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SUSTAINABLE FAMILY FARMING: INTELLIGENT MANAGEMENT OF NATURAL RESOURCES

VIVIANE MALLMANN, LUCAS WAGNER RIBEIRO
ARAGÃO, ROGÉRIO CÉSAR DE LARA DA SILVA



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Sustainable Family Farming: Intelligent Management of Natural Resources

**Viviane Mallmann; Lucas Wagner Ribeiro Aragão;
Rogério César de lara da Silva**

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Abstract: *The present study aimed to analyze the economic results of dairy management at the Alvorescer farm, located in Japorã-MS, from January 2012 to June 2015. To evaluate the economic viability of the management, monthly milk revenues were analyzed. The study concluded that increasing pasture variety and substituting some medications with homeopathy resulted in a 4% reduction in milk production costs from 2012 compared to the first half of 2015, consequently leading to higher monthly income. This work demonstrated the viability of milk production with the proposed management type, as data showed increased earnings and reduced expenses.*

Keywords: *dairy activity, homeopathy, management, pastures, sustainability, profitability.*

1. Introduction

Milk, in addition to being one of the most complete foods, is essential for growth, development, and maintaining a healthy life. Spread worldwide, countless countries produce billions of liters each year. In Brazil, milk production ranks among the top activities in the agricultural sector, generating billions of reais annually and thousands of rural jobs. It is also widely practiced in the state of Mato Grosso do Sul and in Japorã, where the studied farm is located.

However, the milk industry has struggled with price deregulation since the early 1990s. Additionally, the economic opening in the first half of the same decade and the economic stability brought about by the implementation of the Real Plan have influenced the performance of Brazilian agribusiness. Factors such as climate change, neglect of government policies, lack of competing dairies, seemingly high costs relative to returns, product devaluation during periods of high supply, and appreciation during shortages are also issues likely to affect the dairy sector's performance, particularly in primary production.

In this context, economic analysis of the activity becomes essential to quantify the profitability of the venture and identify potential bottlenecks in the production system, enabling a more accurate assessment of the actual efficiency conditions of the farms. This facilitates the allocation of production factors (land, capital, and labor), compelling producers to make more rational decisions and plan their businesses.

Among the main studies conducted on the economic analysis of dairy and other agricultural activities are Matsunaga et al. (1976), Lopes and Carvalho (2000), Gomes (1999), Lopes et al. (2006), and others. Matsunaga et al. (1976) has been used as a reference by the National Confederation of Agriculture (CNA) in the Campo Futuro Program to help producers calculate their costs, including milk production.

Dairy production generates jobs, income, and taxes; this activity is important due to the constant use of labor and is the livelihood of many families living in rural areas. Milk provides stable income, and although production and productivity may be low in family farming, it ensures a constant cash flow for producers.

According to Michels (2003), in Mato Grosso do Sul, the state agricultural federation estimates that the dairy sector is already the third most significant economic activity, with approximately R\$ 130 million annually, generating more than 66,000 jobs, securing the ninth position in national milk production rankings. The dairy sector gained momentum in the mid-1990s and ranks ninth in national milk production (2006 data).

However, for the dairy sector to improve in productivity and quality, further studies are necessary. Given that each region of Brazil has different climatic and soil characteristics, there is no one-size-fits-all recipe for managing dairy cows. Since most of the cows' feed is typically produced on the farm, it is essential to develop experiments and studies aimed at selecting pasture and grain cultivars that are best adapted and productive for the region and establishing a balanced diet at each stage of the animal's life.

An interesting fact is that proper management of available natural resources for dairy cows can lead to significant productivity increases and reduced production costs on the farm. Three critical factors need to be evaluated: annual forage production, animal stocking rate per hectare, and the amount of food purchased outside the property.

Regarding cow feeding, it is known that pastures represent the most economical source of feed for herds today, and pasture-based milk production not only has lower costs compared to conventional intensive systems but also helps preserve renewable resources (HOLMES, 1996; OLIVEIRA et al., 2000).

Thus, this study aimed to examine the economic viability of milk production on a property located in Japorã - MS, where milk production and sales are just one of the family's sources of income. The objective was to monitor the implementation of a

dairy production system, identifying existing bottlenecks in the implementation and analyzing the gross monthly income from the activity on the property from 2012 to 2015.

2. General Objective

Evaluate the development of dairy activity on a farm in the municipality of Japorã-MS.

3. Specific Objectives

- Correlate factors contributing to the increase and maintenance of milk production from cows on the farm;
- Assess the annual milk production from January 2012 to June 2015;
- Analyze the net income from dairy activity during this time period;
- Identify items that reduced the costs of milk production on the farm.

4. Methodology

The methodology for data analysis was based on the work of Marion (2004), which developed electronic spreadsheets subsequently populated with monthly information on income and expenses related to the activity. Milk production data were summed month by month and divided by twelve to obtain the monthly average production in liters. The value of the net monthly income was calculated by summing the gross monthly values divided by twelve, subtracting the expenses.

5. Development

Brazil is the fifth largest milk producer in the world, behind the United States, India, China, and Russia. Goiás ranks first in milk production in Brazil, accounting for 27.3%, followed by Rio Grande do Sul with 11.8% and Paraná with 11.7%. As of 2010, Mato Grosso do Sul had 23,970 dairy farms, representing a 1.7% share of the country's milk production. In the state, the southwest region contributes most to production with 51%, followed by the east with 21%, the north-central with 20%, and finally, the Pantanal region with 8% (IBGE 2010). According to EMPAER (the state research and rural assistance company), Mato Grosso do Sul has eight dairy basins. This study was conducted on a property in Japorã-MS, which

belongs to the southern cone dairy basin of the state; see its economic characteristics in Table 1.

According to Dahmer (2006), the milk production chain in Mato Grosso do Sul is primarily structured around small producers, with approximately 62.5% producing up to 50 liters per day. These producers require specific attention and constant monitoring from both the industry and the state.

5.1- Acquisition of Animals

The farmers chose to buy four pregnant Jersey heifers to start operations in 2012. Acquiring this breed of cattle facilitated dairy management on the property. There are many advantages to working with them, including high productivity compared to other breeds, early maturity in producing milk and breeding, and longer lifespan, as they produce milk for a longer period and are docile. Jersey cattle efficiently convert feed and forage into milk production, performing well in commercial facilities and grazing programs, requiring less pasture area per cow. As grazing intensity increases, profit per hectare also rises (MORAES JÚNIOR, 1997).

Figure 1 shows the cows grazing in a Tifton-85 paddock system.

Fig. 1: Jersey cows grazing in a paddock on the property.



Source: Viviane Mallmann.

The heifers acquired in 2012 quickly began producing, averaging about 12 liters of milk per day per head. In 2013, four more cows in their second year of lactation were purchased, bringing the total to eight cows, which had an average daily lactation of 18 liters. The herd remained unchanged in 2014. However, at

the beginning of 2015, two less productive cows were sold, and four pregnant heifers were acquired, significantly increasing the family's income to an average monthly net profit of R\$ 2,721.60. Over three and a half years, the family's income rose from R\$ 477.36 to R\$ 2,721.60, totaling R\$ 75,003.84 in net income.

Table 1: Characterization of the Southern Cone Dairy Basin in MS

<i>Dairy Basin</i>	<i>Municipalities Included</i>	<i>Main Economic Characteristics</i>
<i>Southern Cone Basin</i>	Amambaí, Aral Moreira, Coronel Sapucaia, Eldorado, Iguatemi, Itaquirai, Japorã, Juty, Mundo Novo, Navirai, Paranhos, Sete Quedas, and Tacuru.	This basin is influenced by southern Brazil's agricultural practices. It prominently features milk cooling techniques since a large volume of production is destined for the states of São Paulo and Paraná. There is an organization among producers to improve the production system, better genetics in the herd, and associations of producers to meet the requirements of industries in the region.

Source: prepared by the author(s) based on MICHELS (2003), EMBRAPA, and FAMASUL.

Table 2: Estimated income result for the period from January 2012 to June 2015.

Year	Average Liters/Month	No. of First Cows	No. of Second and Third Calf Cows	Average Monthly Value	Gross Monthly Income	Monthly Expenses %	Average Monthly Profit
2012	1,440	4	0	0.65	702.00	32	477.36
2013	4,320	0	8	0.89	2,883.60	30	2,018.52
2014	4,560	0	8	0.90	3,420.00	30	2,394.00
2015	5,040	4	6	0.92	3,780.00	28	2,721.60
Total estimated income from 2012 to 2015:					R\$ 75,003.84		

Source: Viviane Mallmann.

The profits during this period increased not only due to the rise in the number of cattle on the farm but also because of reduced expenses on allopathic medicines. This was made possible by implementing five feeding practices: 1) Establishing a grazing area with two additional grass varieties, *Brachiaria* and *Mombaça*, alongside the existing *Tifton 85*; 2) Introducing feed in the trough with corn silage and colonian; 3) Providing *napié* grass and crushed sugarcane daily when grazing decreased; 4) Adding cassava to the cows' diet with balanced feed, using the root as croquettes and leaves in powder; 5) Introducing black oats for winter grazing to ensure a protein source during periods of low pasture growth.

The dietary changes required considerable investment, but the return was immediate. Healthy animals significantly reduced the need for medications, and some homeopathic remedies were introduced into the management. With all these changes on the farm, not only was an increase in average monthly profits expected, but also a decrease in expenses, which turned out to be true. At the end of each month during these three and a half years, balances were conducted to assess the average expenses for milk production, revealing a 4% decrease from 2012 to the first half of 2015.

5.2 - Pasture Management

It is known that dairy cattle feed must be abundant year-round, both in the dry and rainy seasons. Nutritional supplementation using bulky or concentrated feeds should accompany the diet of dairy cows, as their body condition is crucial. Cows must calve in very good condition to ensure they exhibit estrus and can be bred within a short service period, specifically 90 to 120 days postpartum. Cows should calve fat because they will face the stress of calving, lactation, and often changes in diet if they have not been receiving the feed of lactating cows before calving. Thus, not adhering to these practices can hinder the animal's reproductive performance.

(BRESSAN et al., 1997).

To ensure various protein sources throughout the year, a rotational grazing system with three different grasses was adopted: one and a half hectares of Mombaça, half a hectare of *Brachiaria decumbens* Stapf, and two hectares of Tifton 85. Protein, after energy, is the nutrient required in larger quantities by ruminants (BRESSAN et al., 1997). During the winter months, when other grasses decrease in forage, about four hectares of oats are planted for the cows to graze until warmer temperatures begin.

Mombaça grass is a cultivar of *Panicum maximum*, native to Africa, collected by the Institut Français de Recherche Scientifique pour le Développement en Coopération (Orstom) and released in Brazil by Embrapa Gado de Corte in 1993. This cultivar produces 33 tons of dry leaf matter per hectare per year, with an average protein content of 13.4%.

On the farm, *Mombaça* occupies an area of one and a half hectares, featuring fifteen paddocks for rotational grazing. Figure 2 shows the system on the left side, adjacent to the corn planting area.

Fig. 2: Planting of Mombaça on the property.



Source: Viviane Mallmann.

Brachiaria decumbens Stapf has a protein content ranging from 5.0% to 9.0%. While it shows good tolerance to acidic soils, it responds well to fertilization and has high yield potential in fertile soils. It tolerates fire and withstands water deficiency. Its growth habit is tufted, producing semi-decumbent stems with rooting nodes that form new tufts, providing excellent soil coverage. It thrives in summer but is adversely affected by low temperatures and frosts. Although it occupies a significant pasture area in the Midwest, its hay is generally of low quality, with high fibrous content and low digestible protein and energy. Figure 3, the cultivar's paddocks are displayed.

Fig. 3: *Brachiaria decumbens* Stapf pasture.



Source: Viviane Mallmann.

Tifton 85 grass is a good option for animal production systems, whether in pastures or as hay, offering both primary and secondary productivity (PEDREIRA et al., 2000). In the family's site studied, a profit of two thousand eight hundred reais from hay was achieved within the first two months of 2012. Below is Figure 4, showing the Tifton 85 pasture system:

Fig. 4: Food production in the mandala system.

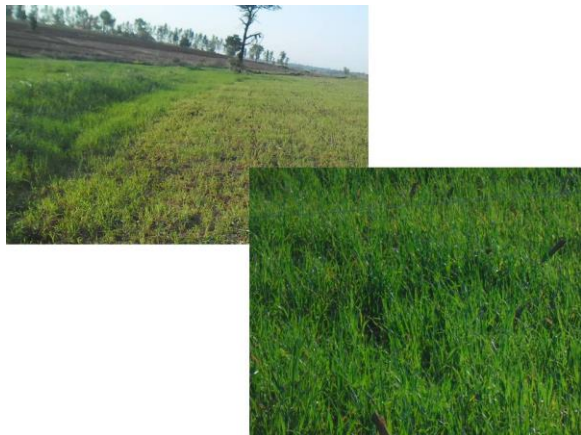


Source: Viviane Mallmann.

Black oats, *Avena strigosa* Schreb., are used on the property as an alternative during the winter months in the region when other pasture protein sources develop more slowly. Among the temperate grasses, black oats have emerged as effective forage alternatives in production systems, being the most prominent in integrated crop-livestock systems in the South Region and also utilized in other Brazilian states (GERDES et al., 2005; FLOSS, 1988). Every year,

about four hectares of the cultivar are sown shortly after the maize harvest, managed with 30 paddocks, rotating daily. Below is Figure 5, showing the black oat paddocks:

Fig. 5: Black oat paddocks.



Source: Viviane Mallmann.

Another grass used on the property is elephant grass. According to Rodrigues et al. (2001), elephant grass, known as napié, originates from the African continent, specifically from Tropical Africa, between 10°N and 20°S latitude. It was discovered in 1905 by Colonel Napier, spread throughout Africa, and was introduced to Brazil in 1920 from Cuba. Today, it is widespread across all five Brazilian regions. It has varieties with thick stems, wide leaves, an intermediate flowering period (April to May), and open clumps. Its use has proven to be a good alternative for summer, showing rapid growth with a 30-day cycle. Approximately five kilograms of napié are cut and crushed per head of cattle each day, occupying half a hectare on the property. The following Figure 6 shows the production of elephant grass on the property.

The colonião (*Panicum maximum* Jacq CV), native to Africa, is recognized for its protein production, ranging from 6% to 11% (ALADARES FILHO, 2000). On the Mallmann family farm, this grass has been cultivated alongside corn and oats since 2012, creating a profitable consortium. The colonião is processed into silage, providing about five kilograms daily for the cows, which is crucial for maintaining milk productivity.

Fig. 6: On the right, a stand of napié grass at the cutting point; on the left, the area it occupies.



Source: Viviane Mallmann.

Additionally, the introduction of homeopathies like Pulsatilla CH 30 and Phytolacca CH 30 improved the cows' well-being during calving and reduced cases of mastitis, leading to more complete milkings. The calves also received homeopathic treatments, showing excellent weight gain. These practices, focused on sustainability and efficiency, were made possible through continuous study and training.

6. Conclusion

This study demonstrates that dairy farming is crucial for the subsistence and settlement of families in rural areas, particularly in the agribusiness sector of Mato Grosso do Sul. However, professionalization is needed to enhance productivity and quality. Government incentives for new technologies and genetic investments are essential.

Data show that diversifying pastures and using homeopathy reduced production costs by 4% between 2012 and mid-2015, leading to increased monthly income. The Brazilian dairy market has the potential for international quality, requiring structural reforms and efficient resource management to become a leading producer in the state.

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