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COMPOST BARN CONFINEMENT DEMONSTRATION UNIT ON A SMALL DAIRY FARM IN THE MUNICIPALITY OF DOURADINA-MS

UNIDADE DEMONSTRATIVA DE CONFINAMENTO COMPOST BARN EM PEQUENA PROPRIEDADE DE ATIVIDADE LEITEIRA, NO MUNICÍPIO DE DOURADINA-MS

UNIDAD DEMOSTRATIVA DE CONFINAMIENTO COMPOST BARN EN UNA PEQUEÑA PROPIEDAD LECHERA EN EL MUNICIPIO DE DOURADINA-MS

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Abstract: Currently, there are various types of cattle farming systems, such as pasture, semi-confinement, and confinement. The confinement system is widely used in Brazil for milk production, bringing well-being to the animals and resulting in higher productivity.

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Consequently, rural producers are opting for the Compost Barn system. This study aimed to present the results obtained from a university extension action based on Compost Barn confinement, developed by professors and students from the Federal University of Grande Dourados/UFGD. The activity was carried out at Sítio Nossa Senhora do Abadia, located in the municipality of Douradina-MS, which has milk production as its main activity. The partnership for the action occurred by implementing a Compost Barn system with a capacity for 30 cows, in a covered shed, having a resting area with rice straw, wood shavings, or sawdust for the animals, separated by a corridor from the troughs and drinkers. Initially, the milk of each cow was weighed, and those with higher production and those not diagnosed with mastitis were incorporated into the confinement. Silage mixed with concentrate was provided in the morning and afternoon. The calves were separated from their mothers on the first day and received milk through a bottle. The results of the extension action demonstrated that the implementation of the Compost Barn enabled increased productivity, with cows producing more milk, a decrease in tick incidence, and no competition for food, as there was greater availability of trough area and abundant food. The occurrence of mastitis cases was lower, in addition to protection against excessive rain and sun, avoiding problems with laminitis. Animal comfort also increased milk production, as well as production, consumption, and environmental control, thus benefiting the rural producer. The action also brought benefits to the extension training of students, improving their knowledge with practical experience. It also made it possible to evaluate a production model to be implemented in other locations, such as in quilombola and settled groups, who, due to the pandemic, could not visit the unit but were able to watch the recorded and edited video. The results of this work fostered the realization of courses with other groups assisted by extension actions, being disseminated in meetings with small producers, settlers, and quilombolas, multiplying the reach of the action.

Keywords: Animal feed, environmental control, university extension, milk production.

Resumo: Atualmente existem diversos tipos de sistema de criação para bovinos, como a pasto, em semiconfinamento e confinamento. O sistema de confinamento é muito utilizado no Brasil na produção de leite, trazendo bem-estar aos animais, resultando em maior produtividade. Com isso, produtores rurais vêm optando pelo sistema Compost Barn (celeiro de compostagem). Assim objetivou-se com este trabalho apresentar os resultados obtidos com uma ação de extensão universitária com base no confinamento Compost Barn, desenvolvido por professores e alunos da Universidade Federal da Grande Dourados/UFGD. A atividade foi realizada no sítio

Nossa Senhora do Abadia, localizado no município de Douradina-MS, que tem como principal atividade a produção de leite. A parceria para a ação ocorreu ao se implantar um sistema Compost Barn com capacidade para 30 vacas, em um barracão coberto, tendo uma área de descanso com palha de arroz, maravalha ou serragem para os animais, sendo separado por um corredor dos cochos e bebedouros. Inicialmente foi realizada a pesagem do leite de cada vaca, sendo então incorporada no confinamento as que apresentaram maior produção e as não diagnosticadas com mastite. Foi fornecida alimentação de silagem misturada com concentrado nos períodos da manhã e tarde. Os bezerros foram separados no primeiro dia de suas mães e receberam leite por meio de mamadeira. Os resultados da ação de extensão demonstraram que a implantação do Compost Barn possibilitou aumento da produtividade, sendo que: as vacas passaram a produzir mais leite, a incidência de carrapatos diminuiu e não ocorria disputa pelo alimento, já que havia disponibilidade de maior de área de cocho e alimento em abundância. A ocorrência de casos de mastite foi menor, além da proteção contra o excesso de chuva e sol, evitando problemas com laminite. Também o conforto animal gerou aumento na produção de leite, além de trazer o controle da produção, do consumo e do ambiente, beneficiando assim o produtor rural. A ação também trouxe benéficos para a formação extensionista dos discentes, aprimorando seus conhecimentos com a vivência prática. Propiciou, ainda, avaliar um modelo de produção a ser a implantado em outras localidades, como no grupo quilombola e de assentados, que, devido à pandemia, não puderam visitar a unidade, mas puderam assistir ao vídeo gravado e editado. Os resultados deste trabalho fomentaram a realização de cursos junto a outros grupos assistidos com ações de extensão, sendo divulgado em reuniões com pequenos produtores, assentados e quilombolas, multiplicando o alcance da ação.

Palavras-chave: Alimentação animal, controle do ambiente, extensão universitária, produção de leite.

Resumen: Actualmente, existen diversos tipos de sistemas de cría para bovinos, como pastoreo, semiconfinamiento y confinamiento. El sistema de confinamiento es muy utilizado en Brasil para la producción de leche, brindando bienestar a los animales, lo que resulta en una mayor productividad. En consecuencia, los productores rurales están optando por el sistema Compost Barn (establo de compostaje). Este estudio tuvo como objetivo presentar los resultados obtenidos de una acción de extensión universitaria basada en el confinamiento Compost Barn, desarrollada por profesores y estudiantes de la Universidad Federal de Grande Dourados/UFGD. La actividad se llevó a cabo en el Sítio Nossa Senhora do Abadia, ubicado

en el municipio de Douradina-MS, que tiene la producción de leche como su principal actividad. La asociación para la acción se produjo al implementar un sistema Compost Barn con capacidad para 30 vacas, en un cobertizo techado, con un área de descanso con paja de arroz, virutas de madera o aserrín para los animales, separada por un pasillo de los comederos y bebederos. Inicialmente, se pesó la leche de cada vaca, y se incorporaron al confinamiento aquellas con mayor producción y las no diagnosticadas con mastitis. Se proporcionó ensilaje mezclado con concentrado por la mañana y por la tarde. Los terneros fueron separados de sus madres el primer día y recibieron leche a través de un biberón. Los resultados de la acción de extensión demostraron que la implementación del Compost Barn permitió un aumento de la productividad, con vacas que producían más leche, una disminución en la incidencia de garrapatas y ninguna competencia por la comida, ya que había una mayor disponibilidad de área de comedero y comida abundante. La ocurrencia de casos de mastitis fue menor, además de la protección contra la lluvia y el sol excesivos, evitando problemas con la laminitis. El confort animal también aumentó la producción de leche, así como el control de la producción, el consumo y el medio ambiente, beneficiando así al productor rural. La acción también trajo beneficios a la formación de extensión de los estudiantes, mejorando sus conocimientos con la experiencia práctica. También hizo posible evaluar un modelo de producción para ser implementado en otros lugares, como en grupos quilombola y asentados, quienes, debido a la pandemia, no pudieron visitar la unidad, pero pudieron ver el video grabado y editado. Los resultados de este trabajo fomentaron la realización de cursos con otros grupos asistidos por acciones de extensión, siendo difundidos en reuniones con pequeños productores, colonos y quilombolas, multiplicando el alcance de la acción.

Palabras clave: Alimentación animal, control ambiental, extensión universitaria, producción de leche.

INTRODUCTION

The confinement regime in milk production has been gaining space on properties, enabling animal welfare, comfort, and higher productivity. In this system, cows receive feed in troughs, requiring comfortable and functional facilities that provide a better environment in terms of thermal comfort to reduce animal stress, thereby increasing their level of well-being and productive response (REZELMAN, 1993).

The acquisition of raw milk in 2019 was 25.01 billion liters, an increase of 2.3% compared to 2018, with an additional 552.42 million liters. A large part of milk production comes from small producers, with 93% of them producing up to 200 liters daily. However, this has been an activity adopted by large producers, gaining space in the national scene (EMBRAPA, 2020).

In 2006, the milking cow herd was 12.711 million heads, moving to 11.507 million in 2017, a difference of 1.2 million cows. It is worth noting that the reduction in heads did not interfere with milk production, as it increased from 20.568 million to 30.156 million liters of milk. It is noticeable that milk production increased while the number of cows decreased, indicating improved animal productivity, genetic improvement, and efficiency of production factors that have been gaining space on properties (EMBRAPA, 2020).

Currently, there are various cattle farming systems, from open field pasture to semi-confinement and confinement. Brazil has most of its cattle raised in the extensive system, considered a more economical and practical way to produce and provide food for animals, given Brazil's favorable climatic characteristics (CARVALHO et al., 2009; DEBLITZ, 2013; FERRAZ; FELÍCIO, 2010). However, due mainly to the seasonality of rain in certain regions, forage production is not constant throughout the year, which necessitates observing animals with weight loss, especially during food scarcity, such as in the winter months, resulting in low production rates (ARRIGONI; MILLEN, 2013).

For milk production, the confinement system has proven to be advantageous, recurrent, and necessary in many countries such as the USA, Israel, Japan, among others. The use of this system in these countries occurred due to the scarcity of available land and the high costs of those near metropolitan limits, as well as the limited potential and seasonality of pastures to sustain high production with genetically improved herds (Novaes, 1993).

In Brazil, there are different types of confinement for dairy cattle, such as individual stalls, called Tie Stall (TS), and free stall systems with Loose Housing (LH) and Free Stall (FS) models, which are the most known by producers, and the more recent Compost Barn (CB) (MAIA, 2018). The Compost Barn originated in the United States, stemming from adaptations of the Loose Housing system (BARBERG et al., 2007).

With the application of the Compost Barn system, there is no need for extensive pasture areas, as dairy farms can be concentrated, thus offering small, medium, and large producers an alternative to increase production, providing more comfort and hygiene for the herd, reducing leg and hoof problems, as they do not need to walk in search of food, in addition to somatic cell

count (SCC). This results in an important effect on increasing production and growth, as well as profit (MAIXNER, 2020).

However, confined dairy farming is an activity that requires producer dedication to attend to all stages, which implies an increase in working hours compared to the traditional pasture farming activity. This factor increases production costs, requiring specialized labor. Still, there are advantages such as more productive management and animal welfare, favoring high milk production without compromising the reproductive and sanitary aspects of the animals (PEREIRA et al., 2010). Thus, this system allows for control of animal intake, in quantities and with the ideal quality for profitable milk production (FRANCO, 2009).

It is important to highlight that in university extension actions, the proximity between the university and producers is fundamental, as it constitutes a link that facilitates planned actions with the unit, since it is possible to exchange knowledge, between those inherent to academic knowledge, combined with the site owner's experience in their daily work. In milk production, extension program actions are a strategic and crucial way to transfer technologies and knowledge generated by academics to rural producers (CENCIA, 2016).

DEVELOPMENT

This work was developed at Sítio Nossa Senhora do Abadia, representative of dairy cattle farming, located in the municipality of Douradina-MS. The property has 60 hectares, located in a tropical climate region with latitude 22° 13′ 18″ South and longitude 54° 48′ 23″ West.

Only female cattle are raised on the property. Immediately after birth, the calves are allowed to suckle colostrum and then separated from the cows, placed in individual shelters until they reach 90 days of age. After this age, they are taken to the confinement area until they reach reproductive age, when they are inseminated and enter milk production. Most of the cows on the property are of the Holstein breed, totaling 83 cows in an artificial insemination system without a cleanup bull. The site owner receives technical guidance from specialized companies and professors from the Federal University of Grande Dourados for cattle management, who develop research and university extension actions there. It is worth noting that before this extension action, the site owner used a different management system, where all cows were kept together in the pasture without any monitoring. At that time, the average milk production was 15 liters per cow. Regarding feed, silage was provided twice a day in troughs, and during pasture seasonality, concentrate consumption was provided during milking. The site owner did

not maintain qualitative control of the milk produced by his cows or the incidence of mastitis, which was quite high.

Given the scenario, a 30-cow capacity Compost Barn confinement system was implemented, consisting of installing a covered shed measuring 33m x 12m (length x width), with a resting area for the animals measuring 33m x 9m (length x width), containing 40cm of rice straw, wood shavings, or sawdust on its floor. Another area installed in the shed was for feeding, measuring 33m x 3m, with a 100L water trough and 10 troughs of 3.3m each (Figure 1). The resting area was separated from the feeding area (troughs and drinkers) by a 1.30m high concrete wall, creating two access spaces to the troughs at its ends.



Figure 1. Shed with resting area (A) and feeding area (B).

In Figure 1A, we can observe the resting area with ample space, free of animal waste, which can negatively affect animal health. Figure 1B shows that, during feeding, the animals are separated from the trough, with access only to their heads, making this model viable as there is no competition between them, allowing ad libitum feeding. Regarding the shed's hygiene, daily washing of the feeding area was introduced using a high-pressure hose, and a waste drainage channel was built, leading to a waste basin, from which they are later removed to be spread on the site's plantations, serving as organic fertilizer, as shown in Figure 2.



Figure 2. Waste deposit from the Compost Barn confinement system.

Regarding the resting area, the bedding was managed by frequently turning it, controlling moisture and density, providing a dry, comfortable, and healthy surface. The bedding material, when mixed with cow feces, generates a high-quality fertilizer in terms of organic matter, an excellent soil fertilizer. Thus, when the producer sees the need to change the bedding, all material is removed and spread on the soil, usually on the corn plantation, which is intended for the cows on the site.

The milk production of each cow began to be measured by weighing the milk with an automatic meter (Figure 3), and mastitis diagnosis was done using the black-bottom mug test, selecting which animals would go to the confinement, i.e., those with higher production and no mastitis diagnosis were selected for the Compost Barn confinement.



Figure 3. Automatic milk meter during milking.

The site owner began weighing the milk once a month and, depending on the milk production results, also relocated cows in the Compost Barn. Thus, those selected received silage and concentrate according to production, in two periods, morning and afternoon.

It is worth noting the aspects that make up university extension, exposed by Olinger (1998), which composed the daily life during the work's installation, as UFGD professors and students were constantly present at the site, following the project's construction, suggesting how the drinkers, troughs, and resting areas should be built. They contributed to the action having technical knowledge, inherent to the learning from university classrooms, combined with the practice of people who live from activities on the site.

This exchange was fundamental to the activity's success, not only in the economic sense but also in the social bonds created between subjects from different social spaces, those who brought the theoretical baggage from classrooms, combined with the practice exercised by people who live in the field. In an interview, Professor Dr. Euclides Reuter de Oliveira mentioned: "all our actions, both research and extension, have a knowledge exchange bias" (MENEGAT and CENCI, 2019). This reflects in the extension actions developed, whether with beekeeping, organic horticulture, silvopastoral systems, semi-free-range poultry farming, reforestation, and milk production, highlighting the economic and subsistence field. The

benefits of university extension in question are numerous during the presence of students and professors in the work's installation process. We can cite the moment of milking the cows, when the students, who started living on the site during the first stages of the unit's installation, holders of academic knowledge, defended the technique of applying knowledge combined with local needs. On the other hand, the site owner executed his practice based on knowledge over time. In the construction of facilities such as troughs, drinkers, animal resting area, ventilation, and waste drainage, there were also differences in ideas, when the owner defended some non-technical placements and the professors and students argued for the construction to bring something practical, comfortable for the animals, and easy local management. Corn management procedures up to silage execution also figured in this logic, when technical information was passed. And in this dialogue of different knowledge and practices, the experience with the shed's construction and dairy cattle management was built, making the extension activity reach other social dimensions, especially those recommended in extension actions, those of partnerships, where different knowledge merge and give meaning to new knowledge.

The dialogue carried out with the action was in line with that recommended by Brandão (1999) and Simon (1996), when they defend that university extension should interact with the community, aiming for a transformation that considers local knowledge and desire.

It is worth noting that the initial intention was to share the stages of the demonstrative unit's installation with the surrounding community of the property where it was created, as well as to receive small farmers from rural settlements and the quilombola community, so that these groups could see all the steps of this economic activity in loco. However, due to the Covid pandemic and social distancing rules, it was not possible to enable visitation on the site. For the publication of the action's execution stages, the student group filmed and edited videos that serve to propagate the knowledge obtained, thus focusing on sharing experiences, one of the essential elements in university extension actions, which defends the exchange and propagation of knowledge.

The results of this action are evidenced, pointing out the faces of the installation, the successes achieved, and the perspectives that show up with extension experiences, which aim to materialize favorable means not only for the site producer where the unit was created but for the surrounding community, providing access to new production practices and economic and social improvement.

RESULTS AND DISCUSSION

With the implementation of the confinement system, it was possible to observe greater productivity in dairy farming and, consequently, higher returns for the site. Before the experiment's installation and the monitoring by UFGD extension professors, we observed that each animal's production averaged 15 liters of milk; after moving to the confinement, they started producing about 20 to 25 liters of milk per day.

The increase in average milk production is justified by several factors, including better feed, provided in a calculated and adequate manner, with no reduction in consumption at any time of the year, as well as the controlled environment of the shed installation, inhibiting stress.

With the shed, there was no reduction in consumption due to the animals' increased body temperature, as they started staying in a cooler and more comfortable environment, without direct exposure to the sun, avoiding stress and physiological changes that affect their productive performance, unlike the other animals that remained in the pasture. It was found that there was no competition for food, with greater availability of the trough area and food provided in abundance.

The incidence of ticks decreased considerably, as the cows were confined in a covered area, without access to pasture, avoiding direct contact with the host. This reduced problems with pesticide residues in milk, stress caused by tick control methods, and, mainly, losses generated by ectoparasites, whether in control or even in production reduction.

In the model used on the site before the experiment's installation, the cows were loose in the pasture, without control over where they lay down, thus keeping the udder in direct contact with the soil, a situation that facilitated mastitis incidence. With the confinement's implementation, the probability of mastitis occurrence was eliminated, with no cases, as the cows started lying on the soft and dry bedding of straw, wood shavings, or sawdust, facilitating hygiene during milking. Additionally, there was greater protection against excessive rain and sun, avoiding laminitis problems. The incidence of flies decreased due to better hygiene in the area.

The site owner started using pasture areas, which previously housed loose cows, to cultivate corn and soybeans, food intended for the animals, which reduced feed costs. Furthermore, more animals are being raised in a smaller space with higher productivity.

Another positive point after the Compost Barn confinement's implementation was that the producer started using waste and bedding compost as organic fertilizer for corn, soybean,

and pasture plantations, saving on fertilizer purchases and increasing production through organic fertilization.

Similar results were obtained in the state of Espírito Santo (Redação Safra ES, 2020), where 45 rural properties in 28 municipalities have the Compost Barn system. Producers who adopted the system evaluate positive points as low installation cost, ease of cow management, tick control, reduction in mastitis cases, increased production, and improved milk quality," highlights the Secretary of Agriculture of Cachoeiro, Robertson Valladão (Redação Safra ES, 2020).

Another example is the municipality of Jerônimo Monteiro, in the south of Espírito Santo state, where the 3E farm has the Compost Barn system, a property that maintained the pasture system (rotational paddock), with an average production of 24 liters per cow/day. After confinement, the same animals started producing an average of 40 liters/day, an increase of around 70%, which translates into financial return for the property (Redação Safra ES, 2020).

In conclusion, with the implementation of the confinement system at Sítio Nossa Senhora do Abadia, in the municipality of Douradina-MS, several advantages were observed, such as the satisfaction of people who live from the income of the work invested in the property, and with the increase in productivity, the improvement in people's living conditions. To draw an analogy with extension activities in other areas, Oliveira et al. (2019), analyzing the training indicator, it can be inferred that the results are directly linked to the work developed with producers. These authors also highlight that research work combined with rural extension from the Federal University of Grande Dourados (UFGD) brought to the community technical training in beekeeping, focusing on management techniques for increased productivity, participatory methodology, concern for sustainability, and logistical support for activities from the beginning of their implementation, in group formation, among others, in addition to concern for the environment.

In addition to the benefits regarding economic factors, during the work's installation process, there was proximity between the neighborhood of that community, sharing knowledge acquired with the experiment's installation practice, exchanging experiences, and strengthening social bonds in the locality's groups. However, this approximation also occurred between the UFGD academic community and food producers, sharing scientific knowledge combined with the practices that producers have, bringing improvement in production processes and in the training of students and professors. The university started to be seen by rural people as an institution that can, through the knowledge passed on, assist in the direction of transformations in the field.

CONCLUSION

It is concluded that the Compost Barn system contributed positively to the property, bringing improvements that generated an increase in milk production, animal welfare, as well as production and consumption control, thus benefiting the site owner. There was a reduction in tick incidence, lower probability of mastitis and laminitis problems, and no competition for food.

Furthermore, it is important to emphasize that extension projects, such as the one reported in this article, are fundamental to university life, both for professors and students, because they complement academic training, bringing the possibility of participating in actions where knowledge goes beyond the scope of classrooms, in a dialogue with the field, the place where this knowledge is applied, making it possible to confirm that science is fundamental to society's development.

University extension is the university's axis that drives the exchange of knowledge between the university and the community, fundamental for current times, providing an opportunity to expand the space for knowledge and experience exchange, propagating knowledge.

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