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FROM THEORY TO PRACTICE: DEMONSTRATION UNIT FOCUSED ON REPRODUCTIVE MANAGEMENT AND ANDROLOGICAL EVALUATION OF SHEEP

DA TEORIA À PRÁTICA: UNIDADE DEMOSTRATIVA VOLTADA AO MANEJO REPRODUTIVO E AVALIAÇÃO ANDROLÓGICA DE OVINOS

DE LA TEORÍA A LA PRÁCTICA: UNIDAD DEMOSTRATIVA DIRIGIDA AL MANEJO REPRODUCTIVO Y EVALUACIÓN ANDROLÓGICA DE OVEJAS

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Abstract: Sheep farming has been carried out by humans for years and is one of the oldest activities in Brazil. However, the breeding of these animals, whether for milk, meat, or skin, is low throughout the country. This is mainly due to low reproductive rates. Given this, the objective of this work was to describe the activities of a demonstration unit focused on reproductive management and andrological evaluation of sheep for students of the courses of the Faculty of Agricultural Sciences of the Federal University of Grande Dourados and sheep breeders in the region, seeking to provide those involved with greater contact with the activity. The demonstration unit for sheep breeding and reproduction is located in the **Ruminant Nutrition Sector of Animal Science at the Federal University of Grande Dourados**, located in the city of Dourados. In the unit, components of the male reproductive **organs** of sheep are evaluated, andrological exams are performed, and semen is collected, evaluated, and recorded on each animal's file. At the end, the data is evaluated, together with the students, producers, and all those involved, and the animals are classified as suitable or unsuitable to be destined for breeding. These reproductive activities, carried out in the demonstration unit **and** aimed at expanding the knowledge of producers and students, are fulfilling their role in qualifying those involved and positively influencing sheep farming in the southern region of the state of Mato Grosso do Sul.

Keywords: Andrological, Ram, Reproduction.

Resumo: A criação ovina pelo homem se dá há anos, sendo uma das atividades mais antigas no Brasil. Entretanto, a criação desses animais, seja voltada a leite, carne ou pele é baixa em todo o país. Isso se dá principalmente, devido aos baixos índices reprodutivos. Visto isso, objetivou-se por meio deste trabalho, descrever as atividades de uma unidade demonstrativa voltada ao manejo reprodutivo e avaliação andrológica de ovinos, para discentes dos cursos da Faculdade de Ciências Agrárias da Universidade Federal da Grande Dourados e criadores de ovinos da região, buscando proporcionar aos envolvidos, um maior contato com a atividade. A unidade demonstrativa de criação e reprodução de ovinos está localizada no

setor de nutrição de ruminantes de Zootecnia da Universidade Federal da Grande Dourados, localizada no município de Dourados. Na unidade é avaliado, componentes do órgão reprodutivo masculino de ovinos, são realizados os exames andrológicos e a coleta e avaliação de sêmen e anotado na ficha de cada animal. Ao final, os dados são avaliados, junto com os alunos, produtores e todos os envolvidos, e os animais são classificados como apto, questionável e não apto, para serem destinados à reprodutor. Essas atividades reprodutivas, realizadas na unidade demonstrativa voltada a ampliar o conhecimento dos produtores e alunos, estão cumprindo o seu papel na cultura dos envolvidos e influenciando positivamente a criação de ovinos na região Sul do Estado do Mato Grosso do Sul.
Palavras-chave: Andrológicos, Carneiro, Reprodução.

Resumen: La cría de ovejas por parte del hombre existe desde hace años, siendo una de las actividades más antiguas de Brasil. Sin embargo, la cría de estos animales, ya sea para obtener leche, carne o piel, es escasa en todo el país. Esto se debe principalmente a las bajas tasas de reproducción. Ante esto, el objetivo de este trabajo fue describir las actividades de una unidad demostrativa enfocada en el manejo reproductivo y evaluación andrológica de ovinos, para estudiantes de cursos de la Facultad de Ciencias Agrícolas de la Universidad Federal de Grande Dourados y criadores de ovinos de la región, buscando proporcionar a los implicados un mayor contacto con la actividad. La unidad demostrativa de cría y reproducción ovina está ubicada en el sector de nutrición de rumiantes de Ganadería de la Universidad Federal de Grande Dourados, ubicada en el municipio de Dourados. En la unidad se evalúan los componentes del órgano reproductor masculino de los ovinos, se realizan exámenes andrológicos y se realizan tomas y evaluaciones de semen que se registran en el registro de cada animal. Al final, se evalúan los datos, junto con los estudiantes, productores y todos los involucrados, y se clasifican los animales como aptos o no aptos, para ser destinados a la reproducción. Estas actividades reproductivas, realizadas en la unidad demostrativa con el objetivo de ampliar el conocimiento de productores y estudiantes, están cumpliendo su papel de capacitar a los involucrados e influir positivamente en la crianza de ovejas en la región sur del estado de Mato Grosso do Sul.
Palabras clave: Andrológico, Carneiro, Reproducción.

INTRODUCTION

Sheep farming by humans dates back more than 11,000 years in Southwest Asia and subsequently spread throughout the world. It is one of the oldest livestock activities in Brazil, with the first records of sheep in the country dating to 1556, when the animals were brought by Portuguese colonizers (BRANDÃO et al., 2022).

According to the latest survey by the Brazilian Institute of Geography and Statistics (IBGE), Brazil ranks 18th in the world in sheep farming, with a national flock of 21,792,139 animals in 2023. The Northeast region leads the national flock with 71.23%, followed by the state of Bahia as the largest producer. The South region accounts for 19.39%, the Central-West 3.95%, the Southeast 2.57%, and the North 2.87% of the national sheep herd (IBGE, 2024).

In the state of Mato Grosso do Sul, production is considered low due to a lack of tradition in sheep and goat farming. According to the most recent Municipal Livestock Production survey by IBGE (2024), the state has a flock of 325,130 sheep.

One of the main advantages of sheep farming is their reproductive capacity, which is realized through lamb production. However, the average reproductive performance of sheep in Brazil is considered low, with lambing rates rarely exceeding 100%, whereas the ideal rate would be 140% (1.4 lambs per lambing ewe) (MOLONEY et al., 2023).

In small ruminants, such as sheep and goats, reproductive efficiency is one of the key factors influencing overall productivity. Good fertility and prolificacy rates, combined with short lambing intervals, result in more lambs born per female, which directly impacts the profitability of the activity (OLIVEIRA et al., 2023).

The main factors limiting sheep reproduction in Brazil include nutritional deficiencies—especially during the dry season due to the predominantly extensive farming systems—lack of sanitary control, poor genetics, and low fertility rates in males. According to Rivero et al. (2012), the percentage of infertile rams at reproductive age may range from 3.5% to 10%, while around 30% may be subfertile.

These are concerning data, considering that 50% of reproductive success depends on the ram. Therefore, it is essential to align sanitary and nutritional conditions, animal welfare, and fertility assessment of the males, given the significant role these components play in the production system, aiming for the maximum reproductive efficiency of the flock (OLIVEIRA et al., 2023).

In this context, there is a need to assess reproductive efficiency along with a complete andrological examination, including evaluation of reproductive organs, conformation, libido, and semen quality in males, to improve the reproductive traits of the herd.

However, technical assistance with qualified professionals remains scarce, due to the limited number of specialists in sheep reproduction in the state, influenced both by the relatively small size of the herd and the lack of investment, which hinders the development of this activity.

Given this demand, rural and university extension actions are essential. These are defined by Facco et al. (2022) as a set of initiatives aimed at the community, with the goal of addressing local problems and needs in the areas where the university operates.

Recognizing the clear lack of knowledge in sheep reproduction and the growing demand for skilled professionals and trained producers, this study aimed to describe the activities of a demonstration unit focused on reproductive management and andrological evaluation of rams, designed for undergraduate students in Animal Science and Agronomy at the Federal University of Grande Dourados and sheep producers in the region.

MATERIAL AND METHODS

Site and Animal Characterization

The demonstration unit for sheep breeding and reproduction is located in the Ruminant Nutrition Sector of the Animal Science program at the Federal University of Grande Dourados, situated in the municipality of Dourados, on the Dourados–Itahum highway, kilometer 12, in the state of Mato Grosso do Sul, Brazil.

At the site, Santa Inês sheep are raised—a woolless breed developed in Brazil through crossbreeding of Morada Nova with the Italian Bergamasca breed. The flock consists of a total of 30 sheep, including one breeding ram (4 years old), 15 adult ewes (2 to 5 years old), and 14 lambs and yearlings (from 1 day to 1 year and 11 months of age), which are used in practical classes.

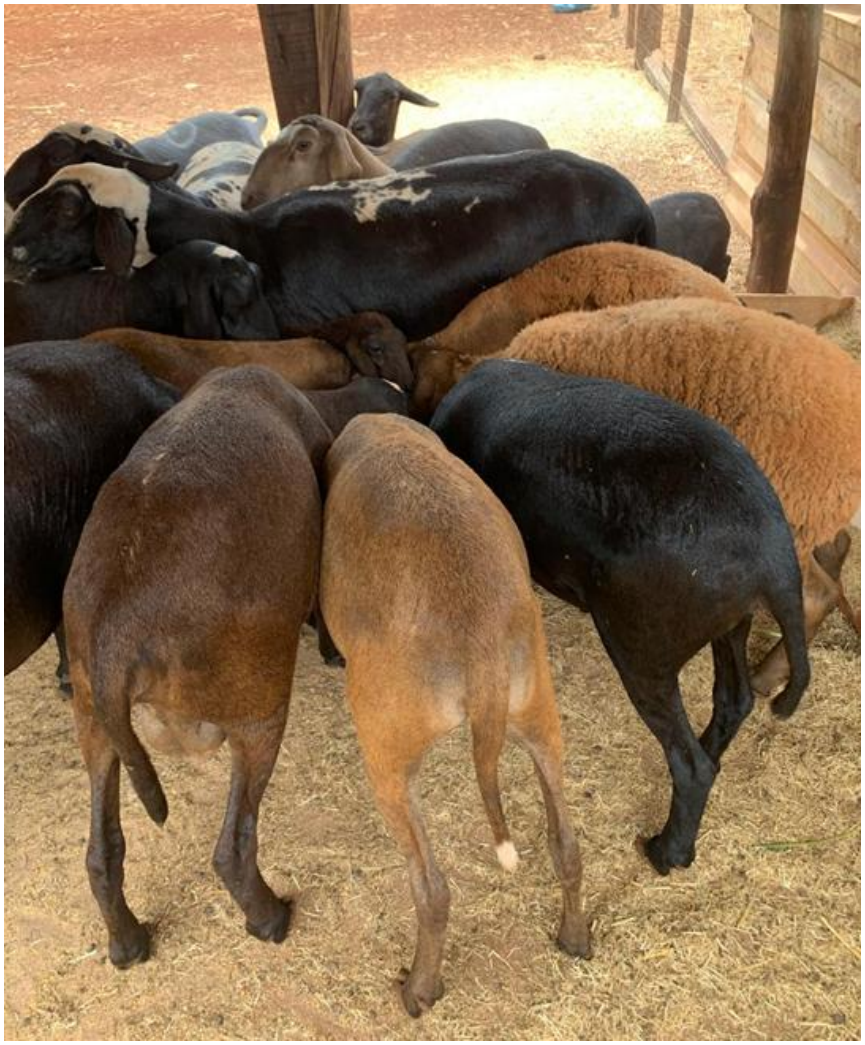

Figure 1. Lambs from the reproduction demonstration unit at the Federal University of Grande Dourados.

Components of the Male Reproductive Organ

The male reproductive system of sheep consists of several organs, including: the scrotal sac, testes, epididymis, spermatic cord, vas deferens, and accessory glands such as the vesicular glands, bulbourethral glands, and prostate—which are located in the abdominal cavity. It also includes the penis (copulatory organ), featuring a urethral process or extension, and the prepuce, as shown in Figure 2 (GRANADOS et al., 2006).

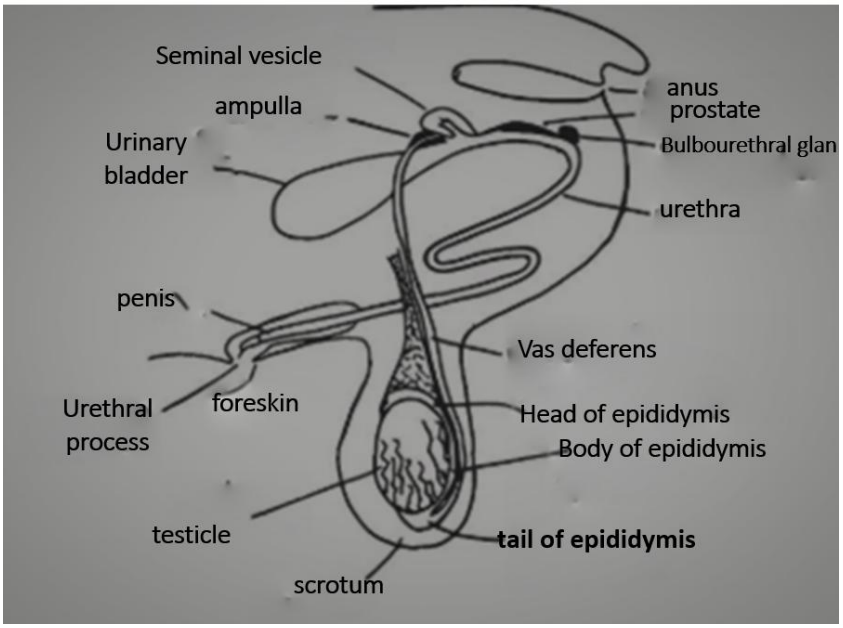

Figure 2. Components of the male reproductive system of sheep.
Source: Adapted from GRANADOS et al. (2006); ALMEIDA (2022).

Conducting the Andrological Examination

The andrological examination was carried out according to the recommendations found in the Manual for Andrological Examination and Animal Semen Evaluation of the Brazilian College of Animal Reproduction (CBRA, 1998), which includes animal and owner data, reproductive history, general physical examination, examination of the external structures of the genital apparatus, reproductive behavior, spermiogram, and report. All individual data for each animal were recorded on a technical form (Table 1).

Table 1. Andrological examination form used in the demonstration unit focused on reproductive management and andrological evaluation of sheep.

ANDROLOGICAL EXAMINATION FORM ORDER NO.:	
ANIMAL DATA	
Name	Breed
Age	Aplomb/locomotion
Aggressiveness/indole:	Obs.
ANDROLOGICAL EVALUATION-TESTICULAR BIOMETRY	
Inspection	Position
Shape	Scrotal perimeter
Symmetry	Length -TD/TE
Testicular Consistency (0-5)	Thickness - TD/TE
Width-TD/TE	Spermatic cord
Epididymis-TD/TE	Obs.
SEMINAL COLLECTION	
Harvest time	Responsible for harvesting
Harvest method	Number of breedings/breeding time
SEMEN EVALUATION	
Volume	Color
Swirling	Appearance
Vigor	Motility
Number of sptz in ejaculate	Concentration (sptz/mL)
Number of mobile spt	
Sperm pathologies	Major Defects
	Minor Defects
	Total Defects
Obs:	

Source: Authors' own, 2024.

The physical examination was carried out in two stages. In the first, animals were observed from a distance, in their rearing environment, noting their behavior, posture, and gait to detect possible lameness, among other factors. In the second stage of the evaluation, reproductive-age males (breeding rams and lambs older than 18 months) were individually observed to detect possible diseases and evaluate their **hooves**, posture, and body condition.

This stage is crucial to ensure the health and good performance of the breeding animals, contributing to the quality of the flock.

Upon completion of the second evaluation stage, all animals were considered suitable, with adequate posture, good body condition, and no apparent diseases, and proceeded to the third stage. Following the physical evaluation of the animals, the external structures of the male genital system were examined, thoroughly evaluating the external genitalia, assessing the scrotum—which individually houses the testes—palpating and measuring its circumference and size with the aid of a caliper (Figure 3, Table 2), the penis (during exteriorization at the time of collection), and the prepuce. At this time, the spermatic cord and epididymis were also evaluated via palpation.

Figure 3. Assessment of testicular biometry of male sheep of reproductive age.

Sheep testicles should be oval in shape, vertical in position, similar in consistency to the uncontracted human biceps, mobile within the scrotum, and symmetrical. Figure 4 demonstrates the variations in the shape of the scrotum. Regarding testicular biometry, there is information in the literature on the ideal scrotal circumference according to the breed and category of the animal, since sperm production is highly correlated with testicular weight and scrotal

circumference measurement, both of which have been used as indicators of sperm production in several species (LOBO et al., 1996).

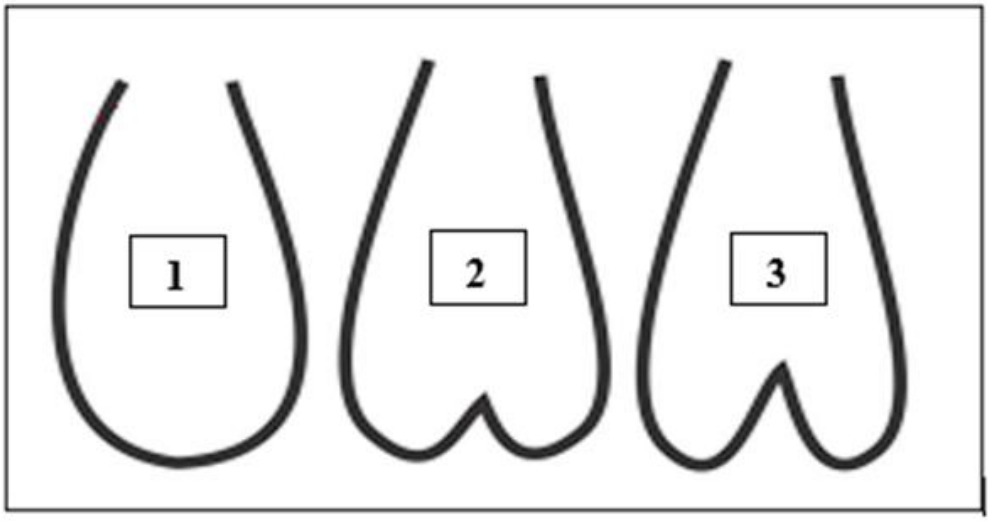

Figure 4. Schematic drawing of the variation of the scrotal sac of sheep. It is important
Source: adapted from MORAIS and SOUZA (2019).

Evaluating the shape of the testicles is essential when looking for a good breeder, to ensure the health and reproductive potential of the sheep. Animals with testicular shapes similar to schematic drawing 1 (figure 4) represent symmetrical, firm testicles indicating good health and reproductive capacity. Animals with testicles similar to shapes 2 and 3 may have fertility problems. These testicles have irregular, asymmetrical shapes, which may indicate probable hormonal problems, or possible injuries or health problems, which may compromise the reproductive capacity of the animals.

Table 2. Values of the biometric characteristics of Santa Inês sheep, collected in the demonstration unit focused on reproductive management and andrological evaluation of sheep during a practical class in 2024.

Male	Body weight (kg)	Body length (cm)	Scrotal circumference (cm)
1	60	104,10	30,04
2	80	110,20	34,50
3	53	101,80	29,50
4	48	93,20	29,70
5	67	103,40	32,20
6	77	106,00	31,90

The weight of the evaluated animals ranged from 48 to 80 kg, while body length (cm) ranged from 93.20 to 110.20 cm, and scrotal circumference ranged from 29.50 to 34.50 cm. This variation was due to the differences in age among the evaluated rams. However, in general, animals with greater weight and longer body length tend to have a larger muscle deposition area.

Additionally, the variation in scrotal circumference is an important measure that influences the reproductive capacity of rams. Animals with larger scrotal circumference tend to have higher fertility. According to Vargas et al. (2024), the average scrotal circumference of Santa Inês rams of reproductive age in Brazil is 34.2 ± 2.1 cm, a factor influenced by both environmental conditions and nutrition.

Semen Collection and Evaluation (Spermiogram)

Semen collection was performed using an artificial vagina, which simulates the ewe's vagina, maintained at an average temperature of 42°C. For collection, a ewe was used as a teaser and manually restrained to stimulate the male to mount. At the moment of ejaculation, the penis was manually diverted into the artificial vagina to collect the semen.

During collection, the semen was stored in clean, dry, and graduated tubes, protected from sunlight. Immediately afterward, the ejaculate was placed in a water bath at a temperature of 37°C.

Once stored, the semen was evaluated for collected volume, color, appearance (milky, creamy, or watery), and odor. Using a microscope, sperm vigor, wave motion (mass motility), sperm concentration, and sperm morphology were also assessed (Table 3).

Table 3. Semen evaluation values of Santa Inês rams, collected at the demonstration unit focused on reproductive management and andrological evaluation of rams during a practical class in 2024.

Males	**Volume (mL)**	**Wave Motion (1- 5)**	**Motility (%)**	**Vigor (1 - 5)**	**Sperm Concentration (10^9 sptz/mL)**	**Total Defects (%)**
1	0,6	5	70	3	2,7	11,4
2	0,7	4	80	4	6,5	13,5
3	0,8	5	80	4	6,4	19,4
4	0,8	5	80	4	4,0	16,2
5	0,6	3	70	4	3,8	12,9
6	0,6	4	80	5	3,3	9,9

Whirlwind = mass movement

The values presented in Table 3 show little variation among the data, which is due to the fact that all animals were already of reproductive age, received the same diet, and were healthy and fit for reproduction. Semen volume ranged from 0.6 to 0.8 mL, while sperm concentration (10^9 spz/mL) varied from 2.7 to 6.5 × 10^9 spz/mL, and sperm vigor ranged from 3 to 5.

The parameter that showed the greatest variation was total defects (%), ranging from 9.9 to 19.4%. Total defects refer to the percentage of spermatozoa with abnormal morphology, and this parameter also varied among animals. The presence of sperm defects can compromise male fertility, potentially resulting in reduced reproductive performance. Animals with a higher

percentage of total defects should be closely monitored to ensure maximum reproductive efficiency during the breeding season.

According to Frazão Sobrinho et al. (2014), the ideal threshold for total sperm defects should be below 10%. The high values found in this evaluation may be related to factors such as season, age, and temperature, which could explain the differences observed among the semen collections.

RESULTS AND DISCUSSION

The establishment of the demonstration unit focused on reproductive management and andrological evaluation of rams at the Federal University of Grande Dourados (UFGD) has positively influenced the academic development of the Faculty of Agricultural Sciences. This unit provides students with greater contact with sheep farming, while also allowing them to deepen the knowledge acquired in the classroom and daily activities, applying their learning into practice without the pressure to be perfect, as the activities are carried out in an educational environment. This leads to more confident and well-prepared future professionals who understand the importance of andrological evaluations and can interpret the corresponding reports.

Through extension activities focused on education and outreach, both students and producers have been able to increase their understanding of sheep reproductive management—from animal phenotype to spermiogram analysis—which contributes to improving flock reproductive efficiency.

The interaction between students and rural producers and/or their families is essential for academic training. This was also emphasized by Hemsing et al. (2021), who highlighted that the contact between students and producers allows for field experience and the identification of real-world issues within production systems.

This connection between students and rural producers is essential to ensure an exchange of information. Leite et al. (2023) stated that the development of extension activities is facilitated when there is a relationship of trust between extension agents and producers, as this trust allows actions to be carried out more effectively, given that extensionists are familiar with the producers' goals and needs.

From the producers' perspective, this demonstration unit also represents a positive advancement for the sector. It serves as a means of transferring knowledge and new technologies to the sheep production chain, contributing to its growth within the state.

Demonstration units are emphasized by Ramos et al. (2023), who noted their effectiveness in the learning process, enhancing understanding and facilitating the exchange of information and technologies.

The potential of sheep farming is also highlighted, as the activity requires less land area compared to cattle ranching. Moreover, because sheep are smaller animals with lower body weight, they require less feed than cattle, making the activity more accessible and manageable.

Practical activities such as courses, hands-on classes, and technical demonstrations are essential for consolidating learning. They serve not only as a learning process for students but also as technical demonstrations for producers. According to Peruzzi and Fofonka (2014), practical demonstrations play a key role in the educational learning process in higher education, acting as facilitators that significantly contribute to academic development.

Practical activities are crucial for consolidating knowledge and generating valuable experiences that help prepare students for real-world challenges. These experiences are especially valuable because they allow students to apply the theoretical knowledge acquired in the classroom (PAZ et al., 2022).

By engaging in practical activities and projects, students demonstrate a greater overall understanding of the subject and its processes. In a study conducted by Andrade et al. (2024), the authors emphasized that performing activities is extremely relevant for building theoretical and practical knowledge.

Another important benefit of the demonstration unit is that it fosters a stronger relationship between producers and the academic environment, making the university more inclusive and engaged with community needs. This point is reinforced by Facco et al. (2022), who highlighted the importance of universities actively responding to the demands of the communities in which they are embedded.

The demonstration unit focused on sheep reproduction and andrological evaluation is establishing itself as an effective tool that positively contributes to the growth and development of sheep farming.

According to Ortega et al. (2015), a healthy relationship between universities and society should be fostered to promote social and economic development, aligned with the producers' needs while considering the institutions' limitations.

This perspective is supported by Gonçalves et al. (2024), who emphasized the importance of rural extension as a means to support producers, aiming to make them more productive and better equipped to carry out their activities.

The positive influence of these actions on the lives of rural producers and on the promotion of sheep farming is also noteworthy, as sheep production offers a viable option for small-scale farmers. It primarily serves as a source of protein for household consumption, with the potential to sell any surplus (VALE & SOUZA, 2020).

Moreover, through this initiative, students from the Faculty of Agricultural Sciences at UFGD are engaging more closely with producers, gaining insight into the challenges and bottlenecks of animal production—an experience that is vital for their professional training.

CONCLUSION

The activities carried out at the demonstration unit focused on reproductive management and andrological evaluation of rams are fulfilling their role in disseminating essential reproductive practices to all stakeholders, while positively influencing sheep farming in the southern region of the state of Mato Grosso do Sul.

This learning environment strengthens the connection between academic knowledge and rural producers, contributing to the comprehensive training of students and improving reproductive performance in flocks, which can ultimately lead to enhanced financial outcomes for sheep producers.

Furthermore, the knowledge provided to future professionals is fundamental for preparing them to meet producers' needs, supporting greater productivity and profitability within the production system.

The data collected from the animals showed satisfactory results, despite the high percentage of total sperm defects observed in some individuals. This underscores the importance of performing andrological evaluations on rams prior to the breeding season, ensuring greater confidence and effectiveness in selecting suitable breeders.

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