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THE MERITS OF ORGANIC MILK PRODUCTION: HIGH ECONOMIC AND ZOOTECHNICAL PERFORMANCE – IS THIS TRUE?

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ABSTRACT

This work analyzed the viability of organic milk with the conventional production system, zootechnically and economically, using benchmarking. The organic farm had better results. Property A had the best yields in terms of the number of lactating cows (53.60 animals), number of cows per hectare (2.14 animals/ha), production total daily milk (1220L/day) and milk production per area (48, L/ha/day), also ranked second in milk production per lactating cow (22.16 L/day). Has positive values both per liter of milk (R$ 0,20 L/day) and per year (R$ 89.060,00/year). But verifying the values of net margins, both -R$ 0,21 /L, -R$ 93.513,00/year and -R$10,47/hectare, there is a significant annual negative result. Cash flows from property A are negative -R$191.989,14 and -R$ 639,6/ha/month, but all properties shown were also negative. With the economic values of property A recalculated based on the real value of the products sold (R$ 8.75) it is clear that the net margins (R$ 8.54/L, R$ 3.480,582,00/year, R$ 139.223,28), return on invested capital (4%) and cash flow (R$ 246.492,89 and R$ 49.859,71/ha/month) are higher, bringing greater economic viability to the business. It can be concluded that the production of organic milk is sustainable technical animal husbrandy and economic point of view.

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INTRODUCTION

The growth of organic production worldwide is a response to society's demand for safer and healthier foods, which comes from good commercial, ethical, social and environmental practices. Under the leadership of the United States, Germany, France and China, the global market generated a record of US$ 97 billion in 2017 (IFOAM, 2019). In addition, organic agriculture has grown on all continents, reaching a record area of approximately 70 million hectares. In Latin America, Brazil is considered the leader in the organic market. In 2018, the Brazilian organic market earned R$ 4 billion, a result 20% higher than that recorded in 2017 (ORGANIS, 2018). However, when taking into account the extent of land destined for organic agriculture, the country ranks third in the region, after Argentina and Uruguay, and 12th in the world (MAPA, 2019).

Between 2012 and 2019, the number of registered producers increased from 5,900 to 17,700, an increase of 300%. In addition, the number of organic production units in Brazil increased from 5.4 thousand to over 22 thousand in 2018 (MAPA, 2019). According to Organics (2019) 19% of the Brazilian population that consumes organic products is in the Southeast region of Brazil, with São Paulo being the largest producer when compared to other states (Rio de Janeiro, Espírito Santo and Minas Gerais), in addition to being considered the largest metropolis in the country. Despite this increase, information on the economic and financial viability of organic milk production is limited. The low supply of organic products on the market, the higher production costs when compared to conventional systems, the lack of specialized labor, as well as their differentiated payment are factors that can negatively contribute to this situation of shortage of information.

However, empirical evidence is being produced, showing organic products to be a viable alternative to conventional milk production, as organic milk producers receive about 50% above the price of the liter, a value calculated by the Center for Advanced Studies in Applied Economics (CEPEA), ESALQ / USP, for the State of São Paulo, in addition to a bonus for quality (good manufacturing practices, high levels of fat and somatic cell count) (SNA, 2018). As a consequence, the production of organic milk and dairy products are growing at around 30% per year (ORGANICNET, 2016). Assuming the same complexity, importance and dynamics of the other sectors of the economy, the organic sector requires a vision from the managers of its rural enterprises, through financial and economic analyzes that allow to evaluate the production and profitability systems from the analysis and control of the production costs (LOPES e CARVALHO, 2001). Thus, this work aimed to analyze and evaluate the viability of organic milk production, comparing it with the conventional production system, both zootechnically and economically, using benchmarking for organic and conventional farms with similar geographical characteristics.

MATERIAL AND METHODS

An organic production farm (Property A) was compared to seven conventional production farms (Properties B, C, D, E, F, G and H) in the state of São Paulo (Brazil). The seven conventional farms were selected from a database of 3259 farms and the selection criteria were the enough number of similar characteristics to those of the organic farm, mainly in relation to the estimated area size for dairy production, semi-intensive breeding, animal breed , climate and region where they were located. What differentiates these farms from being classified as organic or conventional production, in addition to social, environmental, animal awareness and strict legislation to achieve certification, is the management of the treatment and feeding of the animals, since prophylactic allopathy and transgenic foods are not allowed in the organic field. Farm A has 102 hectares (ha), of which 25 ha are used for organic milk production, 32 ha of Permanent Protection Area (PPA) and Legal Reserve Area (LRA), meaning they are protected areas in which native vegetation must be preserved along with water resources, landscape, geological stability, biodiversity, gene flow of fauna and flora, in addition to protecting the soil and ensuring the well-being of human populations. In addition, it has Certification with the organic seal (MAPA, 2003), meeting all its requirements. The dairy herd consists of animals of the Gir, Jersey and Holstein breeds, including crossbreeds of these breeds. The animals are kept in a semi-intensive system of rotational grazing and the diet consists predominantly of *Tifton-85*, *Pennisetum purpureum Schum* and sorghum pastures. The animals are supplemented with sugar cane silage and mineral salt. Its products are sold in the Southeast of Brazil. To analyze the viability of organic properties in relation to conventional ones, the benchmarking tool was used to compare zootechnical and economic performance. Data on physical characteristics of the farm, machinery and equipment, livestock, milk production, investments, payment of debts, total costs, revenue and rent for 12 months (2013-2014) were analyzed and compared between the selected properties. These values were attributed based on the average price CEPEA/ESALQ paid to the producer of conventional systems, considering R$ 1,00 the price of a liter of milk, even if it is not the real value received by the organic system.

The technological vectors were predetermined from the selection of benchmarks. Zootechnical performance, economic margins and economic results were analyzed using Excel® spreadsheets. The zootechnical performances analyzed were:1) number of lactating cows (n°) = total production of milk divided by the production per lactating cow, 2) number of cows per hectare = number of animals producing milk, per hectare of organic milk production; 3) total daily production of milk (L/day) = total daily milk production of all lactating cown on the farm; 4) milk production by area (L/ha/day) = total milk production per hectare of organic milk production; 5) percentage of lactating cows (%) = number of animals producing milk divided by animals in the herd and; 6) milk production per lactating cow (L/day) = average daily individual milk production per animal.

The margin indicators analyzed were: 1) Daily Gross Margin (DGM (R$/L/day)) = Gross Revenue (sales of milk + sale of products + sale of animals) less effective Daily Operating Costs (DOC = agregated costs related to the animals); 2) Annual Gross Margin (AGM (R$/year)) = DGM plus all other aggregated costs such as artificial insemination, transportation, taxes and charges, repair and improvements etc., multiplied by total annual production; 3) Daily Net Margin (R$/L) = Gross Revenue less Total Operating Costs (TOC minus DOC + household labor + machine depreciation); 4) Annual Net Margin (R$/year) = Daily Net Margin (R$/L) multiplied by total annual production; 5) Net Margin per Hectare (R$/ha) = Daily production per lactating cow (liters/cow/day) = daily milk yield/number of lactating cows; 6) The costing methodology was based on operational cost (HOFFMAN et al. 1987) and total cost methods. The indicators analyzed were: 1)Average Cost (R$/L) = TOC + return of average capital invested in animals, improvements, machinery, non-annual forages divided by goods produced; 2) Return of Invested Capital (%) = profitibaility as a percentage of invested capital; 3) Total revenue (R$/L) = sale of products; 4) Cash flow (R$) = total cost less total revenue and 5) Monthly Cash flow (R$/ha/month) = cash flow by area deployed for organic production.

RESULTS

When comparing zootechnical performance of dairy farms (Table 1), Property A has the best yields in terms of the number of lactating cows (53.60 animals), number of cows per hectare (2.14 animals/ha), total daily production of milk (1220L/day) and milk production per area (48, L/ha/day). Regarding the percentage of lactating cows, Properties A, B, E and F were above the 80% margin, which is seen in the literature as an excellent sustainability index for farms. Property A (22.16 L/ day) ranked second in milk production per lactating cow, with Property F having the highest productive rate (24.9 L/day). As for gross and net margins (Table 2), Property A has the third best performance in terms of gross margins, with positive values both per liter of milk (R$ 0,20 L/day) and per year (R$ 89.060,00/year). But verifying the values of net margins, both -R$ 0,21 /L, -R$ 93.513,00 /year and -R$10,47/hectare, there is a significant annual negative result, only surpassed by one of the conventional farms (Property G), which places the organic farm in the penultimate position regarding this indicator. The results for the return on the average cost, the capital invested, on the revenues and cash flow in properties with similar areas can be seen in Table 3.

Table 1. Number of lactating cows (LC), number of cows per ha (Cows /ha), total daily milk production (DMP), milk production per area (MPA), percentage of lactating cows (LC%) and production of lactating cow milk (PLC) from properties with similar areas

Properties	LC (nº)	cows /ha	DMP (L/day)	MPA (L/ha/day)	LC% (%)	PLC (L/day)
A	53,60	2,14	1220,00	48,80	83,90	22,76
B	36,32	1,47	599,82	24,28	83,42	16,53
C	39,34	1,59	621,35	25,05	74,59	15,79
D	25,55	1,06	344,44	14,29	79,02	13,49
E	48,98	2,03	974,75	40,45	88,66	19,85
F	12,06	0,48	300,12	11,91	86,51	24,90
G	21,21	0,90	463,89	19,66	72,12	22,06
H	40,43	1,67	538,25	22,24	66,66	12,21

Table 2. Gross margins (GM) and net margins (NM) of properties with similar areas

Properties	GM (R$/L/day)	GM (R$/year)	NM (R$/L)	NM (R$/year)	NM (R$/ha)
A	0,20	89.060,00	-0,21	-93.513,00	-10,47
B	0,13	28.539,22	0,02	4.153,66	14,96
C	0,22	49.697,43	0,16	36.581,71	125,13
D	0,29	36.215,06	0,23	28.509,86	96,43
E	0,31	108.691,99	0,15	54.114,74	269,24
F	0,31	33.596,76	0,27	29.806,58	107,66
G	0,01	2.045,37	-0,06	-9.559,76	-45,63
H	0,53	104.281,09	0,29	56.112,97	195,53

Table 3. Return on average cost (AC), return on invested capital (RIC), total revenue (TR) and cash flows (CF) for properties with similar areas

Properties	AC (R$/L)	RIC (%)	TR (R$/L)	CF (R$)	CF (R$/ha/month)
A	1,00	-0,34	1,15	-191.989,14	-639,96
B	1,08	0,12	1,14	-18.684,70	-756,47
C	0,93	0,65	1,09	-16.259,34	-655,62
D	0,85	0,96	1,09	-8.211,46	-340,72
E	0,95	0,74	1,11	-24.613,49	-1.027,68
F	0,83	2,63	1,10	-6.715,01	-270,40
G	0,95	0,20	0,89	-12.494,60	-529,43
H	0,79	0,89	1,09	-11.680,40	-482,66

Table 4. Recalculated values for the organic property of NM, RIC and CF

Properties	NM (R$/L)	NM (R$/year)	NM (R$/ha)	RIC (%)	CF (R$)	CF (R$/ha/month)
A	8,54	3.480.582,00	139.223,28	4,00	246.492,89	9.859,71

The return on the average cost of the liter of milk from the organic property (Property A) is the second highest (R$ 1,00). The return on capital invested from property A (R$ 0,34) compared to conventional properties was not as expressive, but compared savings was considered more profitable. Comparing the total revenue, the same property performs the best values in comparison to the others, that is, even having a higher price at the time of sale, the product manages to reach a market niche and surpass the revenue of the conventional product that ends up winning in sold amount.

Cash flows from Property A are negative -R$191.989,14 and -R$ 639,60/ha/month, but all properties shown in table 3 are also negative, showing a higher production expense. With the economic values of property A recalculated based on the real value of the products sold (R$ 8,75) depicted in Table 4, it is clear that the net margins (R$ 8,54/L, R$ 3.480,582,00/year, R$ 139.223,28), return on invested capital (4%) and cash flows (R$ 246.492,89 and R$ 49.859,71/ha/month) are higher than on properties B, C, D, E, F and G, bringing greater economic viability to the business.

DISCUSSION

The analysis of the economic indicators and the understanding of the correlation with the zootechnical indicators is fundamental in the evaluation and determination of the profitability of the dairy activity (SILVA *et al*, 2018). The number of lactating cows is a reflection of the farm's support capacity, as it is an important indicator of the sustainability of the dairy business as they are responsible for generating income from the farm, whether with the production of milk or products, or with the production of animals for replacement or sale (SILVA *et al*, 2018; RESENDE *et al.* 2016). It is observed that the organic property is able to optimize its production more effectively than the conventional properties and still be in accordance with the organic legislation (BRASIL, 2003) which indicates the need for space and handling limitations in its dairy production, where the animal must have freedom of movement in facilities that are appropriate to its species. These limitations are also linked to the use of concentrated foods being a maximum of 15% of the dry matter required daily by the cow (BRASIL, 2011). These rules can limit the productive performance of the zootechnical

indicators of farms that propose to use the organic system because, erroneously, many producers do not adhere to the use of technology, leaving the production process ineffective. Many decisions need to be evaluated for properties to become sustainable (HESLLE *et al*., 2017). Possibly, the organic property studied (Property A) uses these resources to optimize its system, not needing to place more animals in the productive area to be as or more competitive than the conventional ones. This fact is demonstrated by the greater number of cows per hectare among the farms compared due to their similarity in area. Compared with Property F, which has the lowest number of animals per area, it has 345% more animals per hectare. In relation to the other important zootechnical indicator, we analyzed the highest milk production per day, where Property A obtained the best results, reaching more 245 liters of milk per day than Property E, which obtained the second position in the ranking and 920 liters more than Property F, with lower daily production. It is worth mentioning that the animals are of the same breed. Showing the effectiveness and cyclicality not only of the system, but also of the animal management, because as mentioned by Corassin (2004) the management and reproductive aspects are the biggest indicative and possible alterers of animal production. Regarding the percentage of lactating cows, it is important to note that this data analyzes the total number of cows in the herd and generates a percentage value of the number of cows that are in the lactation period, being a data of productive efficiency. Property A occupies the third place, slightly inferior to the other two conventional properties, but in this zootechnical parameter, there are no comparative values when the properties have more than 80% of lactating cows in the herd, as described by Roche (2006) and Faria *et al*. (2007), who states that at least 80% of lactating cows are needed in relation to the total herd cows to consider a very good or excellent index, however according to Silva *et al*. (2015) the ideal would be 60 % of the herd consists of lactating cows and at least 40%, placing all farms compared in good parameters. It is interesting to note that, in the case of the organic system, the price attributed to the liter of milk is an imputed value, that is, it is not effectively what the producer is actually receiving for the liter of milk produced on the property, as it does not sell fluid milk but derivatives. And this is what happens in general in all properties producing organic milk in Brazil, since there are still no specific dairy and industries for this type of productive management, which brings several bottlenecks and difficulties in marketing.

The economic values were attributed based on the average price CEPEA/ESALQ (2014) paid to the producer of conventional Brazilian systems in the region where the organic system is located and in order to facilitate the use of Benchmarking in the analysis of the work. This analysis of the business is essential to know the current reality of production and enable the evaluation of possible new investments and their economic viability (SILVA *et al*., 2018). In the analysis of the tables with the economic indicators, there is a huge discrepancy between properties and a low profitability in Property A with an organic system (Tables 2 and 3), which would prove to be an unviable and economically inefficient productive management, but the loss shown is not real. Reassessing and correcting the net margin results based on the real value of the liter of organic milk (R$ 8,75), the margins would be R$ 8,54; R$ 3.480.582,00 and R$ 139.223,28, respectively, for net margins per liter of milk, per year and per area (Table 4). The net margin is a very important parameter to observe the stability and possible evolution of the property. With the data shown in the table, the organic property would possibly be decapitalized to cover the costs of the activity, but with the actual calculation of the data, it is capable of maintaining itself as well as expanding, bringing a return to the owner and greater visibility for this management. According to Santos and Lopes (2014) in a survey carried out on conventional milk properties, with animals confined to measures of economic efficiency, gross margin, net and result, all production systems showed negative values. Evidencing the difficulty in the sector and the need for further planning in the activity. According to Assis *et al*. (2016), with government help, subsidies, lines of credit, tax cuts, and other actions to stimulate the milk production chain, in addition to research and studies to have products with added value, the country has the possibility to achieve the production costs and quality standards required in the international market. Therefore, we are able to understand the increased demand for organic milk products and why the end consumer is willing to pay for a higher quality product. The return on invested capital of the organic dairy property was negative, different from the results seen in farms whose systems were conventional, but the comparative basis is not accurate because the cost of producing organic milk is generally higher than in conventional systems. When adding value with the by-products, the return tends to be positive and this could be confirmed in this work, when recalculating the RCI. Considering the cost of production added to the expenditures with the other items for the preparation, packaging, transportation and charges necessary to produce one kilogram of the referred by-product, the RCI calculated with the owner's remuneration would be 4% (Table 4), different from the observed when considering the value of milk based on the price CEPEA/ESALQ (2014). The cost of production is a necessary tool for the administrator of the dairy industry, however, its calculation involves some simple and other more complex questions, which is why its use is uncommon. Having adequate control and having a milk production cost system that generates information for making quick and objective decisions are aspects fundamental to the company's success (SANTOS & LOPES, 2014). With the calculation of production costs, management strategies can be adopted with the intention of minimizing them and increasing profitability (BUZA *et al*., 2014). The total revenue per liter of milk from the organic property was the highest, being R$ 0,01 higher than the conventional farm with the highest RT and R$ 0,26 to the farm with the lowest RT, meaning that the financial return would be of R$ 0,15 in organic milk, R$ 0,06 and -R$ 0,06, respectively for the properties mentioned. That is, even without considering the sale of dairy products, the organic property is having a return of up to R$ 0.09 more per liter of milk when compared to conventional ones. Regarding the cash flow in Reais and Reais per hectare per month of the organic property, they placed in last and fifth place, respectively. But, when these same calculations are made based on the real production values of dairy derivatives, these parameters are positive, with the cash flow in reais and reais per hectare per month of R$ 246.492,89 and R$ 9.859,71, respectively, showing a higher financial return (Tabela 4). According to Rödiger and Hamm (2015) there is a market for organic products and consumers are aware of their differentiated value. The knowledge of these data could be a tool to attract more producers to organic management, bringing a greater added value to the products, more income to the producer and disseminating a more sustainable management.

Conclusion

Milk production in the organic model, when calculated with the real sale value in the market, is sustainable from both a technical and an economic point of view, being a viable alternative for milk producers. There is a need to continue researching to improve and disseminate organic techniques and practices more and more, as studies are rare. There are many limitations found for the producer who wants to produce or carry out the agroecological transition, since there are some difficulties imposed by the globalization and competitiveness of the conventional milk system.

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