by the technical team of the three countries. The productivity (biomass) and seed production of 4 native species will be determined: Bush rye (*Enteropogon macrostachyus)*, Maasai love grass (*Eragrostis superba*), Horsetail grass (*Chloris roxburghiana*) and Foxtail grass (*Cenchrus ciliaris*). Also, an experiment to assess the effect of bush clearing by two methods was designed including 3 treatments: a) Control, without intervention: b) Manual bush removal and c) Mechanical treatment for shrubbing. The analysis of the investments, labour and administrative aspects were managed by the technicians with the support of personnel from GIZ. The plots were closedto domestic and wild animals, and have different areas.

Discussion

The characteristics of livestock farming in the ASALs of Kenya, Tanzania and the Arid Chaco of Argentina are similar, both from the natural conditions, the social actors involved, and the restrictions and challenges faced, although their historical trajectories are very different. Technological developments are similar, although with particularities in each country, which allow mutual learning by sharing experiences. While in the two African countries research and extension activities are separated between different institutions, in Argentina both are within the same institution, which favours dialogue and exchange. The exchange of experiences, discussion

and analysis of strategies with practical learning in the visualization of the technological trajectories followed by each of the countries to achieve the resolution of common problems, is highly valued and tends to accelerate the process of development of technologies and its application in livestock systems.

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