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Environmental Technology

Economic indicators of conventional and ecological-based milk production

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ABSTRACT

The global dairy sector has significant numbers: 133 million properties maintain 363 million head of cattle suitable for dairy farming, occupying 20% of the planet's agricultural land. Since the beginning of the 1990s, dairy farming has undergone major transformations in our country, seeking to become competitive and innovative in the global market. With such importance for the economy and for many families, the control of the costs of the property is fundamental because from this it is possible to evaluate the performance of the activity and make the best decisions. The research was carried out in two dairy-producing properties, one in the process of implementing an ecological-based system with De Voisin Racional Pasture (PRV), located in the Santa Júlia Settlement, in the interior of the municipality of Julio de Castilhos-RS. The other property has a conventional production system and is located in the Community of Line One, in the municipality of Nova Palma-RS. Both properties have milk production in pasture as the main source of food for animals. Food represents the highest cost of dairy production; the use of pasture can be a cheaper food and can contribute significantly to reducing the cost of activity. The permanence of families in the dairy activity depends on cost management and management control to better manage their expenses and revenues and with this, improve the productive system practiced and / or that best suits their conditions.

Keywords: Production cost; Pasture systems; Agriculture

RESUMO

O setor global de lácteos apresenta números expressivos: 133 milhões de propriedades mantêm 363 milhões de cabeças de gado adequadas para a pecuária leiteira, ocupando 20% das terras agrícolas do planeta. Desde o início da década de 1990, a pecuária leiteira passou por grandes transformações em nosso país, buscando se tornar competitiva e inovadora no mercado global. Com tamanha importância para a economia e para muitas famílias, o controle dos custos do imóvel é fundamental pois a partir disso é possível avaliar o desempenho da atividade e tomar as melhores decisões. A pesquisa foi realizada em duas propriedades com produção leiteira, uma em processo de implantação de um sistema de base ecológica com Pastagem De Voisin Racional (PRV), localizada no Assentamento Santa Júlia, no interior do Município de Júlio de Castilhos-RS. O outro imóvel possui um sistema de produção convencional e está localizado na Comunidade de Linha Um, no Município de Nova Palma- RS. Ambas as propriedades têm a produção de leite na pastagem como principal fonte de alimento para os animais. A alimentação representa o maior custo de produção leiteira; o uso de pastagem pode ser um alimento mais barato e pode contribuir significativamente para reduzir o custo da atividade. A permanência das famílias na atividade leiteira depende de gestão de custos e controle gerencial para melhor gerir suas despesas e receitas e com isto, melhorar o sistema produtivo praticado e/ou que melhor se adequa as suas condições.

Palavras-chave: Custo de produção; Leite a pasto; Agricultura

1 INTRODUCTION

The figures of the global dairy sector draw attention, as there are 133 million farms, 363 million heads with dairy aptitude, 20% of the agricultural land of the occupied planet and more than 600 million people living on dairy farms (FIGUEIREDO, 2019). Milk is the third agricultural product in total production and the 1st in monetary value, providing 5% of energy, 10% of protein and 9% of the fat consumed globally (FIGUEIREDO, 2019). Brazil is the world's fourth-largest producer of milk (FAO, 2017) and this product is the sixth national product with the highest gross production value (MAPA, 2018), being essential in the food supply and in the generation of employment and income.

According to the Food and Agriculture Organization of the United Nations (2016), the UN agency, some 150 million families worldwide are involved in dairy farming, and

it is characteristic of most developing countries producing small producers because it allows a quick return to small producers.

Corrêa *et al*. (2010) and Paes-de-Souza, Amim and Gomes Souza (2009) state that, since the beginning of the 1990s, dairy cattle have undergone major transformations in our country, seeking to become competitive and innovative in the global market, focusing on scale production with quality, added value and industrialization of differentiated products. The milk production chain in the world is experiencing an accelerated process of technological modernization, which highlights: a) Reduction of the total number of cows used for milk production; b) Increase in the individual size of the properties in the area, the number of cows and the volume of production; (c) reduction in the number of milk-producing properties; d) Improvement of the genetic potential of the herd; (e) increased production in most producing countries; and, f) Growth in the overall quality of supply and production (VILELA *et al.*, 2017). This scenario of intensification of production led to the exclusion of producers, especially in Brazil. In Brazil, 80% of milk production units belong to family agriculture (PA) (ALTAFIN *et al.*, 2011; PERES; DE COSTA; LEAL, 2021), and in the State of Rio Grande do Sul (RS), 97.5% are family farmers (EMATER/RS-ASCAR, 2019).

In the State of Rio Grande do Sul, according to EMATER/RS-ASCAR (2019), milk production is present in 152,489 rural properties present in 494 of the 497 municipalities of the State, and these are distributed in three categories: producers with formal economic activity, producers with informal economic activity and producers without economic activity. Producers with formal economic activity are those who sell raw milk to industries, cooperatives or cheese producers, and those who process milk in their own legalized agroindustries. These totals are 50,664 producers, a percentage of 33.22%. Producers with informal economic activity add up to 11,023, or 7.23%, and some sell raw milk and dairy products made directly by domestic producers to consumers (EMATER/RS-ASCAR, 2019).

However, between 2015 and 2019, there was a reduction in the total number of families producing formal commercial milk from 84,199 to 50,664, making up a relative

percentage of 39.8% farmers who abandoned the activity. On the other hand, an increase in the number of animals per producer, average production per animal and average production per producing property was observed in the period 2015 to 2019, indicating an increase in activity specialization. However, this specialization that increased the production of properties that remained in the activity was not enough to maintain the production of 2015, and there was a reduction in the annual production of the state by 271 million liters (EMATER, 2019).

One factor to be considered in this process of exclusion of small families is that companies and cooperatives that industrialize milk have gradually increased the minimum scale of daily collection. Today, several companies and cooperatives collect only more than 100 liters per day. In this process, families with low investment capacity and smaller areas were excluded. Balem *et al.* (2019) show in a study conducted in an agrarian reform settlement in Júlio de Castilhos-RS, that from 2011 to 2019, 56% of families were excluded, i.e., in 2011 there were 48 families producing milk and in 2019 only 21. This study also shows that it was the smaller and less capitalized families that abandoned the activity due to the requirements of volume, quality, high cost of production and price fluctuations (BALEM *et al.*, 2019).

Nunes (2018) states that the cost of production is an essential part of the management of the rural enterprise, in addition, it is an exceptional tool for the control and management of productive activities and the generation of important information to support decision-making by rural producers. And also, for the formulation of strategies by the public sector. According to Moreira *et al.* (2016), when producers do not stick to any planning and do not adopt any type of control of their activities, especially with regard to their production costs, they may have difficulties to remain in the market.

Given this scenario, the problem of this article is situated in the dairy activity is an opportunity for family farming? How to avoid the exclusion of thousands of families? Are milk production systems and activity management directly related to the exclusion of families?

Considering the importance of dairy farming for family farming and the management context within these realities, the article aims to discuss the role of management and production systems practiced for the permanence of family farmers in the production chain. The article is structured in six sections, the first being this introduction, the second a reference to pasture milk production; the third section discusses the importance of managing and collecting economic data in rural establishments. The fourth section corroborates the methodology used for data collection and analysis. The fifth section presents the results and discussions. Finally, section six of this article presents the final considerations and some questions that may generate new research.

2 PASTURE-BASED MILK PRODUCTION: A LOW-RISK ALTERNATIVE TO FAMILY FARMS

In the view of conventional agriculture, agricultural systems are subsidized by fossil energy, nutrients from industrial synthesis and agrochemicals, which does not imply their ecological and economic sustainability (ALTIERI,2012; CANAVER *et al.*, 2006). Proof of this is the reality of farmers facing a general picture of progressive increase in the costs of insum and equipment in recent decades, with a tendency to stabilize and even reduce the prices of primary products paid to producers (CANAVER *et al.*, 2006). In the case of the milk production chain, according to Breitenbach and Souza (2010), the transformations that the Brazilian sector has been going through from a structural and institutional point of view occur in an imperfect competition market, which causes ever-lower profit margins, especially for farmers.

The productivity increases obtained from technological advances did not lead to increased profits for the producer; on the contrary, it justified the narrowing of the profit margin per unit produced (CANAVER *et al.*, 2006). This is the case of feedlot milk production systems that have shown an average operating production cost of 83%, and in some properties, this cost is close to 90%; in this same research, the authors observed that, when analyzing the total cost of production, the economic result of most

properties is negative, which is due to the high investments needed for confinement (SANTOS; LOPES, 2012; SANTOS; LOPES, 2014). In another study, Lopes, Santos and Carvalho (2012) observed that the economic analysis performed in semi-confinement systems presents positive results, while the total containment systems presented negative gross margin, indicating that producers are decapitalizing and indebted because the revenues obtained were not sufficient to pay even the actual operating expenses. Pieniz (2016), which studies several dairy families in RS, found properties where costs represent 57% of revenues and, according to the author, less efficient groups that presented consecutively 72% and 130% share of costs on total revenue.

One of the contexts discussed by the literature on the exclusion of small family farmers from dairy farming are the production systems practiced (BALEM; MACHADO, 2019; BALEM *et al.*; 2019). Authors show that ecologically based production systems with pasture-based milk production in rational pasture systems are more productive, more profitable, with lower production cost, lower risk and with healthier herd, which implies better milk quality and systems more suitable for family farming (PINHEIRO MACHADO, 2005; CANAVER *et al.*, 2006; LIMA, 2017; BALEM; MACHADO, 2019; BALEM *et al.*, 2019). In addition to the economic issue, Canaver *et al.* (2006) point out that the quality of the environment has been degraded as a consequence of agricultural systems that make high use of chemically synthesized insumism. In the case of natural pasture ecosystems, managing them sustainably requires reconciling animal production and ecological aspects, aiming at the preservation and development of the entire ecosystem (CANAVER *et al.*, 2006). The development of livestock, with pastures as the main food, where its management and improvement are the basis of the systems, becomes a much more interesting alternative than food based on external resources, or food provided in the trough, such as silage and concentrates, as it is an option less dependent on imported inputs and technology (CANAVER *et al.*, 2006).

According to Pereira and Cóser (2001), food represents the highest cost of milk production, the use of pasture can be a cheaper food and can contribute significantly to reduce the cost of activity. Therefore, the intensification of pasture-based milk

production systems is based on the use of species or cultivars with high production of high-quality dry matter that, associated with the use of reasonable management practices, allow an increase in the storage rate and, consequently, productivity (PEREIRA; COSER, 2001). The decrease in the cost of production and consequent increase in profitability in milk production systems occurs when the producer relies less and less on supplies/products external to the property and this is only achieved when the feeding of its animals is based only on pasture in intensive systems, as is the case of PRV (PINHEIRO MACHADO, 2004; BERTON; RICHTER, 2011; LIMA, 2017; BALEM; MACHADO, 2019).

3 IMPORTANCE OF COLLECTING PRODUCTIVE AND ECONOMIC DATA FROM FAMILY PRODUCTION UNITS FOR DECISION MAKING

According to Pieniz (2016, p. 58), "In an environment where the producer does not exert any influence on the price of his product, it is up to him to manage his costs and production scale to ensure the profitability that keeps him competitive in dairy farming". For Pieniz (2016), it is assumed that farmers always strive to produce efficiently. For the author, "Production efficiency and production cost management are important variables in determining their permanence and growth in the activity, since this is a market where the producer is a price manager at the lowest cost" (PIENIZ, 2016; PERES; DA COSTA; LEAL, 2021).

For Dias, Andrade and Gomes Filho (2019), rural accounting is a tool little used by farmers, as it is seen as a complex technique, resulting in a deficiency of accounting systems capable of portraying the characteristics of agricultural activities. Generally, farming families have a lot of work, the managers of the activity are the parents, and these have low levels of schooling and the interaction of daily life is practical and action in the agrosystem and not in the world of letters and numbers. In fact, where people spend their days doing physical effort, on a work day that easily exceeds eight hours a day, and still make the intellectual effort to "do the math", but it still becomes

increasingly necessary to produce these indicators of the viability of the activity because these indicators serve as a reference for family decision-making.

In dairy farming, the indicators that cooperatives, industries and technicians linked to these structures are massively on demand are linked to the productivity of the properties and, consequently, to the animals, even if this high productivity is "at any cost". Generally, what is emphasized on field days and promoted by technicians working for these structures is the need to increase animal productivity, which in fact has occurred, generally causing farmers to take technological packages based on external supplies (concentrated feeding, silage, annual pastures highly fertilized with soluble fertilizers, hormones and expensive management structures). In this model of entry packages, when the farmer pays for the "summer package" with the cooperative or company, he starts to pay for the "winter package", entering what Kiyosaki (2017) would call a "rat race" adapted to the agricultural universe, that is, in an analogy of modern consumer society, where people work and spend all the financial result obtained consuming in a vicious cycle that has no end.[1]

This "production-based" model increases the volume of milk production in households, but this does not necessarily result in an increase in net income. Production systems based on insums are desired by the industries of insums and their resellers, and often part of the salaries of the promotion technicians of the companies and cooperatives that resell the ins is related to the sales commission. The families studied reported that it is very common to be "harassed" by these technicians to buy insums and, mainly, to change from a pasture-based production system to confinement or semi-confinement system.

Given this situation, we understand that it is more applicable and appetizing by most family farming families of RS production systems that are based on "process technologies", where the main insum is the knowledge of the farmer and the management of productive systems with lower risks and lower costs. Thus, the

[1]Rat racing is a term used for an endless, self-destructive or useless exercise, such as the image of a lab rat trying to escape running on a wheel or around a maze (Kiyosaki, 2017).

production of pasture-based milk in the De Voisin Rational Pasture System is one of the main technological alternatives. This information about net income per hectare is essential when we consider that 94.5% of the gaucho families involved in this activity have a pasture-based production system and that these farmers have properties with an average of 18.3 hectares (EMATER, 2019). Thus, we have predominantly small properties in the State of Rio Grande do Sul that develop dairy cattle and, therefore, should develop a productive system that adds a net profit per area that can enable the social reproduction of these families.

In this sense, it is important to incorporate management techniques in rural areas to support decision-making processes, generate information and maintain managerial control, both in production costs and in the projection of improvements, especially for milk producing families (SIMIONATTO *et al.* al., 2017; KRUGER *et al.*, 2019). Likewise, other works emphasize accounting tools to analyze financial results and economic resources, assess the viability of activities, as well as keep families in productive activities (KRUGER; BERGAMIN; GOLLO, 2019; PERES; DA COSTA; LEAL, 2021).

4 METHODOLOGY

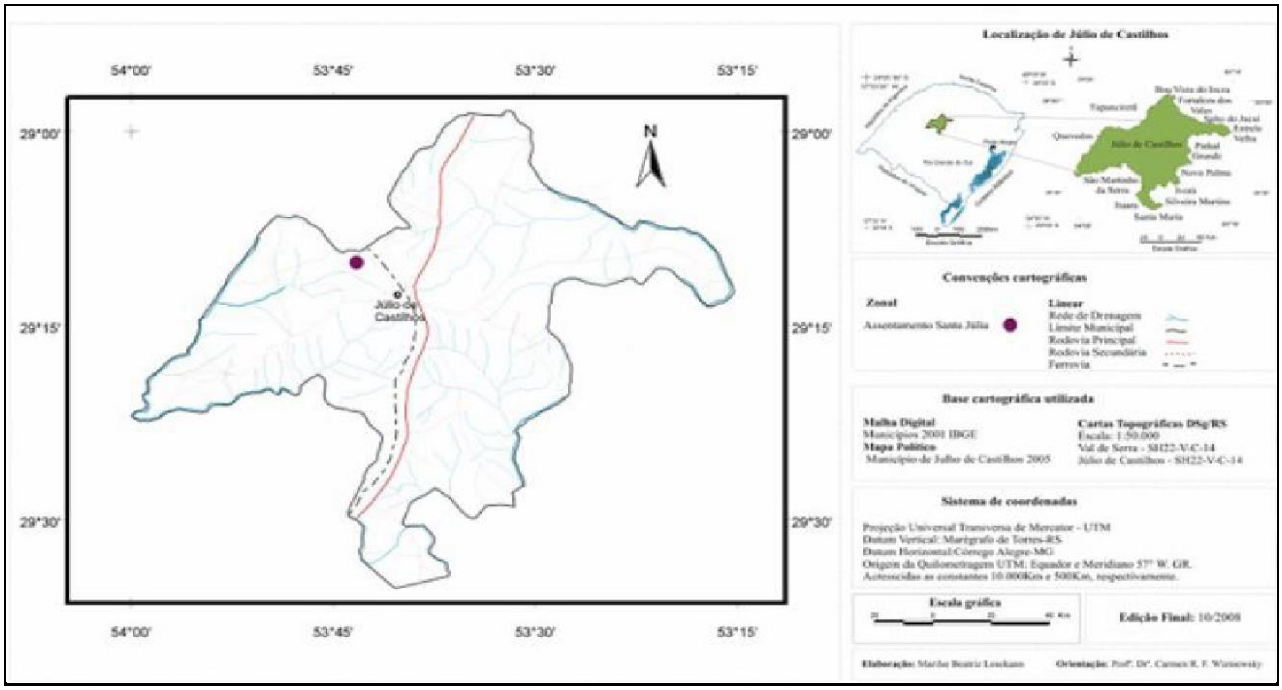
The research was carried out from the research project "Cost of dairy production in different production systems" developed by the Center for Studies in Agroecology and Organic Production - NEA Arapuá, Federal Farroupilha Institute, Julio de Castilhos Campus (IFFAR-JC). It was carried out in two dairy properties, one in the process of implementing an ecologically based system with Rational Voisin Pasture (PRV), located in the Santa Júlia Settlement, in the municipality of Julio de Castilhos-RS. The other property has a conventional production system and is located in the Community of Line One, in the municipality of Nova Palma-RS. Both properties have milk production in pasture as the main source of food for animals.

The municipality of Júlio de Castilhos has great agricultural importance for the region, especially in the production of commodities, where the soybean crop (*Glycine*

max) stands out. It is a municipality with low population density, with 19,579 inhabitants and 1,930 square kilometers, which results in a population density of 9.9 inhabitants/km² (IBGE, 2020).

The Settlement Santa Júlia is located on the ERS Highway that connects the cities of Júlio de Castilhos and Tupanciretã (Figure 01), was created in 1999, and today consists of 60 families, about 150 people, with an average plot of 20 hectares.

Figure 1 - Location of the Settlement in the Municipality of Júlio de Castilhos

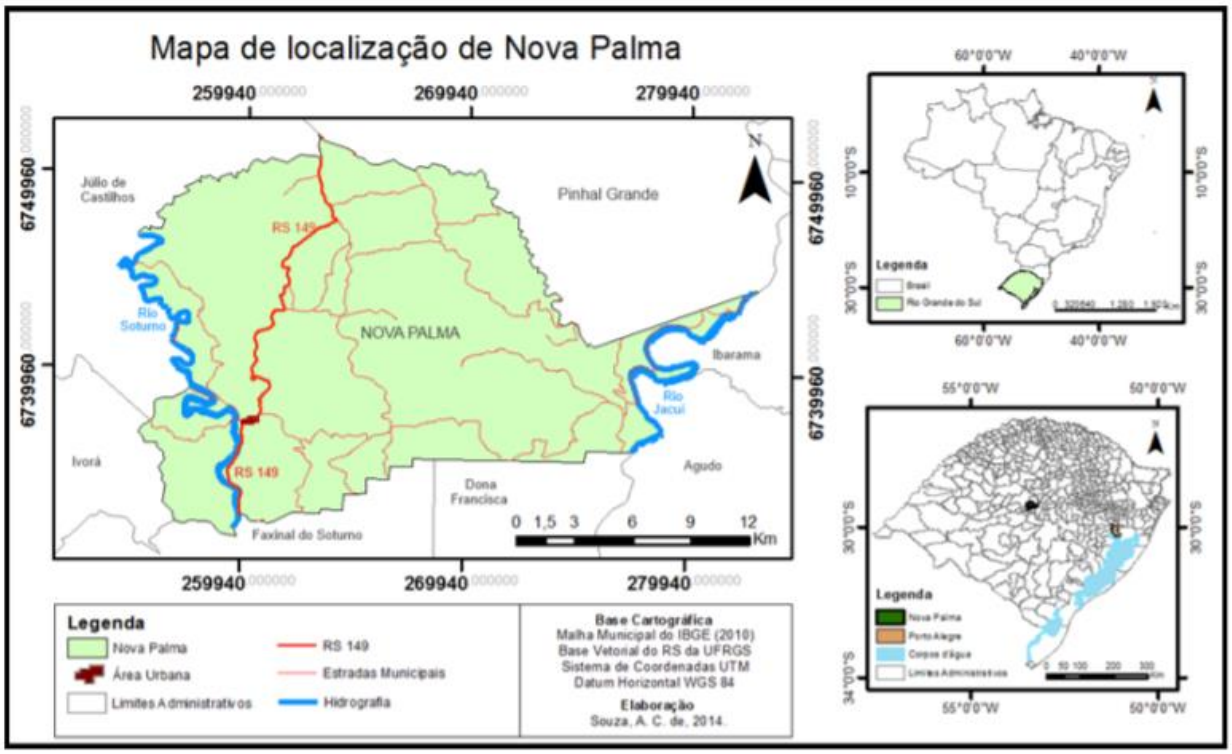


Source: Losekann and Wizniesky (2010)

Nova Palma is a municipality in the Central Region of Rio Grande do Sul, Brazil, located in the so-called Fourth Italian Immigration Colony. It has 6,512 inhabitants and 314,613 square kilometers (IBGE, 2020). According to Lago *et al.* (2006), the city's economy is based on agriculture, small-scale industries, and the municipality's farmers are distributed in 1,244 rural properties, where 656 or 52.7% of the total are between 11 and 50 ha. The crops with the largest cultivated area are soybean, corn, beans and tobacco, respectively. In the production units between 20 and 50 ha, there is greater diversification, which in addition to corn, beans and tobacco, includes the production

of citrus, rice, cattle, goats and milk, quite significant in the municipality (LAGO *et al.*, 2006). Agriculture is not only the most developed activity, but also responsible for most of the municipal revenue, about 42%, which means that the economy of the municipality is based on primary production (LAGO *et al.*, 2006).

Figure 02 - Location map of the Municipality of Nova Palma - RS



Source: Facco, Souza and Benedetti (2017)

For information collection, a Microsoft Excel spreadsheet, called GPL (Dairy Production Management), developed by EMATER-RS/ASCAR was used. Data were collected in several visits to the rural properties studied. The spreadsheet was filled out through conversations with the families and a survey of all the costs used in milk production. All fixed and variable costs were accounted for. The article was developed through the analysis of data from lPG spreadsheets and through bibliographic research.

5.RESULTS AND DISCUSSIONS

5.1 Characteristics of family production establishments and the production systems

Table 1- Characteristics of families and production systems of conventional and ecological basis

Characteristic's	Conventional basic milk production system- Nova Palma	Ecologically based milk production system- Júlio de Castilhos
Number of residents in rural establishments	4 people	3 people
Time in milk production activity	24 years old	17 years old
Size of settlement area	120 hectares	19 hectares
Productive system practiced	Soybeans- 24 hectares Dairy cattle- 28.6 hectares	Soybeans- 8 hectares Dairy cattle - 12 hectares

Source: prepared by the authors, 2022

The conventional-based milk production system consists of the couple and their two daughters, one of whom does not live on the property. They have been engaged in dairy farming for 24 years. They have 120 hectares of land in the municipality of Nova Palma. Of the total area, they plant 24 hectares of soybean, and to develop dairy cattle they use in the summer 7 hectares of native pasture, 3.5 hectares of brachiaria (*Brachiaria decumbens*), 4.5 hectares of millet (*Pennisetum americanum*), 1,6 ha for corn planting (*zea maios*) for silage and for six months in winter (May to October) the soybean cultivation area of 24 ha is used, where oats (*Avena strigosa)* and ryegrass (*Lolium multiflorum*) are grown, totaling an average of 28.6 ha exploited with dairy cattle.

In the ecologically based milk production system, the family is composed of the farmer and his two daughters. They have a plot of 19 hectares in the Santa Júlia Settlement, in Julio de Castilhos/RS, where they have been raising dairy cattle for 17 years. In this property, there is also soybean farming that occupies 8 ha and is rented to third parties in the summer, and dairy cattle that has always been considered the main income-generating activity of the property and currently occupies 8 ha of pasture

in summer, and another 8 ha with oats and grass in winter in the rest of the soybean crop, and thus, on average of the year milk occupies 12 ha. From there, the family made available the usable area destined to dairy cattle on the property so that a PRV project could be installed, becoming a reference unit in the production of pasture-based milk, and the process was guided by the partnership between NEA-IFFAR-JC and EMATER/RS, which took place from the second half of 2018.

The main challenges encountered in this establishment were:

1 - Compacted soil with low organic matter and presence of erosion in a well-accented groove;

2 - Hegemonic presence of Annoni grass (*Flat Eragrostis*) in the area with extensive pasture and mixture of animal categories;

3 - Poorly managed pasture with consequent food restriction for the number of animals they had;

4 - Empty fodder between the summer and winter and winter and summer seasons where the pasture supply was only in an area of 3 ha populated with Annoni;

5 - Need to rent neighboring areas of neighbors in a situation of scarcity and food, in addition to buying silage.

These issues ended up generating a painful system from the point of view of work and unprofitable, as it required a greater purchase of food from outside the property increasing the cost of production. The farmer said that, especially in periods without fodder, the cost of production was more than 80%.

With the implementation of the PRV project, the pasture area was divided into 33 fixed enclosures, supplied with piped water in all of them for animal consumption. Part of this area had Tifton forage (*Cynodon spp*) planted, however, with extensive pasture, Tifton was disappearing and Annoni was predominant. With rotational pasture and cutting, Tifton reestablishes itself and competes with Annoni, until the point of this being extinguished. In the area where the annual summer and winter fodder were grown, the BRS Kurumi elephant grass (*Pennisetum purpureum)* was introduced. Throughout the area, oats and rye grass are planted in winter. The planting of trees in

the electric fences also began to have shading in all lots in the medium term. With this it became easier to manage the animals in the area, facilitating the work, dividing the category of lactating cows that advance in the transhumance through the enclosures, followed by dried cows and heifers that follow the first, which have more nutritional requirements. In periods more favorable to the development of pasture, as soon as the second lot leaves the enclosure, it is cut, accumulating organic matter in the previously naked soil. The pasture is also fertilized after cutting if capital is available. In times of feed shortage, such as in the fall, silage is purchased for additional volume supplementation.

5.2 Survey of productive and economic information of production systems

The demand for information on the profitability of dairy cattle in the nova palma establishment arose through the eldest daughter, who holds the Superior Course of Agribusiness Management Technology. The daughter, at the insistence of the technique of the cooperative of which her parents are members and that sells the milk of the family property, that her parents change the current production system, which is based on the production of pastures for confinement, decided to manage the activity. The technician's argument was that with the confinement system the family could expand production and, thus, the activity in the property would be more profitable. However, as several authors point out, the increase in productivity in dairy activity obtained with the technological advances of intensive production and with a great contribution of external inputs did not result in increased profits for the producer, on the contrary, justified the narrowing of the profit margin per unit produced (CANAVER *et al.*, 2006; SANTOS; LOPES, 2012; SANTOS; LOPES, 2014, PIENIZ, 2016).

In the ecologically based milk production system, the initial and transition system, there is still much to advance in the productive indices, however, the measured indexes show that the activity has potential and allows the family to remain in the activity. The family's goal for 2020 and 2021 is to expand dairy cattle to a total establishment, i.e., 16 hectares performs ecological management and thus materializes

the agroecological transition in this family production unit. Below are the indicators measured in the two establishments analyzed.

Table 2 - Production data on milking activities of conventional and ecological base systems

	Conventional basic milk production system- Nova Palma	**Ecologically based milk production system- Júlio de Castilhos**
Lactating cows (mean/month)	22	12
Milk production (liters/month)	13,986.75	4,561
Milk production sold*(liters/month)	13,623.42	4,321
Milk production (liters/year)	167,841.00	54,729
Milk production sold (liters/year)	163,481.00	51,849
Milk yield (liters/cow lactation/day)	21.52	12.76
Milk yield (liters/cow lactation/year)	7,746.51	4,596
Milk area productivity (liters/ha/year)	5,868.57	4,561

Source: prepared by the authors, 2022

* There is a difference between milk produced and sold, depending on the use of the property (consumption and feeding of heifers)

Evaluating the activity data, we can make some considerations about the establishment of conventional basis. In productive terms, the herd of good genetic quality, predominantly Holsteins, with 22 lactating cows in the average of the year, even in a system based on annual pastures and in a region with robust topography, has very significant average production rates, such as the average daily production of lactating cows above 20 liters per day. In Rio Grande do Sul, the daily average per animal is 13.9 liters (EMATER/RS-ASCAR, 2019).

Evaluating the data of the establishment that maintains ecologically based production system, it is perceived that it is still possible to evolve in the productivity of the animals because the herd has a good genetic base of Holstein cattle and the possibility of expansion to an average of 18 liters per lactating cow per day. This will depend on the availability of bulky food, the farmer improves the area with Tifton,

implanted camp elephant BRS Kurumi because the results with this fodder were positive in the establishment. As the pasture area was significantly depleted and the family did not have available capital for new investments, the recovery becomes slower, however, even in this scenario the results are positive, since milk yield per area (Table 1) is close to the conventional base system.

The following table outlines the results of each economic indicator found for each productive system analyzed.

Table 3- Economic indicators of conventional and ecological-based milk production systems

		Revenue (R$) *	Expense R$	Investment R$	Gross margin R$	Net balance R$
Conventional-base milk production system-Nova Palma	Annual	221,719.48	95,535.90	9,276.00	126,183.58	116,907.58
	Monthly Average	18,476.62	7,961.32	773.00	10,515.29	9,742.29
	Average per hectare	7,752.43	3,340.42	324.34	4,412.01	4,087.68
	Average per liter of milk	1.36	0.58	0.06	0.77	0.72
	Average per cow	7,895.06	3,401.87	330.30	4,493.18	4,162.88
Ecologically based milk production system-Júlio de Castilhos	Annual	84,423.37	40,279.77	2,466.00	44,143.60	41,677.60
	Monthly Average	7,035.28	3,356.65	205.50	3,678.63	3,473.13
	Average per hectare	7,035.28	3,356.65	205.50	3,678.63	3,473.13
	Average per liter of milk	1.63	0.78	0.05	0.85	0.80
	Average per cow	5,949.75	2,838.72	173.79	3,111.03	2,937.24

Source: prepared by the authors, 2022

* Total revenue, including sales of milk and animals

When we evaluate the indicator, we consider most important, the net profit per ha, we evaluate that the conventional base production system is leaving is a value greater than R$ 4,000.00 per ha per year (Table 3). The productive and economic indices are very interesting for a property that produces milk with annual pastures and corn silage, especially by the average monthly liquid (R$ 9,742.29).

It's an interesting income for a family of family farmers. As Stated by Nachiluk and Oliveira (2012), the producer should be aware of how he is producing, measuring the cost and revenue realized with production; working with them this aspect seems redundant, because it means talking about cost measurement when the producer has been performing his activity for a long time, in this case for 24 years, but, as the authors claim, it is necessary. Oliveira (2015) also states that obtaining information about the cost of production is of great importance for any productive activity, because it is from this type of information that the family can make successful decisions.

In the establishment of the ecologically based production system, net profitability is close to R$ 3,500.00 per year for each hectare worked (Table 3). The object is to achieve a profitability of at least R$ 5,000.00 per ha per year, as well as the expansion of the system to the entire area of the property with a gradual increase in the number of animals. Machado, Balem and Santini (2018) found when evaluating the profitability of the PRV system already consolidated in a property in the municipality of Santa Maria, the potential to overcome the barrier of 5,000 reais per ha per year. With this profitability and the activity occupying an area of 16 ha, a net annual income of R$ 80,000.00 or R$ 6,600.00 per month can be obtained, which would be sufficient to allow the social reproduction of the family.

According to Biasi and Alessio (2020), the permanence of families in dairy farming and, consequently, in rural areas, is directly related to the increase in production efficiency using fodder, as this reduces the costs associated with animal feed, improves animal welfare and increases milk production. Pieniz (2016) points out that for farmers to remain competitive in the current scenario of the milk production chain, they need to expand the production scale, review costs and factors that can positively influence the productivity and efficiency of milk production systems. Evaluating both systems, it is observed that the pasture-based milk production system is what keeps them in the business profitably. These systems can be intensified in both realities, since the establishment with conventional-based production system can implement the PRV,

thus increasing the number of animals in the area, and the establishment of ecological basis can expand the PRV area and consolidate the system recovering soil fertility.

However, what we observe in the work of technical assistance and rural extension is that farmers do not make the economic management of their properties and productive activities. In the two properties studied and presented in this article, the families had no management and were unaware of the production costs, and in one of them, there was a false idea that the dairy activity did not have satisfactory economic results and that the family was about to give up the activity.

However, it is necessary to observe the specificities of each rural establishment to understand the conditions that allow the development of one or another system. The establishment with more hectares for cultivation and/or breeding, as in the case of Nova Palma, allowed the conventional system to generate significant income and remunerate the production factors employed. On the other hand, ecologically based systems that strive for low maintenance cost strategies, as seen in Júlio de Castilhos, allow families with fewer available hectares to remain in productive activities in an equitable, economic and environmental way. These aspects reaffirm the importance of cost analysis to identify bottlenecks and restrictions that hinder the performance of the production process, mainly with the objective of maintaining and/or increasing the competitiveness of rural businesses (KRUGER *et al.*, 2019; PERES; DA COSTA; LEAL, 2021).

6 CONCLUSION

The cost of production is an essential part of the management of the rural enterprise, showing the economic result that the productive system is generating, in addition to providing important information to support decision-making and the formation of strategies by producers.

In the two properties studied, the families were unaware of the production costs, one of the families was about to give up, because the impression was that there was not much money left.

The conventional base establishment has a good structure of mechanized milking, quality cattle, machinery and uneven topography. The animal feed is through annual pastures, corn silage and complementation with feed.

In the ecological establishment of dairy cattle is seen as the main income. The family worked with the conventional production system, and in the second half of 2018 began the implementation of the PRV. This change brought the family a reduction in hard work, the system began to provide increasingly quality bulky food, cows improved their body score, production and income generated by the activity.

The ratio represents the highest cost of dairy production, the use of pasture can be a cheaper food and can contribute significantly to reduce the cost of activity. Both properties have the production of pasture milk as the main source of food for animals, which proved to be low cost and investment, generating less expenses and more profits for the producer. Thus, the permanence of families in the dairy activity and, consequently, in the rural environment, depends on practices that favor the producer, with technical assistance of quality, adequate management, efficiency in production and profitability for the producer.

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