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OUTLINE OF GOAT FARMING IN THE MUNICIPALITY OF ANAJATUBA, MARANHÃO, BRAZIL

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ABSTRACT - Goat farming has been present in Brazil since the colonial period, currently the Northeast has the largest contingent of these animals, where they are exploited to obtain meat, milk and leather. The objective of this work was to analyze the profile of goat farming in the municipality of Anajatuba, Maranhão (MA), highlighting the characteristics of the management of the creation and the preponderant socioeconomic aspects involving the activity. For this, eight goat farmers from four villages in the municipality of Anajatuba-MA were interviewed. A pre-structured questionnaire was used with data associated with the owner, property, herd, general management and commercialization of the products. Data were tabulated and presented as percentage averages. The results showed a production chain based on subsistence, with a prevalence of men with an average age of 46 years and low level of education, without planning and technological resources, prevalence of the extensive system of creation dedicated to meat exploitation, with deficient sanitary and reproductive management. There is an inefficiency in the complex that forms the dynamism of the goat production chain in the municipality of Anajatuba-MA.
Keywords: *Capra aegagrus hircus*, goats, production, Brazil Northeast.

PERFIL DA CAPRINOCULTURA NO MUNICÍPIO DE ANAJATUBA, MARANHÃO

RESUMO - A caprinocultura está presente no Brasil desde o período colonial, atualmente o Nordeste possui o maior contingente desses animais, onde são explorados para obtenção de carne, leite e couro. Objetivou-se com este trabalho analisar o perfil da caprinocultura no município de Anajatuba, Maranhão (MA), destacando as características do manejo da criação e os aspectos socioeconômicos preponderantes envolvendo a atividade. Para isso, foram entrevistados oito caprinocultores de quatro povoados do município de Anajatuba-MA. Utilizou-se um questionário pré-estruturado com dados associados ao proprietário, propriedade, rebanho, manejo geral e comercialização dos produtos. Os dados foram tabulados e apresentados em médias percentuais. Os resultados mostraram uma cadeia produtiva baseada na subsistência, com prevalência de homens com média de 46 anos e baixo nível de escolaridade, sem planejamento e recursos tecnológicos, prevalência do sistema extensivo de criação dedicado a exploração de corte, com manejo sanitário e reprodutivo deficientes. Existe uma ineficiência no complexo que forma o dinamismo de cadeia produtiva da caprinocultura no município de Anajatuba-MA.
Palavras-chave: *Capra aegagrus hircus*, caprinos, produção, nordeste brasileiro.

INTRODUCTION

The goat species is distributed across all continents, with a greater concentration in developing countries (MARTINS et al., 2016). According to Food and Agriculture Organization-FAO (2014), the world goat herd had around 1 billion heads (EMBRAPA, 2016). The world's largest herd is China with over 185 million head, followed by India with approximately 133 million head. Brazil has the 22nd world herd of goats, with 12,101,298 heads (IBGE, 2020). However, the production model with low production rates prevails in the country, which result from poor nutrition and ineffective sanitary management (ALVES et al., 2017).

In Brazil, goat farming has been present since the colonial period and the first record dates from 1535, when Portuguese, French and Dutch colonists arrived in the Northeast bringing the first specimens of these animals. The Northeast of Brazil has the largest number of goats in the country, with about 94.5% (IBGE, 2020). Goat production has been characterized as an activity of great cultural, social and economic importance, playing a crucial role in the development of the Northeast (SILVA et al., 2014).

In Maranhão, goat farming can be considered as a source of income and food for small farmers in rural areas, currently almost all municipalities in Maranhão have goat creations, even if it is not very expressive, it is considered a subsistence activity for small producers, being common observe this type of activity in rural properties throughout the state. It is a relatively recent activity, despite the lack of reports on its evolution, some documents show that its strengthening took place from the migration of Northeasterners from Bahia, Pernambuco, Ceará and the South of Brazil, in the 1980s and 1990s, who migrated to the interior and lowlands of Maranhão (ROCHA et al., 2018).

The exploitation of goat farming is based on the production of meat, milk and leather, products that have been gaining prominence in the national economic scenario,

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despite the low technification and low management conditions, causing these animals to have low productivity (CASTRO, et al., 2022). The rusticity, size and ease of handling of goats favor simple and low-cost exploitation (TEIXEIRA et al., 2015).

According to IBGE (2020), the municipality of Anajatuba has a herd of 1488 goats, located on small properties in rural areas. The low technification, and the handling conditions to which these animals are submitted, lead to a low production and the absence of information about this activity in this region. Goat farming is present in the 217 municipalities in Maranhão, where the activity is largely insignificant, with subsistence characteristics, mainly because it is developed in small family rural establishments lacking entrepreneurial technical assistance (TEIXEIRA et al., 2015; SILVA et al., 2018). The limited availability of resources for investment in infrastructure, combined with empirical traditionalism, are part of the elements responsible for the low productivity and enjoyment of herds in the state (HELMER et al., 2020).

It is justified to carry out this study as a mechanism that will enable more detailed knowledge about the order of operation of goat farming in the municipality of Anajatuba - MA, in order to explain the profile of the activity as the main "bottlenecks" and possibilities will be identified. In this sense, the study is of paramount importance to expand knowledge on a topic that is so present in the professional reality of the veterinarian. The objective of this research was to determine and analyze the profile of goat farming in the municipality of Anajatuba - MA, highlighting the circumstances of the management, of the farming and the preponderant socioeconomic aspects involving the activity.

MATERIAL AND METHODS

Maranhão has a territorial dimension of 331936,949 km², spread over 217 municipalities, with an estimated population of 7,000,229 inhabitants. Data from the last census carried out in 2010 showed Maranhão with 63.07% of the population living in urban areas and 36.93% in rural areas, placing the state with the largest rural population in Brazil (IBGE, 2017).

The municipality of Anajatuba was chosen as the study area because it has a substantial number of goats, occupying the 61st place in the ranking of goat farming in the state (IBGE, 2017), in addition to the activity practiced in the municipality presenting similar exploitation characteristics to those observed in other states in northeastern Brazil. Prior knowledge of several properties where the activity is present was also decisive, as it is a municipality close to the capital and easily accessible.

Data collection was carried out through visits to the properties, where the owners were interviewed through a questionnaire composed of qualitative and quantitative information, prepared based on data associated with the owner, property, herd, general management and commercialization of the products, from of eight rural family units, located in four villages in the municipality: Achuí, Afoga, São Miguel, and Palmares.

The language used in the questionnaire sought to be as informal as possible, in an attempt to adapt to the reality of the producer. For a better understanding and detailing of information about the production chain, the determinations proposed by Rocha et al. (2018) so that the investigative study was divided into seven sections: 1st section = social variables of the producer, 2nd section = property infrastructure, 3rd section = procedures adopted for the genetic improvement of the herd, 4th section - covers management variables, according to the breeding system and the purpose of the activity, 5th section = animal feeding, 6th section = sanitary management and 7th section = commercialization of products.

The data from the interviews were expressed in tables and served to delimit the social aspects and establish a comparison between the goat producers in the municipality. A complete observation of each property was also carried out in order to establish factors related to the type of creation and the level of technology implemented in the place. Sampling was for convenience, according to the number of properties included in goat breeding. From the information obtained, the data were tabulated using the Microsoft Excel® program, so that the values obtained were expressed as percentage averages for analysis and discussion.

RESULTS AND DISCUSSION

Taking into account the gender responsible for carrying out the livestock activity, the male totality was observed (Table 1). The responsibilities of work are considered a historical and social phenomenon still driven by the power relations and inheritances of patriarchy. This condition is reinforced by data from IBGE - PENAD (2017) when reporting that in Brazil 90.6% of women perform more household chores and care for people.

The average age of breeders was 46 years, with the highest age being 76 years and the lowest, 32 years (Table 1). Drawn attention to the absence of individuals with a lower age group, the justification would be related to the lack of attraction of young people and the disqualification to perform the necessary skills for the management of the creation. Dos Santos and Kieling (2020) also addressed the shortage of young people in agribusiness, which has been confirmed as one of the great challenges for maintaining and strengthening family rural production in Brazil.

Considering the local housing factor, it was found that 75% of respondents live in rural areas. This finding corroborates the Demographic Census (IBGE, 2010), by reporting that 72.26% of the population of the municipality of Anajatuba resides in rural areas, being donated to their own establishment. As for the level of education, 75% of the producers had completed elementary school, while 25% of them were not literate.

Most producers (75%) are engaged in activities other than raising goats. It was found that there is a mixed livestock activity, this characteristic is common in Brazil, where the small rural producer seeks to diversify the creation in an attempt to maximize the use of the land. This

result is in agreement with Silva et al. (2014), when reporting that, in the municipality of Sumé (PB), 66.67% of subsistence goat farmers have this profile. Regarding technical assistance in the breeding units, 100% of the interviewees reported a total lack of service provision aimed at strengthening the activity.

Most sheepfolds (87.5%) were slatted, however, 62.5% of them were considered inadequate, due to lack of maintenance and only 37.5% of respondents had pasture cultivated on the property, especially grasses of the genus *Panicum* (popularly known as Mombaça-grass and Massai-grass). Native pasture was present in 100% of the properties, represented mainly by grasses of the genus *Canarana* and *Junco*, found in abundance in the natural fields of the municipality (Table 2). The prevalence of native forages as the main components of goat diet represents the reality of extensive farming in the Northeast region in general (MEDEIROS et al., 2018).

TABLE 1 - Social profile of rural producers involved in goat farming, in the municipality of Anajatuba-MA.

Social variables of producers	Condition/gender	Frequency (%)
Marital status	married	50
	single	50
Sex	male	100
	female	---
Residence	rural zone	75
	city	25
Education	illiterate	25
	literacy	37,5
	elementary	37,5
	high school	---
	college	---
Participate in the activity	all members	75
	men + women	-
	only men	25
	only women	---
Perform other activities	yes	75
	no	25
Technical assistance	yes	---
	no	100
Production scale	subsistence	100
	small commercial	---

--- = non-existent and/or without parameter to issue an opinion. Source: Research data.

TABLE 2 - Profile of the support infrastructure available for use by rural producers involved in goat farming in the municipality of Anajatuba-MA.

Variables	Type/source/condition	Frequency (%)
Sheepfold	beaten floor	12,5
	ripped	87,5
	cemented	---
Adequacy of the sheepfold	yes	37,5
	no	62,5
Cultivated pasture	yes	37,5
	no	62,5
Native pasture	yes	100
	no	---
Source of water	weir	50
	well	50
	river	---
	other	---
Water quality	good	75
	regular	---
	bad	25

--- = non-existent and/or without parameter to issue an opinion. Source: Research data.

As for the origin of the sources and the quality of the water available for use by animals and rural families, 50% were from weir, while the other half (50%) came from wells. In the perception of the majority of the interviewees (75%), the water is classified as of good quality, for 25% this resource is considered bad. According to the

informants, the water used for consumption on rural properties has never undergone microbiological analysis or any other special treatment.

As for the way of choosing the breeders, 50% of the interviewees claimed to choose by breed, 37.5% by the size of the animal, and 12.5% by the "size of the ear". Most of these animals originated from the municipality itself (62.5%), some were acquired from other states (25%), such as Pernambuco and Ceará and the rest (12.5%) from other municipalities, such as Miranda do Norte - MA (Table 3).

TABLE 3 - Procedures adopted by farmers to improve the genetic quality of goat herds, in the municipality of Anajatuba-MA.

Variables	Adopted procedures	Frequency (%)
Choice of breeders	breed	50
	size	37,5
	ear size	12,5
Origin of breeders	local	62,5
	another municipality	12,5
	another state	25
Fate of breeding stock after useful life	slaughter	75
	sale	25
Reproduction type	natural mount in the field	100
	controlled natural mount	---
	artificial insemination	---
Separates the breeding male from females	yes	---
	no	100
Castration of males not suitable for breeding	yes	100
	no	---
Consanguinity	yes	75
	no	25

--- = non-existent and/or without parameter to issue an opinion. Source: Research data.

Reproductive control was not performed, there was a predominance of natural mating in the field, with selection only of the breeders, the males were castrated at an average age of eight months. It was possible to verify the presence of predominantly crossbred goat herds, with emphasis on the Anglo-Nubian, Boer breeds and animals without a defined racial pattern (SPRD). In two properties, the presence of Boer, Savana, Kalahari and Anglo-Nubian breeders was evidenced.

Herds with an average of 46 animals were registered, with the largest herd consisting of 120 and the smallest with 10 animals, respectively. The average number of breeders per property was two, the number of matrices in the composition of the herds ranged from 3 to 60, with an average of 21 animals. A reduced number of breeders does not allow income generation to favor the exploitation of small ruminants as the main activity on rural properties, thus, they must be rigorously selected to increase the efficiency of the herd (OLIVEIRA et al., 2017). All producers were dedicated to the exploitation of beef goat farming. This result is in agreement with the data reported by Silva et al. (2015) when they studied the zootechnical and economic characterization of goat farmers in a rural settlement area in the state of Maranhão.

Only one producer (12.5%) used zootechnical bookkeeping (Table 4). This result reflects the low level of organization found in the goat activity of the municipality, since this tool constitutes one of the actions of great impact for the good administration of rural properties, allowing a rational management, with better control over the animals and a more efficient selection.

TABLE 4 - Purpose of breeding, management mechanisms and breeding model observed in goat herds, in the municipality of Anajatuba-MA.

Variables	Adoption/purpose	Frequency (%)
Type of exploitation	dairy	---
	meat	100
	mixed	---
Zootechnical bookkeeping	yes	12,5
	no	87,5
Creation system	ultra extensive	---
	extensive traditional	87,5
	semi-extensive	12,5
	semi-intensive	---
	intensive	---

--- = non-existent and/or without parameter to issue an opinion. Source: Research data.

Regarding food management, there was a predominance of continuous grazing (87.5%) during the year. Only one rural producer (12.5%) offered roughage supplementation to his animals during the dry season. The other producers claimed the lack of infrastructure and lack of knowledge of methods for the formation and conservation of forage resources for use in strategic periods (Table 5).

It was observed that 37.5% of the interviewed producers provided mineral supplementation to the animals. Mineral deficiency in these species installs a symptomatic picture of weakness, osteoporosis, anemia, low immunity to infectious diseases and reduced growth, loss of curling or depigmentation of the wool, ataxia due to medullary demyelination, in which lambs and goats in the first weeks of life present incoordination of the hind limbs, which can result in paraplegia and death (SILVA et al., 2018).

TABLE 5 - Feed management conditions in goat herds, in the municipality of Anajatuba-MA.

Inputs	Type	Frequency (%)
Feed	pasture	87,5
	pasture + forage	12,5
	pasture + dry forage	---
	pasture + forage + concentrate	---
	pasture + forage + concentrate in dry season	---
Mineralization	yes	37,5
	no	62,5

--- = non-existent and/or without parameter to issue an opinion. Source: Research data.

Two producers (25%) reported vaccinating their animals against clostridiosis and only one (12.5%) against rabies (Table 6). These values were higher than those reported in the study described by Silva et al. (2015) with goats in a rural settlement area in Maranhão, which did not detect any vaccination practice, but lower than the 78.65% reported by Santos et al. (2011) with sheep and goats in the Patos microregion (PB).

TABLE 6 - Sanitary practices adopted to control infectious and parasitic diseases in goats, in the municipality of Anajatuba-MA.

Variables	Control practices	Frequency (%)
Vaccination	yes	25
	no	75
Worming	yes	100
	no	---
Navel cutting and disinfection	yes	37,5
	no	62,5
Quarantine of newly acquired animals	yes	25
	no	75
Separation of young from adult animals	yes	---
	no	100
Burying or cremation of dead animals	yes	37,5
	no	62,5
Isolation of sick animals	yes	25
	no	75
Worms	yes	37,5
	no	62,5
Lymphadenitis	yes	50
	no	50
Ecthyma	yes	37,5
	no	62,5
Pododermatitis	yes	12,5
	no	87,5
Intoxication	yes	37,5
	no	62,5

--- = non-existent and/or without parameter to issue an opinion. Source: Research data.

As for the control of gastrointestinal helminths, 100% of the breeders perform the deworming of their animals. Doramectin was cited as the active ingredient most used by breeders. The control is carried out, on average, three times a year, every three months. The results showed that disease control is deficient. As for the cutting and disinfection of the navel of newborn goats, only 37.5% of goat breeders claimed to make use of this practice. This

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index is considered low, for Silva et al. (2015), this procedure avoids contamination by several pathogens that can cause arthritis and other diseases that will impact the development and/or promote the death of the individual.

Only 25% of producers reported separating newly acquired animals before inclusion in the herd. This index is classified as deficient and corroborates the result of 19% reported by Teixeira et al. (2015), when they studied the zoosanitary profile of goat and sheep herds in the state of Maranhão. No goat breeder performs the separation between young and adult animals and between males and females. Regarding the destination of the carcass of dead animals, 37.5% of the interviewees stated that they performed the burial or cremation. This result is shared by Alencar et al. (2010), who obtained 31.8%. This measure is of fundamental importance within the rural property, however, because it is biosafety, the disposal of carcasses is an act that requires a great sense of responsibility in its execution.

Isolation of sick animals was cited by 25% of producers. This index is considered low, since isolation must be done immediately when there is suspicion of a sick animal, to avoid contamination of the herd. Possibly, the lack of information from the breeders, combined with the deficiency in the infrastructure of the breeding system, corroborate the expression of this result.

As for commercialization, 100% of the producers consume and sell the products generated with the activity. Half (50%) sell directly to the consumer, while 50% sell to the middlemen (Table 7). According to Nascimento et al. (2022) this marketing behavior is common throughout the Northeast region. Most producers (62.5%) buy animals for breeding and the rest (37.5%) said they buy animals for recreate. As most do not sell slaughtered animals, none of the producers processes the animals' skin.

TABLE 7 - Mechanisms adopted in the processes of use and negotiation of the main products generated in goat activity, developed by rural producers in the municipality of Anajatuba-MA.

Variables	Use/Trade	Frequency (%)
Animals for own consumption	yes	---
	no	100
Animals for sale	yes	100
	no	---
Type of Marketing (sale)	direct	50
	cooperative	50
	middleman	---
	other	---
Place of sale (city)	internal	12,5
	external	87,5
Condition of sale of the animal	live	87,5
	down	12,5
Remuneration for the sale	in cash	87,5
	on term	12,5
Animal age (months)	<6	---
	6-12	---
	>12	100
Purpose of purchasing animals	recreates	37,5
	termination	---
	reproduction	62,5
Benefits the skin	yes	---
	no	100

--- = non-existent and/or without parameter to issue an opinion. Source: Research data.

In general, inputs into the goat breeding chain are considered basic, both in terms of product diversity and the frequency with which they are demanded in breeding systems. In this context, the main demands are for antiparasitic drugs and the acquisition of animals for breeding. Drugs (antibiotics, anti-inflammatories, repellents), vitamin supplements, vaccines, in addition to the acquisition of seeds for the formation of cultivated pastures, also represent entry costs into the system (Table 8).

The explicit results confirm an inefficient production chain where the fundamentals of subsistence productive arrangements prevail in its structure, devoid of any and all planning and technological resources. It was not possible to delimit the processing sector, since most of it is carried out by third parties, without the producer's knowledge.

The only producer that carries out the slaughter of goats, performs it informally on the property itself and carries out direct sales. For 87.5% of those interviewed, sales are made to the city of São Luís - MA, but the producers are not aware of the exact destination of the animals. It is believed that these animals are slaughtered clandestinely and sold at fairs in the city, where there is no inspection, nor concern with the origin and quality of the meat.

It was possible to observe that in the structure of goat farming in the municipality, the fundamentals of subsistence productive arrangements prevail, devoid of any and all planning and technological resources, with low-education producers, prevalence of the extensive breeding system dedicated to beef exploitation in addition to management. poor sanitation, all this due to the absence of programs that seek to minimize the existing problems and make the creation of goats in the municipality with the necessary characteristics for insertion in the rural family agribusiness.

TABLE 8 - Main input and output inputs in the goat production chain, in the municipality of Anajatuba-MA.

Type		Frequency	Cost/Revenue (R$)
Input	Vaccine	++	---
	Anthelmintic	+++	---
	Common salt	++	---
	Mineral supplement	+	---
	Vitamin	+	---
	Medications (antibiotic, anti-inflammatory, repellent)	++	---
	Forage seed	+	---
	Construction/repair material	+	---
	Third-party labor	---	---
	Animal acquisition	+++	---
	Concentrated feed	---	---
	Corn in grain	+	---
Output	Live animal	+++	17,00/kg dead weight
	Slaughtered animal	+	---
	Milk	---	---
	Skin	---	---
	Excrement	---	---

+ = infrequent, ++ = relative frequency, +++ = frequent. --- = non-existent and/or without parameter to issue an opinion. Source: Research data.

CONCLUSION

There is an inefficiency in the complex that forms the dynamism of the goat production chain in the municipality of Anajatuba-MA.

REFERÊNCIAS

ALENCAR, S.P. MOTA, R.A.; COELHO, M.C.O.C.; NASCIMENTO, S.A.; AREU, S.R.O.; CASTRO, R.S. Perfil sanitário dos rebanhos caprinos e ovinos no Sertão de Pernambuco. **Ciência Animal Brasileira**, v.11, n.1, p.131-140, 2010.

ALVES, A.R.; VILELA, M.S.; ANDRADE, M.V.M.; PINTO, L.S.; LIMA, D.B.; LIMA, L.L.L. Caracterização do sistema de produção caprino e ovino na região sul do Estado do Maranhão, Brasil. **Veterinária e Zootecnia**, v.24, n.3, p.515-524, 2017.

CASTRO, R.L.P.; BRITO, D.R.B.; RIBEIRO, M.C.; COSTA, J.V.; PIRES FILHO, P.C.S. Caracterização de pequenas criações de caprinos e ovinos da Ilha de São Luís. **Revista Sítio Novo Palmas**, v.6, n.1, p.30-41, 2022.

EMBRAPA. EMPRESA BRASILEIRA DE PESQUISA AGROPECUÁRIA. **Sistema de Produção de Caprinos e Ovinos de Corte no Nordeste Brasileiro.** Embrapa Caprinos Sistemas de Produção, 2nd ed. 2016. Available in: <https://www.spo.cnptia.embrapa.br/conteudo?p_p_id=conteudoportlet_WAR_sistemasdeproducaolf6_1ga1ceportlet&p_p_lifecycle=0&p_p_state=normal&p_p_mode=view&p_p_col_id=column-1&p_p_col_count=1&p_r_p_-76293187_sistemaProducaoId=7710&p_r_p_-996514994_topicoId=7909>. Access in: 12 dec. 2021.

HELMER, J.F.; OLIVEIRA, C.A.; CERQUEIRA, V.D.; BEZERRA, P.S.; PRADO, R.G.S.; PIRES, C.R.S.; RIET-CORREA, G. Caracterização dos sistemas de produção de ovinos e caprinos na microrregião de Castanhal, Pará. **Medicina Veterinária**, v.14, n.3, p.202-209, 2020.

IBGE. INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. PNAD. PESQUISA NACIONAL POR AMOSTRA DE DOMICÍLIOS. **PNAD CONTÍNUA 2016: 90,6% das mulheres e 74,1% dos homens realizaram afazeres domésticos ou cuidados de pessoas.** 2017. Available in: <https://agenciadenoticias.ibge.gov.br/2013-agencia-de-noticias/releases/18566-pnad-continua-2016-90-6-das-mulheres-e-74-1-dos-homens-realizaram-afazeres-domesticos-ou-cuidados-de-pessoas.html>. Access: 19 dec. 2021.

IBGE. INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. **Censo Agropecuário 2017.** Rio de Janeiro, IBGE, 2017. Available in: https://sidra.ibge.gov.br/pesquisa/censo-agropecuario/censo-agropecuario-2017#pecuaria. Access in: 20 dec. 2021.

IBGE. INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. **Censo Demográfico 2010.** Rio de Janeiro, IBGE, 2010. Available in: https://sidra.ibge.gov.br/pesquisa/censo-demografico/demografico-2010/inicial. Access in: 20 dec. 2021.

IBGE. INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA. **Pesquisa da Pecuária Municipal 2020.** Rio de Janeiro, IBGE, 2020. Available in: https://sidra.ibge.gov.br/pesquisa/ppm/quadros/brasil/2020. Access in: 20 dec. 2021.

MARTINS, E.C.; MAGALHÃES, K.A.; SOUZA, J.D.F.; GUIMARÃES, V.P.; AROSA, C.M.P.; HOLANDA-FILHO, Z.F. Cenários mundial e nacional da caprinocultura e da ovinocultura. **Boletim Ativo de Ovinos e Caprinos**, v.3, n.2, p.3-6, 2016.

MEDEIROS, H.R.; ANDRADE, J.J.; NOVAES, L.P.; PIMENTA FILHO, E.C. Caracterização e identificação de demandas tecnológicas em sistemas de produção de caprinos no Rio Grande do Norte. **International Symposium on Technological Innovation**, v.9, n.1, p.482-491. 2018.

NASCIMENTO, M.I.S.S.; FERREIRA, F.F.S.; ALBUQUERQUE, H.J.O.; NASCIMENTO, T.L.F.; ALBUQUERQUE, H.O.; CABRAL, A.M.D.; SILVA, L.V.D.; SANTOS, M.J.M.; BARRETO, L.M.G.; LIMA, V.R.S.; SANTOS, G. C.L. Insights two main products from the goat wine culture in the Brazilian Northeast. **Research, Society and Development**, v.11, n.5, e41811528264, 2022.

OLIVEIRA, R.P.M.; OLIVEIRA, F.F.; PASSOS, A.; LAMARÃO, C.V. Ovinos de corte no estado do Amazonas: ênfase em tecnologias no manejo produtivo. **Terceira Margem Amazônia**, v.2, n.9, [s.p.], 2017.

ROCHA, S.F.; OTTATI, A.M.A.A.; CAMPOS, R.T. Produção de caprinos e suínos nos municípios de São Luís, Paço do Lumiar e São José de Ribamar. **Revista de Política Agrícola**, v.27, n.1, p.22-36, 2018.

SANTOS, R.; KIELING, R.I. A atuação do jovem nas cooperativas e a sucessão familiar no agronegócio: o caso do Programa Aprendiz Cooperativo do Campo na Cooperativa Tritícola Mista Campo Novo. **Pleiade**, v.14, n.30, p.48-60, 2020.

SANTOS, T.C.P.; PEÑA ALFARO, C.E.; FIGUEIREDO, S.M. Aspectos sanitários e de manejo em criações de caprinos e ovinos na microrregião de Patos, região Semiárida da Paraíba. **Ciência Animal Brasileira**, v.12, n.2, p.206-212, 2011.

SILVA, A.M.; ALVES, A.S.S.; LIMA, P.R.; SOARES FILHO, P.H. Perfil da caprinocultura de subsistência e qualidade de vida do pequeno criador no município de Sumé-Pb. **Actas Iberoamericanas de Conservación Animal**, v.4, n.4, p.222-224, 2014.

SILVA, I.C.S.; BRITO, D.R.B.; SOARES, E.D.S.; BRITO, A.V.M.; PINHEIRO, A.A. Caracterização zootécnica e econômica dos criadores de caprinos em área de assentamento rural no estado do Maranhão. **Revista Brasileira de Agropecuária Sustentável**, v.5, n.1, p.1-11, 2015.

SILVA, T.R.; SOARES, P.C.; DANTAS, A.F.M.; MARQUES, A.V.S.; FILHO, E.F.O.; AGUIAR, G.M.N.; MARQUES, A.L.A.; RIET-CORREA, F. Serum and liver copper, iron, molybdenum and zinc concentrations in goats and sheep in the state of Paraíba, Brazil. **Pesquisa Veterinária Brasileira**, v.38, n.7, p.1313-1316, 2018.

SILVA, Y.L.; GAMARRA-ROJAS, G.; FERNANDES, F.E.P.; FARIAS, J.L.S.; FERNANDES, C.S. A produção animal na economia da agricultura familiar: estudo de caso no semiárido brasileiro. **Cadernos de Ciência & Tecnologia**, v.35, n.1, p.53-74, 2018.

TEIXEIRA, C.W.; SANTOS, H.P.; SILVA, J.C.R.; RIZZO, H.; MARVULO, M.F.V.; CASTRO, R.S. Perfil zoosanitário dos rebanhos caprinos e ovinos em três mesorregiões do Estado do Maranhão, Brasil. **Acta Veterinaria Brasilica**, v.9, n.1, p.34-42, 2015.