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## Characterization of goat production systems in the Ciego de Ávila province

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**ABSTRACT:** During the period of January-May, 2015, the goat production systems were characterized in all the municipalities of the Ciego de Ávila province. Two hundred and fifteen goat raisers, private as well as state ones, were visited and semi-structured surveys were applied, at farm level and in their respective productive bases. The total animals of the surveyed raisers was 25 735, which is equivalent to 86 % of the stock in the province. The Baraguá municipality stood out as the one with the highest quantity of heads (8 206), followed by the Majagua municipality (5 233 animals), which have 44,9 % of the total stock of the province. The average age of the raisers was lower than 60 years in more than 90 % of the respondents, and the high school or technical level prevailed, which is adequate if the training process about the goat species should be assimilated. In general, the crossbred or creole genotypes prevailed, although the Nubia breed prevailed in Baraguá and the Alpine crossbreed, introduced in previous years, predominated in the Primero de Enero and Majagua municipalities. The weight at slaughter was optimum in Baraguá, Florencia, Majagua and Venezuela (22-25 kg for six-month-old bucks), and the worst situation was observed in Morón with a much lower weight. The characterization made allowed to identify the insufficient attention received by the farmers linked to goat raising, extensive grazing systems on natural covers and little use of other alternative feeding sources, the technical-constructive deficiencies of the facilities, the parasite control, the scarce treatment of wastes before being used, and the limited technical orientation and training provided by the responsible entities of the territory.

**Keywords:** animal production, diagnosis, goat

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### INTRODUCTION

Around 8 000 years ago, goats were among the first animal species domesticated by human beings. Since then, this species has been much used by man, due to its meat, milk and skin, and to other advantages among which the use of their excreta as organic manure and the control of thickets by these animals stand out (ACPA, 2005). In many underdeveloped countries, goats continue to be the main animals that satisfy men's needs (Blanchard, 2004).

Goat stock management imposes new challenges in the next years of the 21<sup>st</sup> century to attenuate the negative effects that man causes on the ecosystem. In this sense, Flores and Ramírez (2013) reported that there are different alternatives that allow to revert this process, such as sustainable raising, based on the use of available inputs in the farm and which considers integrally the sociocultural and economic aspects, allowing to evaluate the reality lived in rural zones.

At international level, China and India are ranked in the first two places regarding the quantity of goats they have, but in the case of China, their productive indicators are among the lowest,

because of such aspects as climate, management systems, feeding, training of farmers and commercialization systems. However, India occupies the first place as milk-producing country (Aréchiga *et al.*, 2008).

Goat rearing in Cuba is highly linked to rural areas, and it is aimed at meat and milk production in the different feeding systems, where the seasonality variability of the available forage resources determines, largely, the nutritional state of the animals throughout the year, according to Bidot (2013). This demands timely decisions that allow the improvement of their productivity through the use of sustainable technological systems and the strengthening of infrastructure, supported by a technological and innovation management system, to increase meat and milk production in goat raising (Rabasa *et al.*, 2012; Pesántez *et al.*, 2014).

The current farming recovery strategy of Cuba is aimed at the management of a sustainable rural development policy which allows to articulate the economic growth with the preservation of natural resources and the environment. It is in the best sense,

far from being contradictory, a harmonic combination of the traditional agricultural work culture with the new entrepreneurial approaches of work organization and management in agriculture, to place the farming development of the country on sustainable bases.

Goat production systems in Cuba are generally in the hands of small farmers who manage the herds traditionally (ONE, 2014), which is finally reflected on the productivity and competitiveness of the goat sector.

The characterization of goat production systems in the Ciego de Ávila province would allow to identify the critical points on which to work in order to improve the productive and sustainability indicators, fundamental basis for the development of the goat industry, and the yield, productivity and acceptance by the consumer will depend largely on it.

Due to the above-expressed facts, the objective of this study was to characterize the goat production systems of the Ciego de Ávila province.

## MATERIALS AND METHODS

The study was conducted in the period between January and May, 2015, and comprised all the municipalities of the Ciego de Ávila province. During this period 215 goat raisers, private as well as state, were visited to whom semi-structured surveys were applied at farm level and in their productive bases (table 1).

Having at least 20 does was taken into consideration as a selection criterion to select the raisers, according to the available information in the Small Livestock Enterprise (EGAME for its initials in

Spanish) and the updated census of the National Center of Livestock Control (CENCOP for its initial in Spanish) of Ciego de Ávila.

In this sense, the total goat stock of the province is estimated in 29 925 heads, according to the updated census of the CENCOP in January, 2015 (table 2).

The questionnaires were elaborated according to the diagnosis-guide proposed by Landini *et al.* (2013), with the inclusion of technological, economic, environmental and social indicators for the farms, suggested by Leeuwis and Aarts (2011). In the study a system approach was applied, according to the proposal made by Landini (2012).

In the characterization of the farm or the raiser the socioeconomic aspects, infrastructure, technological capacities and human potential with regards to goat production were considered. This allowed to identify the main difficulties that limited the raising of the species and their possible solution through the formulation of training programs.

## RESULTS AND DISCUSSION

The total animals of the respondents reached 25 735 heads, which means that the owners of 86 % of the stock in the province were surveyed. This was the direct result of focusing the attention on farmers with herds of 20 does or more, and offers more complete information about the categorization of goat raising. Likewise, it was significant that, from the 215 surveys, 203 were applied in the private sector and only 12 in the state sector, which coincides with the statement by Bidot (2013) and

Table 1. Surveys applied to goat raisers of the Ciego de Ávila province.

Municipality	Quantity of surveys applied	Private sector	State sector
Baraguá	55	55	-
Primero de Enero	15	14	1
Florencia	20	19	1
Venezuela	15	13	2
Ciego de Ávila	20	18	2
Majagua	30	27	3
Ciro Redondo	20	19	1
Chambas	15	14	1
Bolivia	15	14	1
Morón	10	10	-
Total	215	203	12

Table 2. Goat herd per category (January, 2015), Ciego de Ávila province.

Municipality	Goat males					Goat females				General total
	Kids	Growing	Fattening	Bucks	Total	Kids	Growing	Does	Total	
Chambas	96	51	0	55	202	177	163	539	879	1 081
Morón	300	87	0	93	480	348	260	1 382	1 990	2 470
Bolivia	378	280	380	179	1 217	379	502	461	1 342	2 559
Primero de Enero	378	210	6	84	678	363	446	1109	1 918	2 596
Ciro Redondo	233	137	69	113	552	252	241	709	1 202	1 754
Florencia	274	166	68	110	618	295	231	798	1 324	1 942
Majagua	751	636	0	326	1 713	727	788	2 005	3 520	5 233
Ciego de Ávila	250	156	76	133	615	384	349	1 023	1 756	2 371
Venezuela	328	172	47	153	700	231	319	463	1 013	1 713
Baraguá	1 067	857	21	449	2 394	1 003	1 818	2 991	5 812	8 206
Total	4 055	2 752	667	1 695	9 169	4 154	5 117	11 480	20 756	29 925

ONE (2014) who indicated that goat raising in Cuba is, fundamentally in the hands of private raisers.

The Baraguá municipality stood out as the one with the highest number of heads (8 206), followed by the Majagua municipality (5 233), which represented 44,9 % of the total stock of the province. The Chambas municipality was the one with the lowest quantity of heads (1 081).

Regarding the number of females in reproduction (fig. 1), Baraguá also stood out for its large number of does, followed by Majagua.

A larger tradition in goat raising was shown in the Baraguá municipality, with 20 years of experience,

followed by Majagua with 17 years; while the least-experienced raisers were found in Ciego de Ávila, with barely five years since they were incorporated to the activity, and the others occupied an intermediate position between both. In all the municipalities the farm owner was male, predominantly.

When the reasons of rearing this species were analyzed, in Baraguá and Majagua (the highest producers) the influence of tradition was observed; however, in Ciego de Ávila (provincial capital municipality) the goat raising prevailed mainly as economic alternative, and in other municipalities such

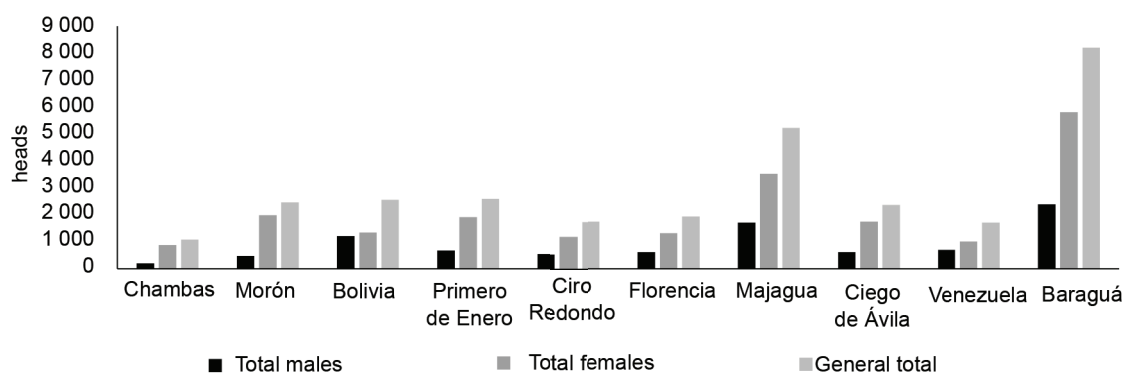


Fig. 1. Comparison of the goat stock among municipalities, according to CENCOP (January, 2015).

as Morón and Venezuela the economic need was combined with the family alternative.

The average age of the raisers was lower than 60 years in more than 90 % of the respondents. The prevailing education level among the raisers was ninth grade (junior high school or polytechnic education), which indicated that there was an adequate educational level to assimilate a training process about the goat species.

It became known that all the raisers associated goat raising with other species and each municipality had its particularities. In Baraguá the association with sheep prevailed, followed by Ciego de Ávila with fattening-dairy cattle. The Majagua municipality showed this same preference, but to a lower extent and more aimed at milk production; while in Morón the association with poultry was preferred.

Table 3 shows the main characteristics of the goat herds in the studied municipalities.

The number of does in the herds oscillated between 40 and 60 for Baraguá and Majagua, and it was lower than or equal to 20 in Chambas and Ciego de Ávila. It is necessary to emphasize that in all the municipalities, in the generality of the cases, the age of the herds oscillated between two and three years.

The buck:doe proportion was considered adequate in most municipalities, and it was in the range 1:15-25; unlike the Primero de Enero, Ciro Redondo and Venezuela municipalities, where this aspect was more deficiently managed. This range coincides with the report by Zamora Piñango (2009) who indicated that in the goat herds the natural or free mating is used as reproductive system and the animals are managed in single herds, with seasonal reproduction that prevents the more efficient use of the buck. In all the surveyed farms bucks were used with two to three years of age (middle-aged bucks), which according to Bidot (2013) is adequate, and they should be rotated every 1,4-1,7 years in order to avoid consanguinity.

On the other hand, the prevailing breed or phenotype in the municipalities was crossbred or creole, recognized for its precocity, prolificacy, rusticity, resistance to diseases and to difficult feeding conditions, although in the Baraguá herds there was preponderance of the Nubia breed and in other municipalities such as Primero de Enero and Majagua the Alpine breed, introduced in previous years, prevailed.

In all the municipalities, except in Baraguá, goat raising was carried out with the purpose of obtaining meat, not commercializing the milk.

Table 3. Main indicators of the goat herds per municipality.

Indicator	Municipality									
	Ch.	Mor.	Bol.	P. E.	C. R.	Fl.	Maj.	C. Á.	Ven.	Bar.
Does in the herd:										
≤ 20	(x)	( )	( )	( )	( )	( )	( )	(x)	( )	( )
21-39	( )	(x)	(x)	(x)	(x)	(x)	( )	(x)	(x)	( )
≥ 40	( )	( )	( )	( )	( )	( )	(x)	( )	( )	(x)
Average age of the herd (years)	2,8	4	2,4	4	4	3,6	3	2	2,6	2
Buck:doe ratio										
1/15-25	(x)	(x)	(x)	( )	( )	(x)	(x)	(x)	( )	(x)
> 1/25	( )	( )	( )	(x)	(x)	( )	( )	( )	(x)	( )
Prevailing breed	Crossbred	Crossbred	Crossbred	Crossbred Alpine	Nubia	Crossbred	Crossbred Alpine	Crossbred	Nubia	Nubia
Objective of the goat raising:										
For its meat	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	(x)	( )
For its milk	( )	( )	( )	( )	( )	( )	( )	( )	( )	(x)

Ch.: Chambas; Mor.: Morón; Bol.: Bolivia; P. E.: Primero de Enero; C. R.: Ciro Redondo; Fl.: Florencia; Maj.: Majagua; C. Á.: Ciego de Ávila; Ven.: Venezuela; Bar.: Baraguá

In Majagua, the objective of delivering animals as breeding stock prevailed. The external aspect of the doe was the predominant criterion for their possible selection, although the kid size and the kidding type, indistinctly, were also considered. However, such indicators as the rump width, the well implanted udders, the verticality of the vulva with regards to the body, the good development or body condition (2,5-3,5 in a scale of 5) and the absence of defects (in the withers and having more than two teats) as criterion for their elimination (sale or slaughter) from the herd, as suggested by Silanikove *et al.* (2010) were not used.

The feeding system mostly used in the municipalities was extensive, basically supported on the continuous grazing of low-quality natural species, on soils of natural fertility, with low organic matter content and deficient internal drainage (Sánchez *et al.*, 2011).

The feeding basis used in all the goat herds of these municipalities depended on the available resources in each locality. In Ciego de Ávila and Morón, with prevailing urban environment, grazing included the boundary strips, gullies and ditches, because the goat owners did not always have lands for grazing.

Only in Baraguá, Majagua and Ciro Redondo there was availability of equipment that allowed to process the potentially available roughages; this supplementation was included in a limited way with other resources of the territory and/or the farm in the dry season, for which the animals did not cover their requirements; this was also influenced by the deficit of feedstuffs in the grazing areas and the high energy expenses due to grazing. Nevertheless, there is a potential of using byproducts and harvest wastes (sugarcane, citrus fruits, roots and tubers and grains) which, from the design of integral strategies at farm level and according to the demands of the species, could change the current situation of that feeding basis.

From the above-explained facts, it is imperative to work on a higher utilization of the byproducts which can help in the supplementation of this species, especially in the season of lower pasture abundance. According to Benavides (2010), the sustainability of agriculture and the natural resources refers to the use of biophysical, economic and social resources, according to their capacity in a geographical space that allows to satisfy the needs of the present and future generations. In the above-mentioned context, Altieri and Toledo (2011) considered necessary the identification of rural potentialities, from their specificities, and the

possibility of solving their problems with active participation of social actors, with lower external dependence.

In the Baraguá and Majagua municipalities the raisers with more than 20 hectares of land prevailed, which would allow, from a re-arrangement of their productions, to have areas aimed at goat development. Morón, Venezuela and Ciego de Ávila, with very little land or without it, are more limited to organize sustainably their feeding basis (table 4).

The minimum infrastructure that allowed to protect the herd from the rain and direct solar radiations was characterized by its degree of rusticity, as in the case of Venezuela, and it was lower in Baraguá.

The shed orientation did not constitute an important element for the goat raisers, because although the N-S position is the recommended in the North hemisphere (Boroto *et al.*, 2011) in order to receive the beneficial effects of solar incidence and maintain the floor hygiene, this was not taken into consideration by most raisers and increased the risk of health affectation in the herd.

The hygienic situation of goat farms in the municipalities was acceptable, in spite of not having a real availability of such products as calcium carbonate (lime) or formaldehyde (formol) of proven effectiveness for those purposes. This could risk the hygiene and health of the goat stock, and explains the high parasite incidence (60-75 %) declared by the raisers, with emphasis on endoparasites.

It was observed that more than 50 % of raisers practice some cleaning of their sheds, although the daily sweeping and collection was carried out only by 20 % of the respondents. These fresh wastes were used as organic matter source directly on the soil in 70 % of the farms, without previous treatment; only in Baraguá, Majagua and Venezuela they received some processing, which showed limited culture in this sense, because the efficiency of their use is low in the areas where it is applied in this way.

Before the antiparasite treatment, in no case the feces samples were sent to the provincial laboratory of veterinary diagnosis to determine the type of parasitism present, and preference for the use of Labiozol® (Albendazole sulfoxide, LABIOFAM, Cuba) was detected in 70 % of the respondents, without rotating the anthelmintic used or using the Famacha® chart. The above-explained facts undoubtedly predispose the goat stock to the appearance of the antiparasite resistance phenomenon (Nari *et al.*, 2013).

Table 4. Main characteristics of the facilities dedicated to goats.

Indicator	Municipality									
	Ch.	Mor.	Bol.	P. E.	C. R.	Fl.	Maj.	C. Á.	Ven.	Bar.
Orientation of the shed:										
N-S	4	2	2	4	5	3	8	2	2	26
Other	11	8	13	11	15	17	22	18	13	29
Roof type:										
Palm leaf	10	5	13	14	19	19	20	5	15	30
Fiber-cement	1	1	1	1		1	5	13		10
Zinc	1	1	1		1		2	2		12
Other	3	3					3			3
Floor type:										
Filling material				2	4		19	11	1	35
Earthen	15	10	15	13	16	20	11	9	14	20
Type of shed:										
Very rustic	12	7	9	10	13	12	20	15	15	5
Little rustic	3	3	6	5	7	8	10	5		50

Along with this, only 60 % of the goats annually received antiparasite treatment, due to the instability in the supply of this product and the limited use of alternative medicine.

The Baraguá and Majagua municipalities, where there is large tradition in goat raising, stood out for the use of natural medicine, with such variants as washing with leaves of *Ceiba pentandra* (L.) Gaertn. And *Cecropia peltata* after kidding to prevent infections. In addition, the use of the infusion of guava (*Psidium guajaba* L.) leaves against diarrhea, and squash (*Cucurbita pepo* L.) seeds in doses from 100 to 150 g against tapeworms was observed.

Goat farms in Baraguá, with larger herds, annually slaughtered double quantity of heads as compared with the other municipalities, and the contracting with the EGAME was also used in 80 % of the farms that sold their goats to be slaughtered. However, although in the Majagua municipality 70 % of their farms had contracts, it contributed a lower quantity of animals for slaughter; something similar occurred in Morón, where none of the farms did contracting as practice for the sale of goats that were annually slaughtered for meat.

Among the advantages of this species the raisers indicated: a) its feeding behavior, browsing and consumption of a large variety of plants make it flexible in the selection of diets to satisfy its nutritional needs; the goat can consume a higher

quantity of feedstuffs per unit of weight and produces, in turn, more milk per unit of live weight; b) the little investment demanded by the species and the possibility of using its productions for family self-supply. This coincides with the studies conducted by Ortega-Cerdà and Rivera-Ferre (2010), who ascribe importance to this species in the food security of small and medium farmers.

The sale prices had remarkable variation, but most oscillated between 12,50 and 13,00 CUP/kg, which is the one established for the purchase of young bucks of 14,00-19,99 and 20 kg, respectively, and is in accordance with the Resolution 6 of the Ministry of Agriculture (2015). The weight at slaughter behaved in a suitable way in the Baraguá, Florencia, Majagua and Venezuela municipalities, and was 22-25 kg for six-month old bucks; the worst situation was shown by Morón with a much lower weight than the above-mentioned one, which limits the potential carcass yield in that species (Hernández, 2004).

In the diagnosis made in the farms of goat raisers only 60 % of the respondents acknowledged the Cuban Association of Animal Production (ACPA for its initials in Spanish) as an important factor for their information level. They also stated that no experience exchange workshops have been carried out in the municipalities; only 20 % of the raisers have received any education about the species,



although more than 95 % of the respondents showed interest in participating in training programs.

Most goat raisers (78 %) acknowledged the application of new technological variants as an alternative to improve productivity and efficiency in the farms. The technical assistance through the EGAME, the municipal university centers and the capacity-building center of the Ministry of Science, Technology and Environment (CITMA for its initials in Spanish) in each municipality was evaluated as positive by only 40 % of the respondents.

## CONCLUSIONS

From the characterization made the following conclusions were reached:

- The feeding of the goat stock is mainly based on the extensive grazing on natural covers, without making an optimum use of other alternative feeding sources.
- The facilities show technical-constructive deficiencies and a remarkable rusticity degree.
- Deficiencies in the parasite control, with preferential use of the same antiparasite drug.
- Scarce treatment of wastes before being used.
- The orientation and technical training by EGAME and ACPA and other centers of the territory is still limited; although there is a generalized interest of farmers in receiving training.

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