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Experience of good practices in the cooperative sector

Reference farm for the extension of the Boer goat breed: a sustainable contribution

Finca de referencia para la extensión de la raza caprina Bóer: un aporte sostenible

Quinta de referência para a extensão da raça de cabra Bôer: uma contribuição sustentável

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ABSTRACT

The work was developed in the period from April 2019 to October 2021, in the farm "Los Miglioris" in La Isla de la Juventud, with the objective of contributing to the creation of a reference farm for the extension of the Boer goat breed in that entity. A characterization of the farm was carried out, taking into account the number of animals per species, human capital and total area. Extension methods such as field days, demonstrations, courses and workshops were applied. Theoretical and empirical methods were used, and a figure was proposed in the form of a guiding thread for the creation of a reference farm for the Boer breed. As main results, a participative diagnosis was applied in the farm to know the existing conditions for the extension of the Boer breed, with which it was recognized that it was necessary to develop improvement actions in the productive unit. Extension

actions are proposed for the creation of a reference farm in the "Los Miglioris" farm, which will serve as an experimental polygon to extend the experience to other producers in the territory.

Keywords: participatory diagnosis; extension; reference farm.

RESUMEN

El trabajo se desarrolló en el período de abril 2019 a octubre 2021, en la finca "Los Miglioris" en la Isla de la Juventud, con el objetivo de contribuir en la creación de una finca de referencia para la extensión de la raza caprina Bóer en esa entidad. Se realiza una caracterización de la finca donde se tuvo en cuenta la cantidad de animales por especie, capital humano y el área total. Se aplicaron métodos de extensión como días de campo, demostraciones, cursos y talleres. Se utilizaron métodos del nivel teórico y empírico, además se propone una figura en forma de hilo conductor para la creación de una finca de referencia de la raza Bóer. Como principales resultados, se aplicó un diagnóstico participativo en la finca para conocer las condiciones existentes para la extensión de la raza Bóer, con lo cual se reconoce que hubo que desarrollar acciones de mejora en la unidad productiva. Se proponen acciones de extensión para la creación de una finca de referencia en la finca "Los Miglioris", la cual servirá de polígono experimental para extender la experiencia a otros productores del territorio.

Palabras clave: diagnóstico participativo; extensión; finca de referencia.

RESUMO

O trabalho foi desenvolvido no período de abril de 2019 a outubro de 2021, na quinta "Los Miglioris", na Ilha da Juventude, com o objetivo de contribuir para a criação de uma quinta de referência para a extensão da raça caprina Bôer naquela entidade. Foi efetuada uma caracterização da exploração, tendo em conta o número de animais por espécie, o capital humano e a área total. Foram aplicados métodos de extensão tais como dias de campo, demonstrações, cursos e oficinas. Foram utilizados métodos teóricos e empíricos, e foi proposta uma figura sob a forma de um fio condutor para a criação de uma quinta de referência para a raça Bôer. Como resultados principais, foi aplicado um diagnóstico participativo na quinta para descobrir as condições existentes para a extensão da raça Bôer, com o qual se reconheceu que tinham de ser desenvolvidas ações de melhoramento na unidade

de produção. São propostas ações de extensão para a criação de uma quinta de referência na quinta "Los Miglioris", que servirá como polígono experimental para estender a experiência a outros produtores do território.

Palavras-chave: diagnóstico participativo; extensão; quinta de referência.

INTRODUCTION

At the end of the twentieth century and the beginning of the present, agriculture has progressively become dependent on technologies and the productive strategy has been oriented towards the national and international market. The use of information is imposed and training is identified as an essential investment in the production process as research is strengthened as a support for innovations. These concepts become premises for the development of livestock farming in Latin America and in the entire tropical region (Marquínez Batista et al., 2022).

Goat production is a practice that has been developed for many years and is mainly manifested in the grazing of this species in fruit and forest plantations (silvopastoral and agrosilvopastoral systems), with the fundamental purpose of taking advantage of the food resources available in these areas for low-cost meat production (Barboza Mora et al., 2020).

Fonseca Pinto et al. (2019) state that goat feeding is mainly based on free grazing of pasture species. This is generally insufficient in terms of the amount of biomass and nutrients, especially during the dry season, when the quality and availability of pasture decreases. This situation causes a delay in the animals' body development, weight loss, low fertility, mortality and a decrease in milk and meat production.

Goats, multipurpose animals, produce meat, milk, skins, hair and their manure is considered an excellent organic fertilizer. In Cuba, the objective of their exploitation is basically directed to milk production. One tenth of the milk consumed in the world comes from goats and, in certain regions, it is the only dairy source; in others, such as in some parts of Asia, India, Africa and the Caribbean, these animals constitute the most important supply of red meat (Rodríguez Cruz et al., 2021).

Extension is a continuous process to bring useful information or technology to the population (communicative dimension) and to help them acquire the knowledge, skills and aptitudes necessary

to make effective use of this information or knowledge. From this perspective, they propose that the agricultural extension system should contribute to increasing production, productivity, net income and family welfare without detriment to the environment, through the strengthening of the organization of production, the full participation of all producers in this organizational process and the use of educational methods (Baracaldo Martínez et al., 2022).

In this context, it is emphasized that communication tools and methods for developing extension programs should serve to integrate end users in the adoption of results, taking into account local knowledge and cultures (Chávez Silvestre et al., 2022).

According to Gispert Muñoz et al. (2019), since the triumph of the Cuban Revolution, the government devoted special attention to livestock development, aware of the need to improve milk and meat production since the most important environmental factor to achieve increases in milk production in Cuba is the supply of adequate feed, which covers the requirements of the animals.

In the conditions of La Isla de la Juventud, the implementation of the Integral Development Program and the elaboration of the Strategic Projection until the year 2030 have intensified the development of goats as an alternative to satisfy the food needs of the population and the demand of the industry. According to the proposed strategy, these species must necessarily become one of the economic bases of the country and of feeding the population.

Since 2010, the incorporation of the Boer breed of the goat species to increase the biodiversity of the animals as a policy of the livestock company within the Agricultural Development Program has been a precedent in the Pinar del Río region. Within this system, the unit under study of the producer Alcides Gonzalez Miglioris was chosen for the establishment of the species where his results in other breeds of the species are taken as experience.

Under these conditions, the problematic situation faced by the following research is related to goat species that have insufficiently manifested their productive potential. In the initial diagnosis carried out by a working group made up of several specialists, the main problems were determined to be the lack of livestock culture in goat breeds, due to insufficient experience in their establishment and exploitation. In the referred territory, these elements may be due to the absence and lack of knowledge of technologies, insufficient economic, human and material resources and an indiscipline in the management of small livestock species, all of which is linked to the lack of a strategy to promote goat farming as a promoter of territorial livestock development.

As main elements, the genetic reserve among producers is deficient, training actions are insufficient and there is no reference farm for goat exploitation in this territory. The following problem needs to be solved: the non-existence of a reference farm for the exploitation of the Boer goat breed in the Pinar del Río region.

The objective is to contribute to the creation of a reference farm for the extension of the Boer goat breed on the "Los Miglioris" farm on La Isla de la Juventud.

MATERIALS AND METHODS

In the course of the research, it was necessary to use different methods that provided its orientation and adequate direction. Theoretical and empirical knowledge methods were used in an interrelated manner in correspondence with the characteristics of the object and the objectives conceived. A participative diagnosis was carried out, applying the brainstorming technique; this process was developed in three work sessions.

Theoretical methods: these allowed corroborating the foundations that support scientific research and present the most important aspects of the object of research.

Historical and Logical: it was used in the act of describing and analyzing the different methods and means used in goat production systems.

Hence, this method made it possible to analyze the logical historical development of the main aspects of goat production and, in particular, the processes that contribute to its improvement, which is materialized in the fact that it is a subject of great interest and help for the scientific community and producers with this species.

The systemic method was used to obtain a systemic vision of the different factors that facilitate or drive the development of goat farming systems, as well as the interrelation of their components.

Empirical methods: were used to reveal the characteristics and behavior of the object of study of the research.

Scientific observation: it was used to obtain information about the application of extension methods used on the farm.

Measurement: it was used to measure the variables foreseen in the research related to the methods and methodologies most used in goat production systems by researchers and producers.

The extension methods applied were:

- Field days to educate farmers in a participatory way about farm conditions
- Exhibitions to demonstrate the management of the Boer breed to farmers
- Courses/workshops to train goat farmers in genetic management of herds

RESULTS AND DISCUSSION

Trends of goat farming systems

Livestock in Latin America and the Caribbean contributes approximately 45% of the region's agricultural value added and represents 40% of the global value of agricultural production. Its value reached 79 billion dollars in the U.S. For several years, the regional growth rate of this sector has been 4%, twice the world average (Ortiz Morales et al., 2021).

In tropical countries, agricultural production is mostly based on small and medium producers and productivity is relatively low compared to highly technified systems (Serrano Torres et al., 2021). Many of these traditional production systems are located in marginal areas, exposed to biotic (diseases and pests) and abiotic (drought, excess water, low soil fertility, aluminum toxicity) stresses, resulting in a vulnerable situation, aggravated by the effects of climate change.

According to Alva Perez et al. (2019) sheep and goats are species that efficiently use forages, compared to other animals, but this feeding must have a good balance of proteins and energies with grazing, however, in the case of goats, the high requirements during lactation must be covered with high quality fresh forage supplements.

In Latin America, sheep and goats represent the fundamental axis of rural development for small and very small producers from the economic, social, productive and food security points of view (Ledezma Torres et al., 2022). For the analysis of the results of this study, economic, productive, social and environmental variables were considered, which allowed a description of the main characteristics of the sheep and goat production systems in Panama, as well as the agroindustrialization and marketing of products derived from goat milk and sheep and goat meat.

Given that resources such as soil and water are increasingly scarce, increased production will have to come from improved productivity. Land brought into production is generally of lower quality and presents greater risks of degradation than land currently under cultivation (Mestra Vargas et al., 2019).

Hernández Medrano et al. (2021), define livestock systems only as those in which more than 90% of the dry matter fed to livestock comes from pasture, annual forage and purchased feed and less than 10% of the total value of production comes from non-livestock agricultural activities. In this toolbox, additional subsystems have been identified to create relatively homogeneous groupings to describe environmental impact. However, although the definitions imply different systems, current pressures on livestock production result in a blurring of the boundaries between one system and another, mixed systems that use external feed and may begin to be indistinguishable from industrial systems.

There is agreement with Hernández Bautista et al. (2022), when pointed out that production systems are strongly confronted with limitations that are almost always the result of the conjunction and/or combination of agroecological and management factors. In the case of the pasture resource, not only the edaphoclimatic conditions are determinant in favoring the expression of the productive potential of the species, but also have a great influence on the management of the pasture in terms of the application of cultural practices.

Furtado Araújo et al. (2020) consider that livestock activities in the tropics are influenced in each production unit by factors such as: communication routes, proximity to cities, type of soil, size of ranch, availability of labor, economic capacity and the activities of the rancher and their idiosyncrasies. Much importance is given to breeding, fattening and milk production, which is considered to be ancillary to these activities. However, milking is an activity that is becoming increasingly popular among farmers due to the good market for milk and its products.

Exploitation of goat species: Boer breed

The development of the Boer breed was due to the need for a strong animal that could withstand the harshest climates and temperatures, where the environments are extreme and arid, thus resulting in a large animal. This breed is believed to be related to native goats that were cared for by the Hottentot and migratory Bantu tribes of South Africa. The name comes from the Dutch word "Boer"

which means farmer, it is believed that they were called this way because they had to differentiate the home goats from the imported goats, all this was in the 19th century.

At the end of the twentieth century and the beginning of the present, agriculture has become progressively dependent on technologies and the productive strategy has been oriented towards the national and international market. The use of information is imposed and training is identified as an essential investment in the production process, while research is strengthened as a support for innovations. These concepts become premises to be able to develop livestock farming in Latin America and throughout the tropical region (Gayo et al., 2018; Martínez Herrera et al., 2020).

It is also referred that these criteria prevailed in the 1960s, when more than 30,000 ha of leguminous plants were planted in Cuba, which were affected by several factors, among them: lack of research and previous experience, lack of knowledge of the adaptation or regionalization of the species used, of their basic management principles, the high level of intensification to which they were subjected, and others, which caused farmers to lose interest in these production systems.

According to Martínez Melo et al. (2022), since the triumph of the Revolution, the government has devoted special attention to the development of livestock, aware of the need to improve milk and meat production, since the most important environmental factor for increasing milk production in Cuba is the supply of adequate feed to meet the requirements of the animals.

However, given the economic conditions in which the revolutionary process has developed, the country's leadership has directed its efforts to ensure that the fundamental basis of livestock feed is the use of high quality pasture and forage, as this is a valuable resource for feeding animals in the tropics.

Therefore, one of the biggest mistakes made is to try to implement an animal improvement program based on modern intensive farming systems, without taking into account not only natural conditions, but also the integration with agriculture and the socio-economic environment.

Scientific and technological development has made it possible to increase the efficiency of livestock farming by improving the sanitary conditions and, in general, the maintenance of the animals (Solís Lucas et al., 2020). This has led to the development of intensive livestock farming as opposed to the traditional, extensive form of utilization (Ormaechea et al., 2019).

Characterization of the farm

The work was carried out at the "Los Miglioris" farm, located in the Delio Chacón Popular Council on La Isla de la Juventud, in the period from April 2019 to October 30, 2021.

The farm has a total area of 26.84 ha, including five hectares of various crops, mainly vegetables, three hectares of infrastructure, and the remaining 18.84 ha are dedicated to grazing, of which only 8 ha are free of marabú, the rest are infested with this species.

The farm's human capital consists of five workers, one of whom is a woman; its main source of income is made up of family members and neighbors from neighboring areas.

It has a total of 32 goats, most of which are of the Boer breed and the rest are Sannen, dedicated to the production of meat and milk, respectively. It also has four cows, 10 sheep, three horses, 12 pigs, 23 rabbits and a flock of chickens, ducks and geese.

In order to understand the dynamics of this process, figure 1 is shown below, which is the common thread for the creation of a reference farm.

Main results in the creation of the reference farm

In order to carry out the research, a work team was defined and the methodological steps for the creation of a reference farm for goat breeding were developed; everything starts from the producer's own request to create the reference area, they are:

Teamwork

- Alcides Gonzalez Miglioris: purebred goat farmer
- Yamisleydis Rodríguez Oliva: extensionist
- Rolando Valdés Lloser: worker
- Alejandro Diéguez Rodríguez: worker
- Antonia Suárez Almaguer: worker
- Enrique Alberto Monteagudo Suárez: worker
- Roberto González Miglioris: worker
- Yailin Martínez Torres: small livestock specialist

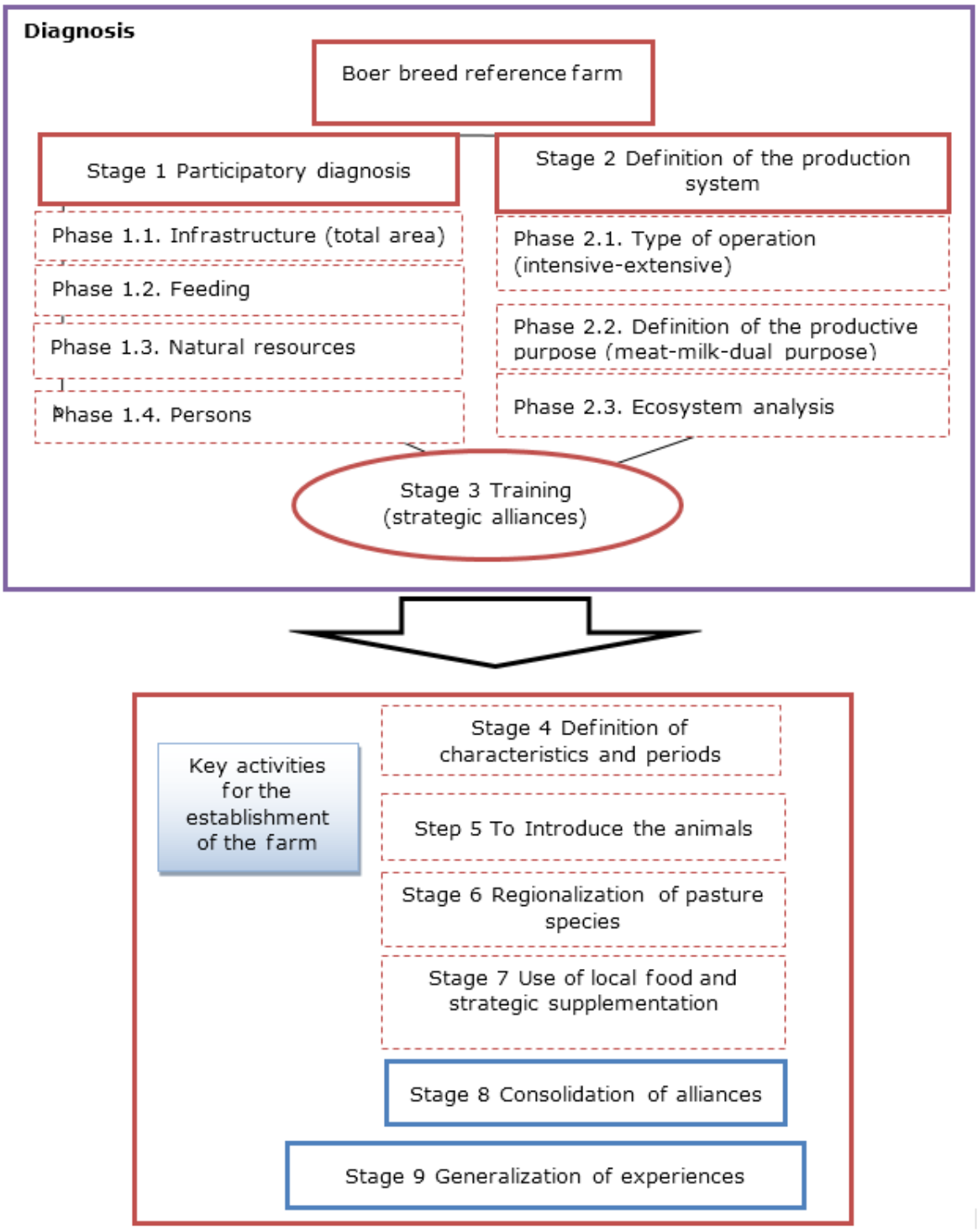

Fig. 1 - Thread for the creation of a reference farm

Source: Prepared by the authors

Through a SWOT analysis, the following aspects are defined by the members of the extension group:

Weaknesses:

- Insufficient training opportunities for goat farmers
- Insufficient productive areas with pasture and fodder for goat feed
- The non-existence of a genetic center to refresh the species in the hands of farmers
- Insufficient relations with training centers

Threats:

- Insufficient strategies for the development of goat species in the region
- Insufficient demand of goats' derivatives by that region´s population
- Environmental conditions and natural phenomena affecting the territory
- Difficulties in the physical infrastructure and resources come mainly from Havana

Strengths:

- To have a comprehensive agricultural development program, including one dedicated to food
- Number of areas to be dedicated to goat farming
- Source of water supply
- Producer experience with other goat species

Opportunities:

- Producers interested in having a reference farm
- Secure market
- Sources of employment of cooperatives belonging to the cooperative
- Government interest in developing the goat species
- Availability of external sources of financing to support local development initiatives

Application of extension techniques

Several extension techniques were applied for the development of the work, thus generating the participation of all members of the extension team.

Among the techniques applied:

- Four field days to instruct producers in a participatory manner on farm conditions, with the participation of Alcides González Miglioris, goat farmer; Yamisleydis Rodríguez Oliva, extensionist; Rolando Valdés Lloser, worker; and Yailin Martínez Torres, specialist in small livestock
- Six demonstrations to show producers how to manage the Boer breed. Yailin Martínez Torres, a specialist in small cattle, participated in these actions as a specialist
- Three courses/workshops to train goat farmers in genetic management of herds, alliances were created with the Upgrading and Training Center and the University. The topics were related to: Management of the Boer breed in tropical conditions, Feeding systems and Management of feed supplement alternatives

Key activities for the establishment of a farm

Components and their good management practices

Productive units:

The work team proposes to consider the following structure for a reference farm:

- Disinfection point
- Milking parlor
- Shadow Ships
- Maternity
- Nursing
- Waiting room
- Warehouse
- Office and personal grooming facilities
- Water tanks
- Sleeves and lanes for animal movement
- Quartons
- Crematorium

On the other hand, the facilities must have dung-heaps for the collection of solid animal waste and plant crop residues. As for the position of the different facilities that will integrate the unit, it will depend on the need to reduce animal movement to a minimum, by allowing mechanical handling of feed and manure with adequate ventilation, as well as fencing of the area.

Good practices

- Maintain an inventory of the areas, broken down according to natural pasture, naturalized pasture, forage, weeds and self-consumption
- The main existing varieties and the main data of the subordinate units must be known
- Herd by species and category
- Total workers and main data on these workers: qualification, salaries, gender
- Main basic means: machinery, transportation, housing, agricultural implements, etc.
- Predominant soil types
- Water supply situation
- Status of the quartering facilities
- Irrigation systems

Soil-plant-animal complex

Plants, animals, water, soil, among others, are renewable resources as long as there is a real concern to exploit them in a way that allows their natural or human-induced regeneration. The excessive use of these resources by producers has led to the depletion of many of them; however, the authors of this research consider that they can be replenished if good management practices are carried out.

Some take little time to renew, as is the case with crops, while others, such as water and forests, take a comparatively longer time to renew.

Among the best practices proposed by the authors are:

Soil

- Manure can become a farm and water pollutant, however, as an animal by-product it can be used cured for direct use, for the manufacture of compost and worm humus to produce biogas and use the sludge also as fertilizer as well as the waste

- The fresh organic matter from the sheds, i.e. from the daily extraction, should be irrigated as a priority in the lower fertility plots. The application should always begin in the farthest quarters of the unit. The cutting areas (fodder) should also have priority in the use of organic matter, that is, after the low fertility quarters

Plant

- Study of the species more adapted to agricultural production conditions
- Characterization of the composition and availability of pastures
- Sowing of pastures, complying with technological discipline
- Implementation of strategies such as the association of legumes and grasses, silvopastoralism, protein banks, etc.
- Utilization of pastures for haymaking, silage, multi-nutritional blocks and pedestal assembly
- Establishment of multipurpose trees and shrubs, in addition to their use as living fences, windbreaks, etc.
- Use of short-cycle species to obtain yields and results in a short period of time
- Proper management of invasive species

Animal

It is also necessary to apply technologies that are viable and easy to use in order to promote their incorporation into production systems, both in the state sector and in cooperatives, which entails taking advantage of the minimum conditions and resources available, always with the will to guarantee today in order to have more and better tomorrow.

- Apply herd management technologies in the different categories
- Establish adequate selection and replacement systems for the herd in production to guarantee the permanence of the best animals
- To create facilities for the producer to increase the productive potential of his herd through genetic development
- Reduce animal mortality in all categories and increase preventive measures against major diseases
- Develop, implement and rescue chemical, biological and physical alternatives for the control of weeds and woody shrubs, especially for the control of marabú (*Dichrostachys cinerea)*
- Promote artificial insemination technology to obtain better reproductive results

As final considerations, the systematization of the theoretical references on goat farming systems in the world context and in Cuba showed that the trend is linked to the increase in goat production to meet the high demand for food to ensure food security and sovereignty.

A participatory diagnosis was carried out in the "Los Miglioris" farm to know the existing conditions for the extension of the Boer breed, recognizing that it was necessary to develop improvement actions in the productive unit. Therefore, extension actions are proposed for the creation of a reference farm in the "Los Miglioris" farm, which will serve as an experimental polygon to extend the experience to other producers in the territory. In addition, it is recommended to continue accompanying the producer of the reference farm in order to achieve the sustainability of the system.

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Conflict of interest:

Authors declare not to have any conflict of interest.

Authors' contribution:

Uliser Vecino Rondon and Adrián Cánova Herrandiz participated in the conception and design of the study, were involved in data collection and analysis, and prepared the draft.

Iván Castro Lizazo was involved in data collection, analysis and interpretation.

Uliser Vecino Rondon and Iván Castro Lizazo made a critical revision of the article with important contributions to its intellectual content.

All the authors reviewed the writing of the manuscript and approve the version finally submitted.