UNIVERSIDADE FEDERAL DO PARANÁ

LUANA OLIVEIRA LEITE

ON-FARM WELFARE ASSESSMENT OF GOATS IN THREE REGIONS OF CEARÁ, BRAZIL

CURITIBA

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Thesis presented to the Post-Graduation Program in Veterinary Sciences of the Agrarian Sciences Sector of the Federal University of Paraná, as a partial requisite for the obtention of the title of Master in Veterinary Sciences.

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Edward Everett Hale

RESUMO

No Brasil, o bem-estar de cabras de corte e de leite é pouco conhecido, especialmente na região Nordeste, onde há maior concentração destes animais, sendo o Ceará um importante estado que cria cabras. Neste contexto, o diagnóstico de bem-estar de cabras de corte e de leite é importante para a identificação dos problemas de saúde e comportamentais que afetam os animais, juntamente com as deficiências presentes nas instalações. O objetivo deste estudo foi diagnosticar o bem-estar de cabras de corte e de leite no Ceará, Brasil. Este estudo foi dividido em cinco capítulos: (1) Apresentação; (2) Proposta de indicadores para avaliação do bem-estar em cabras de corte em fazendas na região do semiárido do Nordeste Brasileiro: uma revisão; (3) Avaliação de bem-estar na fazenda em cabras de corte criadas em sistema semi-intensivo e extensivo no Ceará, Brasil; (4) Avaliação de bem-estar na fazenda em cabras de leite no Ceará, Brasil; (5) Considerações finais. O capítulo 2 teve como objetivo selecionar indicadores baseados no animal e nos recursos para diagnosticar o bem-estar de cabras de corte, além de utilizar esses parâmetros de acordo com o sistema de produção: extensivo, semi-intensivo ou intensivo. Dezoito indicadores foram selecionados para serem aplicados em cabras de corte. O capítulo 3 teve como objetivo desenvolver um protocolo de bem-estar para ser aplicado em cabras de corte, criadas para corte ou genética, em fazendas de sistema extensivo (E) ou semi-intensivo (S). Quinze fazendas foram avaliadas na região Metropolitana de Fortaleza e de Quixadá, no Ceará, Brasil. A nível de grupos, os indicadores abscessos e estresse térmico, baseados nos animais, e os indicadores tipo de bebedouros e acesso a abrigos diferiram significativamente ($p<0,05$) em ambos os sistemas de produção. A nível individual, os indicadores abscessos, corrimento ocular e lesões na orelha diferiram significativamente ($p<0,05$) entre os sistemas. Os resultados mostraram que ambos os sistemas enfrentam problemas similares devido ao estresse térmico, falta de forragem, e problemas de saúde, embora os animais das fazendas S estavam em melhores condições. O capítulo 4 teve como objetivo aplicar o protocolo AWIN Goats para avaliar e comparar o bem-estar de cabras adultas em fazendas com cabras em lactação (L) e não-lactação (NL) no Ceará, Brasil. Treze fazendas foram avaliadas na região Metropolitana de Fortaleza e de Quixadá, e na região leste do Ceará. No primeiro nível de bem-estar, apenas o estresse térmico mostrou diferença significativa ($p<0,05$) entre L e NL. No segundo nível de bem-estar, a nível individual, houve diferença significava ($p<0,05$) quanto aos indicadores abscessos e sobrecrescimento das unhas entre L e NL. Os resultados mostraram que ambos os grupos estavam submetidos aos mesmos problemas de bem-estar, sendo importante implementar medidas para melhorar a qualidade de vida das cabras de leite em fazendas no Ceará. Espera-se que os resultados encontrados esclareçam os produtores e tratadores quanto a importância do bem-estar animal, e os estimulem a promover mudanças de manejo e nas instalações, visando melhorar a qualidade de vida destes animais.

Palavras-chave: Indicadores. Protocolo de bem-estar. Cabras. Qualidade de vida.

ABSTRACT

In Brazil, the welfare of dairy goats and milk is little known, especially in Northeast, where there is a higher concentration of these animals, and Ceará is an important state that raised goats. In this context, the diagnosis of welfare of meat goat does and dairy goats is important for the identification of the health and behavioral problems that affect these animals, along with the deficiencies present in the facilities. The objective of this study was to diagnosis the welfare of meat goat does and dairy goats in Ceará, Brazil. This study was divided into five chapters: (1) Presentation; (2) Proposed indicators for on-farm welfare assessment in meat goat does in the semiarid region of Brazilian Northeast: a review; (3) On-farm welfare assessment in meat goat does raised in semi-intensive and extensive systems in Ceará, Brazil; (4) On-farm welfare assessment in dairy goats in Ceará, Brazil; (5) Final considerations. Chapter 2 aimed to select indicators based on the animal and the resources to diagnose the welfare of meat goat does, especially, in addition to using these parameters according to the production system: extensive, semi-intensive or intensive. Eighteen indicators were selected to be applied on meat goat does. Chapter 3 aimed to develop a welfare protocol to be applied in meat goat does, raised for meat or stud, in extensive (E) or semi-intensive (S) systems. Fifteen farms were evaluated in the Metropolitan region of Fortaleza and Quixadá, Ceará, Brazil. At group level, abscess and thermal stress, animal-based indicators, and drinker type and shelter access differed significantly ($p<0.05$) in both production systems. At the individual level, abscesses, ocular discharge and lesions in head - ears indicators differed significantly ($p <0.05$) between the systems. The results showed that both systems face similar problems due to thermal stress, lack of forage, and health problems, although S animals were in better conditions. Chapter 4 aimed to apply the AWIN Goat protocol to evaluate and compare the welfare of adult goats on farms with lactating (L) and non-lactating (NL) goats in Ceará, Brazil. Thirteen farms were evaluated in the metropolitan region of Fortaleza and Quixadá, and in the eastern region of Ceará. At the first level of welfare, only thermal stress showed a significant difference ($p<0.05$) between L and NL. In the second level of welfare, at the individual level, there was significant difference ($p <0.05$) for abscesses and overgrowth claws indicators between L and NL. These results showed that both groups were subject to the same welfare problems, and it is important to implement measures to improve the quality of life of dairy goats in farms in Ceará. It is hoped that the results found will clarify producers and handlers to the importance of animal welfare and encourage them to promote management and facilities changes to improve the quality of life of these animals.

Keywords: Indicators. Welfare protocol. Goats. Quality of life.

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SUMMARY

1 PRESENTATION

Raising goat has several advantages compared to cattle production as females with short reproductive cycle, with milk yield occurring from one year of age; high prolificacy; short interval between generations, and females can have four kids per year; adaptability of goats to different breeding systems and lower production costs (FONSECA, DA SILVA, OLIVEIRA, 2012).

In Brazil, limitations related to goat breeding are the low level of productivity of the herd, mainly related to inadequate management systems in several stages of breeding, besides low level of organization of the sector and technical and managerial capacity of the producer (SOUSA, 2007). In addition, there is lack of control of infectious and sanitary diseases in places such as Metropolitan of Fortaleza and Hinterland of Ceará (SANTIAGO et al., 2010).

In 2015, it was released a protocol to assess welfare of lactating adult dairy goats in Europe, AWIN Goat (Animal Welfare Indicators for Goats), aiming to diagnose and improve the life of goats (AWIN, 2015a). Currently, there are no protocol to assess the degree of welfare in meat goat does.

The objective of this study was to identify possible indicators to be applied in the welfare assessment of meat goat does and identify the welfare problems that affect these animals, as well as to perform welfare assessments in dairy goats' farms. Results are distributed chapters 2, 3 and 4.

On chapter 2, a review of the literature was made aiming to select animal and resource-based indicators to be applied in farms of meat goat does. These parameters were chosen based on AWIN Goat and Sheep protocols (AWIN, 2015a, b), besides literature regarding goat and sheep health and behaviour. On chapter 3, indicators previously selected on chapter 2 were applied in meat goat does in farms with semi-intensive and extensive systems in Ceará state, Brazil. On chapter 4, AWIN Goat protocol was applied to adult lactating and non-lactating dairy goats in farms in Ceará, Brazil (AWIN, 2015a).

REFERENCES

AWIN. **Animal Welfare Indicators for Goats**. 2015a.

AWIN. **Animal Welfare Indicators for Sheep**. 2015b.

FONSECA, C. E. M.; SILVA, T. L; OLIVEIRA, C. A. **Caprinocultura.** Manual Técnico, 35. 2012.

SANTIAGO, L. B.; ALVES, F. S. F.; PINHEIRO, R. R.; LIMA, A. M. C.; FARIAS, D. A.; CAVALCANTE, A. C. R. Caracterização sanitária da caprino-ovinocultura no Estado do Ceará: dados preliminares, 2010. Available in: <http://ainfo.cnptia.embrapa.br/digital/bitstream/item/28502/1/AAC-Caracterizacao-sanitaria-da-caprino-ovinocultura-no-estado-do-Ceara-dados-preliminares.pdf>. Access in: 08/04/2016.

SOUSA, W. H. O agronegócio da caprinocultura de corte no Brasil. **Tecnologia & Ciência Agropecuária,** João Pessoa, v. 1, n.1, p. 51-58, 2007.

2 PROPOSED INDICATORS FOR ON-FARM WELFARE ASSESSMENT IN MEAT GOAT DOES IN THE SEMIARID REGION OF BRAZILIAN NORTHEAST: A REVIEW

ABSTRACT

The main countries that raise goats in the world have semiarid regions. Brazilian Northeast has the larger semiarid region in the country and holds the major goat livestock. In search for strategies to stimulate sustainable development of goat breeding in Brazil and worldwide, the animal welfare issue was addressed in order to generate studies to semiarid regions. In 2015, AWIN Goat protocol was published in Europe, with indicators that identify welfare level of lactating dairy goats. Currently, there are no welfare protocols for meat goat does. The objective of this study was to select animal and resource-based indicators to assess welfare in meat goat does, considering the type of production system: extensive, semi-intensive or intensive. Eighteen indicators were selected to evaluated the welfare of meat goat does. On the reality of Brazil and other semiarid regions in the world, it is important to develop studies to test these parameters on meat goat does to fill the criteria of validity, reliability and feasibility on its application. Furthermore, knowing the welfare degree of these animals is the best way to make improvements and promote a better quality of life to meat goat does.

Key words: AWIN. Consumer. Parameter. Production system. Quality of life.

2.1 INTRODUCTION

According to FAOSTAT (2015), the number of worldwide goats, between 2013 and 2014, was nearly two billion animals. The main countries that raised goats in 2014 were mainland China (187,869,000), India (133,000,000), Nigeria (71,000,000), Pakistan (66,600), and Bangladesh (55,900,000). In Brazil, Municipal Livestock Research reported the existence of 8,851,879 goats, in 2014, and the Northeast region had the highest number of these animals, with 91.6% of the national goat herd (IBGE, 2014).

The five mainly countries that raise goats present semiarid regions (UNESCO, 1979). In fact, this type of region represents 15.2% of the areas in the world (NATIONS, 2011). In Brazil, semiarid region represents 11.53% of its territory (IBGE, 2005), in which almost 60.0% of Northeast region is included (SUDENE, 2016), with hot and dry climate, low rainfall (range 280-800 millimeters), irregular rains concentrated in three to four months, as well as water scarcity (ARAÚJO, 2011). Under these conditions, raising goats, especially does, brought benefits to this region as low initial capital to start this activity, small scale accumulation of income, and adaptation to agroecosystems of semiarid regions (HOLANDA JÚNIOR and MARTINS, 2007).

Meat goat does have a life of six to seven years on farm, being used while providing healthy offspring, and do not have dystocia or abortions (RECIFE. SEBRAE, 2000). It is recommended that reproductive life of these animals starts around seven to eight months (BRASÍLIA. CODEVASF, 2011). In Brazil, goats are raise in three different systems: extensive, semi-intensive and intensive. In Northeast, the main form of raising goats is in extensive system (VOLTOLINI et al., 2011), in which animals are kept in rudimentary facilities, with sanitary management practices rarely used, and feeding on natural pastures, reflecting a low reproductive rate and high mortality rate. The productivity depends almost exclusively on weather conditions and soil fertility (BRASÍLIA. CODEVASF, 2011). Semi-intensive system has a moderate use of technology, with supplemental feed and health management practices. The goals of intensive systems goals are higher productivity per animal or production per area available, with cultivation and fertilization of pastures, division of pastures in paddocks and breeding season being frequent management practices in this system (BRASÍLIA. CODEVASF, 2011).

The Ministry of Agriculture, Livestock and Supply (MAPA) has tried several methods to stimulate sustainable development of goat breeding in Brazil, and animal welfare issue was included in Strategic Agenda for Sheep and Goats, between 2010 and 2015, with the goal of generating specific studies to Brazilian reality (MAPA, 2011). In addition, demand for products that assure welfare of livestock animals has increased in recent years (BATTINI et al., 2014). In Brazil, consumers from Piracicaba-SP (88%) (DONOFRE et al., 2013), Rio Verde-GO (66.9%) (SCHALY et al., 2010), Curitiba-PR (66%) (PABIS, 2011) and São Luís-MA (63.9%) (ANUNCIAÇÃO et al., 2010) would accept paying a higher value for a product with welfare assurance of animals involved.

One way to assess animal welfare is through indicators. Farm animal welfare parameters can be divided into behavioural, physiological, health (BROOM; FRASER, 2010) and zootechnical (APPLEBY et al., 2011). Behavioural assessments are based on abnormal behaviours; physiological parameters can be evaluate by heart and respiratory rates, and cortisol measurement; health indicators of herd can be measure by incidence and prevalence of diseases; and zootechnical indicators can be measured with body condition score, mortality and birth rates.

In 2015, a protocol was release to assess welfare of lactating adult dairy goats in Europe, AWIN Goat (Animal Welfare Indicators for Goats), with the objective to use indicators based mainly in animals and available resources, generating data that represent quality of life in animals (AWIN, 2015a). Currently, there are no indicators to assess the degree of welfare in meat goat does. Considering that Brazilian Northeast has the highest concentration of goats' herd in Brazil, with a large proportion of its territory located in a semiarid region, and specific weather and rainfall conditions, the aim of this review was to identify possible indicators to be applied in the welfare diagnosis of meat goat does in this region.

2.2 SELECTION AND TYPES OF INDICATORS FOR WELFARE ASSESSMENT IN MEAT GOAT DOES

Assessment of animal welfare requires the use of several indicators that address physical and mental health, besides natural behavior of each species (BLOKHUIS et al., 2010). Parameters for farm animals were defined by two protocols: Welfare Quality®, designed for pigs, poultry, dairy and beef cattle (WELFARE QUALITY®, 2009) and Animal Welfare Indicators (AWIN), design for sheep, dairy

goats, horses, donkeys and turkeys (AWIN PROJECT, 2015). Welfare Quality® is defined with four principles and twelve criteria of welfare, with most of them presented in AWIN protocols (WELFARE QUALITY® 2009; AWIN PROJECT, 2015). Each criterion has welfare indicators that can be observed in more than one principle. TABLE 1 shows welfare principles, criteria and indicators of AWIN Goat and Sheep (AWIN, 2015a, b).

TABLE 1 - PRINCIPLES AND CRITERIA OF WELFARE FOR SHEEP AND GOATS, WITH RESPECTIVE INDICATORS IN EACH CATEGORY (AWIN, 2015A, B).

WELFARE PRINCIPLES	WELFARE CRITERIA	WELFARE INDICATORS
Good Feeding	Appropriate nutrition	[ab] Body Condition Score [a] Hair coat condition [a] Queuing at feeding [b] Score lamb mortality
	Absence of prolonged thirst	[a] Queuing at drinking [b] Water availability
Good Housing	Confort around resting	[a] Bedding [b] Fleece cleanliness
	Thermal confort	[a] Thermal stress [b] Panting [b] Access to shade/shelter (outdoors only)
	Ease of movement	[a] Kneeling at feeding rack [b] Stocking density (housed animals only) [b] Hoof overgrowth (housed animals only)
Good Health	Absence of injuries	[a] Severe lameness [b] Body and head lesions [b] Leg injuries
	Absence of disease	[ab] Abscess [ab] Body Condition Score [ab] Faecal soiling [a] Hair coat condition [ab] Nasal discharge [a] Oblivion [ab] Ocular discharge [a] Overgrown claws [a] Udder asymmetry [b] Mucosa colour [b] Lameness [b] Mastistis and udder lesion (lactating ewes only) [b] Respiratory quality [b] Fleece quality
	Absence of pain and pain induced by management procedures	[a] Improper disbudding [a] Severe lameness [b] Tail lengh
Appropriate Behaviour	Expression of social behaviour	[a] Queuing at feeding [a] Queuing at drinking [b] Social Withdraw
	Expression of other behaviours	[a] Oblivion [b] Stereotype [b] Excessive itching
	Good human-animal relationship	[a] Latency to the first contact test [b] Familiar human approach test
	Positive emotional state	[ab] Qualitative Behaviour Assessment

[a]AWIN Goat. [b]AWIN Sheep.

Parameters or indicators used by AWIN and Welfare Quality® protocols were selected based on validity, ensuring the degree of current animal welfare; reliability, being identified by different observers, regardless of external conditions such as time of day; and feasibility, which applies to farm level (WELFARE QUALITY®, 2009; AWIN PROJECT, 2015). There are three types of indicators: animal-based, concerned about physical and mental health, besides natural behaviour of species; resource and management-based, concerned about stocking density, housing conditions, health plans, etc (BLOKHUIS et al., 2010). The last type is used at a questionnaire level (WELFARE QUALITY®, 2009; AWIN PROJECT, 2015).

In this review, most indicators used to diagnose welfare in meat goat does were selected from AWIN Goat and AWIN Sheep protocols (AWIN, 2015a, b). One parameter was suggested by the authors, based on studies about health management and conditions of facilities for goats in Brazilian Northeast (BRASÍLIA. SEBRAE, 2009; BRASÍLIA. CODEVASF, 2011) in order to increase the level of welfare of these animals. Rearing systems, besides climate and rainfall characteristics of this region, were considered in selection of these measures. TABLE 2 shows a proposal of animal and resources-based indicators to be tested on welfare diagnosis in meat goat does in Brazilian Northeast.

TABLE 2 - PROPOSAL OF 18 INDICATORS TO APPLY IN WELFARE ASSESSMENT OF GOAT DOES IN DIFFERENT PRODUCTION SYSTEMS.

INDICATORS/ REARING SYSTEMS	EXTENSIVE, SEMI-INTENSIVE AND INTESIVE SYSTEMS	EXCLUSIVELY FOR INTENSIVE SYSTEM
Animal-based indicators	[a] Hair Coat Condition [a] Abscesses [a] Nasal discharge [a] Oblivion [a] Queueing at feeding [a] Thermal stress [b] Lameness [b] Body and head lesions [b] Leg injuries [b] Familiar human approach test [ab] Body Condition Score [ab] Faecal soiling [ab] Ocular discharge [ab] Qualitative Behaviour Assessment	
Resources-based indicators	[b] Water availability [b] Access to shade and shelter [c] Cleanliness of facilities	[b] Stocking density

Legend: [a]Indicators of AWIN Goat (AWIN, 2015a). [b]Indicators of AWIN Sheep (AWIN, 2015b). [ab]Indicators of AWIN Goat and Sheep (AWIN, 2015a, b). [c]Indicator proposed by the authors.

SOURCE: The author (2017)

2.3 ANIMAL-BASED INDICATORS

Body Condition Scoring (BCS): VILLAQUIRAN et al. (2004) reported that nutritional status of goats can be measured, subjectively, by palpation of the lower back and sternum, aiming to feel the amount of muscle and fat in these areas. Goats with high or low BCS may have systemic diseases and reproductive problems. In semiarid Brazilian Northeast, many animals are fed only with natural vegetation, even in the dry season (ARAÚJO FILHO, 2006), being supplemented when it is possible (HOLANDA JÚNIOR and MARTINS, 2007).

Queuing at feeding: dairy goats on low rank of hierarchy were observed feeding in a smaller period, and waiting in line for their turn to eat, for a longer period, when compared to goats in medium and high rank hierarchy (JØRGENSEN et al., 2007). These authors also reported that aggressive interactions increase significantly when the number of goats per trough is higher. Brazilian manuals recommend a space of 20 to 30 cm per adult animal in the trough (CEARÁ. EMBRAPA, 2005; BRASÍLIA.

SEBRAE, 2009; BRASÍLIA. CODEVASF, 2011). Meanwhile, Code of Welfare for goats indicates a space of 40 cm per adult as adequate (NEW ZEALAND GOVERNAMENT, 2012). This indicator is most important in confined systems and when goats have limited access to food.

Hair coat condition: this parameter may indicate the existence of pathologies or diseases on animals (BERG et al., 2009). Dairy goats with matted, rough and scurfy hair had lower BCS, deficiency or excess of minerals and increased presence of abnormal sounds in lungs compared to goats with shiny and homogeneous coat (BATTINI et al., 2015).

Thermal stress: Thermal neutral zone for goats is between 20 and 30°C, with critical heat stress at temperatures above 34ºC (BAÊTA and SOUZA, 2010). Goats submitted to temperatures above 30ºC in Paraíba-BR presented an increase in respiratory rate, rectal temperature and sweating rate, with reduction in food intake and water consumption (BRASIL et al., 2000).

Lameness: most reported lameness in goats occurs due to diseases in hooves caused by inadequate nutrition, environmental and anatomical factors (PUGH, 2002), and sickness, such as Caprine Arthritis Encephalitis (CAE), sole ulcer, white line abscesses, sole abscesses and pododermatitis (NOGUEIRA et al., 2009; AGUIAR et al., 2011). ALENCAR et al. (2010) cited hooves problems in small ruminants, associated with lameness, in farms (49.2%) located in Pernambuco-BR.

Abscesses: occurrence of external abscesses in the body, in the region of the lymphnodes, is closely associated with Caseous Lymphadenitis (CL) in small ruminants (SMITH and SHERMAN, 2009). In Pernambuco-PR, 52,38% goats had lymphnodes affected by CL (SOUZA et al., 2014) and this disease was prevalent in farms (66.9%) in Ceará (PINHEIRO et al., 2000).

Body and head lesions: barbed wire and wood splinters were reported by stockpeople from Maranhão-BR as causes of injuries in goats, and a gateway for ticks and subsequent myiasis (BRITO et al., 2005). In this study, tick larvae were found in head, neck, belly and perianal region.

Leg injuries: occurrence of alopecia region, scabbed and swelling areas on the joints of legs in sheep may be indicative of injury, arthritis or animals lying on hard surfaces for prolonged time (AWIN, 2015b). In goats, arthritis is a symptom of CAE, especially observed in adults (NOGUEIRA et al., 2009).

Faecal soiling: this indicator measures the presence of soft faeces in anal region. Occurrence of diarrhea in goats is associated with copper deficiency, sudden change in diet, rumen acidosis, nematodes and cestodes infections (PUGH, 2002). Diarrhea caused by gastrointestinal worms was reported in farms (78.7%) with goats in Ceará-BR (PINHEIRO et al., 2000).

Nasal discharge: dairy goats with tuberculosis caused by *Mycobacterium tuberculosis* complex showed bilateral nasal discharge (MELO et al., 2012). Contagious caprine pleuropneumonia, Parainfluenza type 3, *Oestrus ovis* larvae, tumors and foreign bodies are other causes of this clinical sign in small ruminants (PUGH, 2002; OLIVEIRA et al., 2004). In Pernambuco-BR, farms (63.3%) with small ruminants presenting nasal discharge were reported (ALENCAR et al., 2010).

Ocular discharge: this symptom is observed in bacterial diseases, such as infectious keratoconjunctivitis in goats (OLIVEIRA et al., 2004). Keratoconjunctivitis was reported in farms (29.1%) with goats in Ceará-BR (PINHEIRO et al., 2000). Ocular changes suggestive of keratoconjunctivitis were found in farms (77.6%) with small ruminants in Pernambuco-BR (ALENCAR et al., 2010).

Oblivion: goats are gregarious animals and only isolate themselves from herd in moments before delivery (LICKLITER, 1985), or due to health problems, standing immobile and facing parts of housing structure, according to reports from farmers and technicians (BATTINI et al., 2014).

Familiar human approach test (FHAT): this test evaluates the level of fear of animals determined by previous human-animal interaction (MATTIELLO et al., 2010). After a human being walks towards goats, the distance of flight is measure (AWIN, 2015b). FHAT was tested on dairy goats in extensive system (MATTIELLO et al., 2010).

Qualitative Behaviour Assessment (QBA): this specie-specific indicator seeks to identify animal emotions through behaviour expression and body posture (WEMELSFELDER et al., 2000). Descriptors as agitated, alert, bored, curious, relaxed were selected to add qualitative information to welfare diagnosis of dairy goats (AWIN, 2015a). It is important to test QBA in meat goat does too.

2.4 RESOURCE-BASED INDICATORS

Water availability: constant supply of water for small ruminants is essential to regulating body temperature, especially in Brazilian Northeast semiarid (ARAÚJO et al., 2011). In addition, these authors reported that provision of water points and ease of access to them are important factors, especially in dry periods. Water quality should be considered because contaminants such as bacteria, viruses and protozoa are transmitted to animals through this vehicle, being important to assess cleanliness of water points (AWIN, 2015b).

Cleanliness of facilities: a study conducted in Brazilian Northeast reported that only 14% of producers performed daily cleaning of facilities, being more common this practice be done in periods longer than one week (68.8%) (ALENCAR et al., 2010) or every 15 days (61.1%) (FILGUEIRA et al., 2009). ALENCAR et al. (2010) found out that the most prevalent type of floor in small ruminant farms was bare soil (74.8%), making it difficult to clean, but producers performed it by sweeping and applying whitewash. This indicator is also important in extensive system because animals spent all night in facilities.

Stocking density: individual space is important in management of goats, particularly in intensive systems, because it reduces frequency of aggressive interactions between animals (BARROSO et al., 2000). Goats should have a space of $2m^2$ per animal, when kept in pen (NEW ZEALAND GOVERNMENT, 2012). However, Brazilian manuals recommend an area of $1m^2$ per doe (CEARÁ. EMBRAPA, 2005; BRASÍLIA. SEBRAE, 2009; BRASÍLIA. CODEVASF, 2011).

Access to shade and shelter: NEW ZEALAND GOVERNMENT (2012) reported that goats kept on pasture, in absence of shadow, had higher water consumption, reduction of grazing behavior, and increased respiratory rate, with mouth opening and tongue protrusion in extreme cases, indicating heat stress. Shelter is important to ensure that animals stay dry, out of wet soil, and protected from wind. Animals allocated in hot and dusty environments are more prone to develop pneumonia in absence of shadow.

Meat goat does and rearing systems in Brazilian Northeast were considered on the selection of these indicators to assess animal welfare. Most animal-based parameters were selected from AWIN Goat, because this protocol was specifically developed for this specie. Indicators such as queuing at drinking, severe lameness, udder asymmetry, improper disbudding were excluded because they are more directed to dairy goats, in intensive and semi-intensive rearing systems (AWIN, 2015a).

Inclusion of AWIN Sheep indicators, such as lameness, body and head lesions, leg injuries, familiar human approach test, water availability, access to shade and shelter, stocking density (AWIN, 2015b) occurred because this protocol has been developed for different types of rearing systems, including extensive ones, which is more relevant to meat goats in Brazilian Northeast. A new indicator, cleanliness of facilities, was included because of its possible impact on animal health. Directed studies to prove validity, reliability and feasibility of these indicators in meat goat does are needed.

2.5 CONCLUSION

Animal welfare needs to be included in goat breeding as a way to improve goats' living conditions and the quality of products, and this requirement has already been made by external markets, especially European ones. The selection of specific indicators to assess the welfare of meat goat does is the first step to discuss the elaboration of a specific welfare protocol for meat goat does in the semiarid region of Brazilian Northeast. Welfare assessments detect problems faced by the animals, helping in the search for improvements in the productive chain, which is valuable to bring development to goat breeding in Brazilian Northeast. Together with the proposed indicators, others as presence of aggressive behaviour, stereotypies, coughing and vulvar discharge could be included. The indicators proposed are feasible and must be tested in meat goat does in the semiarid region of Brazilian Northeast to verify criteria of validity and reliability and to generate studies to elaborate an specific welfare protocol for meat goat does.

REFERENCES

AGUIAR, G. M.; SIMÕES, S. V.; SILVA, T. R.; et al. Foot rot and other foot diseases of goat and sheep in the semiarid region of northeastern Brazil. **Pesquisa Veterinaria Brasileira**, v. 31, n. 10, p. 879–884, 2011.

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

ANUNCIAÇÃO, A. R. DE A. DA; SOBRINHO, I. C. DE M.; VIANA, D. C.; et al. Animal welfare production: perception of breeders, handlers, consumers, teacher and

scholars at the Universidade Estadual do Maranhão. p.1–3. 2010. Available in: <http://www.sovergs.com.br/site/38conbravet/resumos/956.pdf>.

APPLEBY, M. C.; MENCH, J. A.; OLSSON, I. A.; HUGHES, B. O. **Animal Welfare**. **(2nd edition)**. Wallingford: CABI Publishing, 2011.

ARAÚJO, G. G. L. DE; VOLTOLINI, T. V.; TURCO, S. H. N.; PEREIRA, L. G. R. A água nos sistemas de produção de caprinos e ovinos. **Produção de caprinos e ovinos no Semiárido**. Embrapa Semiárido, 2011. p.69–94.

ARAÚJO, S. M. S. A região semiárida do Nordeste do Brasil: Questões Ambientais e Possibilidades de uso Sustentável dos Recursos. **Rios Eletrônica**, p. 89–90, 2011.

ARAÚJO FILHO, J. A. DE. **Aspectos Zooecológicos e Agropecuários do Caprino e do Ovino nas Regiões Semi-áridas**. 2006.

AWIN. **Animal Welfare Indicators for Goats**. 2015a.

AWIN. **Animal Welfare Indicators for Sheep**. 2015b.

AWIN PROJECT. Animal Welfare Indicators. 2015. Available in: <http://www.animal-welfare-indicators.net/site/>.

BAÊTA, F. D. C.; SOUZA, C. D. F. **Ambiência em edificações rurais: conforto térmico (2nd edition)**. Viçosa: UFV, 2010.

BARROSO, F. G.; ALADOS, C. L.; BOZA, J. Social hierarchy in the domestic goat: effect on food habits and production. **Applied Animal Behaviour Science**, v. 69, p. 35–53, 2000.

BATTINI, M.; PERIC, T.; AJUDA, I.; et al. Hair coat condition: A valid and reliable indicator for on-farm welfare assessment in adult dairy goats. **Small Ruminant Research**, v. 123, n. 2–3, p. 197–203, 2015.

BATTINI, M.; VIEIRA, A.; BARBIERI, S.; et al. Invited review: Animal-based indicators for on-farm welfare assessment for dairy goats. **Journal of Dairy Science**, v. 97, p. 1–24, 2014.

BERG, W.; JOLLY, A.; RAMBELOARIVONY, H.; ANDRIANOME, V.; RARAMIMANANA, H. A scoring system for coat and tail condition in ringtailed lemurs, *Lemur catta*. **American Journal of Primatology**, v. 71, n. 3, p. 183–190, 2009.

BLOKHUIS, H. J.; VEISSIER, I.; MIELE, M.; JONES, B. The Welfare Quality® project and beyond: Safeguarding farm animal well-being. **Acta Agriculturae Scand Section A**, v. 60, p. 129-140, 2010.

BRASIL, L. H. D. A.; WECHESLER, F. S.; JUNIOR, FLÁVIO BACCARI GONÇALVES, H. C.; BONASSI, I. A. Efeitos do Estresse Térmico Sobre a Produção,

Composição Química do Leite e Respostas Termorreguladoras de Cabras da Raça Alpina. **Revista Brasileira de Zootecnia**, v. 29, n. 6, p. 1632–1641, 2000.

BRASÍLIA. CODEVASF. **Manual de Criação de Caprinos e Ovinos**. 2011.

BRASÍLIA. SEBRAE. **Manejo Básico de Ovinos e Caprinos**. 2009.

BRITO, D. R. B.; SANTOS, A. C. G.; GUERRA, R. M. S. N. C. Ectoparasitos em rebanhos de caprinos e ovinos na microrregião do alto Mearim e Grajaú, estado do Maranhão. **Revista Brasileira de Parasitologia Veterinária**, v. 14, n. 2, p. 59–63, 2005.

BROOM, D. M.; FRASER, A. F. **Comportamento e Bem-estar de animais domésticos (2nd edition)**. Barueri: Manole, 2010.

CEARÁ. EMBRAPA. **Boas práticas na produção de caprinos e ovinos de corte**, 2005.

DONOFRE, A. C.; SILVA, I. J. O. DA; CABRELON, M. A. F. A importância do bem-estar dos animais de produção para os consumidores de Piracicaba - SP/Brasil. 2013. Available in: <http://sisca.com.br/resumos/SISCA_2013_069.pdf>.

FAOSTAT. Brazilian goat's head in 2013-2014. 2015. Available in: <http://faostat3.fao.org/compare/E>.

FILGUEIRA, T. M. B.; AHID, S. M. M.; SUASSUNA, A. C. D.; SOUZA, W. J. DE; FONSECA, Z. A. A. DE S. Aspectos epidemiológicos e sanitários das criações de caprinos na região da Chapada do Apodi. **Revista Verde de Agroecologia e Desenvolvimento Sustentável**, v. 4, n. 2, p. 64–67, 2009.

HOLANDA JÚNIOR, E. V.; MARTINS, E. C. Análise da produção e do mercado de produtos caprinos e ovinos: o caso do território do sertão do Pajeú em Pernambuco. 2007. Available in: <https://www.embrapa.br/busca-de-publicacoes/-/publicacao/533505/analise-da-producao-e-do-mercado-de-produtos-caprinos-e-ovinos-o-caso-do-territorio-do-sertao-do-pajeu-em-pernambuco>

IBGE. Semiárido. 2005. Available in: <http://www.ibge.gov.br/home/geociencias/geografia/semiarido.shtm?c=4>.

IBGE. **Produção da Pecuária Municipal**. 2014.

JØRGENSEN, G. H. M.; ANDERSEN, I. L.; BOE, K. E. Feed intake and social interactions in dairy goats-The effects of feeding space and type of roughage. **Applied Animal Behaviour Science**, v. 107, n. 3–4, p. 239–251, 2007.

LICKLITER, R. E. Behavior associated with parturition in the domestic goat. **Applied Animal Behaviour Science**, v. 13, p. 335–345, 1985.

MAPA. **Agenda Estratégica Caprinos e Ovinos 2010-2015**. 2011.

MATTIELLO, S.; BATTINI, M.; ANDREOLI, E.; et al. Avoidance distance test in goats: A comparison with its application in cows. **Small Ruminant Research**, v. 91, n. 2–3, p. 215–218, 2010.

MELO, L. E. H.; MOTA, R. A.; MAIA, F. C. L.; et al. Ocorrência e caracterização da tuberculose em caprinos leiteiros criados no estado de Pernambuco. **Pesquisa Veterinaria Brasileira**, v. 32, n. 9, p. 831–837, 2012.

NATIONS, U. United Nations Decade for deserts and the fight against desertification - Why Now. 2011. Available in: <http://www.un.org/en/events/desertification_decade/whynow.shtml>.

NEW ZEALAND GOVERNAMENT. **Animal Welfare (Goats) Code of Welfare 2012**. 2012.

NOGUEIRA, D. M.; PINHEIRO, R. R.; SELMO, F.; ALVES, F. **Artrite encefalite caprina viral: um alerta aos produtores**. 2009.

OLIVEIRA, A. A. DA F.; ALVES, F. S. F.; PINHEIRO, R. R.; CHAPAVAL, L.; PINHEIRO, A. A. **Micoplasmoses em Pequenos Ruminantes**. 2004.

PABIS, J. C. **Opinião dos criadores sobre bem estar animal: percepção de sofrimento no métodos empregados para criação dos animais de produção**. Curitiba, 67 p. Monografia (Especializaçao no curso de Gestão em Defesa Agropecuária) - Universidade Federal do Paraná, Curitiba, 2011.

PINHEIRO, R. R.; GOUVEIA, A. M. G.; ALVES, F. S. F.; HADDAD, J. P. A. Aspectos epidemiológicos da caprinocultura cearense. **Arquivo Brasileiro de Medicina Veterinaria e Zootecnia**, v. 52, n. 5, p. 534–543, 2000.

PUGH, D. G. **Sheep & Goat Medicine**. Philadelphia: Saunders, 2002

RECIFE. SEBRAE. **Manual de Caprinocultura**. 2000.

SCHALY, L. M.; OLIVEIRA, M. C. DE; SALVIANO, P. A. P.; ABREU, J. M. DE. Percepção do comsumidor sobre bem-estar de animais de produção em Rio Verde, GO. **PUBVET**, v. 4, 2010.

SMITH, M. C.; SHERMAN, D. M. **Goat Medicine (2nd Edition)**. Iowa: Wiley-Blackwell, 2009.

SOUZA, A. M. DOS S.; JÚNIOR, E. DE M. D.; ZAFALON, L. F.; VESCHI, J. L. A. Ocorrência de Cicatrizes e Abscessos Causados pela Linfadenite Caseosa em Caprinos do Rebanho da Embrapa Semiárido. 2014. Available in: <http://ainfo.cnptia.embrapa.br/digital/bitstream/item/124429/1/PROCI-2015.00013.pdf>.

SUDENE. Semiárido - Superintendência do Desenvolvimento do Nordeste (SUDENE). 2016. Available in: <http://www.sudene.gov.br/acesso-a-informação/institucional/area-de-atuacao-da-sudene/semiarido>.

UNESCO. **Map of the world distribution of arid regions**. 1979.

VILLAQUIRAN, M.; GIPSON, T. A; MERKEL, R. C. **Body Condition Scores in Goats**. 2004.

VOLTOLINI, T. V.; SANTOS, R. M.; MORAES, S. A. D. A.; DE, G. G. L. Principais modelos produtivos na criação de caprinos e ovinos. In: VOLTOLINI, T. V et al. **Produção de caprinos e ovinos no Semiárido**. Embrapa Semiárido, 2011. p. 219–232.

WELFARE QUALITY®. **Welfare Quality® Assessment protocol for cattle**. 2009.

WEMELSFELDER, F.; HUNTER, E. A.; MENDI, M. T.; LAWRENCE, A. B. The spontaneous qualitative assessment of behavioural expressions in pigs: First explorations of a novel methodology for integrative animal welfare measurement. **Applied Animal Behaviour Science**, v. 67, n. 3, p. 193–215, 2000.

3 ON-FARM WELFARE ASSESSMENT IN MEAT GOAT DOES RAISED IN SEMI-INTENSIVE AND EXTENSIVE SYSTEMS IN CEARÁ, BRAZIL

ABSTRACT

Meat goat does are an essential source of milk, protein and goatskin for middle and low income people in Brazilian northeast. Assessment of goat welfare helps to identify the challenges faced by these animals and to search for solutions to improve the quality of life of them. The aim of this study were to develop a protocol to evaluate the welfare of meat goat does raised for meat or stud purpose in animals kept in extensive (E) and semi-intensive (S) systems through animal and resource-based indicators, identify the welfare problems that affect these animals and compare both production systems. Fifteen farms located in the Metropolitan Region of Quixadá and Quixeramobim, Ceará, Brazilian Northeast, were recruited. A standard protocol was elaborated over a selection of animal and resource-based indicators developed for dairy goats and ewes. Assessments were performed at group and individual level. Significance difference between S and E farms was set at $p<0.05$ to all tests. At group level, oblivion and thermal stress indicator had significant difference ($p<0.05$) between goats in S and E farms. Negative descriptors on Qualitative Behaviour Assessment (QBA) had similar results on both groups and there was no significant difference between positive descriptors in E and S farms. About resource-based indicators, type of drinkers and access to shelter differ significantly ($p<0.05$) between semi-intensive and extensive systems, with goats in S farms allocated in places with more access to water during the night period and protected from wind. Type of facility was considered more complex to animals in S farms than in E farms. At individual level, abscess, ocular discharge and lesions in ears had significant different results in both production systems due to distinct management of goats. The great similarities between results showed that farmers in both production systems faced problems due to heat stress, lack of forage and health issues.

Key words: AWIN. Indicator. Production system. Brazilian northeast. Quality of life.

3.1 INTRODUCTION

Raising goats in Brazilian Northeast is an important social-economic activity, especially for middle and low income people, being an essential source of milk, protein and goatskin (SILVA and ARAÚJO, 2000). More than 90% of goats live in this region (IBGE, 2014), with Ceará being the fourth largest state that raised goats (IBGE, 2013). Almost 60% of Northeast presents semiarid region (SUDENE, 2016). This territory has environmental conditions constituted by hot and dry climate, irregular rains concentrated in few months, with water scarcity, especially in dry periods, and Caatinga as the main vegetation type (ARAÚJO, 2011). Almost the entire territory of Ceará is inserted in semiarid region (IPECE, 2005).

BRASÍLIA. SEBRAE (2009) mentioned that the majority of national production of goats is low, especially in the Northeast, since breeding goats in this region is an activity mainly focused on subsistence. The productivity of the herds is quite restricted due to technological and handling limitations as difficult access to forage in dry season, herds with lower genetic quality, precarious reproductive management practices (lack of males control) and sanitary conditions (mortality of young animals as a result of infectious and parasitic diseases), leading to high mortality rates. In this situation, the animals end up showing a slower development, with the slaughter weight being reached only in animals older than one year.

In Brazil, meat goat does have a life of six to seven years on farm, and are maintained while providing healthy offspring, and do not have reproductive problems, being the main category of animals present in farms (PINHEIRO et al.; RECIFE. SEBRAE, 2000). Goats are raised in three different systems: extensive, with animals kept in rudimentary facilities and feeding on natural pastures; semi-intensive, with supplemental feed and better health management practices; and intensive one, in which goals are higher productivity per animal or production per area available, with better technology resources as farming and fertilization of pastures (BRASÍLIA. CODEVASF, 2011) In the Northeast region, goats are mainly raised in extensive systems (VOLTOLINI et al., 2011).

In order to improve the development of small ruminants breeding in Brazil, The Ministry of Agriculture, Livestock and Supply (MAPA) included animal welfare as an important goal to achieve (MAPA, 2011). Animal welfare involves concern about the ability of an individual to adapt to the challenges imposed by the environment

(BROOM, 1986). This author also said that a high degree of welfare can be related to the little effort and expenditure of resources in this adaptation. Failure to cope with difficulties in the environment increases animal mortality, reduces the rate of growth and increases the emergence of diseases. In this context, the welfare assessment of farm animals, also sentient beings, has been increasingly worldwide (BLOKHUIS et al., 2010). Species-specific protocols have been developed aiming to identify the challenges faced by farm animals and searching for solutions to promote a better quality of life to them (WELFARE QUALITY®, 2009; AWIN PROJECT, 2015). Indicators used have to be valid, represent the welfare state of the animal appropriately; reliable, the same result must be found by two people or more; feasible, easy to apply at farm level (BATTINI et al., 2015).

The AWIN Project was developed to help on welfare assessment of turkeys, horses, donkeys, sheep and dairy goats, but AWIN Goat protocol was designed to assess the welfare of adult lactating dairy goats raised in intensive and semi-intensive systems, especially (AWIN, 2015a), with specific animal and resource-based indicators. Currently, there are no welfare protocols for meat goat does. The objective of this study was to develop a protocol to evaluate the welfare of meat goat does; to apply this protocol in meat goat does kept in extensive (E) and semi-intensive (S) systems and to compare the welfare of goats in each production system (E and S), in order to identify the main problems faced by goats in each system.

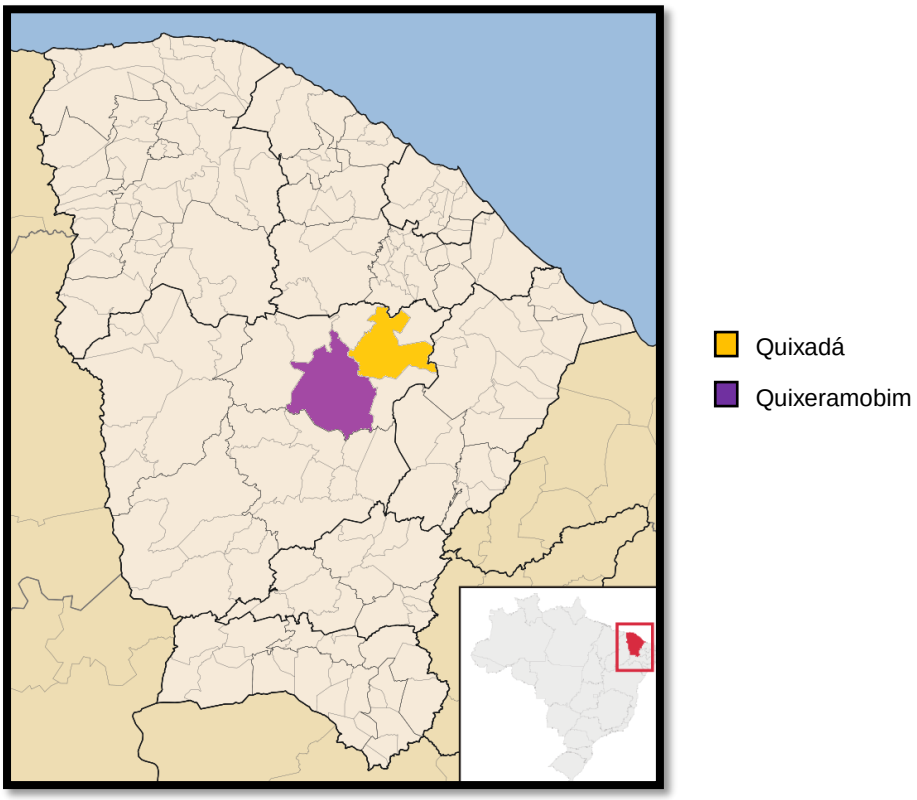
3.2 MATERIAL AND METHODS

3.2.1 FARMS AND ANIMALS

Fifteen farms located in the Metropolitan Region of Quixadá and Quixeramobim, Ceará, Brazil were recruited via Association of Goat and Sheep Breeders of Ceará State (ACOCECE), Association of the Lagoa Rasa Community and Association of Living with the Semiarid (CONVIVER). FIGURE 1 shows the cities of Quixadá and Quixeramobim. The welfare assessment protocol was designed for, and applied to, adult meat goat does raised for meat or stud purpose in extensive and semi-intensive rearing systems. All farms were visited in July 2016. Some information about the research was given to the Presidents of Associations before the visits occurred.

In ten farms, animals were kept in extensive systems (E), characterized by rudimentary facilities, with animals being released early during the day and housed before night, feeding only on natural pastures of Caatinga. In five farms, animals are maintained in semi-intensive systems (S), with similar conditions of an extensive farm but with the addition of supplemental feed, infirmary and quarantine facilities. In addition, health handling procedures as hooves trimmed are more frequently.

FIGURE 1 - LOCALIZATION OF CITIES WHERE OCURRED THE ASSESSMENTS IN FARMS IN CEARÁ STATE, BRAZIL.



SOURCE: adapted from WIKIPÉDIA (2017)

Meat goat does evaluated had at least seven months, an adequate age for breeding, accordlying to technical recommendations (BRASÍLIA. CODEVASF, 2011). Animals were used by farmers for their own consumption, goatskin trade, and sale of live goats, for breeding or meat purpose, in fairs.

3.2.2 DEVELOPMENT OF THE PROTOCOL TO BE APPLIED ON FARM ASSESSMENTS

A standard protocol was elaborated over a selection of animal and resource-based indicators applied to dairy goats (AWIN, 2015a) and ewes (AWIN, 2015b). Some parameters were selected from a review of the published literature on small ruminant health (CAROPRESE et al., 2009; LLONCH et al., 2015) and type and cleanliness of facilities for small ruminants in Brazilian Northeast (BRASÍLIA. SEBRAE, 2009; ALENCAR et al., 2010; BRASÍLIA. CODEVASF, 2011).

A single observer performed all evaluations. A checklist was developed and applied in a standard order in each farm. Animals were assessed on group level followed by an individual evaluation. The observations were registered on papers and transferred to Excel v.10 later. On-farm visits occurred between 07:00 a.m. and 04.00 p.m., according to the availability of farmers. Each farm received the results of diagnosis with suggestions to improve the welfare of goats.

In all farms, goat welfare assessment interrupted the daily routine at group (n=13; 86.66%) and individual level (100%) due to the fact that the animals were released early in the morning (06:00 – 07:00 a.m.) in Caatinga, mostly in unfenced fields, and only returned at 04:00 to 05:00 p.m. In addition, there were difficulties in access to several farms (n= 11; 73.33%) that were located in areas far from the cities, Quixadá e Quixeramobim, in places without signalling, being necessary the presence of the Association of the Lagoa Rasa Community's president during visits.

3.2.3 FIRST WELFARE LEVEL: GROUP ASSESSMENTS

The recording sheet (APPENDIX 1) used at group evaluation was adapted from AWIN Goat and Sheep Protocol (AWIN, 2015a, b). Two groups of animals, kept in fenced fields or in pens, were evaluated on each farm, but if this case was not possible, only one group was assessed. The first group was randomly selected and goats kept in infirmary and quarantine were not considered in the assessment. The protocol was applied in 16 groups (two on farm 02). No physical contact was performed with animals at this level. Evaluations started outside the pens/fields following to the inside. Superficial temperature (°C) and relative humidity of air (%) was calculated with Digital Thermo Hygrometer ITHT2210 at begin of each assessment. On the beginning of evaluations, local time was recorded.

Seven animal-based indicators (TABLE 3) and four resource-based parameters (TABLE 4) were selected to evaluated welfare of goats at this level.

Lameness parameter was divided in variables minor, lame and severely lameness scored as 1 to 3, respectively. On resource-based indicators, access to shade and shelter indicator were separated in two different variables; water availability was measure in five variables (water availability, number of drinkers, type of drinkers, cleanness of drinkers and functionality of drinkers). Cleanliness of facilities was proposed by authors due to footrot disease being an important cause of lameness in goats (AGUIAR et al., 2009). Type of facility, type of floor, frequency of cleanness and type of cleanness were also investigated. Frequency of cleanness was categorized in once a day, once a week and every fifteen days or more, adapted from FILGUEIRA et al. (2009). For the variable stocking density, the values were categorized into three ranges: poor (< 1.5m^2), adequate (between 1.51 – 1.59m^2) and good (≥ 2m^2), adapted from AWIN (2015b).

Animal-based indicators were scored as Visual Analogue Scale (VAS), with left and right points defining minimum and maximum scores (0-125mm), respectively (Qualitative Behaviour Assessment); number of goats presenting the selected parameter (oblivion, thermal stress, hair coat condition, lameness score); presence/absence (faecal soiling); flight distance from stockperson approach (Familiar Human Approach Test - FHAT). FHAT was classified on positive (number of goats that approached or initiated voluntary contact - sniffing, nosing), neutral (0 cm), bad (1-100cm) and very bad (> 101 cm).

Resource-based indicators were scored as presence/absence, type, quality and yes/no functioning (water availability); presence/absence and type (access to shade and shelter); quality (stocking density; cleanliness of facilities). The parameter cleanliness of facilities was evaluated based on assessor perception of the degree of cleanness. The inclusion of this indicator on Good Housing Principle relies on the question “Are the animals properly housed?” (WELFARE QUALITY®, 2009). The authors considered that an adequate facility, with a clean floor, without puddles, mud and large concentration of feces, is an important factor to ensure welfare to goats.

TABLE 3 - CHARACTERIZATION OF ANIMAL-BASED INDICATORS USED TO ASSESS THE WELFARE OF GROUPS OF MEAT GOAT DOES IN CEARÁ.

INDICATOR	WELFARE PRINCIPLE	DESCRIPTION
Qualitative Behaviour Assessment (QBA)	Appropriate behaviour	The assessor evaluated details of behaviour, posture, and animal body language using descriptions such as aggressive, fearful, relaxed.
Oblivion	Appropriate behaviour	The number of goats physically or mentally isolated from the group is recorded.
Thermal stress	Good housing	Number of goats showing heat (high accelerate respiration rate) or cold (shivering or presence of bristly hair) stress signs is counted.
Faecal soiling	Good health	The presence of soft and liquid manure below the tail head is visually assessed as a sign of diarrhea.
Hair coat condition	Good feeding/ Good health	The number of goats presenting poor hair coat (defined as matted, rough, scurfy, uneven, shaggy hair coat frequently longer than normal) is recorded.
Lameness score	Good health	Goats are moved into the fenced fields and the number of lame animals is recorded.
Score 0		Not lame. Goat's weight is borne on all four feet.
Score 1		Head nodding is perceived or the limb is rapidly lifted when touches the ground.
Score 2		Obvious head nodding is perceived; foot may be held-up whilst standing; goats may be grazing on knees.
Score 3		Goat is lying down and do not move. Animal is reluctance to stand or move.
Familiar Human Approach Test	Appropriate behaviour	The closest distance (m) of approach the group, before a flight response is evoke, is recorded. If an animal stands motionless, this is recorded as 0 m. Animals that approach voluntary and/or interact (sniffing or touching) are recorded too.

SOURCE: Adapted from BATTINI et al. (2015) and AWIN Sheep Protocol (AWIN, 2015b)

TABLE 4 - CHARACTERIZATION OF RESOURCE-BASED INDICATORS USED TO EVALUATE THE WELFARE OF GROUPS OF MEAT GOAT DOES IN CEARÁ.

INDICATOR	WELFARE PRINCIPLE	DESCRIPTION
Stocking density	Good housing	The size of pen/housing dimensions (m^2) is recorded and divided for the number of goats inside.
Good		Goats have, at least, $2m^2$ each.
Adequate		Goats have at least $1,51m^2$ but less than $2m^2$.
Poor		Goats have $1,5m^2$ or less.
Access to shade and shelter	Good housing	The presence of shade and shelter is recorded.
Water availability	Good feeding	The number and type of water point (bucket, automatic drinker and natural water source) is recorded.
Presence and type		Check if the water point is functioning.
Functioning		Dirty (water and water points are dirty; natural water source are stagnant or polluted); Partially dirty (water points are dirty but the water is clean); Clean (water and water points are clean; natural water source are clean and unpolluted).
Cleanliness		
[a]Cleanliness of facilities	[b]Good housing	The cleanliness of facilities is recorded.
Clean		The floor was covered with faeces in less than 25% of the area.
Partially dirty		The floor was covered with faeces in an area between 25 and 75% of the floor.
Dirty		The floor was covered with faeces in more than 75% of the area.

[a]Indicator proposed by the authors
[b]Welfare principle suggested by the authors

SOURCE: Adapted from AWIN Sheep Protocol (AWIN, 2015b)

3.2.3.1 QUALITATIVE BEHAVIOUR ASSESSMENT (QBA)

QBA for dairy goats is a tool developed to measure the behaviour through animal's body expressions after a period of observation (AWIN, 2015a). Goat behaviours were identified according to specific descriptors that expresses an emotional meaning. The terms used for dairy goats are aggressive, agitated, alert, bored, fearful, frustrated, irritated, suffering, content, curious, lively, relaxed and sociable. The detailed description of each term is found on AWIN Goat protocol (AWIN, 2015a). The same descriptors were applied on meat goat does.

The median of five positive and eight negative descriptors was measured on each farm and classified according to QBA score (0-125mm) on a five ordinal scale. Regarding results related to positive descriptors, the scale ranged from 0-25mm – very bad; 26-50mm – bad; 51-75mm – adequate; 76-100mm – good and 101-125mm – very

good. The five ordinal scale associated to negative descriptors had inverted categories, e.g. 0-25mm – very good. Subsequently, each farm had two results. The description of each category can be seen below TABLE 5.

TABLE 5 - FIVE ORDINAL SCALE REGARDING QUALITY OF GOATS FEELINGS BASED ON THE ASSESSMENT OF POSITIVE AND NEGATIVE DESCRIPTORS FROM QBA (AWIN, 2015A).

CATEGORY	DESCRIPTION
Very bad	Prevalence of lower levels of positive descriptors or higher levels of negative ones. Goats are submitted to an aversive environment.
Bad	Prevalence of low levels of positive descriptors or high levels of negative ones. Adequate goat behaviour is compromised.
Regular	Neutral point with balanced positive and negative emotions.
Good	Prevalence of high levels of positive descriptors or low levels of negative ones, but less so. Goat behaviour tends to be adequate to the specie.
Very good	Prevalence of higher levels of positive descriptors or lower levels of negative ones. Goat behaviour is healthy.

SOURCE: Adapted from MELLOR (2016)

QBA started with the assessor choosing one fixed observation point, outside the pen, to evaluate the goats for ten minutes. Semi-intensive farms were assessed between 07:00 a.m. and 01:00 p.m., and extensive farms between 08:00 a.m. and 04:30 p.m. Assessor waited for ten minutes at the local point before the evaluation started.

QBA was performed according to animal's location at the time of assessment. In three farms (01, 04 – S and 02 – E) animals were kept at pasture when the evaluation occurred, and in two farms (09 and 10 – E), animals were assessed on different facilities where they usually stay. These data were not considered on statistical analyses. Eleven groups were evaluated at facilities, with four in semi-intensive systems (three farms) and seven in extensive ones (seven farms).

3.2.4 INDIVIDUAL ASSESSMENTS

The recording sheet (APPENDIX 2) used at individual evaluations was adapted from AWIN Goat and Sheep Protocol (AWIN, 2015a, b). The number of meat goat does individually assessed was determined by a scheme on AWIN Goat protocol (AWIN, 2015a). The assessor used the minimum sample, with 50% of prevalence, 90% of confidence interval and 10% of accuracy. Eight animal-based parameters were selected to be applied on meat goat does (TABLE 6). The indicators were scored as

very thin (1)/ thin (2)/ adequate (3)/ fat (4)/ very fat (5) (Body Condition Score); presence/absence (abscess, faecal soiling, nasal discharge, ocular discharge, vulvar discharge, respiration quality, lesions on head, body and udder teats). Indicators related to lesions had four classification: 0 = absent; MIm = presence of minor lesion with myiasis; MI = presence of minor lesion without myiasis; MAm = presence of major lesion with myiasis; MA = presence of major lesion without myiasis. In this phase, an assistant helped to restrain the goats.

TABLE 6 - DESCRIPTION OF WELFARE INDICATORS APPLIED AT INDIVIDUAL ASSESSMENT OF MEAT GOAT DOES.

INDICATOR	DESCRIPTION
Body Condition Score (BCS)	BCS is asses using a five-level (1-5) scoring method (VILAQUIRAN et al., 2004).
Faecal soiling	The presence of soft and liquid manure below the tail head is visually assessed as a sign of diarrhea.
Abscess	The presence of external abscesses in front area is recorded.
Nasal discharge	The presence of any mucous or purulent discharge from the nose is visually assessed.
Ocular discharge	The presence of clearly visible flow from one or two eyes is visually assessed.
Vulvar discharge	The presence of any mucous, purulent or sanguineous discharge from the vulva is visually assessed.
Respiration quality	The presence of obvious effort on inspiration, persistent coughing and audible breath sounds is recorded.
Lesions on head, body and udder teats	The presence of lesions is recorded, with or without myiasis (presence of maggots on animal)
No lesions	No evidence of lesions in all these parts.
Minor	Lesions type (scratches, healed, open wounds, ear notches) that are greater than 2cm and less than 10cm, without blood.
Major	Wounds greater than 10 cm, opened, and that reach or not the muscle layer.

SOURCE: Adapted from BATTINI et al. (2015), AWIN Sheep Protocol (AWIN, 2015b) and LLONCH et al., 2015

After evaluations, recommendations to improve the welfare of meat goat does was sent to each producer. An example can be seen in APPENDIX 3.

3.2.5 STATISTICAL ANALYSES

Data were analyzed using IBM SPSS, v. 19. At group/pen level, indicators related to resources, goat health, human animal-relationship (FHAT) and QBA were processed comparing farms on semi-intensive and extensive systems. At individual

level, indicators related to animal health were also processed comparing farms on semi-intensive and extensive systems.

For health animal-based indicators at group level, the prevalence of each indicator was calculated on total number of goats and at farm level, and the significant difference between the types of production system was determined by Chi-square test. Regarding the human-animal relationship indicator, descriptive statistics was applied in the familiar human approach test and significant difference was measured by Mann-Whitney test. Data related to QBA was analyzed with Mann-Whitney test. Average of Temperature (°C) and relative humidity (%) evaluated in morning and afternoon periods to all farms was calculated with student t test (normally distributed data).

Significant difference related to resource-based indicators, cleanliness of drinkers and cleanliness of facilities and stocking density, between production systems, was calculated by Mann-Whitey test. Significant difference to others parameters was determined by Chi-square test.

For animal-based indicators at individual level, the prevalence of each indicator was calculated on total number of goats and at farm level. Significant difference related to BCS, between type of production system, was calculate with Mann-Whitney test. Others variables were analyzed with Chi-square test.

Data normality were assessed with Shapiro-Wilk test. Fisher's exact test was used, instead of Chi-square test, every time that number of cells on 2X2 contingency table was below to five. Significance was set at $p<0.05$ to all tests. This study was approved by the Ethics Committee of Federal University of Paraná, with protocol number 029/2016.

3.3 RESULTS

3.3.1 FARMS AND ANIMALS

The characteristics of farms regarding production system, number of evaluated animals, purpose of production and breeds can be observed in TABLE 7. The main purpose of production on farms visited were meat (90%). In S farms, pure breed meat goats occurred in 60% of properties (n=3) and in E farms, mixed breeds were predominant (100%; n=10). Goats with or without kids were usually kept together with wethers and bucks at the facility on extensive systems (Farms 01, 04, 06, 07, 08 and

10) and in intensive systems (Farms 02 and 05). Farm 06 (E) and Farm 05 (S) had goats with sheep together at pasture and in facilities and Farm 03 (S) had goats and sheep together only at pasture.

TABLE 7 - CHARACTERIZATION OF FARMS IN TERMS OF TOTAL ANIMALS, NUMBER OF ANIMALS EVALUATED AT EACH LEVEL OF WELFARE, PRODUCTION PURPOSE AND BREEDS.

FARM	TYPE OF PRODUTION SYSTEM	NUMBER OF GOAT DOES PER FARM	GOATS ASSESSED AT FIRST WELFARE LEVEL (GROUP 1)	GOATS ASSESSED AT FIRST WELFARE LEVEL (GROUP 2)	GOATS ASSESSED AT SECOND WELFARE LEVEL	PURPOSE OF PRODUCTION	BREED
Farm 01	Semi-intensive	107	31	0	47	Meat and Stud	Boer
Farm 02	Semi-intensive	346	19	19	56	Meat and Stud	Savanna, Boer and Kalahari
Farm 03	Semi-intensive	14	14	0	14	Meat	Mixed breed of Anglo-Nubian
Farm 04	Semi-intensive	18	18		18	Stud	Anglo-Nubian
Farm 05	Semi-intensive	18	18	0	16	Meat	Mixed breed of Saanen, Anglo-Nubian and Alpine goat
Farm 01	Extensive	18	18	0	18	Meat	Mixed breed of Saanen, Anglo-Nubian and Alpine goat
Farm 02	Extensive	30	30	0	22	Meat and goatskin	Mixed breed of Toggenburg, Saanen, Boer, Alpine goat and Anglo-Nubian
Farm 03	Extensive	7	7	0	7	Meat	Mixed breed of Saanen and Anglo-Nubian
Farm 04	Extensive	44	44	0	26	Meat	Mixed breed of Saanen, Anglo-Nubian and Boer
Farm 05	Extensive	13	13	0	13	Meat	Mixed breed of Toggenburg, Anglo-Nubian and Alpine goat
Farm 06	Extensive	27	27	0	19	Meat	Mixed breed of Saanen, Anglo-Nubian and Alpine goat
Farm 07	Extensive	22	22	0	16	Meat	Mixed breed of Saanen, Anglo-Nubian and Alpine goat
Farm 08	Extensive	50	50	0	29	Meat and Stud	Mixed breed of Toggenburg, Anglo-Nubian, Saanen and Alpine goat
Farm 09	Extensive	17	17	0	17	Meat and Stud	Mixed breed of Toggenburg, Saanen and British Alpine goat
Farm 10	Extensive	36	36	0	26	Meat	Anglo-Nubian and Boer and mixed of both breeds

SOURCE: The author (2017)

3.3.2 FIRST WELFARE LEVEL: GROUP ASSESSMENTS

On 15 farms, 16 groups were evaluated (six on S farms and ten E farms). On farm 01 was not possible assessed more than one group because animals were at open field, at the time of visit 02:23 p.m., and the assessor chose not to interfere on goat's routine and do the group evaluations. As consequence, five resource-based indicators were not assessed on this farm: stocking density, floor type and measures related to cleanliness of facilities (type, quality and frequency/form of cleanness). A total of 383 meat goat was evaluated at group level.

Mean values of temperature (°C) and relative humidity (%), according to morning (07:00 a. m – 12:00 a.m.) and afternoon (01:00 a.m. – 04:00 p.m.) periods, are demonstrated on TABLE 8. There is significant difference between assessments started in morning and afternoon, in S and E farms, related to relative humidity (p=0.008), but not to temperature (p=0.05).

TABLE 8 - MEAN VALUES OF AMBIENT VARIABLES MEASURE AT THE START OF ASSESSMENTS IN S AND E FARMS (N=15) ON MORNING (N=9) AND AFTERNOON (N=6) PERIODS.

AMBIENT	S AND E FARMS			
VARIABLES	MORNING	MIN-MAX	AFTERNOON	MIN-MAX
Temperature (°C)	31,96[a]	29 – 34,72	34,25[a]	31,4 – 36,72
Relative humidity (%)	53,41[a]	43,76 – 68,17	40,96[b]	34,22 – 51,31

Mean values fallowed by different letters on line have p <0.05.

SOURCE: The author (2017)

3.3.2.1 HEALTH ANIMAL-BASED INDICATORS

The prevalence of seven variables (five indicators) on S farms and E farms was demonstrated on TABLE 9. The total number of goats evaluated was 119 on S farms and 264 on E farms. There is significant difference (p<0.05) between oblivion and thermal stress indicators between production systems. FIGURE 2 shows two isolated goats.

TABLE 9 - PREVALENCE OF ANIMAL-BASED INDICATORS ON GOATS NUMBER ON SIX GROUPS (N=119) IN SEMI-INTENSIVE FARMS AND TEN GROUPS (N=264) IN EXTENSIVE FARMS.

ANIMAL-BASED INDICATORS	NUMBER (%)		NUMBER (%)		P-VALOR
	GOATS	S GROUPS	GOATS	E GROUPS	
Oblivion	5 (4.23)	2 (40.0)	1 (0.38)	1 (10.0)	0.012*
Thermal stress	0 (0.0)	0 (0.0)	11 (4.18)	3 (30.0)	0.021*
Faecal soiling	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-
Hair coat condition	10 (8.47)	3 (60.0)	32 (12.16)	8 (80.0)	0.245
Minor lameness	2 (1.69)	2 (40.0)	1 (0.38)	1(10.0)	0.228
Lame	0 (0.0)	0 (0.0)	3 (1.14)	3 (30.0)	0.555
Severely lameness	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-

*(P<0.05)

SOURCE: The author (2017)

FIGURE 2 - TWO ISOLATED GOATS, ON THE LEFT, DURING FEEDING TIME ON S FARM.

SOURCE: The author (2017)

3.3.2.2 HUMAN-ANIMAL RELATIONSHIP

The Familiar Human Approach Test, FHAT (AWIN, 2015b), was chosen to measure the quality of relationship between meat goat does and the stockperson (TABLE 1). TABLE 10 shows the flight distance of goats, comparing S and E groups.

TABLE 11 categorized farms on positive, neutral, bad or very bad Human-Animal Relationship (HAR).

TABLE 10 - DESCRIPTIVE STATISTIC OF FLIGHT DISTANCE (CM) OF GOATS AFTER STOCKPERSON APPROACH IN SEMI-INTENSIVE (N=6) AND EXTENSIVE (N=10) GROUPS.

PRODUCTION SYSTEM	FLIGHT DISTANCE (CM)			
	MEAN	STANDART ERROR	MINIMUM	MAXIMUM
Semi-intensive	133.1	37,79	0	345
Extensive	121.9	31,53	0	239

SOURCE: The author (2017)

TABLE 11 - RESULT OF SEMI-INTENSIVE (N=6) AND EXTENSIVE (N=10) GROUPS REGARDING FLIGHT DISTANCE (CM) WHEN FAMILIAR HUMAN APPROACH TEST WAS APPLIED.

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CATEGORY/PRODUCTION SYSTEM	NUMBER OF FARMS (%)	
	SEMI-INTENSIVE	EXTENSIVE
Neutral HAR (0 cm)	1 (16.66)	1 (10.00)
Bad HAR (01-100 cm)	1 (16.66)	5 (40.00)
Very Bad HAR (> 101cm)	4 (66.66)	4 (50.00)

SOURCE: The author (2017)

Positive HAR was not found in any goats on both production systems. There was no statistic significant difference between S and E groups (p=0.905). Categorization of these data is a proposal and specific studies regarding flight distance on goats are necessary to stablish a better distinction of bad and very bad HAR.

3.3.2.3 QUALITATIVE BEHAVIOUR ASSESSMENT (QBA)

QBA used at analysis was related to E farms (05, 07, 08, 09, 10, 11 and 12) and S farms (02, 03 and 05). Group 02 of Farm 02 was included on analysis. TABLES 12 and 13 show results of positive and negative descriptors on VAS (mm) in farms, respectively. The results for both group of descriptors, in S and E farms, related to

quality of goats feelings are demonstrated in TABLE 14. There is no significant difference between S and E farms (p=0.847), regarding classification.

TABLE 12 - RESULTS OF EXTENSIVE (N=7) AND SEMI-INTENSIVE (N=3) FARMS FOR FIVE POSITIVE DESCRIPTORS ON VAS, RANGED FROM 0 TO 125MM (AWIN, 2015A).

SEMI-INTENSIVE AND EXTENSIVE FARMS	CONTENT	CURIOUS	LIVELY	RELAXED	SOCIABLE
Farm 02	25	29	41	65	52
Farm 02 – group 02	0	12	79	69	105
Farm 03	0	67	0	125	103
Farm 05	36	83	5	20	26
Farm 01	33	62	90	99	111
Farm 03	113	102	115	107	51
Farm 04	14	79	46	98	81
Farm 05	0	125	5	0	6
Farm 06	0	68	7	64	100
Farm 07	5	12	15	51	6
Farm 08	0	36	8	36	13

SOURCE: The author (2017)

TABLE 13 - RESULTS OF EXTENSIVE (N=7) AND SEMI-INTENSIVE (N=3) FARMS FOR EIGHT NEGATIVE DESCRIPTORS ON VAS, RANGED FROM 0 TO 125MM (AWIN, 2015A).

SEMI-INTENSIVE AND EXTENSIVE FARMS	AGRESSIVE	AGITATED	ALERT	BORED	FEARFUL	FRUSTRATED	IRRITATED	SUFFERING
Farm 02	21	6	98	0	60	13	0	0
Farm 02 – Group 2	0	0	104	0	53	0	0	0
Farm 03	9	69	125	6	108	40	9	7
Farm 05	0	0	99	7	37	0	7	0
Farm 01	19	31	125	82	13	59	6	0
Farm 03	0	68	91	7	11	0	20	7
Farm 04	0	107	94	9	0	11	38	14
Farm 05	7	125	125	0	12	0	16	0
Farm 06	0	106	114	0	102	0	0	0
Farm 07	69	15	54	11	13	11	34	0
Farm 08	9	0	101	31	49	0	45	0

SOURCE: The author (2017)

TABLE 14 - CLASSIFICATION OF EACH EXTENSIVE (N=7) AND SEMI-INTENSIVE (N=3) FARMS RELATED TO FIVE POSITIVE AND EIGHT NEGATIVE DESCRIPTORS ON QBA.

FARM	TYPE OF PRODUCTION SYSTEM	[a]NEGATIVE DESCRIPTORS	[b]POSITIVE DESCRIPTORS
Farm 02	Semi-intensive	Very good	Bad
Farm 02 - group 2	Semi-intensive	Very good	Regular
Farm 03	Semi-intensive	Very good	Regular
Farm 05	Semi-intensive	Very good	Bad
Farm 01	Extensive	Very good	Good
Farm 03	Extensive	Very good	Very good
Farm 04	Extensive	Very good	Good
Farm 05	Extensive	Very good	Very bad
Farm 06	Extensive	Very good	Regular
Farm 07	Extensive	Very good	Very bad
Farm 08	Extensive	Very good	Very bad

[a] Negative descriptors were classified as Vary good, 0-25mm; Good, 26-50mm; Regular, 51-75mm; Bad, 76-100mm and Very bad, 101-125mm.
[b] Positive descriptors were classified as Vary bad, 0-25mm; Bad, 26-50mm; Regular, 51-75mm; Good, 76-100mm and Very good, 101-125mm.

SOURCE: The author (2017)

3.3.2.4 RESOURCE-BASED INDICATORS

All farms had water availability for goats and drinkers were functioning properly; shadow at pasture was provided to all animals. In farm 1 (S), animals were also protected from the sun by an unfinished construction (FIGURE 3). Characterization of resource-based indicators related to water availability and shelter are demonstrated on TABLE 15. There is no significant difference for cleanliness of drinkers and cleanliness of facilities between production systems ($p>0.05$). FIGURE 4 shows and example of dirty, partially dirty and clean floor. There is significant difference for type of drinkers ($p=0.001$) and access to shelter ($p=0.036$). FIGURE 5 shows an example of shelter in S farm.

FIGURE 3 - UNFINISHED CONSTRUCTION PROVIDING SHADOW TO GOATS AT OPEN FIELD ON FARM 1.

SOURCE: The author (2017)

FIGURE 4 - ASSESSMENT OF FACILITIES REGARDING PRESENCE LEVEL OF FECES ON FLOOR (CLEANLINESS OF FACILITIES INDICATOR). A) DIRTY. B) PARTIALLY DIRTY. C) CLEAN.

SOURCE: The author (2017)

FIGURE 5 - SHELTER FOR GOATS AND SHEEP ON S FARM.

SOURCE: The author (2017)

TABLE 15 - CHARACTERIZATION OF RESOURCE-BASED INDICATORS RELATED TO WATER AVAILABILITY AND TO SHELTER ON FARMS ON EACH PRODUCTION SYSTEM.

GROUP	TYPE OF PRODUCTION SYSTEM	NUMBER OF DRINKERS	TYPE OF DRINKERS	CLEANLINESS OF DRINKERS	ACCESS TO SHELTER
Farm 01	Semi-intensive	2	Automathic drinker	Dirty	Yes
Farm 02	Semi-intensive	1	Automathic drinker	Clean	No
Farm 02	Semi-intensive	1	Automathic drinker	Partially dirty	No
Farm 03	Semi-intensive	1	Automathic drinker	Dirty	No
Farm 04	Semi-intensive	2	[1]Bucket/ [2]Automathic drinker	[1]Dirty/ [2]Clean	Yes
Farm 05	Semi-intensive	2	Bucket	Partially dirty	Yes
Farm 01	Extensive	1	Lake	Clean	No
Farm 02	Extensive	3	[1]Bucket/ [2]Lake	[1]Dirty/ [2]Clean	No
Farm 03	Extensive	1	Bucket	Dirty	No
Farm 04	Extensive	1	Lake	Clean	No
Farm 05	Extensive	2	[1]Bucket/ [2]Lake	[1]Partially dirty/ [2]Clean	No
Farm 06	Extensive	3	Bucket	Partially dirty	No
Farm 07	Extensive	2	[1]Bucket/ [2]Bucket	[1]Clean/ [2]Partially dirty	No
Farm 08	Extensive	1	Lake	Clean	No
Farm 09	Extensive	1	Lake	Clean	No
Farm 10	Extensive	6	Bucket	Partially dirty	No

[1,2] Refers to the type of drinkers and cleanliness of drinkers on each line of the table.

SOURCE: The author (2017)

Parameters related to type and cleanness of facility are showed on TABLE 16. All farms evaluated were classified as good (≥ $2m^2$) to stocking density. Due to a methodological error, stocking density was not assessed on farms 9 and 10 on extensive systems. There is significant difference for type of facility ($p=0.008$), but not for type of floor ($p> 0.05$). Goat house refers to a more sophisticated facility, with internal divisions and presence of feeders, drinkers, salt shakers, ripped or cemented floor, with roof; rustic facility indicates a place where there is no internal divisions and may or may not have feeders, with bare soil usually (ALENCAR et al., 2010).

TABLE 16 - CHARACTERIZATION OF RESOURCE-BASED INDICATORS RELATED TO CONDITIONS OF FACILITIES IN FARMS ON EACH PRODUCTION SYSTEM.

GROUP	TYPE OF PRODUCTION SYSTEM	TYPE OF FACILITY	STOCKING DENSITY	TYPE OF FLOOR	CLEANLINESS OF FACILITIES
Farm 01	Semi-intensive	Goat house			
Farm 02	Semi-intensive	Goat house	8.25	Bare soil	Partially dirty
Farm 02	Semi-intensive	Goat house	8.25	Bare soil	Partially dirty
Farm 03	Semi-intensive	Rustic facility	11.81	Bare soil	Dirty
Farm 04	Semi-intensive	Goat house	3.33	Cement/ Bare soil	Clean
Farm 05	Semi-intensive	Rustic facility	6.76	Cement/Bare soil	Dirty
Farm 01	Extensive	Rustic facility	4.85	Bare soil	Dirty
Farm 02	Extensive	Rustic facility	5.82	Bare soil	Dirty
Farm 03	Extensive	Rustic facility	7.87	Bare soil	Dirty
Farm 04	Extensive	Rustic facility	3.2	Bare soil	Clean
Farm 05	Extensive	Rustic facility	6.4	Bare soil	Dirty
Farm 06	Extensive	Rustic facility	5.56	Bare soil	Dirty
Farm 07	Extensive	Rustic facility	2.28	Bare soil	Clean
Farm 08	Extensive	Rustic facility	2.12	Bare soil	Dirty
Farm 09	Extensive	Rustic facility		Bare soil	Dirty
Farm 10	Extensive	Rustic facility		Bare soil	Partially dirty

SOURCE: The author (2017)

In S farms, results to frequency of cleanness were once a day (25%; n=1), once a week (50%; n=2) and every fifteen days or more (25%; n=1); In E farms, results were once a week (10%; n=1) and every fifteen days or more (90%; n=9). Cleanness in S farms was usually made with sweep and flamethrower (50%) or just sweep (50%). E farms cleaned facilities only sweeping (100%).

3.3.3 SECOND WELFARE LEVEL: INDIVIDUAL ASSESSMENTS

A total of 344 meat goat does were individually evaluated. The prevalence of BCS was calculated based on total number of goats individually assessed on semi-intensive (n=151) and extensive systems (n=193) (TABLE 17). There was no significant difference between the type of production system regarding to BCS (p=0.157).

TABLE 17 - PREVALENCE OF BCS ON GOATS IN SEMI-INTENSIVE (N=151) AND EXTENSIVE (N=193) FARMS.

PRODUCTION	BCS INDICATOR (%)				
SYSTEM	1	2	3	4	5
Semi-intensive	28 (18.54)	58 (38.41)	50 (33.11)	9 (5.96)	6 (3.97)
Extensive	28 (14.50)	68 (35.23)	72 (37.30)	21 (10.88)	4 (2.07)

SOURCE: The author (2017)

The prevalence of seven animal-based parameters are demonstrated on TABLE 18. Abscesses and ocular discharges were significant different ($p<0.05$) between production systems. The prevalence of six animal-based variables related to lesions are demonstrated on TABLE 19. Only lesions on head – ears showed significant different ($p<0.05$). FIGURE 6 shows different ear cuts in E farms. FIGURE 7 shows goats with nasal discharge and abscess.

TABLE 18 - PREVALENCE OF SEVEN INDICATORS ON GOATS INDIVIDUALLY ASSESSED ON FIVE SEMI-INTENSIVE (S) FARMS (N=151) AND ON TEN EXTENSIVE (E) FARMS (N=193).

ANIMAL-BASED INDICATORS	NUMBER (%)		NUMBER (%)		P-VALOR
	GOATS	S FARMS	GOATS	E FARMS	
Faecal soiling	5 (3.31)	3 (60.0)	6 (3.10)	4 (40.0)	1.000
Abscess	25 (16.55)	4 (80.0)	19 (9.84)	7 (70.0)	0.044*
Nasal discharge	11 (7.28)	2 (40.0)	8 (4.14)	6 (60.0)	0.206
Ocular discharge	24 (15.89)	4 (80.0)	16 (8.29)	4 (40.0)	0.029*
Vulvar discharge	0 (0.0)	0 (0.0)	2 (1.03)	2 (20.0)	0.506
Respiration quality	1 (0.66)	1 (20.0)	0 (0.0)	0 (0.0)	1.000

* $p<0.05$

SOURCE: The author (2017)

TABLE 19 - PREVALENCE OF SEVEN VARIABLES RELATED TO MINOR (MI) AND MAJOR (MA) LESIONS WITHOUT MYIASIS ON GOATS INDIVIDUALLY ASSESSED ON FIVE SEMI-INTENSIVE (S) FARMS (N=151) AND ON TEN EXTENSIVE (E) FARMS (N=193).

REGION OF LESIONS	NUMBER (%)			NUMBER (%)			P-VALOR (MI)	P-VALOR (MA)
	GOATS (MI)	GOATS (MA)	S FARMS	GOATS (MI)	GOATS (MA)	E FARMS		
Head - ears	16 (10.59)	2 (1.32)	4 (80.0)	17 (8.80)	62 (32.12)	9 (90.0)	0.576	0.001*
Head - eyes	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.51)	0 (0.0)	1 (10.0)	-	1.000
Head - face/muzzle	0 (0.0)	0 (0.0)	0 (0.0)	3 (1.55)	0 (0.0)	2 (20.0)	-	0.259
Head - neck	3 (1.98)	2 (1.32)	3 (60.0)	1 (0.51)	2 (1.03)	2 (20.0)	0.323	1.000
Body	3 (1.98)	1 (0.66)	3 (60.0)	4 (2.07)	1 (0.51)	4 (40.0)	1.000	1.000
Udder and teats	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-	-

* $p<0.05$

SOURCE: The author (2017)

FIGURE 6 - DIFFERENT EAR CUTS PERFORMED IN E FARMS IN CEARÁ, BRAZIL.

SOURCE: The author (2017)

FIGURE 7 - GOAT WITH SEROUS OCULAR DISCHARGE (A) AND GOAT WITH ABSCESS IN PRÉ-FEMORAL LYMPHONOD (B).

SOURCE: The author (2017)

3.4 DISCUSSION

3.4.1 FARMS AND ANIMALS

Raising goats in extensive system still predominate in Ceará-BR and in Brazilian Northeast, with animals being released in the pasture without fence to feed exclusively in the Caatinga (VOLTOLINI et al., 2011). PINHEIRO et al. (2000) cited the presence of farms in extensive (77.9%) and semi-intensive (19.6%) systems in Ceará-BR. It is known that the adoption of feeding and sanitary management, besides improvements of facilities has a positive impact on the welfare of farm animals, with increase in productivity as consequence (MCINERNEY, 2004). However, it is important to consider that the change from an extensive to an intensive system requires financial investments in order to purchase sophisticated equipment and facilities, and have access to technical assistance, and many producers are not able to carry out this enterprise (ALEXANDRE and MANDONNET, 2005). The low educational level demonstrated by non-literate producers or farmers that can only write their name (30-35.95%), and that have complete primary education (5-38.20%), from Ceará-BR and Paraiba-BR (LIMA et al.; SANTOS et al., 2012), can contribute as an aggravating factor in the search for better conditions for animals and their owners (SILVA, 2006). In this sense, raising goats in Brazilian Northeast in general has some challenges to overcome. Northeastern farmers still has difficulties to implement zootechnical bookkeeping as an important routine on the farm (COSTA et al., 2008; SANTOS et al.,

2011), as well as a registry containing informations regarding animal health care. Aiming to improving the conditions of goats in the semiarid Northeast, the Ministry of National Integration, together with Goats and Sheep Embrapa, among other organizations, started a project in 2011 entitled Lamb Route (Rota do Cordeiro) with the objective of professionalizing the productive chain of goats and sheep through the creation of integrated agroindustrial systems (ROTA DO CORDEIRO, 2017). Some of the project's specific objectives are to ensure adequate and low-cost nutrition throughout the year; improve the health conditions of the herd and create a breeding genetic standard of the herd. This project showed an initiative to change the conditions of raising small ruminants in the semiarid Northeast.

Raising meat goat does together with bucks and wethers is still a common practice in some type of installations as rustic facility (ALENCAR et al., 2010). Regarding raising goats with other ruminants, integrated livestock with sheep and cattle is still adopted by many producers in Brazilian Northeast (COSTA et al., 2008), aiming a greater diversification of products to be offered in the market. Studies related to the impact on the welfare of goats, in the presence or absence of other species, must be carried out, especially regarding to BCS, because when there is low concentrate supply available, cattle and sheep are the first species to receive it (HOLLAND JÚNIOR and MARTINS, 2007).

3.4.2 HEALTH ANIMAL-BASED INDICATORS

Goats stablish social groups than can persist for years, and as gregarious animals, they prefer stay together, with isolation only occurring in pre-parturient females (LICKLITER, 1985) or when animals presenting some disease, accordlying to farmers report (BATTINI et al., 2014). The presence of goats, with listless or depressed attitude, that isolated themselves in S and E farms is an expression of poor welfare, and a previous indicator of health problems. Segregated goats could be related to undernutrition or overnutrition, leading to pregnancy toxemia; feeding of roughages deficient in proteins; exposure to hot and dry weather conditions, leading to rumen impactation; gastrointestinal parasitism and chronic enterotoxemy (SMITH and SHERMAN, 2009). Oblivion is a complex indicator and should be applied only by trained assessors.

An inadequate environment causes thermal stress, and animals struggle to maintain a constant body temperature (VIANA et al., 2013). Factors as breed, physical effort, ambient temperature, feed intake, gestation and age can influence on respiratory rate (SILVA et al., 2006). Occurrence of heat stress in eleven animals in extensive systems (TABLE 09), with goats presenting elevated respiratory rate (panting), could had influence from several climate factors as solar radiation, wind velocity, precipitation, ambient temperature and relative humidity of air (RH) (FAO and INPhO, 1998). In the three farms where animals had panting, ambient temperature was above 34ºC (farm 06 = 36.72ºC; farm 07 = 34.03ºC and farm 10 = 34.86 ºC), considered by BAÊTA and SOUZA (2010) a critical point to cause heat stress on goats. This author also reported that thermal neutral zones for goats are between 20-30ºC, and only in one S farm, when the assessment started at 07:51 a.m., ambient temperature was below to 30 ºC (farm 3 = 29 ºC). This result differs from others authors that cited high temperatures above goats thermal neutral zone in northeast semiarid only after 11 a. m. (SILVA et al., 2006; GOMES et al., 2008). Farm 06, 07 and 10 were evaluated in afternoon (13:00- 15:00 p.m.). Along with temperature, another factor that impacts animal welfare and productivity is RH (BAÊTA and SOUZA, 2010). Values of RH found in the previously mentioned farms were 38.06% (farm 06), 38.28% (farm 07) and 34.22% (farm 10). Although low RU rates promote more efficiently evaporation mechanisms, can also cause irritation on mucous membrane and respiratory problems, while high values can cause fungus infections (FAO and INPhO, 1998; BAÊTA and SOUZA, 2010). An adequate range of RU in animals in tropical climates are between 40 to 80% (FAO and INPhO, 1998).

Heat stress increase physiological parameters, such as water intake (BRASIL et al., 2000), respiratory rate, rectal temperature and skin temperature (especially in afternoon period) (SILVA et al., 2006). SILVA et al. (2016) cited that high ambient temperatures promote decrease of heat loss, due to the lower temperature gradient between the skin of the animal and environment. In this case, animal can maintain body temperature with vasodilation, due to increase of skin temperature, however if temperature continues to raise, heat loss is performed by evaporation mechanisms such as respiration e/or sweating. Heat stress decreases physiological parameters as feed intake in order to reduce metabolic heat production, especially due to rumen fermentation (ALEXANDRE and MANDONNET, 2005), causing weight loss on dairy goats (BRASIL et al., 2000). In hot weathers, it is common farm animals reduce daily

activity, and dairy goats submitted to heat stress decrease eating, ruminating and resting behaviours (DARCAN et al., 2008). Studies to evaluated behaviour, physiological and reproductive parameters in meat goat does under thermal stress are necessary to observe the real impact on goat welfare. Meat goat does usually spent all day at unfenced pasture in Ceará-BR, so it is important reduce heat stress providing adequate water sources and sufficient shadow at facilities. Thermal stress assessment occurred approximately 15-20 minutes after goats were set up at the facility in mostly E farms, after being at pasture (including the three farms with panting animals), and some individuals may have become physically fatigued during the journey and did not have enough time to recover. This situation didn't occur in S farms and maybe could explain why animals, even with high temperature levels, did not showed any sign of heat stress. As result, the evaluation of thermal stress must be performed after the resource indicators or at pasture, when possible.

The presence of soft faecal material below and on both sides of the tail was not identified on goats in S and E farms, at group level. Several parasitic, infectious and non-infectious diseases, besides nutritional problems, can cause diarrhea on goats (SMITH and SHERMAN, 2009). Gastrointestinal parasites are responsible for the highest number of goat deaths and economic losses to producers (CEARÁ. EMBRAPA, 2015), with *Haemonchus* sp. being the most prevalent helminth in farms with small ruminants in Ceará-BR (MELO et al., 2003). Absence of soft faecal material in goats could be due to the condition of extreme drought in Ceará-BR in July 2016 (ANA, 2016), with the possibility of the animals presenting the larval inhibition in the organism, and consequent absence of clinical signs of parasitism (COSTA et al., 2011).

High prevalence of goats with poor hair condition in S and E farms could be due to pathologies or diseases on animals (BERG et al., 2009). BATTINI et al. (2015) reported that dairy goats with matted, rough and scurfy hair presented imbalance of minerals, abnormal sounds in lungs and lower BCS compared to animals with adequate hair condition. Since poor hair coat condition is considered a first sign for health and nutrition problems (SMITH and SHERMAN, 2009), studies with meat goat does to determine pathologies associated with this indicator is necessary.

Lameness is caused especially by feet pathologies, as infectious footrot, and infectious and non-infectious diseases (PUGH, 2002). Goats with Caprine Arthritis Encephalitis (CAE) can present lameness (PINHEIRO et al., 2004). This author

reported the prevalence of properties (7.9%) in Central Hinterland of Ceará-BR with positive serology to Caprine Arthritis Encephalitis Virus (CAEV) in goats. Low incidence of lameness in goats in this study could be due to inexistence of several problems that cause this condition or inexperience of the assessor. New investigations related to this indicator are important.

3.4.3 HUMAN-ANIMAL RELATIONSHIP (HAR)

WAIBLINGER et al. (2006) cited that Human-Animal Relationship is related to a mutual perception between animals and humans, based on the quality of previous contact that could range from positive to neutral, and more predominantly negative interactions, perceiving by animals during veterinary treatment, restraint practices and depopulation. Positive interactions is associate with high confidence levels in human beings and low fear reactions, e. g. regular gentle handling may provide a more friendly environment in aversive situations. The number of contact, duration and nature of daily interactions shape the relationship between stockpeople and animals. The higher mean value for animals in semi-intensive systems than extensive indicates that feeding management alone, sometimes considered a reward for animals (WAIBLINGER et al., 2006), was not being treated by goats as a sufficient stimulus to secure a positive HAR.

Negative HAR, demonstrated by fear behaviour on mostly farms, was present in meat goats in S and E farms. Although our results, this study had better answers when compared to a similar avoidance distant test performed in dairy ewes (NAPOLITANO et al., 2011). Mean value of flight distance was higher in ewes (273,75 cm), ranged from 150-420 cm, than in meat goat does, and despite sheep are more shy and fearful animals (MIRANDA-DE LA LAMA and MATIELLO, 2010), improvements on HAR are necessary to promote a better quality of life to small ruminants. The existence of FHAT equal to 0 cm (n=1, S farm; n= 1, E farm) showed that is possible, at least, to have a neutral HAR, but this is not the best result. Strategies to promote positive HAR as increased contact with animals, changes in stockperson’s attitude through educational programs and genetic selection for tractability are necessary to goats developed stronger bonds with human beings (WAIBLINGER et al., 2006).

3.4.4 QUALITATIVE BEHAVIOUR ASSESSMENT (QBA)

The search for an adequate understanding of animal behavior had led scientists to study emotions that may be related to animal welfare (WEMELSFELDER et al., 2000; 2001). BATTINI et al. (2014) cited a set of positive and negative terms that can be used to describe behaviours performed by dairy goats. In order to facilitate welfare diagnosis in each farm, a categorization was elaborated based on a scale for quality of life (MELLOR, 2016). Regarding negative descriptors, all farms presented as results very good on the ordinal scale. Presence of high levels of aggressive, irritated or suffering emotions seems to be related to a reduction of behavioral spectrum due to limited space at facilities (MIRANDA-DE LA LAMA and MATIELLO, 2010), which did not occurred in this study (TABLE 14). Several factors may interfere on emotional state of animals, such as feeding routine and quality of human-animal interaction, and it is still unclear which factors have the greatest impact on the emotions of goats (GROSSO et al., 2016). The change on daily routine of animals, due to evaluations, may had caused stress, and consequently agonistic behaviours. Alert descriptor had high levels in almost all farms, probably due to the presence of an unusual person (assessor) outside the facility, and in this case, the assessment should started at least twenty minutes after examiner positioning. High levels of fearful behaviour in mostly farms indicates that HAR needs improvements. Although the conclusion of prevalence of low levels of negative terms, in some farms there was at least one negative term with high level, and maybe a more refined method is required to better represent these feelings.

Study of positive feelings had been investigated in farm animals more recently than negative ones (BOISSY et al., 2007). In S farms, results ranged from regular to bad, indicating that animals are inclined to have more negative emotions than positive ones. In E farms, results ranged from very good to very bad, indicating that is possible that goats achieve healthy behaviours (farm 03; 10%), but also live in an aversive environment (farms 05, 07 and 08; 30%) (TABLE 14). High levels of positive feelings show groups with stable hierarchy, and consequently reduced aggressiveness; stronger bonds between individuals; exploratory behaviour, and animals that rest in pairs (MIRANDA-DE LA LAMA and MATIELLO, 2010). Animals that demonstrate behaviors directed towards a certain objective, voluntarily, based on previous rewarding experiences, are presenting a positive emotional state, with a sense of being in control of the situation (MELLOR, 2016). This author cited that an increase

confidence level between goats and humans could be an important measure to improve positive feelings.

QBA assessments could have different results depending on the period of day that evaluations occurred, with significant impact on mood and activity of animals involved, as demonstrated in dairy cows (GUTMANN et al., 2015). In this context, it is possible that assessments performed at the time of feeding with concentrated supply brings different results. In S and E farms located in semiarid regions in Brazil, where animals are released in early morning, assessments after this period (06:00 a.m. – 07:00 a.m.) could stimulate anxiety in animals housed for evaluations, with influence on mood and activity patterns consequently.

QBA should be apply to all farms in the same day period, and at pasture to observe a new behavioral pattern. It is also important to apply QBA in farms in the presence and absence of bucks to observe if the emotional state of does is affected. As a complex behaviour indicator, QBA should be applied only by a trained observer. The use of these same descriptors for meat goat does that are used for dairy goats was a proposal of this study, but for a more specific behavioral diagnosis, it is necessary performed additional tests, with possible inclusion of other descriptors.

3.4.5 RESOURCE-BASED INDICATORS

Resource-based indicators are a complementary away to increase animal welfare (BLOKHUIS et al., 2010). An adequate environment provides comfort to rest and sleep, sufficiently space to performed some movements, thermal relief, cleaned area to maintain health status, adequate water availability (AWIN, 2015a, b). Stocking density indicator was adequate in all farms, and this indicator should be apply only in intensive systems. In all farms, meat goat does had access to water. In farms with water in buckets only, four E farms (40%) and one S farm (20%), meat goat does can suffer thirsty during day time, and probably during night too, and this could compromise body weight, dry matter intake, energy intake, especially in semiarid regions as Brazilian Northeast (ARAÚJO et al., 2010). Feed intake has an impact on water intake and thus the opposite (LANGHANS et al., 1989). Automatic drinkers presented in almost all S farms (80%) provides a better situation for housed goats when compared to housed animals in E farms.

Physiological stage, as pregnancy, lactation and growing influenced on water requirements, and also goat breed, age, ambient temperature and sex, with females drinking more than males (CSIRO, 2007; ARAÚJO et al., 2011). High temperatures induce lower consumption of feed and increased evaporation and skin cooling (ARAÚJO et al., 2010). These authors cited that provide shade for goats, and this occurred in all farms assessed, reduces water ingestion.

Water quality is important to animals health because water could be a vehicle for chemical, physical and biological pollutants (ARAÚJO et al., 2011). In thirty water troughs evaluated on fifteen farms, dirty (16.66%; n=5) and partially dirty water drinkers (n=6; 20%) showed the necessity for improvements regarding water quality. The extended dry period, which affected Ceará-BR (ANA, 2016), made access to good quality water more difficult. This situation can be improved by using crops with high levels of water, implementing strategies to capture rain water, managing soils to optimize forage productivity (ARAÚJO et al., 2010).

NEW ZEALAND GOVERNAMENT (2012) cited access to shelter as an important indicator for several reasons: protection against rain, heat and wind; isolation during kidding period or hiding goat kids, and reduction of health and welfare problems as thermal stress or hooves problems due to mud soil. An adequate space must be provided to all animals in extreme weathers. In semiarid regions, full protection against wind can be difficult to achieve with adequate thermal conditions to goats due to the hot climate during almost year (ARAÚJO, 2011). This could explain the absence of shelters in E farms (100%) and in half groups of S farms. The impact of shelters in goat health and welfare in Brazilian semiarid regions needs to be studied in different times of year, including on rain period, and it is important to search for the most adequate shelter to meat goat does considering thermal stress and health problems as important guiders.

An adequate facility promotes a better relationship between animals and stockpeople due to the optimization of animal management and diseases control on daily work, and protection for animals (SILVA et al., 2010). In hinterland of Pernambuco-BR, it was common the presence of two type of goats facilities: goat house and rustic facility (ALENCAR et al., 2010), and also in Ceará-BR. The first type represents a more complex installation and was found only in S farms (80%). In E farms, there was only rustic facilities (100%). PINHEIRO et al. (2000) commented that the type of production system chose by farmers is correlated to their sociocultural level,

and it is possibly related to type of facility and animal handling. The space (m^2) for each goat at facilities, in all evaluated farms (100%; n=12), was include on good category, which ensure sufficiently space for animals to move freely and lie down (AWIN, 2015b).

Bare soil is the type of floor predominant in E farms (100%) and in 50% of S farms (n=2). ALENCAR et al. (2010) found the prevalence of bare soil in properties (74.8%) in Pernambuco-BR. Cemented floor was present in farms (16.2%; n=18) in Pernambuco-BR, and in 50% of S farms (n=2) together with bare soil. Cleanliness of facilities indicator was proposed by authors with the intention to verify if it was feasible. Almost all E farms (70%) and one S farm (25%; n=1) had dirty floors covered with feces and/or wet areas. This situation is linked with results regarding the frequency of cleanliness. Dirty facilities in E farms were cleaned in fifteen days or more, showing an inadequate farm management. The only farm considered clean was swept everyday. ALENCAR et al. (2010) mentioned that 14.4%, 16.8% and 68.8% of 125 farms in Pernambuco-BR performed cleanliness at once a day, once a week and in fifteen days or more, respectively. Regarding the cleanliness of facilities, the authors concluded that the accomplishment of a pilot study to best select each category (dirty, partially dirty and clean) would have assisted more during assessments, regarding time of application and category choice. This may be a good indicator, but other studies need to be performed to confirm its validity and reliability. These results regarding cleanliness of facilities indicators showed the need to educate farmers about health risks caused by an inadequate environment for goats. Feet lesions were present in goats (17.99%) in semiarid region of Paraiba-BR (AGUIAR et al., 2011) and infectious pododermatitis was reported in farms (67.7%) in Ceará-BR (PINHEIRO et al., 2000). Studies to verify the correlation between cleanliness of floor, frequent cleanness of facilities and incidence of diseases in hooves need to be performed.

3.4.6 INDIVIDUAL ASSESSMENTS

ALEXANDRE and MANDONNET (2005) cited that in harsh environments, as semiarid regions, browse is the principal component of goat's diet during all year. Meat goats used to feed with native grasses and plants on rainy season and foliage and shrubs in dry period. The lack of forage, especially in dry season, leads to underfeeding in small ruminants, and farmers cannot buy concentrated supply or preserved forage

due to expensive costs. This occurred in E farms, and almost all animals had low Body Condition Score (BCS), (BCS 1,2 = 49.73%). Goats survive drought as a result of reduced metabolism and efficient mobilization of body reserves, but with the cost of low performances, even being able to reproduce (ALEXANDRE and MANDONNET, 2005). In S farms, feeding with concentrate supply was not enough to maintain animals with an adequate BCS (BCS=3) and mostly animals had low BCS (BCS 1,2 = 56.95%). In mostly cases, concentrated feeding that was provide for animals was not adequate because it does not meet the nutritional demands of goats in lactation, gestation and growing (COSTA et al., 2008). This seems explain the similar results in both production system, and also the lack of veterinary services and their cost are another important problem faced by semiarid producers (ALEXANDRE and MANDONNET, 2005).

Individual assessment of goats allowed to find animals with soft feces in both production systems, showing this evaluation is more accurate when performed on individuals. The presence of animals with dry feces on both sides of tail was more common probably due to the presence of protected larvae in the organism (gastrointestinal parasites) as cited before. The occurrence of abscess could be due to infectious diseases, as Caseous Lymphadenitis (CL) (SMITH and SHERMAN, 2009). Goats with cutaneous abscess was observed in farms (92.5%) of small ruminants in Pernambuco-BR (ALENCAR et al., 2010) and goats infected with CL was detected in farms (66.9%) in Ceará-BR (PINHEIRO et al., 2000), showing the need to improve sanitary status of animals in Brazilian Northeast. In human beings, formation of abscess was related to complications after intramuscular injections due to incorrect use of the technique, at the time of application, use of small needles and introduction of pathogens by needle (CASSIANI and RANGEL, 1999). It is possible that more animals with abscess in S farms, when compared to E farms, occurred due to complications after vaccination. This could be solved with an adequate training of stockpeople.

Lower levels of ocular discharge was found in dairy goats (6%) in several UK farms (ANZUINO et al., 2010) than in our study. Acute respiratory virus, as Parainfluenza type 3, entropion, conjunctivitis caused by *Chlamydia psittaci*, corneal ulceration, keratoconjunctivitis and foreign body could cause ocular discharge in small ruminants (PUGH, 2002). In Brazilian Northeast, keratoconjunctivitis was reported in farms (29.1%) in Ceará-BR (PINHEIRO et al., 2000) and in farms (38.2%) in Paraíba-BR (SANTOS et al., 2011). Several ocular changes, including discharge, was showed

in farms (77.6%) in Pernambuco-BR (ALENCAR et al., 2010). Higher incidence in S farms in dry season could be due to the ration dust (CHAPAVAL et al., 2011) and possibly facilities that did not allow adequate wind circulation (presence of shelters).

Nasal discharge occurs in nutritional, parasitic, infectious and non-infectious diseases (SMITH and SHERMAN, 2009). Higher farms number, with goats presenting nasal discharge, was found in farms (63.3%) in Pernambuco-BR when compared to our results. The occurrence of pneumonia in farms (44.9%) in Ceará-BR were more related to rainy season (PINHEIRO et al., 2000), and the assessments were performed in dry season.

Vulvar discharge occurs in pathologies related to reproductive organs as caprine herpes virus (PUGH, 2002). The presence of sanguineous vulvar discharge was reported in one goat, being isolated the microorganisms *Streptococcus sp* and *Escherichia coli* from the sample. In the same study, one goat with mucous vulvar discharge presented positive serology for toxoplasma, chlamydia and *Staphylococcus sp.* (PEREIRA et al., 2013). In contrast, ALENCAR et al. (2010) found sanguineous vulvar discharge in farms (42.2%) in hinterland of Pernambuco-BR. Sanguineous vulvar discharge is observed during pseudopregnancy (PUGH, 2002). The correct diagnosis of this clinical sign is essential for proper treatment. It is important the analysis of vulvar discharge in farms with occurrence of abortions (PEREIRA et al., 2013).

SMITH and SHERMAN (2009) cited that in the end of estrous cycle, it is possible to observe mucous to serous discharge. An untrained observer can misinterpreted these signs. The detection of this indicator needs greater accuracy compared to some others, and it is possible that the assessor missed the evaluation. LLONCH et al. (2015) mentioned that is necessary a reliable method to assess this indicator in sheep. The authors conclude that vulvar discharge is a complex indicator and should be exclude from assessments due to difficult reliability and feasibility.

Goats with audible breathing or persistent coughing were not reported in this study, with the exception of one goat in S farms. These results are in contrast with reported by ALENCAR et al. (2010) that found farms (59.2%) with animals presenting cough. Bronchopneumonia in goats occurred due to virus, bacteria, fungus and parasites, being important protect animals against rain, cold and provides a clean facility (CHAPAVAL et al., 2011).

Lesions in head and body could be due to traumas, skin damage and hair losses (ANZUINO et al., 2010). Barbed wire were present in farms (54.8%) in Pernambuco-BR (ALENCAR et al., 2010), and stockpeople in Maranhão-BR reported this type of fence as an important cause of injuries in goats (BRITO et al., 2005). These injuries could be a gateway for ticks and subsequent myiasis. Identification of small ruminants occurred only in 35.95% and 66% farms in Paraiba-BR and Pernambuco-BR, respectively (ALENCAR et al., 2010; SANTOS et al., 2011). In Pernambuco-BR, farmers (47.7%) used ear cuts to recognize animals. Goats in E farms were identified usually with ear cut, with different sizes. This practice, compared to other techniques as tattoos and ear tags, do not allow an individual identification and consequently the record of vaccination date, diseases, deliveries (ALENCAR et al., 2010). NEW ZEALAND GOVERNAMENT (2012) cited that ear punches should be applied only when ear tag was not feasible, and no more than 10% of ear tissue should be removed. Local anesthetic or analgesic to block or relieve pain is recommended to minimize discomfort, pain and distress in cirurgical husbandry practices, and in case of signs of post-operative complications, appropriate remedial action must be performed (CODE OF WELFARE, 2005). Although application of ear cuts in goats was probably due to cultural heritage, the education of farmers regarding animal sentient are fundamental to change this reality. Due to this situation, an indicator to assess the type of fence it is important in Ceará and Brazilian semiarid regions. Lesions in udder and teats were not found in this study, but udder lesions occurred in farms (76.7%) in Pernambuco-BR (ALENCAR et al., 2010). BATTINI et al. (2015) cited that assessment of lesions was excluded from AWIN prototype due to scarce reliability in dairy goats. The authors suggest that assess leg injuries, the presence of lesions or swelling in knees, should be included in the protocol for assess welfare in meat goat does.

3.5 CONCLUSIONS

Regarding the elaboration of the protocol, mostly of indicators selected were feasible to use on-farm, probably due to their applicability on dairy goats and sheep. Studies to verify validity and reliability for the selected indicators are necessary to assure a valid degree of welfare for meat goat does. Due to different environmental variables in the morning and afternoon, especially regarding to relative humidity, with severe consequences to thermal comfort for goats, it is recommended to perform all

evaluations in the afternoon. Regarding the differences between S and E farms, oblivion and thermal stress were the only indicators that showed higher prevalence in S farms than in E farms. QBA negative descriptors were similar in farms on both production systems and do not had significant difference regarding positive descriptors. Regarding resource-based indicators, type of drinkers and access to shelter differed significantly, with goats in S farms allocated in places with more access to water during night period and protected from wind. Type of facility was more complex to animals in S farms than in E farms. At individual level, abscess, ocular discharge and lesions in ears had significant difference results in both production systems due to distinct management of goats. Studies related to the importance of each indicator should be carried out, aiming the classification of farms regarding quality of life of animals, and facilitating the guidance of producers for the resolution of the most relevant findings. The great similarities between results showed that farmers in both production systems faced problems due to heat stress, lack of forage and health issues. Encouraging farmer's education aiming reduce survival-critical negative effects of goat management to low levels and provide environments, in which goats could experience positive emotional states, should be an important goal for veterinarians, technical assistants and government agencies responsible for health and welfare of farm animals.

REFERENCES

AGUIAR, G. M. N. DE; ASSIS, A. C. O.; SILVA, T. R. DA; et al. Pododermatite infeciosa em ovinos e caprinos no sertão paraibano. **Ciência Animal Brasileira**, p. 585–590, 2009.

AGUIAR, G. M.; SIMÕES, S. V.; SILVA, T. R.; et al. Foot rot and other foot diseases of goat and sheep in the semiarid region of northeastern Brazil. **Pesquisa Veterinária Brasileira**, v. 31, n. 10, p. 879–884, 2011.

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

ALEXANDRE, G.; MANDONNET, N. Goat meat production in harsh environments. **Small Ruminant Research**, v. 60, n. 1–2 SPEC. ISS., p. 53–66, 2005.

ANA. Monitor das secas do Nordeste brasileiro. 2016. Available in <http://monitordesecas.ana.gov.br/>. Acess in: 23/2/2017.

ANZUINO, K.; BELL, N. J.; BAZELEY, K. J.; NICOL, C. J. Papers Assessment of welfare on 24 commercial UK dairy goat farms based on direct observations. **Veterinary Record**, v. 167, p. 774–780, 2010.

ARAÚJO, G. G. L. DE; VOLTOLINI, T. V.; CHIZZOTTI, M. L.; TURCO, S. H. N.; CARVALHO, F. F. R. DE. Water and small ruminant production. **Revista Brasileira de Zootecnia**, v. 39, p. 326–336, 2010.

ARAÚJO, G. G. L. DE; VOLTOLINI, T. V.; TURCO, S. H. N.; PEREIRA, L. G. R. A Água nos sistemas de produção de caprinos e ovinos. In: VOLTOLINI, T. V et al. **Produção de caprinos e ovinos no Semiárido**. Embrapa Semiárido, 2011. p.69–94.

ARAÚJO, S. M. S. A região semiárida do Nordeste do Brasil: Questões Ambientais e Possibilidades de uso Sustentável dos Recursos. **Rios Eletrônica**, p. 89–90, 2011.

AWIN. **Animal Welfare Indicators for Goats**. 2015a.

AWIN. **Animal Welfare Indicators for Sheep**. 2015b.

AWIN PROJECT. Animal Welfare Indicators. 2015. Available in: <http://www.animal-welfare-indicators.net/site/>.

BAÊTA, F. D. C.; SOUZA, C. D. F. **Ambiência em edificações rurais: conforto térmico (2nd edition).** Viçosa: UFV, 2010.

BATTINI, M.; PERIC, T.; AJUDA, I.; et al. Hair coat condition: A valid and reliable indicator for on-farm welfare assessment in adult dairy goats. **Small Ruminant Research**, v. 123, n. 2–3, p. 197–203, 2015.

BATTINI, M.; STILWELL, G.; VIEIRA, A.; et al. On-farm welfare assessment protocol for adult dairy goats in intensive production systems. **Animals**, v. 5, n. 4, p. 934–950, 2015.

BATTINI, M.; VIEIRA, A.; BARBIERI, S.; et al. Invited review : Animal-based indicators for on-farm welfare assessment for dairy goats. **Journal of Dairy Science**, v. 97, p. 1–24, 2014.

BERG, W.; JOLLY, A.; RAMBELOARIVONY, H.; ANDRIANOME, V.; RARAMIMANANA, H. A scoring system for coat and tail condition in ringtailed lemurs, Lemur catta**. American Journal of Primatology**, v. 71, n. 3, p. 183–190, 2009.

BLOKHUIS, H. J.; VEISSIER, I.; MIELE, M.; JONES, B. The Welfare Quality® project and beyond: Safeguarding farm animal well-being. **Acta Agriculturae Scand Section A**, v. 60, p. 129-140, 2010.

BOISSY, A.; MANTEUFFEL, G.; JENSEN, M. B.; et al. Assessment of positive emotions in animals to improve their welfare. **Physiology and Behavior**, v. 92, n. 3, p. 375–397, 2007.

BRASIL, L. H. D. A.; WECHESLER, F. S.; JUNIOR, FLÁVIO BACCARI GONÇALVES, H. C.; BONASSI, I. A. Efeitos do Estresse Térmico Sobre a Produção, Composição Química do Leite e Respostas Termorreguladoras de Cabras da Raça Alpina. **Revista Brasileira de Zootecnia**, v. 29, n. 6, p. 1632–1641, 2000.

BRASÍLIA. CODEVASF. **Manual de Criação de Caprinos e Ovinos**. 2011.

BRASÍLIA. SEBRAE. **Manejo Básico de Ovinos e Caprinos**. 2009.

BRITO, D. R. B.; SANTOS, A. C. G.; GUERRA, R. M. S. N. C. Ectoparasitos em rebanhos de caprinos e ovinos na microrregião do alto Mearim e Grajaú, estado do Maranhão. **Revista Brasileira de Parasitologia Veterinária**, v. 14, n. 2, p. 59–63, 2005.

BROOM, D. M. Indicators of poor welfare. **British Veterinary Journal**, v. 142, n. 6, p. 524–526, 1986.

CAROPRESE, M.; CASAMASSIMA, D.; RASSU, S. P. G.; NAPOLITANO, F.; SEVI, A. Monitoring the on-farm welfare of sheep and goats. **Italian Journal of Animal Science**, v. 8, n. 1s, p. 343, 2009.

CASSIANI, S. H. DE B.; RANGEL, S. M. Complicações Locais Pós-Injeções Intramusculares Em Adultos. **Usp-Rp**, v. 32, n. 2, p. 444–450, 1999.

CEARÁ. EMBRAPA. **Controle de verminose em caprinos e ovinos**. 2015.

CHAPAVAL, L; OLIVEIRA, A. A. F.; ALVES, F. S. F.; ANDRIOLI, A; ARAUJO, A. M.; OLIVINDO, C. C. **Manual do produtor de cabras leiteiras**. Viçosa: Aprenda Fácil, 2011.

CODE OF WELFARE**. Animal Welfare (Painful Husbandry Procedures) Code of Welfare 2005.** 2005.

COSTA, R. G.; ALMEIDA, C. C.; PIMENTA FILHO, E. C.; HOLANDA, E. V.; SANTOS, N. M. Caracterização do sistema de produção caprino e ovino na região semi-árida do estado da Paraíba. Brasil. **Archivos de Zootecnia**, v. 57, n. 218, p. 195–205, 2008.

COSTA, V. M. M.; SIMÕES, S. V. D.; RIET-CORREA, F. Controle das parasitoses gastrintestinais em ovinos e caprinos na região semiárida do Nordeste do Brasil. **Pesquisa Veterinária Brasileira**, v. 31, n. 1, p. 65–71, 2011.

CSIRO. **Nutrient requirements of domesticated ruminants**. Australia: CSIRO, 2007.

DARCAN, N.; CEDDEN, F.; CANKAYA, S. Spraying effects on some physiological and behavioural traits of goats in a subtropical climate. **Italian Journal of Animal Science**, v. 7, n. 1, p. 77–85, 2008.

FAO; INPHO. Farm structures in tropical climates. 1998. Available in: <http://www.fao.org/3/a-s1250e/S1250E00.htm#Contents>. Access in: 22/2/2016.

FILGUEIRA, T. M. B.; AHID, S. M. M.; SUASSUNA, A. C. D.; SOUZA, W. J. DE; FONSECA, Z. A. A. DE S. Aspectos epidemiológicos e sanitários das criações de caprinos na região da Chapada do Apodi. **Revista Verde de Agroecologia e Desenvolvimento Sustentável**, v. 4, n. 2, p. 64–67, 2009.

GOMES, C. A. V; FURTADO, D. A.; MEDEIROS, A. N.; et al. Efeito do ambiente térmico e níveis de suplementação nos parâmetros fisiológicos de caprinos Moxotó. **Revista Brasileira de Engenharia Agrícola e Ambiental**, v. 12, n. 2, p. 213–219, 2008.

GROSSO, L.; BATTINI, M.; WEMELSFELDER, F.; et al. On-farm Qualitative Behaviour Assessment of dairy goats in different housing conditions. **Applied Animal Behaviour Science**, v. 180, p. 51–57, 2016.

GUTMANN, A. K.; SCHWED, B.; TREMETSBERGER, L.; WINCKLER, C. Intra-day variation of qualitative behaviour assessment outcomes in dairy cattle. **Animal Welfare**, v. 24, n. 3, p. 319–326, 2015.

IBGE. **Produção da Pecuária Municipal**. 2013.

IBGE. **Produção da Pecuária Municipal**. 2014.

IPECE. Região semi-árida cearense. 2005. Available in: <http://www2.ipece.ce.gov.br/atlas/capitulo1/12/pdf/Regiao_Semi_Arida.pdf>. Acesso em: 10/1/2017.

LANGHANS, W.; SENN, M.; MEYER, A. H.; SCHARRER, E. Feeding behaviour of pigmy goats during water deprivation. **Asian-Australasian Journal of Animal Sciences**, v. 2, n. 3, p. 273–274, 1989.

LICKLITER, R. E. Behavior associated with parturition in the domesti goat. **Applied Animal Behaviour Science**, v. 13, p. 335–345, 1985.

LIMA, A. M. C.; FARIAS, D. A. DE; SANTIAGO, L. B.; et al. Caracterização dos produtores de caprinos e ovinos das Mesorregiões Metropolitana de Fortaleza e dos Sertões Cearenses. 2012. Available in: <https://ainfo.cnptia.embrapa.br/digital/bitstream/item/28500/1/AAC-Caracterizacao-dos-produtores-de-caprinos-e-ovinos-das-Mesorregioes-metropolitana.pdf>.

LLONCH, P.; KING, E. M.; CLARKE, K. A.; DOWNES, J. M.; GREEN, L. E. A systematic review of animal based indicators of sheep welfare on farm, at market and during transport, and qualitative appraisal of their validity and feasibility for use in UK abattoirs. **Veterinary Journal**, v. 206, n. 3, p. 289–297, 2015.

MAPA. **Agenda Estratégica Caprinos e Ovinos 2010-2015**. 2011.

MELLOR, D. J. Updating animal welfare thinking: Moving beyond the “Five Freedoms” towards “A lifeworth living”. **Animals**, v. 6, n. 3, 2016.

MELO, A. C. F. L.; REIS, I. F.; BEVILAQUA, C. M. L.; et al. Nematódeos resistentes a anti-helmíntico em rebanhos de ovinos e caprinos do estado do Ceará, Brasil. **Ciência Rural**, v. 33, n. 2, p. 339–344, 2003.

MIRANDA-DE LA LAMA, G. C.; MATIELLO, S. The importance of social behaviour for goat welfare in livestock farming. **Small Ruminant Research**, v. 90, n. 1–3, p. 1–10, 2010.

NAPOLITANO, F.; DE ROSA, G.; GIROLAMI, A.; SCAVONE, M.; BRAGHIERI, A. Avoidance distance in sheep: Test-retest reliability and relationship with stockmen attitude. **Small Ruminant Research**, v. 99, n. 2–3, p. 81–86, 2011.

NEW ZEALAND GOVERNAMENT. **Animal Welfare (Goats) Code of Welfare 2012**. 2012.

PEREIRA, M. F.; MOTA, R. A.; PEIXOTO, R. M.; PIATTI, R. M. Estudo de casos de aborto em caprinos e ovinos no estado de Pernnambuco, Brasil. **Ciência Veterinária nos trópicos**, v. 16, n. 1, p. 18–30, 2013.

PINHEIRO, R. R.; GOUVEIA, A. M. G.; ALVES, F. S. F.; HADDAD, J. P. A. Aspectos epidemiológicos da caprinocultura cearense. **Arquivo Brasileiro de Medicina Veterinária e Zootecnia**, v. 52, n. 5, p. 534–543, 2000.

PINHEIRO, R. R.; MARIA, A.; GOUVEIA, G.; et al. Perfil de propriedades no estado do ceará relacionado à presença do lentivírus caprino. **Ciência Animal**, v. 14, n. 1, p. 29–37, 2004.

PUGH, D. G. **Sheep & Goat Medicine.** Philadelphia: Saunders, 2002.

RECIFE. SEBRAE. **Manual de Caprinocultura**. 2000.

ROTA DO CORDEIRO. Semiárido Nordestino. 2017. Available in: <http://www.mi.gov.br/rota-do-cordeiro>. Access in: 09/03/2017.

SANTOS, T. C. P. DOS; FIGUEREDO, S. C. DE; BELTRÃO, R. DE A. M. S.; ALFARO, C. E. P. Aspectos Sanitários E De Manejo Em Criações De Caprinos E Ovinos Na Microrregião De Patos, Região Semi-Árida Da Paraíba. 2012. Available in: <http://propi.ifto.edu.br/ocs/index.php/connepi/vii/paper/viewFile/3759/1950>.

SANTOS, T. C.; PEÑA-ALFARO, C. E.; FIGUEIREDO, S. M. Aspectos Sanitários E De Manejo Em Criações De Caprinos E Ovinos Na Microrregião De Patos, Região Semi-Árida Da Paraíba. **Ciência Animal Brasileira**, v. 12, n. 2, p. 206–212, 2011.

SILVA, E. M. N. DA; SOUZA, B. B. DE; SILVA, G. D. A.; et al. Avaliação da adaptabilidade de caprinos exóticos e nativos no semi-ário paraibano1. **Ciência e Agrotecnologia**, v. 30, n. 3, p. 516–521, 2006.

SILVA, F. L. R. DA; ARAÚJO, A. M. DE. Desempenho produtivo em caprinos mestiços no semi-árido do Nordeste do Brasil. **Revista Brasileira de Zootecnia**, v. 29, n. 4, p. 1028–1035, 2000.

SILVA, M. R.; SOUZA, B. B.; GUIMARÃES, L. J.; et al. Estresse Térmico e sua Influência na Fisiologia Hormonal de Pequenos Ruminantes. **Journal of Animal Behaviour and Biometeorology**, v. 4, n. 2, p. 50–54, 2016.

SILVA, V. R.; FURTADO, D. A.; AZEVEDO, M. A.; WALLACE, J. Instalações para caprinos. **Revista Educação Agrícola Superior**, v. 25, n. 2, p. 99–103, 2010.

SMITH, M. C.; SHERMAN, D. M. **Goat Medicine (2nd Edition)**. Iowa: Wiley-Blackwell, 2009.

SUDENE. Semiárido - Superintendência do Desenvolvimento do Nordeste (SUDENE). 2016. Available in: <http://www.sudene.gov.br/acesso-a-informação/institucional/area-de-atuacao-da-sudene/semiarido>.

VIANA, M. P.; MEDEIROS, A. DA R.; SOUZA, B. B. DE. Effect of thermal stress on the physiology , production and reproduction of goats. ACSA – **Agropecuária Científica no Semiárido**, v. 9, n. 4, p. 1–8, 2013.

VILLAQUIRAN, M.; GIPSON, T. A; MERKEL, R. C. **Body Condition Scores in Goats**. 2004.

VOLTOLINI, T. V.; SANTOS, R. M.; MORAES, S. A. D. A.; DE, G. G. L. Principais modelos produtivos na criação de caprinos e ovinos. In: VOLTOLINI, T. V et al. **Produção de caprinos e ovinos no Semiárido**. Embrapa Semiárido, 2011. p. 219–232.

WAIBLINGER, S.; BOIVIN, X.; PEDERSEN, V.; et al. Assessing the human-animal relationship in farmed species: A critical review. **Applied Animal Behaviour Science**, v. 101, n. 3–4, p. 185–242, 2006.

WELFARE QUALITY®. **Welfare Quality® Assessment protocol for cattle**. 2009.

WEMELSFELDER, F.; HUNTER, E. A.; MENDI, M. T.; LAWRENCE, A. B. The spontaneous qualitative assessment of behavioural expressions in pigs: First explorations of a novel methodology for integrative animal welfare measurement. **Applied Animal Behaviour Science**, v. 67, n. 3, p. 193–215, 2000.

WEMELSFELDER, F.; HUNTER, T. E. A.; MENDL, M. T.; LAWRENCE, A. B. Assessing the “whole animal”: a free choice profiling approach. **Animal Behaviour**, v. 62, n. 2, p. 209–220, 2001.

4 ON-FARM WELFARE ASSESSMENT IN DAIRY GOATS IN CEARÁ, BRAZIL

ABSTRACT

Raising dairy goats is a growing activity in Brazilian Northeast, with government organizations investing in new technologies to produce milk and cheese with better quality. Accessing dairy the welfare of goats is a new and complementary method of accomplish this result. The objective of this study was to apply AWIN Goat protocol to evaluate and compare the welfare of adult lactating and non-lactating dairy goats in Ceará, Brazil (BR). Thirteen farms were recruited via Associations. Lactating (L) farms were represented by ten properties and Non-lactating (NL) farms by eight properties. At first welfare level, group assessments occurred at one pen through animal and resource-based indicators, latency to the first contact test and qualitative behaviour assessment. At second welfare level, group assessments occurred in other different pens through animal and resource-based indicators and latency to the first contact test. Individual evaluations occurred in all farms. Significant difference between L and NL farms was set at $p<0.05$ to all tests. As results, during group evaluations at fist welfare level, only thermal stress indicator showed significant difference ($p<0.05$) between L and NL farms. There is no significant difference ($p>0.05$) between L and NL farms for indicators, at second welfare level. On individual assessments, only Body Score Condition and overgrown claws showed significant difference ($p<0.05$) between L and NL farms. These results demonstrated that both groups are submitted to the same welfare problems in Ceará-BR, being important that measures to improve human-animal relationship and animal and resource-based indicators be implemented in farms in Ceará-BR.

Key words: AWIN. Parameter. Quality of life. Human-animal relationship. Positive emotions.

4.1 INTRODUCTION

SEVI et al. (2009) cited that goat breeding is distributed worldwide, especially in developing countries, in which they are raised in extensive system to attend families' demands. Goats were considered rustic animals, because of their ability to cope with harsh environments and bad management practices, consequently people used to think that welfare problems and low productive performance were not related to these challenges. This thought has been changing in recent decades and concerns about animal welfare has been increasing. Conscious consumers are demanding for safe products that respect animals over all the process, and this is a reality in Brazil too. Studies showed that more than 60% of consumers agrees to pay a higher value for a product with welfare assurance of animals involved (ANUNCIAÇÃO et al., 2010; DONOFRE et al., 2013).

In order to increase dairy goat production, farmers adopted semi-intensive and intensive conditions (MARIA et al., 2016), where animals have a better feeding strategy and health care. In addition, the interest in raising highly productive dairy breeds, with standard quality products that include animal welfare, were motivational efforts that transformed goat breeding (SEVI et al., 2010).

Raising dairy goats is a growing activity in Brazilian Northeast, according to CEARÁ.EMBRAPA (2016), with government organizations investing in new technologies to produce milk and cheese with better quality, and also developing researches to improve management and health of goats. Recommendations on good practices in milking are also available, encouraging production and seeking achieve new quality standards (CHAPAVAL et al., 2009) . Accessing the welfare of dairy goats is a new and complementary method to accomplish this result, especially in Brazilian Northeast, which holds the largest herd of goats in Brazil (91.6%) (IBGE, 2014), with Ceará state being the fourth largest state that raised goats (IBGE, 2013).

AWIN Goat is a protocol developed to evaluate dairy goat welfare kept under semi-intensive and intensive production system mainly (AWIN, 2015a). This protocol uses animal-based indicators, related to natural behaviour of species, besides physical and mental health; and resource and management-based parameters, including stocking density and health plans. The protocol was designed to evaluate the welfare of lactating adult dairy goats (AWIN, 2015a), but the selected indicators were chosen based on goats biology, which allows them to be tested in others categories, such as

non-lactating females. Lactating mammals have high physiological demands (SPEAKMAN, 2008), and depending on the milking conditions, goats can suffer emotional and physical stress resulting in decreased productivity and health problems (SEVI et al., 2009). In this context, our hypothesis is that non-lactating goats have a higher degree of welfare.

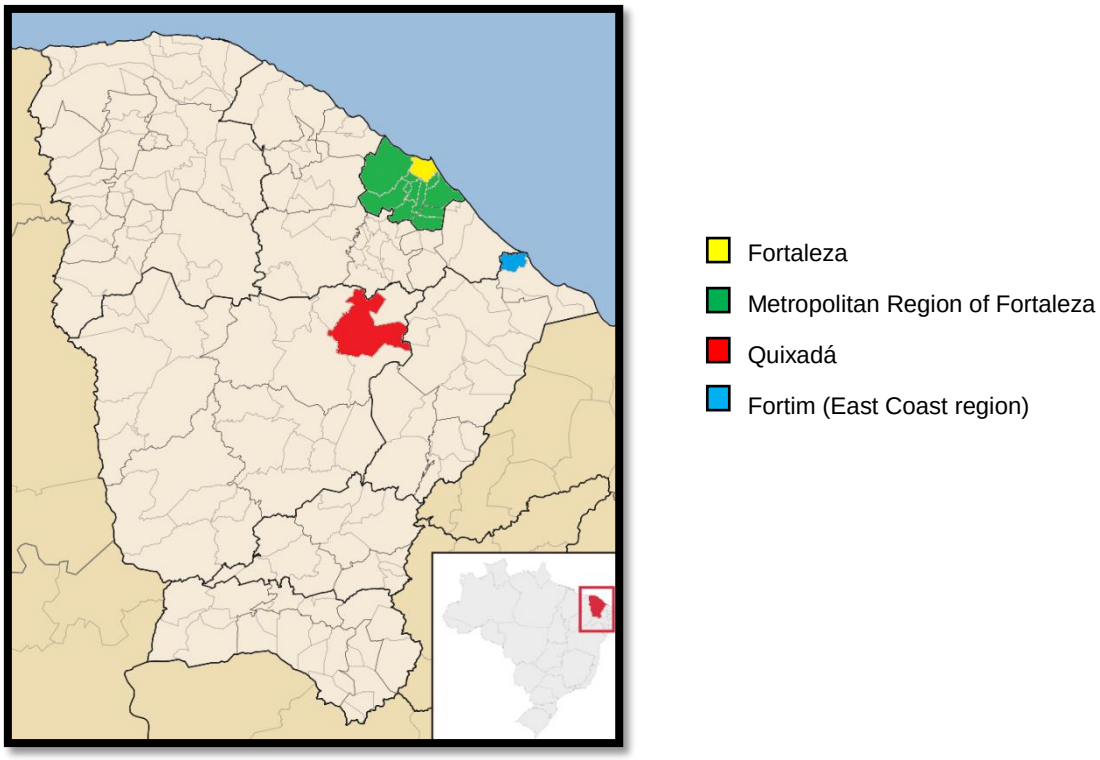
There are some studies involving goat's welfare (GROSSO et al., 2016; MERSMANN et al., 2016), but few published studies in Brazil related to this subject (LIMA and BARBOSA FILHO, 2013; PAULO and LOPES, 2014). In order to understand the current welfare of dairy goats, the objective of this study was to apply AWIN Goat protocol to evaluate the welfare between adult lactating and non-lactating dairy goats in Ceará, Brazil (BR).

4.2 MATERIAL AND METHODS

4.2.1 FARMS AND ANIMALS

Thirteen farms were recruited via an Association of Milk Goat Breeders of Ceará (CAPRILEICE) and Association of Goat and Sheep Breeders of Ceará State (ACOCECE). AWIN Goat Protocol was applied in farms located in Metropolitan Region of Fortaleza (n=7), Fortim district in East Coast region (n=1) and Metropolitan Region of Quixadá (n=5) Ceará, Brazilian Northeast (FIGURE 8). Lactating (L) farms were represented by ten farms and Non-lactating (NL) farms by eight farms. In five farms, the protocol was applied in both groups. Goat breeds presented in this study were Saanen, Alpine and British Alpine, Murciana, Canindé, and also mixed breeds of Saanen, Alpine and Anglo-Nubian. All farms were visited between August and September 2016. Some information about the research was given to farmers or Presidents before the visits occurred.

FIGURE 8 - LOCATION OF CITIES AND REGIONS WHERE OCURRED THE ASSESSMENTS ON FARMS ICEARÁ STATE, BRAZIL.



4.2.2 FIRST-LEVEL WELFARE ASSESSMENT

In order to evaluate animal and resource-based indicators, a two-level approach was presented in AWIN Goat Protocol (AWIN, 2015a). The assessments occurred at group level, without any physical contact with goats. Twelve indicators were used to evaluate the welfare of goats (TABLE 20). All parameters were animal-based, except for bedding, that was divided in quality and quantity of cleanness (AWIN, 2015a). On Latency to the first contact test indicator, time delay in which animals started contacting with assessor was categorized in very good Human Animal-Relationship (HAR) (1 to 24s); good HAR (25-60s) and bad HAR (> 61s). Other nine resource-based indicators, presented in Appendix C on AWIN Goat protocol (AWIN, 2015a), were also investigated (TABLE 21) in first and second level of welfare assessment. Stocking density was categorized in good (≥ 2m^2), adequate (between 1.51 – 1.59m^2) and poor (<1,5m^2), based on AWIN (2015b). Total length of feeding and water trough(s) (m) was classified in adequate (≥ 0.40 cm) and poor (< 0.40 cm), based on Toussaint (1997). Due to animals management, with lactating and non-

lactating goats housed together, three L farms (06, 07 and 09) and two NL farms (05 and 07) were excluded from the assessment of queuing at feeding and at drinking, latency to the first contact test and qualitative behaviour assessment. Farm 03 (NL) was excluded due to goats being housed together with bucks or wethers. Indicators queuing at feeding and at drinking were recorded as the number of time the behaviour occurred and not the number of goats that performed it. Queuing at feeding and drinking was observed in seven L farms and five NL farms.

The assessment started at feed distribution, outside the pens, and continued inside. Superficial temperature (°C) and relative humidity of air (%) was calculated with Digital Thermo Hygrometer ITHT2210 at begin of assessment on each farm (n=13). A pre-established order to apply the indicators was conducted by the assessor. Only one pen was evaluated at the first level in L and NL farms. This pen was selected based on the greater risk of poor welfare to goats, as highest density, lower feeding space/animal ratio, lower drinking place/animal ratio, and presence of horned and hornless goats in the same pen. If all pens had equally conditions, one pen was selected randomly. Infirmary, culling, quarantine or maternity pens were excluded from evaluations. The authors decided to submit all farms to the second level of assessment aiming to show, especially, the prevalence of individual indicators in dairy goats in Ceará.

TABLE 20 - DESCRIPTION AND MEASUREMENT OF INDICATORS AT FIRST-LEVEL WELFARE ASSESSMENT.

INDICATOR	DESCRIPTION	SCORING
Improper disbudding	The number of goats showing presence of residual horns (scurs) is recorded.	Number of goats
Abscess	The presence of external abscesses in front area is recorded.	Presence/absence
Kneeling at the feed rack	The number of kneeling goats (front legs flexed, the rear up compared to other goats) is counted during feeding time.	Number of goats
Queuing at feeding	The number of goats queuing at the feed rack, during feeding time, is counted using a scan sampling method until 15 minutes.	Number of goats
Queuing at drinking	The number of goats queuing at the drinkers, after feeding time, is counted using a scan sampling method until 15 minutes.	Number of goats
Hair coat condition	The number of goats presenting poor hair coat (defined as matted, rough, scurfy, uneven, shaggy hair coat frequently longer than normal) is recorded.	Number of goats
Oblivion	The number of oblivious goats (physically or mentally isolated from the group) is recorded.	Number of goats
Thermal stress	The number of goats showing heat (high accelerate respiration rate) or cold (shivering or presence of bristly hair) stress signs is counted.	Number of goats
QBA	Assessor evaluated details of behaviour, posture, and animal's body language using descriptions such as aggressive, fearful, relaxed.	Scores on visual analogue scale
Latency to the first contact test	The latency from the time the first goat nuzzles or touches any part of the assessor's body that was immobile in a selected place in the pen is recorded (maximum time: 300 seconds).	Time elapsed
Severe Lameness	Goats are moved in the pen and the number of severely lame animals (based on abnormal gait, head nodding, spine curvature, and presence of kneeling in different places than the feeding rack) is counted.	Number of goats
Bedding	The quantity and cleanliness of the bedding in the pen is evaluated.	Quantity: sufficient/insufficient Cleanliness: clean/dirty

SOURCE: Adapted from Battini et al. (2015) and AWIN Goat (AWIN, 2015a)

TABLE 21 - DESCRIPTION OF RESOURCE-BASED INDICATORS USED AT FIRST AND SECOND LEVEL OF WELFARE ASSESSMENT.

INDICATOR	DESCRIPTION
Stocking density	The individual space (m^2) of each goat was calculated based on the total pen area (m^2) and divided by the number of goats.
Number of feeding spaces	The number of feeding spaces is recorded.
The length (m) of feeding trough(s) per goat	The individual length (m) of feeding trough(s) that each goat has to feed is recorded.
Number of functioning water places	Number of functioning water places is recorded**.**
Presence of linear water trough(s)	The presence of linear water trough(s) is recorded.
Total length (m) of linear water trough(s) per goat	The individual length (m) of linear water trough(s) that each goat has to drink is recorded.
Presence of horned and dehorned goats	The presence of horned and dehorned goats at the same pen is recorded.
Flooring material	The type of flooring material on each pen is recorded.
Bedding material	The type of bedding material on each pen is recorded.

SOURCE: Adapted from AWIN Goat (AWIN, 2015a)

4.2.2.1 QUALITATIVE BEHAVIOUR ASSESSMENT (QBA)

QBA was developed to some species to evaluated animals behaviour through indicators that have an emotional connotation (WEMELSFELDER et al., 2000). In dairy goats, behaviours were identified according to specific descriptors (AWIN, 2015a). The terms or descriptors used to access goats emotions are: aggressive, agitated, alert, bored, fearful, frustrated, irritated, suffering, content, curious, lively, relaxed and sociable. AWIN Goat protocol (AWIN, 2015a) has each term described in details. The median of five positive and eight negative descriptors was measured on each farm and classified accordlying to QBA score (0-125mm) on a five ordinal scale. Regarding results related to positive descriptors, the scale ranged from 0-25mm – vary bad; 26-50mm – bad; 51-75mm – adequate; 76-100mm – good and 101-125mm – very good. The five ordinal scale associated to negative descriptors had inverted categories, e.g. 0-25mm – very good. Subsequently, each farm had two results. The description of each category can be seen below TABLE 22.

TABLE 22 - FIVE ORDINAL SCALE REGARDING QUALITY OF GOATS FEELINGS BASED ON THE ASSESSMENT OF POSITIVE AND NEGATIVE DESCRIPTORS FROM QBA (AWIN, 2015A).

CATEGORY	DESCRIPTION
Very bad	Prevalence of lower levels of positive descriptors or higher levels of negative ones. Goats are submitted to an aversive environment.
Bad	Prevalence of low levels of positive descriptors or high levels of negative ones. Adequate goat behaviour is compromised.
Regular	Neutral point with balanced positive and negative emotions.
Good	Prevalence of high levels of positive descriptors or low levels of negative ones, but less so. Goat behaviour tends to be adequate to the specie.
Very good	Prevalence of higher levels of positive descriptors or lower levels of negative ones. Goat behaviour is healthy.

SOURCE: Adapted from MELLOR (2016)

In this study, evaluations started with the assessor choosing one fixed observation point, outside the pen, to evaluate the goats for ten minutes. The descriptors were measure using the Visual Analogue Scale (VAS), with the left and right points defining the minimum and maximum scores (0-125mm), respectively.

4.2.3 SECOND LEVEL WELFARE ASSESSMENT

In this phase, the assessment occurred at group and individual level (AWIN, 2015a). Eighteen animal-based parameters were used at group evaluations, in which eleven were the same applied at the first level (TABLE 20), with the exception of abscess, and six were applied on each goat separately (TABLE 23).

TABLE 23 - DESCRIPTION AND MEASUREMENT OF INDIVIDUAL ANIMAL-BASED INDICATORS AT SECOND LEVEL WELFARE ASSESSMENT.

INDICATOR	DESCRIPTION	SCORING
Body scoring condition (BCS)	BCS is assessed on individual goats, using a three-level visual scoring method.	Very thin/ normal/ very fat
Faecal soiling	The presence of soft and liquid manure below the tail head is visually assessed as a sign of diarrhea.	Presence/absence
Nasal discharge	The presence of any mucous or purulent discharge from the nose is visually assessed.	Presence/absence
Ocular discharge	The presence of clearly visible flow from one or two eyes is visually assessed.	Presence/absence
Overgrown claws	The presence of rear claws that are deformed and/or with excess horn tissue is visually assessed.	Presence/absence
Udder asymmetry	The presence of asymmetric udders (in which one half is at least 25% longer than the other, excluding the teats) is visually assessed.	Presence/absence

SOURCE: Adapted from BATTINI et al. (2015) and AWIN Goat (AWIN, 2015a)

Pens were assessed at group accordling to AWIN's methodology (AWIN, 2015a). If a farm had between two and seven pens, the protocol was applied at two pens, and above eight, in three pens, including the first one evaluated (first welfare level). Four pens were evaluated in L farms and six pens in NL farms regarding animal and resource-based indicators (TABLE 20). Due to a methodological error, QBA was applied in this level at pens and not at farm level and the results were excluded from this study.

The number of goats evaluated individually was determined by a scheme on AWIN Goat procotol (AWIN, 2015a). Abscess indicator was assessed as an individual parameter in front and rear pre-selected area of goats and overgrown claws parameter was adapted to assess all hooves. Individual assessments were performed with an assistant that helped to restrain the goats, but only the same person evaluated all indicators (first and second level). After evaluations, recommendations to improve the welfare of dairy goats was sent to each producer. An example can be seen in APPENDIX 4.

4.2.4 STATISTICAL ANALYSES

Data were analyzed using IBM SPSS statistics v.19. At group level, indicators related to animal and resource-based indicators, latency to the first contact test and QBA were processed comparing N and NL farms. At individual level, animal-based indicators were processed comparing N and NL farms.

At group level, the prevalence of animal-based indicators was calculated on total number of goats and at farm level, and the significant difference between L and NL farms was determined by Chi-square test, at first and second welfare level. Significant difference for queuing at feeding and drinking, latency to the first contact test and QBA was measure by Mann-Whitney test. Significant difference between mean values of Temperature (°C) and relative humidity (%), evaluated in morning and afternoon periods on each farm, was calculated with student t test (data normally distributed).

For resource-based indicators, total length of feeding trough(s) (m) and presence of horned and dehorned goats was interpreted with Chi-square test. Stocking density was analyzed with Mann-Whitney test.

For animal-based indicators at individual level, the prevalence of each indicator was calculated on total number of goats and at farm level. Significant difference related to BCS in L and NL farms was calculate with Mann-Whitney test. Other variables were analyzed with Chi-square test.

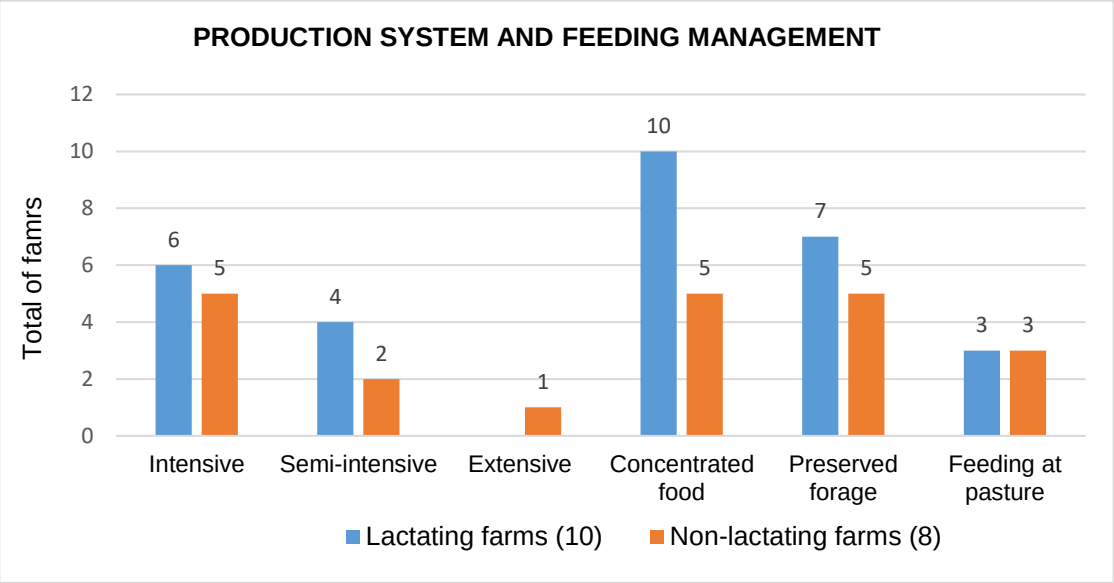
Data were not normality distributed, as assessed by Shapiro-Wilk test. Fisher's exact test was used every time that the number of cells on 2X2 contingency table was below to five. Significance was set at $p<0.05$ to all tests. This study was approval by Ethics Committee of Federal University of Paraná, with protocol number 029/2016.

4.3 RESULTS

4.3.1 FARMS AND ANIMALS

In L farms, 85 adult dairy goats were evaluated at group level and 108 at individual level; in NL farms, 65 and 72 goats were assessed at group and individual level, respectively. The type of production system and feeding management of goats in both L and NL farms can be observed in FIGURE 9. Animals kept in semi-intensive systems had occasional access to pasture and in extensive ones goats spent all day on pasture, being housed before night.

FIGURE 9 - TYPE OF PRODUCTION SYSTEM AND FEEDING MANAGEMENT PERFORMED IN L (N=10) AND NL (N=8) FARMS IN CEARÁ, BRAZIL.



SOURCE: The author (2017)

Mean values for temperature (°C) and relative humidity (percentage) at the start of assessment on each farm, accordlying to morning (07:00 a. m – 12:00 a.m.) and afternoon (01:00 a.m. – 04:00 p.m.) periods, are demonstrated on TABLE 24. There is no significant difference ($p>0.05$) between assessments started in morning and afternoon, regarding environmental variables.

The characteristics of the farms regarding the animal production status and total number of goats evaluated on each welfare level can be observed in TABLE 25. Farm 01 (NL) had one more assessment at second welfare level than AWIN goat protocol (AWIN, 2015a) recommend and Farm 08 (NL) had one less evaluation than expected.

TABLE 24 - MEDIA VALUES OF AMBIENT VARIABLES MEASURE IN L AND NL FARMS ON MORNING (N=7) AND AFTERNOON (N=6) PERIODS.

AMBIENT VARIABLES	L AND NL FARMS			
	MORNING	MIN-MAX	AFTERNOON	MIN-MAX
Temperature (°C)	31,08[a]	27,67 – 36,62	33,20[a]	28,62 – 39,64
Relative humidity (%)	57,08[a]	42,30 – 78,28	48,93[a]	28,72 – 65,19

Mean values fallowed by different letters on line have p <0.05.

SOURCE: The author (2017)

TABLE 25 - CHARACTERIZATION OF FARMS IN TERMS OF ANIMAL PRODUCTION STATUS, TOTAL OF GOATS AND NUMBER OF EVALUATED ANIMALS AT FIRST AND SECOND LEVEL OF WELFARE.

FARMS	GOATS IN LACTATION AND NON-LACTATION	TOTAL OF GOATS LACTATING AND NON-LACTATING	NUMBER OF PENS/FARM	NUMBER OF GOATS EVALUATED (1º WELFARE LEVEL)	NUMBER OF GOATS EVALUATED - FIRST GROUP (2º WELFARE LEVEL)	NUMBER OF GOATS EVALUATED - SECOND GROUP (2º WELFARE LEVEL)	NUMBER OF GOATS EVALUATED - THIRD GROUP (2º WELFARE LEVEL)
Farm 01	Lactaction	6	1	6	0	0	0
Farm 02	Lactaction	20	4	4	3	0	0
Farm 03	Lactaction	9	1	9	0	0	0
Farm 04	Lactaction	18	1	18	0	0	0
[1]Farm 05	Lactaction	12	12	1	1	1	0
Farm 06	Lactaction	12	1	12	0	0	0
[2]Farm 07	Lactaction	3	1	3	0	0	0
[3]Farm 08	Lactaction	4	1	4	0	0	0
[4]Farm 09	Lactaction	7	1	7	0	0	0
[5]Farm 10	Lactaction	22	7	8	8	0	0
Farm 01	Non-lactation	9	9	1	1	1	1
Farm 02	Non-lactation	4	2	2	2	0	0
Farm 03	Non-lactation	3	2	3	3	0	0
[1]Farm 04	Non-lactation	8	2	5	3	0	0
[2]Farm 05	Non-lactation	6	1	6	0	0	0
[3]Farm 06	Non-lactation	5	1	5	0	0	0
[4]Farm 07	Non-lactation	19	1	19	0	0	0
[5]Farm 08	Non-lactation	34	5	14	0	0	0

[1,2,3,4,5] Farms where the protocol was applied in both lactating and non-lactating dairy goats.

SOURCE: The author (2017)

Goats breed predominant in L farms was Saanen, British Alpine and mixed breeds of Saanen, Alpine and Anglo-nubian; in NL farms, breeds was Saanen, British Alpine, Alpine, Murciana, Canindé and mixed breeds of Saanen and Alpine goats. Three NL farms were not collecting milk products on the moment of assessment due to extended dry period in Ceará and limited resources.

4.3.2 GROUP EVALUATIONS AT FIRST AND SECOND LEVEL OF WELFARE ASSESSMENT

4.3.2.1 ANIMAL-BASED INDICATORS

The prevalence of seven animal based-indicators on the first group evaluated on each L and NL farms was demonstrated on TABLE 26. There is only significant difference ($p<0.05$) on thermal stress between L and NL farms, regarding animal-based indicators at first welfare assessment.

TABLE 26 - PREVALENCE OF ANIMAL-BASED INDICATORS ON TOTAL GOATS NUMBER ON TEN L FARMS (N=72) AND ON EIGHT NL FARMS (N=55) ON THE FIRST WELFARE LEVEL.

ANIMAL-BASED INDICATORS	NUMBER (%)		NUMBER (%)		P-VALOR
	GOATS	L FARMS	GOATS	NL FARMS	
Improper disbudding	2 (2.77)	2 (20.0)	4 (7.27)	3 (37.5)	0.402
Abscess	0 (0.0)	0 (0.0)	1 (1.81)	1 (12.5)	0.433
Kneeling at the feed rack	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-
Hair coat condition	16 (22.22)	5 (50.0)	6 (10.9)	3 (37.5)	0.095
Oblivion	1 (1.38)	1 (10.0)	0 (0.0)	0 (0.0)	1.000
Thermal stress	6 (8.33)	3 (30.0)	0 (0.0)	0 (0.0)	0.036*
Severe Lameness	1 (1.38)	1 (10.0)	0 (0.0)	0 (0.0)	1.000

*P<0.05

SOURCE: The author (2017)

In five L farms, queuing behaviour was observed 24 times at feeding and in one NL farm, this action was recognized twice. Queuing behaviour at drinking was only observed five times in one NL farm. There is no statistic significant difference between L and NL farms regarding the behaviour of queuing at feeding ($p=0.087$) and queuing at drinking ($p=0.280$) at first welfare assessment.

The prevalence of six animal based-indicators on the first and second groups evaluated at second welfare level on each L and NL farms was demonstrated on TABLE 27. There is no statistic significant difference (p>0.05) between L and NL farms regarding animal-based indicators at second welfare assessment.

TABLE 27 - PREVALENCE OF ANIMAL-BASED INDICATORS ON TOTAL GOATS NUMBER ON FOUR GROUPS IN L FARMS (N=13) AND ON SIX GROUPS IN NL FARMS (N=11), AT SECOND WELFARE LEVEL.

ANIMAL-BASED INDICATORS	NUMBER (%)		NUMBER (%)		P-VALOR
	GOATS	L GROUPS	GOATS	NL GROUPS	
Improper disbudding	1 (7.69)	1 (25.0)	0 (0.0)	0 (0.0)	1.000
Kneeling at the feed rack	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-
Hair coat condition	5 (38.46)	3 (75.0)	3 (27.27)	1 (16.66)	0.667
Oblivion	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-
Thermal stress	2 (15.38)	2 (50.0)	0 (0.0)	0 (0.0)	0.478
Severe Lameness	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	-

SOURCE: The author (2017)

The queuing behaviour at feeding and at drinking was not observed in any goats on both N and NL groups at second welfare level.

4.3.2.2 LATENCY TO THE FIRST CONTACT TEST (LFCT)

TABLE 28 shows descriptive statistics of LFCT in L and NL farms, at first level, and TABLE 29 categorized farms on very good, good or bad Human-Animal Relationship (HAR), modified from AWIN Goat app (AWIN ITALY, 2015). The same information at second welfare level is presented on TABLES 30 and 31. Categorization of these data is a proposal and specific studies regarding latency test on goats are necessary to stablish a better distinction of bad and very bad HAR. There is no statistic significant difference between L and NL farms (p=0.268) at first welfare level and between L and NL pens (p=0.905), at second welfare level.

TABLE 28 - DESCRIPTIVE STATISTIC OF LATENCY TEST OF GOATS WITH THE ASSESSOR STANDING IMOBILLE IN THE PENS OF L (N=7) AND NL (N=5) FARMS, AT FIRST WELFARE LEVEL.

FARMS	LATENCY TEST (S)			
	MEDIA	STANDART ERROR	MINIMUM	MAXIMUM
Lactating	231,14	35,27	91	300
Non-lactating	151,6	64,08	14	300

SOURCE: The author (2017)

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TABLE 29 - RESULT OF L (N=7) AND NL (N=5) FARMS REGARDING TIME ELAPSED WHEN LATENCY TO THE FIRST CONTACT TEST WAS APPLIED, AT FIRST WELFARE LEVEL.

	NUMBER OF FARMS (%)	
CATEGORY/FARMS	LACTATION	NON-LACTATION
Very good HAR (1-24s)	0 (0.0)	2 (25.00)
Good HAR (25-60s)	0 (0.0)	0 (0.0)
Bad HAR (> 61s)	7 (100.00)	3 (37.50)

SOURCE: The author (2017)

TABLE 30 - DESCRIPTIVE STATISTIC OF LATENCY TEST OF GOATS WITH THE ASSESSOR STANDING IMOBILLE IN THE PENS OF L (N=4) AND NL (N=5) FARMS, AT SECOND WELFARE LEVEL.

GROUPS	LATENCY TEST (S)			
	MEDIA	STANDART ERROR	MINIMUM	MAXIMUM
Lactating	199,5	61,92	46	300
Non-lactating	204,5	58,65	45	300

SOURCE: The author (2017)

TABLE 31 - RESULT OF L (N=4) AND (N=5) GROUPS REGARDING TIME ELAPSED WHEN LATENCY TO THE FIRST CONTACT TEST WAS APPLIED, AT SECOND WELFARE LEVEL.

	NUMBER OF GROUPS (%)	
CATEGORY/FARMS	LACTATION	NON-LACTATION
Very good HAR (1-24s)	0 (0.0)	0 (0.00)
Good HAR (25-60s)	1 (25.00)	1 (12.50)
Bad HAR (> 61s)	3 (75.00)	4 (50.00)

SOURCE: The author (2017)

4.3.2.3 RESOURCE-BASED INDICATORS

Six resource-based indicators regarding space in pen (m^2) and size of feeding and water trough on L and NL farms are showed on TABLE 32 (1º welfare level) and TABLE 33 (2º welfare level). On TABLE 32, stocking density in farm 7 (L) and farm 5 (NL) was not measure due to a methodological error. Total length of feeding trough(s) (m) results were considered poor (<0.40cm) at first and second welfare levels in farm 06 (L) and in farms 03 and 08 (NL). The length (m) of feeding trough(s) per goats was not measure when there was a goat per pen (at first and second welfare level). On farm 01 (NL), TABLE 32, each goat had more than $2m^2$ per pen, based on the similarities between pen size in this farm, and the exactly measure of the other pens was not performed. Results regarding flooring and bedding type, and also quantity and cleanness of bedding at first and second assessment level, are showed in TABLE 34 and 35, respectively.

There is no significant difference ($p>0.05$) for stocking density, total length of feeding trough(s) (m) and presence of horned and dehorned goats between L and NL farms, at first and second welfare level.

TABLE 32 - PREVALENCE OF SIX RESOURCE-BASED INDICATORS ON TEN L FARMS AND ON EIGHT NL FARMS IN THE FIRST WELFARE LEVEL.

FARMS	LACTATING AND NON-LACTATING GOATS	NUMBER OF GOATS PER PEN	STOCKING DENSITY	NUMBER OF FEEDING SPACES	THE LENGTH (M) OF FEEDING TROUGH(S) PER GOATS	NUMBER OF FUNCTIONING WATER PLACES	TOTAL LENGTH (M) OF LINEAR WATER TROUGH(S) PER GOAT	PRESENCE OF HORNED AND DEHORNED GOATS (YES/NO)
Farm 01	Lactating	6	2,27	1	1,07	1	0	Yes
Farm 02	Lactating	4	2,56	1	0,42	1	0	No
Farm 03	Lactating	9	7,15	2	0,41	1	0	No
Farm 04	Lactating	18	4,19	2	0,74	2	0	No
[1]Farm 05	Lactating	1	9,6	1		1	0	No
Farm 06	Lactating	14	1,24	1	0,35	1	0	Yes
[2]Farm 07	Lactating	3		1	0,61	2	0	No
[3]Farm 08	Lactating	4	4,77	2	0,7	1	0	No
[4]Farm 09	Lactating	7	6,56	1		1	0	Yes
[5]Farm 10	Lactating	8	1,57	2	0,55	1	0,12	No
Farm 01	Non-lactating	1	2,25	1		1	0	No
Farm 02	Non-lactating	2	7,47	1	0,55	1	0	Yes
Farm 03	Non-lactating	3	1,22	1	0,11	1	0	Yes
[1]Farm 04	Non-lactating	5	2,47	1	0,37	1	0	No
[2]Farm 05	Non-lactating	6		1	0,61	2	0	No
[3]Farm 06	Non-lactating	5	4,77	1	0,47	1	0	No
[4]Farm 07	Non-lactating	19	6,81	1		1	0	Yes
[5]Farm 08	Non-lactating	14	0,93	2	0,29	1	0,12	Yes

[1,2,3,4,5] Farms where the protocol was applied in both lactating and non-lactating dairy goats.

SOURCE: The author (2017)

TABLE 33 - PREVALENCE OF FIVE RESOURCE-BASED INDICATORS ON FOUR L GROUPS AND ON SIX NL GROUPS IN THE SECOND WELFARE LEVEL.

FARMS	GROUP PER FARM	LACTATING AND NON-LACTATING GOATS	NUMBER OF GOATS PER PEN	STOCKING DENSITY	NUMBER OF FEEDING SPACES	THE LENGTH (M) OF FEEDING TROUGH(S) PER GOATS	NUMBER OF FUNCTIONING WATER PLACES	TOTAL LENGTH (M) OF LINEAR WATER TROUGH(S) PER GOAT	PRESENCE OF HORNED AND DEHORNED GOATS (YES/NO)
Farm 02	Group 01	Lactating	3	2,18	1	0,57	1	0	No
Farm 05	Group 01	Lactating	1	5,7	1		1	0	No
Farm 05	Group 02	Lactating	1	9,6	1		1	0	No
Farm 10	Group 01	Lactating	8	1,57	2	0,55	1	0,12	Yes
Farm 01	Group 01	Non-lactating	1		1		1	0	No
Farm 01	Group 02	Non-lactating	1		1		1	0	No
Farm 01	Group 03	Non-lactating	1		1		1	0	No
Farm 02	Group 01	Non-lactating	2	14,24	1	0,55	1	0	No
Farm 03	Group 01	Non-lactating	6	3,9	2	0,32	1	0	Yes
Farm 04	Group 01	Non-lactating	3	3,2	1	0,37	1	0	Yes

SOURCE: The author (2017)

TABLE 34 - PREVALENCE OF FOUR RESOURCE-BASED INDICATORS ON TEN L FARMS AND ON EIGHT NL FARMS IN THE FIRST WELFARE LEVEL.

FARMS	LACTATING AND NON-LACTATING GOATS	FLOORING MATERIAL	BEDDING MATERIAL	QUANTITY OF BEDDING (INSUFFICIENT/SUFFICIENT/NO BEDDING)	CLEANNESS OF BEDDING (DIRTY/ CLEAN/NO BEDDING)
Farm 01	Lactating	Concrete	Straw	Insufficient	Dirty
Farm 02	Lactating	Concrete	No bedding	No bedding	No bedding
Farm 03	Lactating	Sand	No bedding	No bedding	No bedding
Farm 04	Lactating	Wood slatted floor	No bedding	No bedding	No bedding
[1]Farm 05	Lactating	Bare soil	No bedding	No bedding	No bedding
Farm 06	Lactating	Bare soil	No bedding	No bedding	No bedding
[2]Farm 07	Lactating	Bare soil	No bedding	No bedding	No bedding
[3]Farm 08	Lactating	Bare soil	No bedding	No bedding	No bedding
[4]Farm 09	Lactating	Bare soil	No bedding	No bedding	No bedding
[5]Farm 10	Lactating	Wood slatted floor	No bedding	No bedding	No bedding
Farm 01	Non-lactating	Concrete	No bedding	No bedding	No bedding
Farm 02	Non-lactating	Bare soil	No bedding	No bedding	No bedding
Farm 03	Non-lactating	Concrete	No bedding	No bedding	No bedding
[1]Farm 04	Non-lactating	Bare soil/concrete	Sand	Insufficient	Dirty
[2]Farm 05	Non-lactating	Bare soil	No bedding	No bedding	No bedding
[3]Farm 06	Non-lactating	Bare soil	No bedding	No bedding	No bedding
[4]Farm 07	Non-lactating	Bare soil	No bedding	No bedding	No bedding
[5]Farm 08	Non-lactating	Wood slatted floor	No bedding	No bedding	No bedding

[1,2,3,4,5] Farms where the protocol was applied in both lactating and non-lactating dairy goats.

SOURCE: The author (2017)

TABLE 35 - PREVALENCE OF FOUR RESOURCE-BASED INDICATORS ON FOUR GROUPS IN L FARMS AND ON SIX GROUPS IN NL FARMS IN THE SECOND WELFARE LEVEL.

FARMS	GROUP PER FARM	LACTATING AND NON-LACTATING GOATS	FLOORING MATERIAL	BEDDING MATERIAL	QUANTITY OF BEDDING (INSUFFICIENT/SUFFICIENT/NO BEDDING)	CLEANNESS OF BEDDING (DIRTY/ CLEAN/NO BEDDING)
Farm 02	Group 01	Lactating	Concrete	No bedding	No bedding	No bedding
Farm 05	Group 01	Lactating	Bare soil	No bedding	No bedding	No bedding
Farm 05	Group 02	Lactating	Bare soil	No bedding	No bedding	No bedding
Farm 10	Group 01	Lactating	Wood slatted floor	No bedding	No bedding	No bedding
Farm 01	Group 01	Non-lactating	Wood slatted floor	No bedding	No bedding	No bedding
Farm 01	Group 02	Non-lactating	Wood slatted floor	No bedding	No bedding	No bedding
Farm 01	Group 03	Non-lactating	Concrete	No bedding	No bedding	No bedding
Farm 02	Group 01	Non-lactating	Bare soil	No bedding	No bedding	No bedding
Farm 03	Group 01	Non-lactating	Concrete	No bedding	No bedding	No bedding
Farm 04	Group 01	Non-lactating	Bare soil	Sand	Insufficient	Clean

SOURCE: The author (2017)

The quantity and quality of bedding in L and NL farms are demonstrated in FIGURE 10 and FIGURE 11, respectively.

FIGURE 10 - INSUFFICIENT AND DIRTY BEDDING MATERIAL IN FARM 01 (L FARM) AT FIRST WELFARE LEVEL.

A

SOURCE: The author (2017)

FIGURE 11 - INSUFFICIENT AND CLEAN BEDDING MATERIAL IN FARM 04 (NL FARM) AT SECOND WELFARE LEVEL.

SOURCE: The author (2017)

4.3.2.4 QUALITATIVE BEHAVIOUR ASSESSMENT AT FIRST ASSESSMENT LEVEL

QBA was applied in six L farms and four NL farms. Farm 05 (L) and farm 01 (NL) were excluded due to presence of one animal at pen. TABLE 36 and 37 show results of positive and negative descriptors on VAS (mm). Results for both group of descriptors, in L and NL farms, related to quality of goats feelings are demonstrated in TABLE 38. There is no significant difference between L and NL farms (p=0.502), regarding classification.

TABLE 36 - RESULTS OF LACTATING (N=6) AND NON-LACTATING (N=4) FARMS FOR FIVE POSITIVE DESCRIPTORS ON VAS, RANGED FROM 0 TO 125MM (AWIN, 2015A).

LACTATING AND NON-LACTATING FARMS	CONTENT	CURIOUS	LIVELY	RELAXED	SOCIABLE
Farm 01	9	15	35	79	14
Farm 02	79	21	108	112	103
Farm 03	15	42	25	42	84
Farm 04	16	41	111	10	41
Farm 08	0	0	0	125	83
Farm 10	58	18	19	125	35
Farm 02	125	125	125	102	62
Farm 04	17	125	42	0	45
Farm 06	0	0	0	125	70
Farm 08	76	33	77	79	25

SOURCE: The author (2017)

TABLE 37 - RESULTS OF LACTATING (N=6) AND NON-LACTATING (N=4) FARMS FOR EIGHT POSITIVE DESCRIPTORS ON VAS, RANGED FROM 0 TO 125MM (AWIN, 2015A).

LACTATING AND NON-LACTATING FARMS	AGRESSIVE	AGITATED	ALERT	BORED	FEARFUL	FRUSTRATED	IRRITATED	SUFFERING
Farm 01	110	98	14	21	12	37	25	18
Farm 02	28	17	125	25	0	26	40	0
Farm 03	0	6	40	0	57	23	0	0
Farm 04	7	98	15	12	0	104	24	7
Farm 08	0	0	30	0	0	0	0	0
Farm 10	0	0	16	0	0	0	0	0
Farm 02	0	125	125	0	0	0	22	0
Farm 04	0	47	125	28	6	66	0	0
Farm 06	0	0	17	0	0	0	0	0
Farm 08	0	90	71	0	0	0	25	0

SOURCE: The author (2017)

TABLE 38 - RESULTS FOR L (N=6) AND NL (N=4) FARMS RELATED TO CLASSIFICATION OF FIVE POSITIVE AND EIGHT NEGATIVE DESCRIPTORS.

FARM	LACTATING AND NON-LACTATING FARMS	[a]NEGATIVE DESCRIPTORS	[b]POSITIVE DESCRIPTORS
Farm 01	Lactation	Very good	Very bad
Farm 02	Lactation	Very good	Very good
Farm 03	Lactation	Very good	Bad
Farm 04	Lactation	Very good	Bad
Farm 08	Lactation	Very good	Very bad
Farm 10	Lactation	Very good	Bad
Farm 02	Non-lactating	Very good	Very good
Farm 04	Non-lactating	Very good	Bad
Farm 06	Non-lactating	Very good	Very bad
Farm 08	Non-lactating	Very good	Good

[a] Negative descriptors were classified as Vary good, 0-25mm; Good, 26-50mm; Regular, 51-75mm; Bad, 76-100mm and Very bad, 101-125mm.
[b] Positive descriptors were classified as Vary bad, 0-25mm; Bad, 26-50mm; Regular, 51-75mm; Good, 76-100mm and Very good, 101-125mm.

SOURCE: The author (2017)

4.4.3 INDIVIDUAL ASSESSMENTS

A total of 108 lactating goats and 72 non-lactating goats were evaluated at individual level. The prevalence of BCS was calculated based on total number of goats individually assessed (TABLE 39). There is significant difference between L and NL farms regarding to BCS (p=0.048).

TABLE 39 - PREVALENCE OF BCS ON LACTATING (N=108) AND NON-LACTATING (N=72) GOATS.

PRODUCTION SYSTEM	BCS INDICATOR (%)		
	-1	0	1
Lactating	36 (33.30)	64 (59.30)	8 (7.40)
Non-lactating	35 (48.60)	33 (45.8)	4 (5.6)

SOURCE: The author (2017)

The prevalence of six animal-based parameters are demonstrated on TABLE 40. There is significant difference between the type of production system regarding to overgrown claws (p=0.001). FIGURE 12 shows an example of overgrown claw.

TABLE 40 - PREVALENCE OF SIX INDICATORS ON GOATS INDIVIDUALLY ASSESSED ON TEN L FARMS (N=108) AND ON EIGHT NL FARMS (N=72).

ANIMAL-BASED INDICATORS	NUMBER (%)		NUMBER (%)		P-VALOR
	GOATS	L FARMS	GOATS	NL FARMS	
Faecal soiling	0 (0.00)	0 (00.0)	1 (1.40)	1 (12.50)	0.400
Overgrown claws	18 (16.70)	4 (40.0)	1 (1.40)	1 (12.50)	0.001*
Abscess	1 (0.90)	1 (10.0)	1 (1.40)	1 (12.50)	1.000
Udder asymmetry	14 (13.00)	6 (60.0)	1 (1.40)	1 (12.50)	0.006
Ocular discharge	8 (7.40)	3 (30.0)	5 (6.90)	3 (37.50)	0.906
Nasal discharge	2 (1.90)	2 (20.0)	0 (0.0)	0 (0.00)	0.517

* p<0.05

SOURCE: The author (2017)

FIGURE 12 - GOAT IN L FARM WITH OVERGROWN CLAW.

SOURCE: The author (2017)

4.4 DISCUSSION

4.4.1 GROUP EVALUATIONS

4.4.1.1 ANIMAL-BASED INDICATORS

Signs of thermal stress as panting, with or without open mouth, and extended neck and legs held away from body, when lying down (AWIN, 2015a), occurr when animals are submitted to temperatures above thermal comfort zone (20-30°C) or critical zone (> 34°C) (BAÊTA and SOUZA, 2010). RU for farm animals is ranged from 40 to 80% in tropical climates (FAO and INPhO, 1998). Goats with panting signs in L farms, at the time of evaluation, were exposed to the following temperature (°C) and air humidity (%): farm 02 = 35.83°C, 33.23%; farm 03 = 39.64ºC, 28.73%; farm 06 = 33.64ºC, 42.3%. Both temperature and humidity presented inadequate values for goats in farms 02 and 03.

The increase in respiratory frequency is an attempt to adapt to thermal stress, aiming to maintenance of homeothermia, but if performed for a long period may interfere with food intake and rumination (MARIA et al., 2016), causing weight loss on dairy goats and reduced milk yield (BRASIL et al., 2000). In our study, only lactating goats had thermal stress probably due to the higher metabolic rate, when comparing with non-lactating goats, being more sensitive to heat (BRASIL et al., 2000). Although temperature was higher than thermal comfort zone, mostly goats showed to be adapted to this situation in Ceará-BR, without showing panting signs. All farms with panting animals had Saanen goats, an exotic breed widespread in the country (CHAPAVAL et al., 2011), with less resistant to thermal stress than crossbreeds (ROBERTO, 2012). Nutritional management, physical modifications of the environment, as sprinkling with natural or forced air movement, and investments in thermo-resistant breeds can be some solutions to be apply especially in regions with high temperatures (DAS et al., 2016).

Presence of goats with scurs, due to improper disbbuding, can cause pain related to sequelae as sinusitis (SMITH and SHERMAN, 2009). Goats horned or partially horned had advantage in social dominance and can be more aggressive than hornless ones, especially in feeding through, and both group should be housed separately (MIRANDA-DE LA LAMA and MATIELLO, 2010).

The existence of goats with poor hair condition, in first and second welfare level in both groups, possible occurred due to mineral imbalance, as vitamin A, or diseases as coccidiosis (SMITH and SHERMAN, 2009). It is essential identify the causes and treat animals.

Queuing at feeding is influenced by number of animals per feeding through, quality of feeding and social dominance, in which low rank goats suffers more than medium and high rank animals, including with aggressive interactions (JORGENSEN et al., 2007). TOUSSAINT (1997) cited that 40 cm per through is recommended for goats, but LORETZ et al. (2004) commented that more space should be provided for horned goats. This indicator was higher in lactating goats probably due to high physiological demands (SPEAKMAN, 2008), when compare to non-lactating goats, and the animals were more hungry.

Low incidence of other animal-based indicators suggests an adequate management of health. Kneeling at the feeding rack is not a useful indicator to be applied in goat farms in Ceará and should not be used to assess welfare of goats in Ceará. Non-lactating goats in both welfare level had a better result than lactating goats probably due to the high metabolic demands of lactation that needs to be compensated with a better management to prevent farm animals to get sick. The protocol should be applied in rainy season to verify the existence of different welfare problems.

4.4.1.2 LATENCY TO THE FIRST CONTACT TEST (LFCT)

WAIBLINGER et al. (2006) cited that the measure of an animal reaction to a human presence aims to understand emotions existent during an interaction. Inferences about social attachment to humans and nature of previous experiences (positive, neutral, negative) can be done. In L and NL farms, at first and second welfare level, goats presented high media of LFCT when comparing to dairy goats in small farms (mean= 26.9s) (MATTIELLO et al., 2010). At first level, only two NL farms presented good HAR (< 24s), accordling to AWIN ITALY (2015), with goats that approached quickly and interacted with the assessor. In other L and NL farms, both group showed very bad HAR. At second welfare level, any farm presented good HAR. A study revealed that daily gentle contact with goats reduces approach time in a latency test (JACKSON and HACKETT, 2007). Animals that are not accustomed with human contact, shows fear as predominant reaction, and if negative handling occurs, this situation can become worse (WAIBLINGER et al., 2006). Based on these results, it is possible that lactating goats are dealing with negative experiences during milking, as fear of handler (SEVI et al., 2009) or pain sensation due to inflammation in the udder. It this case, daily gentle contact with lactating and non-lactating goats should

be performed and goats should be evaluated by a veterinarian aiming improves HAR and health, respectively.

4.4.1.3 RESOURCE-BASED INDICATORS

At first welfare level, regarding stocking density, only one L farm and two NL farms had poor space (m^2) per goat. Some authors recommended different sizes of floor area to adult goats without kids, ranged from 1.0 to 1.75m^2 (TOUSSAINT, 1997; LORETZ et al., 2004), but NEW ZEALAND GOVERNAMENT (2012) suggested 2m^2 per mature goat. LORETZ et al. (2004) cited that goats are more individualistic animals than sheep and prefers larger individual spaces for lying down, without contact with other individuals (ANDERSEN and BOE, 2007). These last authors also said that when there is a limited area for animals, it is important reduce social stress and aggression between goats using different floor levels, and if possible, provide a wall area aiming increase the safety feeling. Low rank goats are more affected by reduced floor size, with decrease of resting time (ANDERSEN and BOE, 2007).

TOUSSAINT (1997) recommended a space of 40cm per animal in feeding through. At first welfare level, one L farm and two NL farms showed poor space of feeding trough (< 40cm), and in second welfare level, two NL farms presented this situation. Low spaces increase competition for food, and low rank goats need to share feeding places or only access food after high rank animals (LORETZ et al., 2004), increasing the number of queuing animals (JORGENSEN et al., 2007). In this situation, it is important to increase the number of feeders in the pens. Horned and hornless goats were present at all these farms with poor space at feeding through. Horned goats has the highest position in social hierarchy, and consequently have higher food consumption (BARROSO et al., 2000), being in an advantageous position than hornless goats. This author also related positively the presence of horns with aggressiveness, which can lead to serious injuries to hornless goats. It is important housed horned and hornless goats separately (MIRANDA-DE LA LAMA and MATIELLO, 2010). NORDMANN et al. (2011) cited that the design of feeding place impacts on social behaviour and the use of a feed barrier is useful. These authors cited that an adequate feed barrier design needs has backward view of approaching goats and should promote an easy way out and protection by physical separation for each

goat. As results, they found out that metal palisade reduce levels of agonistic behaviours and chronic stress in the pen for horned and hornless goats maintained separately.

In lambs and kids, water intake increased as the number of animals per pen increased (VAN et al., 2007), being important that goats have an adequate space for drinking. The farm with inadequate linear water through (< 40cm) in this study showed five non-lactating animals in queuing at drinking and since goats prefers to drink around feeding time (ROSSI and SCHARRER, 1992), the restriction of this behavior decrease food intake (LANGHANS et al., 1989).

Absence of many farms with poor results, regarding stocking density and space on feeding through, shows some interest of producers related to goat welfare, since Brazilian manuals recommended spaces of $1m^2$ per animal at pen and 20-30 cm per goat at feeding through (BRASÍLIA. SEBRAE, 2009; BRASÍLIA. CODEVASF, 2011).

Bedding quantity and quality was not adequate at first welfare level. At first welfare level, only one L and NL farms provided bedding for goats and it was insufficiently and dirty. It is important that bedding material do not become wet, moldy or noxious to animals, avoiding risk for their welfare and health (NEW ZEALAND GOVERNAMENT, 2012), as development of feet diseases (CHRISTODOULOPOULOS, 2009). At second welfare level, one NL farm provided bedding for goats, but the quantity was insufficiently. An adequate bedding layer, between 7,62 to 10,16 cm, should be provided to ensure comfort for goats, and frequency of cleanliness must be performed depending on area size and number of animals per pen (SMITH, 2010; BRASÍLIA. CODEVASF, 2011).

4.4.1.4 QUALITATIVE BEHAVIOUR ASSESSMENT AT FIRST ASSESSMENT LEVEL

BOISSY et al. (2007) cited that decades before, animal welfare scientists realize that to provide a good environment for animals, they need to know how animals feel. Since then, studies related to pain and suffering has been done and, more recently, researches regarding expression of positive emotions in animals. QBA analyzes positive and negative behaviours in goats (AWIN, 2015a). The five categories proposed for assess welfare in goats in L and NL farms was based on quality of life

(MELLOR, 2016). Regarding negative descriptors, all farms presented as results very good on the ordinal scale. One L farm presented high level for aggressive behaviour, and other L farm for frustrated. Aggressiveness may have occurred in goats as an establishment of social dominance. Farm 1 (L) have horned and hornless goats housed together, and this situation can be dangerous for hornless goats (BARROSO et al., 2000). Presence of frustrated goats in farm 4 (L), housed in pen in intensive system, without contact with outdoor areas, is accordlying with GROSSO et al. (2016) that reported a similar situation in housed goats. CASAMASSIMA et al. (2001) showed that indoor sheep were less idling at pasture and demonstrated more locomotor activities and lying behaviour when compared to housed ones. Two NL farms and one L farm had high levels for alert descriptor. This may have occurred due to the presence of an unusual person (assessor) outside the facility, since goats are curious animals (MIRANDA-DE LA LAMA and MATIELLO, 2010). Although some negative descriptors showed high levels, the inclusion in categories seems to represent each farms. During individual reports, the assessor can mark a specific descriptor with high value and informs farmers about possible causes and solutions for it.

Positive descriptors had similar results in L and NL farms. Presence of farms with good or very good categories shows that is possible to provide positive experiences for goats. Mostly L farms (83.3%) and half NL farms (50%) demonstrated negative categories for positive emotions, showing that absence of negative emotions does not necessarily promote high levels of positive feelings (MELLOR, 2016). Presence of positive emotions are associated with anticipation of a reward and in obtaining an expected result through a behavior directed to a specific objective (BOISSY et al., 2007). These authors cited that is important to develop situations for animals anticipate a positive reward and provide more space to play as a way to improve positive emotional state.

It is important to performed QBA assessments at the same period of day to avoid possible different results due to animal mood or activity patterns, as demonstrated in dairy cows (GUTMANN et al., 2015). QBA should be applied only 45 minutes to one hour after feeding distribution.

4.4.2 INDIVIDUAL ASSESSMENTS

In dairy goats, body fat reserve has an impact on milk yield, fertility and general health of animals (KOYUNCU and ALTINÇEKIÇ, 2013). Low BCS occurs due to mobilization of body fat reserve, reduce energy intake and increased energy output, especially in early stage of lactation or high heat load situations (CAROPRESE et al., 2009). Milk yield decreased with low BCS (KOYUNCU and ALTINÇEKIÇ, 2013). Animals with chronic contagious diseases, as Caseous Lymphadenitis (CL) and Caprine Arthritis Encephalitis (CAE), gastrointestinal parasites and photodermatitis, and in painful conditions, such laminitis or footrot, has BCS reduced (SMITH and SHERMAN, 2009). Meanwhile, animals with very high BCS are predisposed to have reproductive problems, as dystocia (KOYUNCU and ALTINÇEKIÇ, 2013).

Although NL farms have higher number of goats with thin BSC than L farms, the prevalence of goats in this condition was high in both groups (> 30%). This probably occurred due to an inadequate diet, especially regarding to concentrated food since all lactating goats received it and only 62.5% of non-lactating goats received it. Also, all animals had limited roughage, due to dry season in Ceará-BR at the time of evaluation (ANA MONITOR, 2016). An adequate feeding is more important for dairy goats in two specific situations, in late gestation, when it is necessary the production of adequate colostrum for kids and reserves for lactation period, and in early lactation, to prevent a higher decrease in BCS (KOYUNCU and ALTINÇEKIÇ, 2013). Considering that goats in NL farms are dry, an adequate feeding was especially important for lactating goats.

Fat goats (BCS = 1) were present at this study, but less than other categories in both groups (<10%), and it is important to identify these individuals aiming to provide a good BCS. A better nutritional management need to be apply at L and NL farms to improve the welfare of dairy goats.

Overgrown hooves are a major predisposing factor of lameness in goats (EZE, 2002; CHRISTODOULOPOULOS, 2009). Hoof trimming was performed in few farms (16.5%) in Ceará-BR, usually twice a year (81%), being this inadequate management a possible cause of footrot (PINHEIRO, 2000). It is also important that dry bedding material being provide for dairy goats, especially when hoof trimming was not performed with an adequate frequency, aiming to protect goats from other diseases (CHRISTODOULOPOULOS, 2009). It is possible that lactating goats were less handling than non-lactating goats, regarding hoof trimming, to avoid stress the animals, but KIBAR and ÇAGLANYAN (2016) cited that dairy cows had increase in milk yield after claw trimming. This situation needs further investigations in dairy goats.

Soft faecal material was only identified in one goat in NL farm. In Rio Grande do Norte-BR, gastrointestinal parasites were more prevalent during rainy months due to high temperatures and humidity, being these environmental conditions essential to stimulate larval development in small ruminants (AHID et al., 2008). In this study, during months without rain, *eggs per gram of faeces* (EPG) were negative. At the time of assessments in L and NL farms, there was a severe drought in Ceará-BR in August-September 2016 (ANA MONITOR, 2016), and it is possible that animals were not infected due to correct sanitary management in farms or because larvae were in a non-infectious stage, with absence of clinical signs of parasitism (COSTA et al., 2011).

Low incidence of abscesses in L and NL farms demonstrated an adequate sanitary management, with animals possible being protect from CL, and stockpeople applying a correct technique during vaccine applications (SMITH and SHERMAN, 2009). In Paraíba-BR, BANDEIRA et al. (2007) found out that 30.2% farmers vaccinated goats against CL. These last authors said that vaccination campaigns performed by government was essential to help producers increased vaccination rate of animals. Annual vaccination against CL is an important measure to insure health and welfare for goats (WINDSOR and BUSH, 2016).

Although udder asymmetry was not significant different between L and NL farms, lactating animals had high prevalence of this condition. Udder asymmetry has been associated with chronic intramammary infection, as CAE and contagious agalactiae, with consequently atrophy of one half of udder (BATTINI et al., 2014). Improve hygiene during milking and performed vaccination associated with antibiotic therapy are important strategies to prevent mastitis in small ruminants (PEIXOTO et al., 2010).

Presence of ocular discharge in dry season could be due to ration dust (CHAPAVAL et al., 2011) or several diseases (SMITH and SHERMAN, 2009), being keratoconjunctivitis an important disorder affecting goats in farms in Ceará-BR (29.1%) (PINHEIRO et al., 2000). Nasal discharge has several causes as nutritional, parasitic, infectious and non-infectious diseases (SMITH and SHERMAN, 2009). Low incidence of this condition could be due to dry season, since pneumonia was reported in farms in (44.9%) in Ceará-BR during rainy season (PINHEIRO et al., 2000).

4.5 CONCLUSIONS

At group evaluations in the first welfare level, only thermal stress indicator was worst in adult lactating dairy goats than adult non-lactating dairy goats, but animals in both groups were submitted to heat stress. Other parameters had similar results for both groups. At second welfare level, all animals had similar results for animal and resource-based indicators and latency to the first contact test. During individual assessments, goats in NL farms had worst conditions regarding ECC and goats in L farms regarding overgrown claws. Although lactating goats had higher metabolic demands when comparing with non-lactating, this study showed great similarities between L and NL farms regarding almost all indicators. The main positive points regarding wellfare were low prevalence of abscess, oblivion, severe lameness, feeder space with less than 40 cm per goat, poor space related to stocking density, faecal soiling and nasal discharge in L and NL farms. Furthermore, there was absence of kneeling at feed rack and bad results related to QBA negative descriptors. The main negative points regarding welfare in L farms were high prevalence of hair coat condition, thermal stress, high values for LFCT, presence of horned and horneless goats in the same pen, insufficient and dirty bedding for goats, bad results related to QBA positive descriptors, thin animals (BCS= -1), overgrown claws, udder asymmetry and ocular discharge. The main negative points regarding welfare in NL farms were high prevalence of improper disbudding, hair coat condition, high values for LFCT, presence of horned and horneless goats in the same pen, insufficient bedding for goats, bad results related to QBA positive descriptors, thin animals (BCS= -1) and ocular discharge. These results demonstrated that both groups are submitted to welfare problems in farms in Ceará-BR and it is essential that producers seek for veterinary assistance and means to improve human-animal relationship, aiming to reduce fear and increase the expression of positive emotional state in goats.

REFERENCES

AHID, S. M. M.; SUASSUNA, A. C. D.; MAIA, M. B.; COSTA, V. M. D. M.; SOARES, H. S. Parasitos Gastrintestinais em Caprinos e Ovinos da Região Oeste do Rio Grande do Norte, Brasil. **Ciência Animal Brasileira**, v. 9, n. 1, p. 212–218, 2008.

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

ANA. Monitor das secas do Nordeste brasileiro. 2016. Available in: <http://monitordesecas.ana.gov.br/>. Access in: 23/2/2017.

ANDERSEN, I. L.; BOE, K. E. Resting pattern and social interactions in goats-The impact of size and organization of lying space. **Applied Animal Behaviour Science**, v. 108, n. 1–2, p. 89–103, 2007.

ANUNCIAÇÃO, A. R. DE A. DA; SOBRINHO, I. C. DE M.; VIANA, D. C.; et al. Animal welfare production: perception of breeders, handlers, consumers, teacher and scholars at the Universidade Estadual do Maranhão. p.1–3, 2010. Available in: <http://www.sovergs.com.br/site/38conbravet/resumos/956.pdf>.

AWIN. **Animal Welfare Indicators for Goats.** 2015a.

AWIN. **Animal Welfare Indicators for Sheep**. 2015b.

AWIN PROJECT. AWINGOAT APP. 2015. Available in: <https://play.google.com/store/apps/details?id=sands.mapCoordinates.android&hl=en>.

BAÊTA, F. D. C.; SOUZA, C. D. F. **Ambiência em edificações rurais: conforto térmico (2nd edition).** Viçosa: UFV, 2010.

BANDEIRA, D. A.; CASTRO, R. S.; AZEVEDO, E. O.; MELO, L. S. S.; MELO, C. B. Perfil sanitário e zootécnico de rebanhos caprinos nas microrregiões do Cariri paraibano. **Arquivo Brasileiro de Medicina Veterinária e Zootecnia**, v. 59, n. 6, p. 1597–1600, 2007.

BARROSO, F. G.; ALADOS, C. L.; BOZA, J. Social heirarchy in the domestic goat: effect on food habits and production. **Applied Animal Behaviour Science**, v. 69, p. 35–53, 2000.

BATTINI, M.; VIEIRA, A.; BARBIERI, S.; et al. Invited review : Animal-based indicators for on-farm welfare assessment for dairy goats. **Journal of Dairy Science**, v. 97, p. 1–24, 2014. American Dairy Science Association.

BOISSY, A.; MANTEUFFEL, G.; JENSEN, M. B.; et al. Assessment of positive emotions in animals to improve their welfare. **Physiology and Behavior**, v. 92, n. 3, p. 375–397, 2007.

BRASIL, L. H. D. A.; WECHESLER, F. S.; JUNIOR, FLÁVIO BACCARI GONÇALVES, H. C.; BONASSI, I. A. Efeitos do Estresse Térmico Sobre a Produção, Composição Química do Leite e Respostas Termorreguladoras de Cabras da Raça Alpina. **Revista Brasileira de Zootecnia**, v. 29, n. 6, p. 1632–1641, 2000.

BRASÍLIA. CODEVASF. **Manual de Criação de Caprinos e Ovinos**. 2011.

BRASÍLIA. SEBRAE. **Manejo Básico de Ovinos e Caprinos**. 2009.

CAROPRESE, M.; CASAMASSIMA, D.; RASSU, S. P. G.; NAPOLITANO, F.; SEVI, A.; et al. Monitoring the on-farm welfare of sheep and goats**. Italian Journal of Animal Science**, v. 8, n. 1s, p. 343, 2009.

CASAMASSIMA, D.; SEVI, A.; PALAZZO, M.; et al. Effects of two different housing systems on behavior, physiology and milk yield of Comisana ewes. **Small Ruminant Research**, v. 41, n. 2, p. 151–161, 2001.

CEARÁ. EMBRAPA. Derivados do leite de cabra são destaque na Semana de Ciência & Tecnologia. 2016. Available in: <https://www.embrapa.br/busca-de-noticias/-/noticia/17248240/derivados-do-leite-de-cabra-sao-destaque-na-semana-de-ciencia--tecnologia>.

CHAPAVAL, L.; MORORÓ, A. M.; SOUSA, A. P. B. DE; RAMOS, M. O. **Boas Práticas Agropecuárias na Ordenha de Cabras Leiteiras**. 2009.

CHAPAVAL, L; OLIVEIRA, A. A. F.; ALVES, F. S. F.; ANDRIOLI, A; ARAUJO, A. M.; OLIVINDO, C. C. **Manual do produtor de cabras leiteiras**. Viçosa: Aprenda Fácil, 2011.

CHRISTODOULOPOULOS, G. Foot lameness in dairy goats. **Research in Veterinary Science**, v. 86, n. 2, p. 281–284, 2009.

COSTA, V. M. M.; SIMÕES, S. V. D.; RIET-CORREA, F. Controle das parasitoses gastrintestinais em ovinos e caprinos na região semiárida do Nordeste do Brasil. **Pesquisa Veterinária Brasileira**, v. 31, n. 1, p. 65–71, 2011.

DONOFRE, A. C.; SILVA, I. J. O. DA; CABRELON, M. A. F. A importância do bem-estar dos animais de produção para os consumidores de Piracicaba - SP/Brasil. 2013. Available in: <http://sisca.com.br/resumos/SISCA_2013_069.pdf>.

EZE, C. A. Lameness and reproductive performance in small ruminants in Nsukka Area of the Enugu State, Nigeria. **Small Ruminant Research**, v. 44, n. 3, p. 263–267, 2002.

FAO; INPHO. Farm structures in tropical climates. 1998. Available in: <http://www.fao.org/3/a-s1250e/S1250E00.htm#Contents>. Access in: 22/2/2016.

GROSSO, L.; BATTINI, M.; WEMELSFELDER, F.; et al. On-farm Qualitative Behaviour Assessment of dairy goats in different housing conditions. **Applied Animal Behaviour Science**, v. 180, p. 51–57, 2016.

GUTMANN, A. K.; SCHWED, B.; TREMETSBERGER, L.; WINCKLER, C. Intra-day variation of qualitative behaviour assessment outcomes in dairy cattle. **Animal Welfare**, v. 24, n. 3, p. 319–326, 2015.

IBGE. **Produção da Pecuária Municipal**. 2013.

IBGE. **Produção da Pecuária Municipal**. 2014.

JACKSON, K. M. A.; HACKETT, D. A note: The effects of human handling on heart girth, behaviour and milk quality in dairy goats. **Applied Animal Behaviour Science**, v. 108, n. 3–4, p. 332–336, 2007.

JORGENSEN, G. H. M.; ANDERSEN, I. L.; BOE, K. E. Feed intake and social interactions in dairy goats-The effects of feeding space and type of roughage. **Applied Animal Behaviour Science**, v. 107, n. 3–4, p. 239–251, 2007.

KIBAR, M.; ÇAGLANYAN, T. Effect of Hoof Trimming on Milk Yield in Dairy Cows with Foot Disease. **Acta Scientiae Veterinariae**, v. 44, p. 1–7, 2016.

KOYUNCU, M.; ALTINÇEKIÇ, S. Ö. Importance of body condition score in dairy goats. **Macedonian Journal of Animal Science**, v. 3, n. 2, p. 167–173, 2013.

LANGHANS, W.; SENN, M.; MEYER, A. H.; SCHARRER, E. Feeding behaviour of pigmy goats during water deprivation. **Asian-Australasian Journal of Animal Sciences**, v. 2, n. 3, p. 273–274, 1989.

LIMA, L. R. D.; BARBOSA FILHO, J. A. D. Impact of pre-slaughter management on the welfare of goats and sheep. **Journal of Animal Behaviour and Biometeorology**, v. 1, n. November, p. 52–60, 2013.

LORETZ, C.; WECHSLER, B.; HAUSER, R.; RÜSCH, P. A comparison of space requirements of horned and hornless goats at the feed barrier and in the lying area. **Applied Animal Behaviour Science**, v. 87, n. 3–4, p. 275–283, 2004.

MARIA, M.; VIEIRA, M.; MIRLANDA, F.; et al. Aspectos fisiológicos e bioclimáticos de caprinos nas regiões semiáridas Physiological and bioclimatic aspects of goats in semi-arid regions. **Medicina Veterinária e Zootecnia**, v. v.10, n. n.5, p. 356–369, 2016.

MATTIELLO, S.; BATTINI, M.; ANDREOLI, E.; et al. Avoidance distance test in goats: A comparison with its application in cows. **Small Ruminant Research**, v. 91, n. 2–3, p. 215–218, 2010.

MELLOR, D. J. Updating animal welfare thinking: Moving beyond the “Five Freedoms” towards “A lifeworth living”. **Animals**, v. 6, n. 3, 2016.

MERSMANN, D.; SCHMIED-WAGNER, C.; NORDMANN, E.; GRAML, C.; SUSANNE, W. Influences on the avoidance and approach behaviour of dairy goats towards an unfamiliar human-An on-farm study. **Applied Animal Behaviour Science**, v. 179, p. 60–73, 2016.

MIRANDA-DE LA LAMA, G. C.; MATIELLO, S. The importance of social behaviour for goat welfare in livestock farming. **Small Ruminant Research**, v. 90, n. 1–3, p. 1–10, 2010.

NEW ZEALAND GOVERNAMENT. **Animal Welfare (Goats) Code of Welfare 2012**. 2012.

NORDMANN, E.; KEIL, N. M.; SCHMIED-WAGNER, C.; et al. Feed barrier design affects behaviour and physiology in goats. **Applied Animal Behaviour Science**, v. 133, n. 1–2, p. 40–53, 2011.

PAULO, J. L. DE A.; LOPES, F. DE A. Daily activity patterns of Saanen goats in the semi-arid northeast of Brazil. **Revista Brasileira de Zootecnia**, v. 43, n. 9, p. 464–470, 2014.

PEIXOTO, R. D. M.; MOTA, R. A.; DA COSTA, M. M. Mastite em pequenos ruminantes no Brasil. **Pesquisa Veterinária Brasileira**, v. 30, n. 9, p. 754–762, 2010.

PINHEIRO, R. R.; GOUVEIA, A. M. G.; ALVES, F. S. F.; HADDAD, J. P. A. Aspectos epidemiológicos da caprinocultura cearense. **Arquivo Brasileiro de Medicina Veterinária e Zootecnia**, v. 52, n. 5, p. 534–543, 2000.

ROBERTO, J. V. B. **Efeito Do Ambiente Térmico E Uso Da Saanen E Seus Mestiços Com O Boer No Semiárido brasileiro**. Patos, 89 p. Dissertação (Mestrado em Zootecnia) - Universidade Federal de Campina Grande, Centro de Saúde e Tecnologia Rural, Patos, 2012.

ROSSI, R.; SCHARRER, E. Circadian patterns of drinking and eating in pygmy goats. **Physiology and Behavior**, v. 51, n. 5, p. 895–897, 1992.

SEVI, A.; CASAMASSIMA, D.; PULINA, G.; PAZZONA, A. Factors of welfare reduction in dairy sheep and goats. **Italian Journal of Animal Science**, v. 8, p. 81–101, 2009.

SMITH, C. K. **Raising Goats for Dummies**. Hoboken: Wiley-Publishing, Inc, 2010.

SMITH, M. C.; SHERMAN, D. M. **Goat Medicine (2nd Edition)**. Iowa: Wiley-Blackwell, 2009

SPEAKMAN, J. R. The physiological costs of reproduction in small mammals. **Philosophical transactions of the Royal society B**, v. 363, p. 375–398, 2008.

TOUSSAINT, G. The housing of milk goats. **Livestock Production Science**, v. 49, n. 2, p. 151–164, 1997.

VAN, D. T. T.; MUI, N. T.; LEDIN, I. Effect of group size on feed intake, aggressive behaviour and growth rate in goat kids and lambs. **Small Ruminant Research**, v. 72, n. 2–3, p. 187–196, 2007.

WAIBLINGER, S.; BOIVIN, X.; PEDERSEN, V.; et al. Assessing the human-animal relationship in farmed species: A critical review. **Applied Animal Behaviour Science**, v. 101, n. 3–4, p. 185–242, 2006.

WEMELSFELDER, F.; HUNTER, E. A.; MENDI, M. T.; LAWRENCE, A. B. The spontaneous qualitative assessment of behavioural expressions in pigs: First

explorations of a novel methodology for integrative animal welfare measurement. **Applied Animal Behaviour Science**, v. 67, n. 3, p. 193–215, 2000.

WINDSOR, P. A.; BUSH, R. D. Caseous lymphadenitis: Present and near forgotten from persistent vaccination?. **Small Ruminant Research**, v. 142, p. 6–10, 2016.

5. FINAL CONSIDERATIONS

Results of our study showed that it is possible to apply animal and resource-based indicators to assess the welfare of meat goat does and dairy goats in Ceará farms. The inclusion of different parameters must be perform in order to better adequate the protocol for meat goat does in semiarid regions, as Brazilian Northeast. More studies regarding validity, reliability and feasibility of indicators need to be execute aiming to refine the diagnosis of meat goat does in Ceará and Brazilian Northeast, since mostly goats are present in this region.

In relation to welfare assessments in meat goat farms, mostly animal and resource-based indicators showed feasibility for on-farm evaluations. Although goats had better results when raised in semi-intensive systems, mostly animals were submitted to inadequate conditions regarding heat stress, lack of forage and health issues. It is important that farmers and scientists search together for solutions to improve the welfare of goats in semiarid regions. This protocol needs to be enhanced and should be apply in Brazilian Northeast farms, aiming to understand the current welfare of meat goat does in different states of Brazil.

In relation to welfare assessments in dairy goat farms, the results showed the necessity for improvements regarding facilities and management of animals. Lactating (L) and non-lactating (NL) goats had almost similar results, with L goats suffering more possibly due to their physiological state. In order to maintain health animals, farmers needs to improve goat management aiming a better quality of life for dairy goats.

It is hoped that results of the present study encourage farmers and stockpeople to see goats as sentient animals, and which need adequate care to express a better productive potential. Animal welfare is being addressed on each step of productive chain, since conscious consumers are asking for products in which animals had a good living condition. Brazilian goat farmers need to embrace this reality and promote changes to improve life of animals.

REFERENCES

AGUIAR, G. M. N. DE; ASSIS, A. C. O.; SILVA, T. R. DA; et al. Pododermatite infeciosa em ovinos e caprinos no sertão paraibano. **Ciência Animal Brasileira**, p. 585–590, 2009.

AGUIAR, G. M.; SIMÕES, S. V.; SILVA, T. R.; et al. Foot rot and other foot diseases of goat and sheep in the semiarid region of northeastern Brazil. **Pesquisa Veterinaria Brasileira**, v. 31, n. 10, p. 879–884, 2011.

AHID, S. M. M.; SUASSUNA, A. C. D.; MAIA, M. B.; COSTA, V. M. D. M.; SOARES, H. S. Parasitos Gastrintestinais em Caprinos e Ovinos da Região Oeste do Rio Grande do Norte, Brasil. **Ciência Animal Brasileira**, v. 9, n. 1, p. 212–218, 2008.

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

ALEXANDRE, G.; MANDONNET, N. Goat meat production in harsh environments. **Small Ruminant Research**, v. 60, n. 1–2 SPEC. ISS., p. 53–66, 2005.

ANA. Monitor das secas do Nordeste brasileiro. 2016. Available in <http://monitordesecas.ana.gov.br/>. Acess in: 23/2/2017.

ANDERSEN, I. L.; BOE, K. E. Resting pattern and social interactions in goats-The impact of size and organization of lying space. **Applied Animal Behaviour Science**, v. 108, n. 1–2, p. 89–103, 2007.

ANUNCIAÇÃO, A. R. DE A. DA; SOBRINHO, I. C. DE M.; VIANA, D. C.; et al. Animal welfare production: perception of breeders, handlers, consumers, teacher and scholars at the Universidade Estadual do Maranhão. p.1–3. 2010. Available in: <http://www.sovergs.com.br/site/38conbravet/resumos/956.pdf>.

ANZUINO, K.; BELL, N. J.; BAZELEY, K. J.; NICOL, C. J. Papers Assessment of welfare on 24 commercial UK dairy goat farms based on direct observations. **Veterinary Record**, v. 167, p. 774–780, 2010.

APPLEBY, M. C.; MENCH, J. A.; OLSSON, I. A.; HUGHES, B. O. **Animal Welfare**. **(2nd edition)**. Wallingford: CABI Publishing, 2011.

ARAÚJO FILHO, J. A. DE. **Aspectos Zooecológicos e Agropecuários do Caprino e do Ovino nas Regiões Semi-áridas**. 2006.

ARAÚJO, G. G. L. DE; VOLTOLINI, T. V.; CHIZZOTTI, M. L.; TURCO, S. H. N.; CARVALHO, F. F. R. DE. Water and small ruminant production. **Revista Brasileira de Zootecnia**, v. 39, p. 326–336, 2010.

ARAÚJO, G. G. L. DE; VOLTOLINI, T. V.; TURCO, S. H. N.; PEREIRA, L. G. R. A Água nos sistemas de produção de caprinos e ovinos. In: VOLTOLINI, T. V et al.

Produção de caprinos e ovinos no Semiárido. Embrapa Semiárido, 2011. p.69–94.

ARAÚJO, S. M. S. A região semiárida do Nordeste do Brasil: Questões Ambientais e Possibilidades de uso Sustentável dos Recursos. **Rios Eletrônica**, p. 89–90, 2011.

AWIN PROJECT. Animal Welfare Indicators. 2015. Available in: <http://www.animal-welfare-indicators.net/site/>.

AWIN PROJECT. AWINGOAT APP. 2015. Available in: <https://play.google.com/store/apps/details?id=sands.mapCoordinates.android&hl=en>.

AWIN. **Animal Welfare Indicators for Goats**. 2015a.

AWIN. **Animal Welfare Indicators for Sheep**. 2015b.

BAÊTA, F. D. C.; SOUZA, C. D. F. **Ambiência em edificações rurais: conforto térmico (2nd edition)**. Viçosa: UFV, 2010.

BANDEIRA, D. A.; CASTRO, R. S.; AZEVEDO, E. O.; MELO, L. S. S.; MELO, C. B. Perfil sanitário e zootécnico de rebanhos caprinos nas microrregiões do Cariri paraibano. **Arquivo Brasileiro de Medicina Veterinária e Zootecnia**, v. 59, n. 6, p. 1597–1600, 2007.

BARROSO, F. G.; ALADOS, C. L.; BOZA, J. Social heirarchy in the domestic goat: effect on food habits and production. **Applied Animal Behaviour Science**, v. 69, p. 35–53, 2000.

BATTINI, M.; PERIC, T.; AJUDA, I.; et al. Hair coat condition: A valid and reliable indicator for on-farm welfare assessment in adult dairy goats. **Small Ruminant Research**, v. 123, n. 2–3, p. 197–203, 2015.

BATTINI, M.; STILWELL, G.; VIEIRA, A.; et al. On-farm welfare assessment protocol for adult dairy goats in intensive production systems. **Animals**, v. 5, n. 4, p. 934–950, 2015.

BATTINI, M.; VIEIRA, A.; BARBIERI, S.; et al. Invited review : Animal-based indicators for on-farm welfare assessment for dairy goats. **Journal of Dairy Science**, v. 97, p. 1–24, 2014.

BERG, W.; JOLLY, A.; RAMBELOARIVONY, H.; ANDRIANOME, V.; RARAMIMANANA, H. A scoring system for coat and tail condition in ringtailed lemurs, *Lemur catta*. **American Journal of Primatology**, v. 71, n. 3, p. 183–190, 2009.

BLOKHUIS, H. J.; VEISSIER, I.; MIELE, M.; JONES, B. The Welfare Quality® project and beyond: Safeguarding farm animal well-being. **Acta Agriculturae Scand Section A**, v. 60, p. 129-140, 2010.

BOISSY, A.; MANTEUFFEL, G.; JENSEN, M. B.; et al. Assessment of positive emotions in animals to improve their welfare. **Physiology and Behavior**, v. 92, n. 3, p. 375–397, 2007.

BRASIL, L. H. D. A.; WECHESLER, F. S.; JUNIOR, FLÁVIO BACCARI GONÇALVES, H. C.; BONASSI, I. A. Efeitos do Estresse Térmico Sobre a Produção, Composição Química do Leite e Respostas Termorreguladoras de Cabras da Raça Alpina. **Revista Brasileira de Zootecnia**, v. 29, n. 6, p. 1632–1641, 2000.

BRASÍLIA. CODEVASF. **Manual de Criação de Caprinos e Ovinos**. 2011.

BRASÍLIA. SEBRAE. **Manejo Básico de Ovinos e Caprinos**. 2009.

BRITO, D. R. B.; SANTOS, A. C. G.; GUERRA, R. M. S. N. C. Ectoparasitos em rebanhos de caprinos e ovinos na microrregião do alto Mearim e Grajaú, estado do Maranhão. **Revista Brasileira de Parasitologia Veterinária**, v. 14, n. 2, p. 59–63, 2005.

BROOM, D. M. Indicators of poor welfare. **British Veterinary Journal**, v. 142, n. 6, p. 524–526, 1986.

BROOM, D. M.; FRASER, A. F. **Comportamento e Bem-estar de animais domésticos (2nd edition)**. Barueri: Manole, 2010.

CAROPRESE, M.; CASAMASSIMA, D.; RASSU, S. P. G.; NAPOLITANO, F.; SEVI, A. Monitoring the on-farm welfare of sheep and goats. **Italian Journal of Animal Science**, v. 8, n. 1s, p. 343, 2009.

CASAMASSIMA, D.; SEVI, A.; PALAZZO, M.; et al. Effects of two different housing systems on behavior, physiology and milk yield of Comisana ewes. **Small Ruminant Research**, v. 41, n. 2, p. 151–161, 2001.

CASSIANI, S. H. DE B.; RANGEL, S. M. Complicações Locais Pós-Injeções Intramusculares Em Adultos. **Usp-Rp**, v. 32, n. 2, p. 444–450, 1999.

CEARÁ. EMBRAPA. **Boas práticas na produção de caprinos e ovinos de corte**, 2005.

CEARÁ. EMBRAPA. **Controle de verminose em caprinos e ovinos**. 2015.

CEARÁ. EMBRAPA. Derivados do leite de cabra são destaque na Semana de Ciência & Tecnologia. 2016. Available in: <https://www.embrapa.br/busca-de-noticias/-/noticia/17248240/derivados-do-leite-de-cabra-sao-destaque-na-semana-de-ciencia--tecnologia>.

CHAPAVAL, L.; MORORÓ, A. M.; SOUSA, A. P. B. DE; RAMOS, M. O. **Boas Práticas Agropecuárias na Ordenha de Cabras Leiteiras**. 2009.

CHAPAVAL, L; OLIVEIRA, A. A. F.; ALVES, F. S. F.; ANDRIOLI, A; ARAUJO, A. M.; OLIVINDO, C. C. **Manual do produtor de cabras leiteiras**. Viçosa: Aprenda Fácil, 2011.

CHRISTODOULOPOULOS, G. Foot lameness in dairy goats. **Research in Veterinary Science**, v. 86, n. 2, p. 281–284, 2009.

CODE OF WELFARE**. Animal Welfare (Painful Husbandry Procedures) Code of Welfare 2005.** 2005.

COSTA, R. G.; ALMEIDA, C. C.; PIMENTA FILHO, E. C.; HOLANDA, E. V.; SANTOS, N. M. Caracterização do sistema de produção caprino e ovino na região semi-árida do estado da Paraíba. Brasil. **Archivos de Zootecnia**, v. 57, n. 218, p. 195–205, 2008.

COSTA, V. M. M.; SIMÕES, S. V. D.; RIET-CORREA, F. Controle das parasitoses gastrintestinais em ovinos e caprinos na região semiárida do Nordeste do Brasil. **Pesquisa Veterinária Brasileira**, v. 31, n. 1, p. 65–71, 2011.

CSIRO. **Nutrient requirements of domesticated ruminants**. Australia: CSIRO, 2007.

DARCAN, N.; CEDDEN, F.; CANKAYA, S. Spraying effects on some physiological and behavioural traits of goats in a subtropical climate. **Italian Journal of Animal Science**, v. 7, n. 1, p. 77–85, 2008.

DONOFRE, A. C.; SILVA, I. J. O. DA; CABRELON, M. A. F. A importância do bem-estar dos animais de produção para os consumidores de Piracicaba - SP/Brasil. 2013. Available in: <http://sisca.com.br/resumos/SISCA_2013_069.pdf>.

EZE, C. A. Lameness and reproductive performance in small ruminants in Nsukka Area of the Enugu State, Nigeria. **Small Ruminant Research**, v. 44, n. 3, p. 263–267, 2002.

FAO; INPHO. Farm structures in tropical climates. 1998. Available in: <http://www.fao.org/3/a-s1250e/S1250E00.htm#Contents>. Access in: 22/2/2016.

FAOSTAT. Brazilian goat’s head in 2013-2014. 2015. Available in: <http://faostat3.fao.org/compare/E>.

FILGUEIRA, T. M. B.; AHID, S. M. M.; SUASSUNA, A. C. D.; SOUZA, W. J. DE; FONSECA, Z. A. A. DE S. Aspectos epidemiológicos e sanitários das criações de caprinos na região da Chapada do Apodi. **Revista Verde de Agroecologia e Desenvolvimento Sustentável**, v. 4, n. 2, p. 64–67, 2009.

FONSECA, C. E. M.; SILVA, T. L; OLIVEIRA, C. A. **Caprinocultura.** Manual Técnico, 35. 2012.

GOMES, C. A. V; FURTADO, D. A.; MEDEIROS, A. N.; et al. Efeito do ambiente térmico e níveis de suplementação nos parâmetros fisiológicos de caprinos Moxotó.

Revista Brasileira de Engenharia Agrícola e Ambiental, v. 12, n. 2, p. 213–219, 2008.
GROSSO, L.; BATTINI, M.; WEMELSFELDER, F.; et al. On-farm Qualitative Behaviour Assessment of dairy goats in different housing conditions. **Applied Animal Behaviour Science**, v. 180, p. 51–57, 2016.

GUTMANN, A. K.; SCHWED, B.; TREMETSBERGER, L.; WINCKLER, C. Intra-day variation of qualitative behaviour assessment outcomes in dairy cattle. **Animal Welfare**, v. 24, n. 3, p. 319–326, 2015.

HOLANDA JÚNIOR, E. V.; MARTINS, E. C. Análise da produção e do mercado de produtos caprinos e ovinos: o caso do território do sertão do Pajeú em Pernambuco. 2007. Available in: <https://www.embrapa.br/busca-de-publicacoes/-/publicacao/533505/analise-da-producao-e-do-mercado-de-produtos-caprinos-e-ovinos-o-caso-do-territorio-do-sertao-do-pajeu-em-pernambuco>.

IBGE. **Produção da Pecuária Municipal**. 2013.

IBGE. **Produção da Pecuária Municipal**. 2014.

IBGE. Semiárido. 2005. Available in: <http://www.ibge.gov.br/home/geociencias/geografia/semiarido.shtm?c=4>.

IPECE. Região semi-árida cearense. 2005. Available in: <http://www2.ipece.ce.gov.br/atlas/capitulo1/12/pdf/Regiao_Semi_Arida.pdf>. Acesso em: 10/1/2017.

JACKSON, K. M. A.; HACKETT, D. A note: The effects of human handling on heart girth, behaviour and milk quality in dairy goats. **Applied Animal Behaviour Science**, v. 108, n. 3–4, p. 332–336, 2007.

JORGENSEN, G. H. M.; ANDERSEN, I. L.; BOE, K. E. Feed intake and social interactions in dairy goats-The effects of feeding space and type of roughage. **Applied Animal Behaviour Science**, v. 107, n. 3–4, p. 239–251, 2007.

KIBAR, M.; ÇAGLANYAN, T. Effect of Hoof Trimming on Milk Yield in Dairy Cows with Foot Disease. **Acta Scientiae Veterinariae**, v. 44, p. 1–7, 2016.

KOYUNCU, M.; ALTINÇEKIÇ, S. Ö. Importance of body condition score in dairy goats. **Macedonian Journal of Animal Science**, v. 3, n. 2, p. 167–173, 2013.

LANGHANS, W.; SENN, M.; MEYER, A. H.; SCHARRER, E. Feeding behaviour of pigmy goats during water deprivation. **Asian-Australasian Journal of Animal Sciences**, v. 2, n. 3, p. 273–274, 1989.

LICKLITER, R. E. Behavior associated with parturition in the domestic goat. **Applied Animal Behaviour Science**, v. 13, p. 335–345, 1985.

LIMA, A. M. C.; FARIAS, D. A. DE; SANTIAGO, L. B.; et al. Caracterização dos produtores de caprinos e ovinos das Mesorregiões Metropolitana de Fortaleza e dos

Sertões Cearenses. 2012. Available in: <https://ainfo.cnptia.embrapa.br/digital/bitstream/item/28500/1/AAC-Caracterizacao-dos-produtores-de-caprinos-e-ovinos-das-Mesorregioes-metropolitana.pdf>.

LIMA, L. R. D.; BARBOSA FILHO, J. A. D. Impact of pre-slaughter management on the welfare of goats and sheep. **Journal of Animal Behaviour and Biometeorology**, v. 1, n. November, p. 52–60, 2013.

LLONCH, P.; KING, E. M.; CLARKE, K. A.; DOWNES, J. M.; GREEN, L. E. A systematic review of animal based indicators of sheep welfare on farm, at market and during transport, and qualitative appraisal of their validity and feasibility for use in UK abattoirs. **Veterinary Journal**, v. 206, n. 3, p. 289–297, 2015.

LORETZ, C.; WECHSLER, B.; HAUSER, R.; RÜSCH, P. A comparison of space requirements of horned and hornless goats at the feed barrier and in the lying area. **Applied Animal Behaviour Science**, v. 87, n. 3–4, p. 275–283, 2004.

MAPA. **Agenda Estratégica Caprinos e Ovinos 2010-2015**. 2011.

MARIA, M.; VIEIRA, M.; MIRLANDA, F.; et al. Aspectos fisiológicos e bioclimáticos de caprinos nas regiões semiáridas Physiological and bioclimatic aspects of goats in semi-arid regions. **Medicina Veterinária e Zootecnia**, v. v.10, n. n.5, p. 356–369, 2016.

MATTIELLO, S.; BATTINI, M.; ANDREOLI, E.; et al. Avoidance distance test in goats: A comparison with its application in cows. **Small Ruminant Research**, v. 91, n. 2–3, p. 215–218, 2010.

MELLOR, D. J. Updating animal welfare thinking: Moving beyond the “Five Freedoms” towards “A lifeworth living”. **Animals**, v. 6, n. 3, 2016.

MELO, A. C. F. L.; REIS, I. F.; BEVILAQUA, C. M. L.; et al. Nematódeos resistentes a anti-helmíntico em rebanhos de ovinos e caprinos do estado do Ceará, Brasil. **Ciência Rural**, v. 33, n. 2, p. 339–344, 2003.

MELO, L. E. H.; MOTA, R. A.; MAIA, F. C. L.; et al. Ocorrência e caracterização da tuberculose em caprinos leiteiros criados no estado de Pernambuco. **Pesquisa Veterinaria Brasileira**, v. 32, n. 9, p. 831–837, 2012.

MERSMANN, D.; SCHMIED-WAGNER, C.; NORDMANN, E.; GRAML, C.; SUSANNE, W. Influences on the avoidance and approach behaviour of dairy goats towards an unfamiliar human-An on-farm study. **Applied Animal Behaviour Science**, v. 179, p. 60–73, 2016.

MIRANDA-DE LA LAMA, G. C.; MATIELLO, S. The importance of social behaviour for goat welfare in livestock farming. **Small Ruminant Research**, v. 90, n. 1–3, p. 1–10, 2010.

NAPOLITANO, F.; DE ROSA, G.; GIROLAMI, A.; SCAVONE, M.; BRAGHIERI, A. Avoidance distance in sheep: Test-retest reliability and relationship with stockmen attitude. **Small Ruminant Research**, v. 99, n. 2–3, p. 81–86, 2011.

NATIONS, U. United Nations Decade for deserts and the fight against desertification - Why Now. 2011. Available in: <http://www.un.org/en/events/desertification_decade/whynow.shtml>.

NEW ZEALAND GOVERNAMENT. **Animal Welfare (Goats) Code of Welfare 2012**. 2012.

NOGUEIRA, D. M.; PINHEIRO, R. R.; SELMO, F.; ALVES, F. **Artrite encefalite caprina viral: um alerta aos produtores**. 2009.

NORDMANN, E.; KEIL, N. M.; SCHMIED-WAGNER, C.; et al. Feed barrier design affects behaviour and physiology in goats. **Applied Animal Behaviour Science**, v. 133, n. 1–2, p. 40–53, 2011.

OLIVEIRA, A. A. DA F.; ALVES, F. S. F.; PINHEIRO, R. R.; CHAPAVAL, L.; PINHEIRO, A. A. **Micoplasmoses em Pequenos Ruminantes**. 2004.

PABIS, J. C. **Opinião dos criadores sobre bem estar animal: percepção de sofrimento no métodos empregados para criação dos animais de produção**. Curitiba, 67 p. Monografia (Especializaçao no curso de Gestão em Defesa Agropecuária) - Universidade Federal do Paraná, Curitiba, 2011.

PAULO, J. L. DE A.; LOPES, F. DE A. Daily activity patterns of Saanen goats in the semi-arid northeast of Brazil. **Revista Brasileira de Zootecnia**, v. 43, n. 9, p. 464–470, 2014.

PEIXOTO, R. D. M.; MOTA, R. A.; DA COSTA, M. M. Mastite em pequenos ruminantes no Brasil. **Pesquisa Veterinária Brasileira**, v. 30, n. 9, p. 754–762, 2010.

PEREIRA, M. F.; MOTA, R. A.; PEIXOTO, R. M.; PIATTI, R. M. Estudo de casos de aborto em caprinos e ovinos no estado de Pernnambuco, Brasil. **Ciência Veterinária nos trópicos**, v. 16, n. 1, p. 18–30, 2013.

PINHEIRO, R. R.; GOUVEIA, A. M. G.; ALVES, F. S. F.; HADDAD, J. P. A. Aspectos epidemiológicos da caprinocultura cearense. **Arquivo Brasileiro de Medicina Veterinaria e Zootecnia**, v. 52, n. 5, p. 534–543, 2000.

PINHEIRO, R. R.; MARIA, A.; GOUVEIA, G.; et al. Perfil de propriedades no estado do ceará relacionado à presença do lentivírus caprino. **Ciência Animal**, v. 14, n. 1, p. 29–37, 2004.

PUGH, D. G. **Sheep & Goat Medicine**. Philadelphia: Saunders, 2002

RECIFE. SEBRAE. **Manual de Caprinocultura**. 2000.

ROBERTO, J. V. B. **Efeito Do Ambiente Térmico E Uso Da Saanen E Seus Mestiços Com O Boer No Semiárido brasileiro**. Patos, 89 p. Dissertação (Mestrado em Zootecnia) - Universidade Federal de Campina Grande, Centro de Saúde e Tecnologia Rural, Patos, 2012.

ROSSI, R.; SCHARRER, E. Circadian patterns of drinking and eating in pygmy goats. **Physiology and Behavior**, v. 51, n. 5, p. 895–897, 1992.
ROTA DO CORDEIRO. Semiárido Nordestino. 2017. Available in: <http://www.mi.gov.br/rota-do-cordeiro>. Access in: 09/03/2017.

SANTIAGO, L. B.; ALVES, F. S. F.; PINHEIRO, R. R.; LIMA, A. M. C.; FARIAS, D. A.; CAVALCANTE, A. C. R. Caracterização sanitária da caprino-ovinocultura no Estado do Ceará: dados preliminares, 2010. Available in: <http://ainfo.cnptia.embrapa.br/digital/bitstream/item/28502/1/AAC-Caracterizacao-sanitaria-da-caprino-ovinocultura-no-estado-do-Ceara-dados-preliminares.pdf>. Access in: 08/04/2016.

SANTOS, T. C. P. DOS; FIGUEREDO, S. C. DE; BELTRÃO, R. DE A. M. S.; ALFARO, C. E. P. Aspectos Sanitários E De Manejo Em Criações De Caprinos E Ovinos Na Microrregião De Patos, Região Semi-Árida Da Paraíba. 2012. Available in: <http://propi.ifto.edu.br/ocs/index.php/connepi/vii/paper/viewFile/3759/1950>.

SANTOS, T. C.; PEÑA-ALFARO, C. E.; FIGUEIREDO, S. M. Aspectos Sanitários E De Manejo Em Criações De Caprinos E Ovinos Na Microrregião De Patos, Região Semi-Árida Da Paraíba. **Ciência Animal Brasileira**, v. 12, n. 2, p. 206–212, 2011.

SCHALY, L. M.; OLIVEIRA, M. C. DE; SALVIANO, P. A. P.; ABREU, J. M. DE. Percepção do comsumidor sobre bem-estar de animais de produção em Rio Verde, GO. **PUBVET**, v. 4, 2010.

SEVI, A.; CASAMASSIMA, D.; PULINA, G.; PAZZONA, A. Factors of welfare reduction in dairy sheep and goats. **Italian Journal of Animal Science**, v. 8, p. 81–101, 2009.

SILVA, E. M. N. DA; SOUZA, B. B. DE; SILVA, G. D. A.; et al. Avaliação da adaptabilidade de caprinos exóticos e nativos no semi-ário paraibano1. **Ciência e Agrotecnologia**, v. 30, n. 3, p. 516–521, 2006.

SILVA, F. L. R. DA; ARAÚJO, A. M. DE. Desempenho produtivo em caprinos mestiços no semi-árido do Nordeste do Brasil. **Revista Brasileira de Zootecnia**, v. 29, n. 4, p. 1028–1035, 2000.

SILVA, M. R.; SOUZA, B. B.; GUIMARÃES, L. J.; et al. Estresse Térmico e sua Influência na Fisiologia Hormonal de Pequenos Ruminantes. **Journal of Animal Behaviour and Biometeorology**, v. 4, n. 2, p. 50–54, 2016.

SILVA, V. R.; FURTADO, D. A.; AZEVEDO, M. A.; WALLACE, J. Instalações para caprinos. **Revista Educação Agrícola Superior**, v. 25, n. 2, p. 99–103, 2010.

SMITH, C. K. **Raising Goats for Dummies**. Hoboken: Wiley-Publishing, Inc, 2010.

SMITH, M. C.; SHERMAN, D. M. **Goat Medicine (2nd Edition)**. Iowa: Wiley-Blackwell, 2009.

SOUSA, W. H. O agronegócio da caprinocultura de corte no Brasil. **Tecnologia & Ciência Agropecuária,** João Pessoa, v. 1, n.1, p. 51-58, 2007.

SOUZA, A. M. DOS S.; JÚNIOR, E. DE M. D.; ZAFALON, L. F.; VESCHI, J. L. A. Ocorrência de Cicatrizes e Abscessos Causados pela Linfadenite Caseosa em Caprinos do Rebanho da Embrapa Semiárido. 2014. Available in: <http://ainfo.cnptia.embrapa.br/digital/bitstream/item/124429/1/PROCI-2015.00013.pdf>.

SPEAKMAN, J. R. The physiological costs of reproduction in small mammals. **Philosophical transactions of the Royal society B**, v. 363, p. 375–398, 2008.

SUDENE. Semiárido - Superintendência do Desenvolvimento do Nordeste (SUDENE). 2016. Available in: <http://www.sudene.gov.br/acesso-a-informação/institucional/area-de-atuacao-da-sudene/semiarido>.

TOUSSAINT, G. The housing of milk goats. **Livestock Production Science**, v. 49, n. 2, p. 151–164, 1997.

UNESCO. **Map of the world distribution of arid regions**. 1979.

VAN, D. T. T.; MUI, N. T.; LEDIN, I. Effect of group size on feed intake, aggressive behaviour and growth rate in goat kids and lambs. **Small Ruminant Research**, v. 72, n. 2–3, p. 187–196, 2007.

VIANA, M. P.; MEDEIROS, A. DA R.; SOUZA, B. B. DE. Effect of thermal stress on the physiology , production and reproduction of goats. ACSA – **Agropecuária Científica no Semiárido**, v. 9, n. 4, p. 1–8, 2013.

VILLAQUIRAN, M.; GIPSON, T. A; MERKEL, R. C. **Body Condition Scores in Goats**. 2004.

VOLTOLINI, T. V.; SANTOS, R. M.; MORAES, S. A. D. A.; DE, G. G. L. Principais modelos produtivos na criação de caprinos e ovinos. In: VOLTOLINI, T. V et al. **Produção de caprinos e ovinos no Semiárido**. Embrapa Semiárido, 2011. p. 219–232.

WAIBLINGER, S.; BOIVIN, X.; PEDERSEN, V.; et al. Assessing the human-animal relationship in farmed species: A critical review. **Applied Animal Behaviour Science**, v. 101, n. 3–4, p. 185–242, 2006.

WELFARE QUALITY®. **Welfare Quality® Assessment protocol for cattle**. 2009.

WEMELSFELDER, F.; HUNTER, E. A.; MENDI, M. T.; LAWRENCE, A. B. The spontaneous qualitative assessment of behavioural expressions in pigs: First

explorations of a novel methodology for integrative animal welfare measurement. **Applied Animal Behaviour Science**, v. 67, n. 3, p. 193–215, 2000.

WEMELSFELDER, F.; HUNTER, T. E. A.; MENDL, M. T.; LAWRENCE, A. B. Assessing the “whole animal”: a free choice profiling approach. **Animal Behaviour**, v. 62, n. 2, p. 209–220, 2001.

WINDSOR, P. A.; BUSH, R. D. Caseous lymphadenitis: Present and near forgotten from persistent vaccination?. **Small Ruminant Research**, v. 142, p. 6–10, 2016.

APPENDIX 1 - FIRST LEVEL OF WELLNESS ASSESSMENT

(ASSESSMENT IN GROUPS)

Group observation information

Identification of the subgroup: 1 ☐ 2 ☐

Location (pen / pasture): _____

Number of goats per group: _____

Relative Humidity (%) and Temperature (°C):_____

Beginning of observation time:_____

Behavioural observations

1) Application of Qualitative Behaviour Assessment (QBA)
2) Abnormal behaviour

	Number of goats per group	% per group
Oblivion	☐ *NA	

*NA = Not applicable

3) Thermal stress

	Number of goats per group	% per group
Heat stress signs	☐ NA	

Health observations

1) Faecal soiling

	Number of goats per group	% per group
Presence of soft feces	☐ NA	

2) Hair coat condition

	Number of goats per group	% per group
Poor hair coat	☐ NA	

3) Lameness

	Number of goats per group	% per group
Minor lameness (1)	☐ NA	
Lame (2)	☐ NA	
Major lameness (3)	☐ NA	

Human Animal-Relationship

Flight observed: ☐ Yes If yes, Distance:_____
☐ No

Goat approached: ☐ Yes
☐ No

Goat initiating voluntary contact with human: ☐ Yes
☐ No

Resource-based measures

1) Goats on all systems:

Pen/field dimension: Length (m):_____ x Width (m):_____ = Area (m^2):_____

Presence of kids? ☐ Yes ☐ No

2) Goats on all systems:

Access to shade: ☐ Yes ☐ No Type:_____

Access to shelter: ☐ Yes ☐ No Type:_____

Comments and notes

3) Water availability

	Number	Clean	Partially dirty	Dirty	Accessible/Functional	
					Yes	No
Bucket						
Automatic drinker						
Natural water source						
Another source						

4) Cleanliness of facilities

Cleanliness/Subgroups	Subgroup 01	Subgroup 02
Clean		
Partially dirty		
Dirty		

Type:_____

Frequency of cleannness:

_____

_____

Way of cleaning:_____

Additional informations

_____

_____

_____

_____

APPENDIX 2 - SECOND LEVEL OF WELFARE ASSESSMENT (INDIVIDUAL ASSESSMENT)

To be continued

Nº of goats	ID Type	Breed	BCS (1-5)	Faecal soiling (0, 1)	Abscess (0, 1)	Nasal discharge (0,1)	Ocular discharge (0,1)	Vulvar discharge (0,1)	Respiration quality (0,1)
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									

0 = Absent; 1 = Present

APPENDIX 2 - SECOND LEVEL OF WELFARE ASSESSMENT (INDIVIDUAL ASSESSMENT)

Conclusion

Nº of goats	Lesions on head – ears (1,2) (Myiasis-Y,N)	Lesions on head – eyes (1-3) (Myiasis -Y,N)	Lesions on head – face/ muzzle (1-3) (Myiasis -Y,N)	Lesions on head - neck (1-3) (Myiasis -Y,N)	Lesions on body (1-3) (Myiasis -Y,N)	Lesions on udder or teats (1-3) (Myiasis -Y,N)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						

1 = Minor – Hairless patches or scratches, or healed lesions, or ear notches or open wounds which do not reach the muscle layer, that are greater than 2 cm but less than 10 cm (AWIN, 2015b).
2 = Major – Open wounds that are greater than 10 cm and/or at a depth that reaches the muscle layer (AWIN, 2015b).
Myiasis – Open abrasions with clear presence of maggots on any part of the animal (AWIN, 2015b). Y = Yes; N = No.

APPENDIX 3 – RECOMMENDATIONS TO IMPROVE THE WELFARE OF MEAT GOAT DOES

Levantamento dos problemas e realização de recomendações para melhorar o manejo de cabras de corte

Data

Prezado Sr (Sra) xxxxxx,

Gostaríamos de agradecer a oportunidade de visitarmos a sua propriedade. Ficamos muito felizes em verificar que seus animais não apresentaram isolamento, fezes ao redor do ânus, manqueira (claudicação), medo do proprietário, chiqueiro (instalação) sujo, corrimento nos olhos, no nariz, na vagina.

Alguns pontos podem ainda ser corrigidos para que o senhor tenha um incremento no bem-estar dos seus animais e, como consequência, um provável impacto positivo na produção.

Os pontos seriam os seguintes:

Relacionados às instalações

1. Um dos baldes possuía água com sujidades. Água com areia no fundo propicia o desenvolvimento de contaminantes, como vírus, bactérias, fungos e protozoários que causam doenças, como diarreias, além de perda de peso e baixa imunidade (cabras podem ficar doentes).

Relacionados aos animais

1. 3 cabras apresentaram pelagem com problemas (pelo muito longo, áspero)

2. Há a presença de problemas reprodutivos, como Aborto, embora sejam poucos casos no ano (4), podendo representar a presença de agentes patológicos, como bactérias e protozoários na mãe, além de uma subnutrição.
3. Animais muito agressivos e irritados.
4. Na avaliação da condição física do animal (Escore de Condição Corporal (ECC) onde foi dada uma nota de 1-5, sendo 1= magro, 2= muito magro, 3= adequado, 4= gordo e 5= muito gordo.
5. Quanto à saúde dos animais (Total = 16), pode-se observar a presença de:
    - Abscessos (n =3; 12,5%)
    - Lesões da orelha (n =10; 62,50%)
    - Lesões no corpo (n = 1; 6,25%)
    - Lesões no pescoço (n=1; 6,25%)

Recomendações quanto às instalações

1. É muito importante que seja sempre disponibilizada água limpa e fresca para os animais, especialmente em climas secos e quentes, porque pode ocorrer desidratação. A limpeza dos baldes deve ser realizada regularmente de forma que não acumule outras sujidades. Este é um ponto a ser observado pelos donos da fazenda e um esquema de limpeza pode ser montado. Sugestão: a limpeza dos baldes deve ser feita diariamente, e deve ser fornecida água limpa.

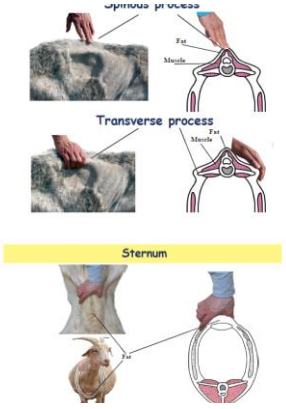
Recomendações quanto aos animais

1. Pelagem com problemas pode indicar que o animal tenha algum tipo de doença ou patologia. Estudos com cabras de leite mostraram que animais com a pelagem emaranhada, áspera, e com descamação possuíam aumento de sons no pulmão, problemas de minerais (sódio, cloreto) desbalanceados e baixo escore de condição corporal (ECC). Sugestão: acompanhamento dos animais que apresentem pelagem com pelos eriçados, quanto a: manifestação de doenças e baixo escore de condição corporal (ECC), menor do que 3 (Figura 01).
2. Apesar da baixa incidência de aborto, os principais agentes etiológicos infeciosos envolvidos em abortos no Nordeste, detectados em estudos, foram as bactérias *Chlamydophila abortus* (clamidiose) e *Leptospira spp*

(leptospirose) e os protozoários *Neospora caninum* (neosporose)*, Toxoplasma gondii* (toxoplasmose) *e Trypanosoma vivax* (tripanossomíase). No período seco, o aborto tem como uma das principais causas a subnutrição, havendo deficiência de proteínas e minerais. Sugestão: diante de um caso de aborto, chamar um médico veterinário para avaliar o feto na busca por bactérias, protozoários, e outras causa

3. Agressividade e irritabilidade presente em alguns animais. A agressividade é observada quando a hierarquia das cabras é contestada, ou seja, quando a líder é confrontada por outra cabra. Pode ocorrer no momento da alimentação, e em casos do espaço onde os animais vivem ser pequeno, o que não é o caso desta fazenda. A agressividade pode ser por cabeçadas, ameaças, chifradas. Sugestão: procurar observar os momentos na qual ocorrem estas interações agressivas. Em casos de brigas frequentes, em momentos diferentes da alimentação, procurar o agressor e em último caso retirar este animal do rebanho.
4. Na avaliação do Escore de Condição Corporal (ECC), o ECC variando de 1 a 5 significa: 1= magro, 2= muito magro, 3= adequado, 4= gordo e 5= muito gordo, respectivamente. Pode-se observar que 4 animais tiveram o ECC = 2, magro. Esses animais provavelmente apresentam algum grau de desnutrição. Já todos os outros animais avaliados, 12 cabras possuem o ECC = 3, ideal (Figura 01). ECC abaixo de 3 pode levar a problemas reprodutivos, como a dificuldade de emprenhar, e a ocorrência de doenças sistêmicas. Sugestão: observar se os animais com o ECC = 2 estão se alimentando.

Total de cabras avaliadas = 16 04 (25%) 12 (75%)



Como avaliar

Muito magra Magra Ideal Gorda Muito gorda

Figura 01. Avaliação do Escore de Condição Corporal – ECC, variando de 1 a 5, em cabras. http://www2.luresext.edu/goats/research/BCS_factsheet.pdf.

5. Quanto aos indicadores de saúde:
   - Abscessos: pode indicar a presença de Linfadenite Caseosa (“mal do caroço”), de feridas infectadas ou locais de injeções. No último caso, ignorar as recomendações. Sugestão: entrar em contato com um médico veterinário para a remoção cirúrgica adequada dos nódulos; eliminar animais contaminados do rebanho; vacinar os animais do rebanho como prevenção contra a doença.
   - Lesões na orelha, no corpo e pescoço: podem ser causadas por arame farpado ou farpas de madeiras de árvores, e podem causar ferimentos que podem vir a ser contaminados por carrapatos, e posteriormente haver uma infecção por larvas de moscas, causando a miíase (“bicheira”). Sugestão: procurar observar essas lesões nas cabras, tratar com antissépticos e acompanhar a cura ou evolução da lesão. Em situações graves, chamar um médico veterinário para tratar das lesões. Em caso de muita lesão na orelha, pensar em substituir o brinco por colar.

- Presença de calo no joelho. O calo ocorre em decorrência do contato do animal com superfícies ásperas, durante o descanso. Sugestão: colocar cama para os animais, no local onde dormem; na impossibilidade de realizar isto, observar se estes calos não apresentam lesões que permitam a infiltração de microrganismos (bactérias, vírus) que possam levar a uma doença.

CONCLUSÃO: Os achados em relação à saúde dos animais refletem que os animais estão em condições um pouco abaixo da adequada, devendo ser dada atenção especial à questão das lesões de orelha, agressividade entre os animais e a presença de abscessos. Mas, o cuidado com estas questões irá tornar o manejo dos animais bem adequados. Quanto às instalações, a limpeza da água nos baldes é o fator mais importante e deve ser cuidado.

Eu, Luana Oliveira Leite, agradeço a oportunidade de ter realizado este trabalho em sua propriedade. Espero ter contribuído com alguma informação e melhora no seu rebanho. Coloco-me à disposição para eventuais dúvidas e outros esclarecimentos pelo telefone (85) 99610-2580 (TIM) ou no e-mail: luanaoliv.vet@gmail.com.

Atenciosamente,

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APPENDIX 4 – RECOMMENDATIONS TO IMPROVE THE WELFARE OF DAIRY GOATS

Levantamento dos problemas e realização de recomendações para melhorar o manejo de cabras de leite

Data

Prezado Sr (Sra) XXX,

Gostaríamos de agradecer a oportunidade de visitarmos a sua propriedade. Ficamos muito felizes em verificar que seus animais não apresentaram descorna inapropriada, abscessos, comportamento de se ajoelhar para se alimentar e fazer fila para beber água e para comer, isolamento, sujidade por fezes na região anal, supercrescimento das unhas e assimetria do úbere.

Alguns pontos podem ainda ser corrigidos para que o senhor tenha um incremento no bem-estar dos seus animais e, como consequência, um provável impacto positivo na produção.

Os pontos seriam os seguintes:

Relacionados aos animais

6. Duas cabras apresentaram pelagens com deficiências na Baia com 5 animais (Não-lactação), como a presença de pelagem áspera, especialmente na região na coluna.
7. Realização da descorna dos animais.
8. Agressividade presente em alguns animais no momento da alimentação.
9. A qualidade do relacionamento humano-animal pode ser avaliada por meio do Teste de Latência ao Primeiro Contato. Neste teste, animais que não interagem com uma pessoa estranha que entra na baia, e permanece por um tempo parada, demonstram medo. O tempo máximo para esta interação ocorrer é de

5 minutos. O tempo ideal de aproximação é abaixo de 24 segundos. Todas as cabras apresentaram o tempo de 5 minutos sem nenhuma interação.

10. Na avaliação da condição física do animal, o Escore de Condição Corporal (ECC) é medido por meio dos escores de -1 = animais muito magros, 0 = animais em condição adequada, 1 = animais obesos.
11. Quanto à saúde dos animais (Total = 9), pode-se observar a presença de:
    - Assimetria do úbere (n = 1; 11,11%)

Recomendações quanto aos animais

6. Pelagem com deficiências pode indicar que o animal tenha algum tipo de doença ou patologia. Estudos com cabras de leite mostraram que animais com a pelagem emaranhada, áspera, e com descamação possuíam aumento de sons no pulmão, desbalanceamento de minerais e baixo escore de condição corporal (animais magros ou muito magros). Sugestão: acompanhamento dos animais que apresentem pelagem com pelos ásperos, quanto a manifestação de doenças e baixo escore de condição corporal (ECC = -1), como pode ser visto na Figura 01.

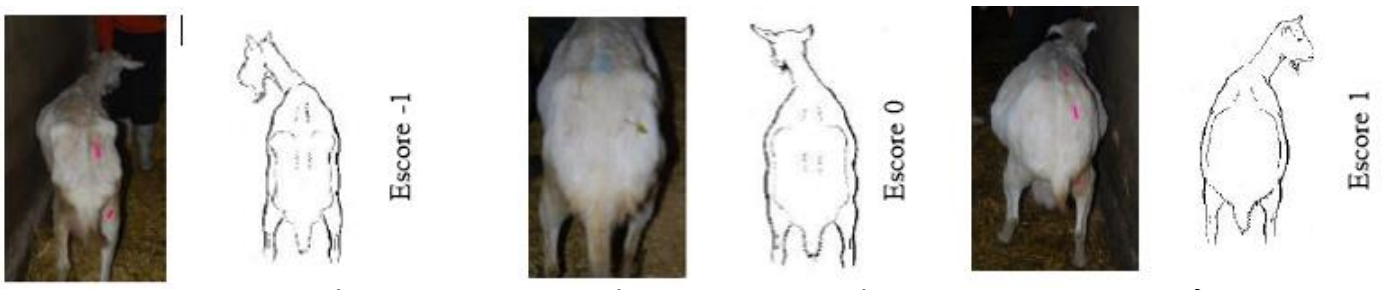

Figura 01. Escore de Condição Corporal (ECC) utilizado para avaliar a condição corporal das cabras (AWIN, 2015a).

mochação em cabritos jovens minimiza a dor, estresse e outras consequências negativas, como infecção, para os animais. Mesmo sendo o mais indicado, a mochação também deve ser realizada com analgesia, independente do procedimento a ser realizado. Sugestão: chamar um médico veterinário.

8. Quanto a agressividade presente em alguns animais. A agressividade é observada quando a hierarquia é contestada, na hora da alimentação, na forma de cabeçadas, mordidas e empurrões. Sugestão: procurar observar os momentos na qual ocorrem estas interações agressivas. Caso ocorra no

momento da alimentação, procurar averiguar se todas as cabras estão se alimentando corretamente e apresentando um bom ECC, mínimo 0. Em casos de brigas frequentes, na qual você observe que muitos animais estão sendo prejudicados (não se alimentando corretamente e apresentando ferimentos), em momentos que não sejam na alimentação, procurar o agressor e retirá-lo do grupo (colocar em outro grupo e observar o comportamento por um tempo ou vender).

9. A avaliação do Escore de Condição Corporal (ECC), o ECC varia de -1 a 1, sendo -1 = muito magro, 0 = adequado, e -1 = obeso. Dos animais avaliados, 2 apresentaram ECC = -1, muito magros, 6 o ECC = 0, adequado e 1 apresentou o ECC= 1, muito obesa. Cabras muito magras (ECC= -1) provavelmente apresentam algum grau de desnutrição. Situações de baixo ECC (-1) e alto (1) também podem acarretar problemas reprodutivos e doenças sistêmicas. ECC = 0, que é o ideal, indica uma boa alimentação e absorção deste alimento, especialmente devido a exigência da produção leiteira. Sugestão: contratar um veterinário ou zootecnista para avaliar a dieta dos animais; procurar observar quais animais estão em piores condições de alimentação (ECC = -1) e, se possível, fornecer condições adequadas para que se alimentem corretamente, como a divisão dos cochos e melhor distribuição do alimento.
10. Quanto aos indicadores de saúde:
    - Assimetria do úbere: ocorre quando uma das glândulas mamárias está em posição diferente da outra (geralmente mais próxima do corpo da cabra). É um dos principais problemas que afetam cabras de leite e está relacionada à infecção e inflamação da glândula mamária. Pode ser resultado de uma infecção intramamária, causada por mastite, com subsequente fibrose e atrofia da glândula. Está também associada à dor e desconforto para a cabra. Sugestão: na presença de cabras com assimetria do úbere é interessante colher o leite destes animais e mandar para laboratório para o diagnóstico de mastite, sendo a lactocultura (cultura de bactérias no leite) o teste mais confiável para detecção de mastite e das bactérias causadoras desta enfermidade.

CONCLUSÃO: Os achados em relação à saúde dos animais refletem que os animais estão em condições relativamente adequadas, com poucos problemas de saúde, devendo ser dada atenção especial à questão da alimentação e da assimetria do úbere. É importante que correções no manejo sejam feitas para redução da agressividade entre os animais e melhora da condição do escore corporal.

Eu, Luana Oliveira Leite, agradeço a oportunidade de ter realizado este trabalho em sua propriedade. Espero ter contribuído com alguma informação e melhora no seu rebanho. Coloco-me à disposição para eventuais dúvidas e outros esclarecimentos pelo telefone (85) 99610-2580 (TIM) ou no e-mail: luanaoliv.vet@gmail.com.

Atenciosamente,

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ANNEX 1 – CERTIFICATE OF THE ANIMAL USE ETHICS COMMITTEE OF THE AGRICULTURAL SCIENCES CAMPUS OF THE UNIVERSIDADE FEDERAL DO PARANÁ, PROTOCOL NUMBER 029/2016

UNIVERSIDADE FEDERAL DO PARANÁ
SETOR DE CIÊNCIAS AGRÁRIAS
COMISSÃO DE ÉTICA NO USO DE ANIMAIS

CERTIFICADO

Certificamos que o protocolo número029/2016, referente ao projeto **"Diagnóstico de bem-estar em cabras de leite e corte no Ceará"**,sob a responsabilidade de**Rita de Cassia Maria Garcia**– que envolve a produção, manutenção e/ou utilização de animais pertencentes ao filo Chordata, subfilo Vertebrata (exceto o homem), para fins de pesquisa científica ou ensino – encontra-se de acordo com os preceitos da Lei nº 11.794, de 8 de Outubro, de 2008, do Decreto nº 6.899, de 15 de julho de 2009,e com as normas editadas pelo Conselho Nacional de Controle da Experimentação Animal (CONCEA), efoi aprovado pela COMISSÃO DE ÉTICA NO USO DE ANIMAIS (CEUA) DO SETOR DE CIÊNCIAS AGRÁRIAS DA UNIVERSIDADE FEDERAL DO PARANÁ - BRASIL, com grau 1 de invasividade, em reunião de 11/05/2016.

Vigência do projeto	Julho/2016 a Setembro/2016
Espécie/Linhagem	Caprino
Número de animais	9000
Peso/Idade	30 a 70 kg / Acima de 1 ano
Sexo	Fêmea
Origem	Fazendas comerciais do Ceará

CERTIFICATE

We certify that the protocol number 029/2016, regarding the project **"Welfare diagnosis in dairy and meat goats in Ceará"** under **Rita de Cassia Maria Garcia** supervision – which includes the production, maintenance and/or utilization of animals from Chordata phylum, Vertebrata subphylum (except Humans), for scientific or teaching purposes – is in accordance with the precepts of Law nº 11.794, of 8 October, 2008, of Decree nº 6.899, of 15 July, 2009, and with the edited rules from Conselho Nacional de Controle da Experimentação Animal (CONCEA), and it was approved by theANIMAL USE ETHICS COMMITTEE OF THE AGRICULTURAL SCIENCES CAMPUS OF THE UNIVERSIDADE FEDERAL DO PARANÁ (Federal University of the State of Paraná, Brazil), with degree 1 of invasiveness, in session of11/05/2016.

Duration of the project	July/2016untilSeptember/2016
Specie/Line	Caprine
Number of animals	9000
Wheight/Age	30 to 70 kg / Over 1 year
Sex	Female
Origin	Commercial farms of Ceará

Curitiba, 11 de maio de 2016.

Simone Tostes de Oliveira Stedile

Presidente CEUA-SCA

6. VITA

Luana Oliveira Leite is a veterinarian, graduated by State University of Ceará (UECE) in 2013.2. Her main area of work are animal welfare, especially in small ruminants, in one health and animal abuse.