

## **Economic analysis of the activities of a farm located on the municipality of Rio Grande, on Southern Brazil**

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### **Abstract**

Producers must achieve a management degree that allows the evaluation of the economic return from the propriety and the activities involved on it, making it possible, by data analysis, to obtain information which enables technical decisions. The objective of this study is to evaluate the costs of production and its productive procedures. The work was done in a rural propriety where are performed several activities. Data collection started on July 1<sup>st</sup> of 2009 and ended on June 31<sup>st</sup> of 2010. There were evaluated the following items: gross margin of the property and of the different processes; depreciation; average cost; investment return and profitability. Fixed, variables, total and opportunity costs were also identified. Most productive processes typified the total costs, but did not pay off the economic costs, the Angus breeding could settle the total economic cost, while the breeding of Criollo horses does not cover variable costs. It was noticed that the profitability of the macro productive process was positive. The cost of capital opportunity demonstrated that the property should develop a strategic plan to increase their productive rates in the different agricultural activities.

**Keywords:** Cost analysis. Rural business. Profitability.

## **Análise econômica das atividades realizadas em uma propriedade rural no Município de Rio Grande-RS, Brasil**

### **Resumo**

Os produtores devem atingir um grau de gerenciamento que possibilite avaliar o retorno econômico da propriedade e das atividades que ela envolve, para que consiga através da análise dos dados, obter informações que possibilitem decisões técnicas. O objetivo do presente estudo foi realizar uma análise dos custos de produção e de seus processos produtivos. O trabalho foi realizado em uma propriedade rural onde são desenvolvidas diversas atividades. A coleta de dados iniciou no dia 1 de julho de 2009 e terminou em 31 de junho de 2010. Foram avaliados os seguintes itens: margem bruta da propriedade e dos diferentes processos; depreciação; custo médio; lucratividade e rentabilidade. Também foram identificados os custos fixos, variáveis, total e de oportunidade. A maioria dos processos produtivos saldou o custo total, porém não quitou os custos econômicos. A cabanha de Angus, conseguiu liquidar o custo econômico total, já a criação de cavalos crioulos não cobre os custos variáveis. Pode-se verificar que

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a rentabilidade e lucratividade do macro processo produtivo foram positivas. O custo de oportunidade de capital demonstrou que a propriedade deverá elaborar um planejamento estratégico para aumentar seus índices produtivos nos diferentes atividades agropecuárias.

**Palavras-chave:** Análise de custos. Empresa rural. Rentabilidade.

## Introduction

With the current development of the economy to global level, increasingly complex and competitive scenarios were formed, forcing companies to look for information which gives support to their management decisions (FREITAS; ALMEIDA; COSTA, 2008).

Agribusiness is one of the fastest growing sectors in the Brazilian economy, however, for agricultural activities to continue to be developed in Brazil with good results, it is essential that a "business" mentality be brought to the rural entrepreneurs (RUIZ, 2015).

Some concepts must be understood by technicians and farmers so that this economic and financial vision can collaborate with their production system. Among them, the cash flow that, according to Cunha *et al.* (2014) shows the survival of the business in short term, with revenues and expenses provided in a property, generating or not an important financial capital that may ultimately provide new acquisitions, such as: agricultural equipment, facilities and even the payment of debts and or taxes.

The knowledge of some economic indicators has total relevance to the administrative success of manufacturing activities. Among the main indexes, the patrimonial balance presents a summarized statement of the financial position of the company at a given time (PEREIRA; SILVA; CARVALO, 2014). Nogueira (2004) believes that fixed costs are features that are not fully consumed during a production cycle and require full attention. In the beef cattle industry, Barbalho *et al.* (2006) point out among the main applications and contributions of cost accounting: knowing the real cost of each head of cattle; composing the stock value of live animals; determining the profitability after the sale; determining the profit of the period; determining the optimal time for sale; knowing which specialization is most profitable, whether it is breeding, stocking, finishing or compositions of them; determining whether it is more profitable to confine livestock or to raise it in grazing systems; knowing if it is more profitable to rent, to make

a partnership or to contract a loan to purchase land; Rationalize costs and expenses; assisting in operational control; and budgeting and planning to reduce disbursements.

Variable costs refer to resources that are consumed in the production cycle; total costs are the sum of the variable costs and the fixed costs. The apportionment by the share of revenues according to Rocha *et al.* (2014) must be used to divide and separate the administrative costs of all productive activities developed in a given company.

The efficient productive system is linked to the correct monitoring of machines and facilities depreciation; and the efficient representation of the profitability, investment return and opportunity cost of the invested capital (NOGUEIRA, 2004; TOFÓLI, 2008; CATELLI *et al.*, 2014; RUFINO *et al.*, 2014). In this sense, Franco *et al.* (2009) report that for a farm with 1000 finishing heads of cattle, a depreciation corresponding to 4.68% of total costs and a profitability of 43.17% was found. However, the authors do not consider the opportunity costs of land, capital invested and inventory variation, which would reduce profitability considerably, in addition to reducing the percentage related to depreciation. This reinforces the need to consider all the costs, otherwise the results obtained do not represent the real economic situation of the production system. For example, Souza (2014), analyzing the economic viability of a beef cattle stocking and finishing system, considering the opportunity costs of land, capital and stock variation, which in the case studied was negative, obtained a profitability of 9,40%. A difference in profitability becomes clear and reinforces the importance of performing the analysis correctly.

The profitability of pasture or feedlot systems varied on average from 9.4 to 13.25 and 0.6 to 3.9%, respectively, according to the scenarios of value-for-sale of the animals (RAUPP; FUGANTI, 2014). The authors highlight the greater risk when finishing is performed in feedlots. Therefore, risk analysis should be considered in production systems, especially when comparing different systems or activities.

The understanding of these concepts allows producers to achieve a level of management which enables to evaluate the economic return of the property and of the activities involved on it, in order to obtain information and therefore enable taking technical decisions.

Thus, the objective was to conduct an economic analysis of the productive processes in the rural property, in order to perceive the viability of the activities developed on the farm.

### Materials and methods

The study was conducted in a rural property in the municipality of Rio Grande - RS on Southern Brazil. The owners started the production activities in 1973 with the lease of 326 hectares. Currently, they have a total of 2,500 hectares, having as sources of income: Beef cattle breeding, of Angus breed, Criollo horses, rice cultivation, and land lease for agricultural partners and sale of water for planting rice.

Meetings were held with the owners, when field visits and collection of patrimonial, economic and productive data were carried out. The activities started on July 1<sup>st</sup> of 2009 to June 31<sup>st</sup> of 2010.

The inventory was made with base on the owner's federal income tax, with the objective of survey the patrimony to support the balance calculation and accounting depreciation on production costs.

The analysis of the patrimonial balance was found necessary for the company's financial health visualization, in other words, to verify if the company's net worth is decreasing or increasing.

There were evaluated the following items: total cost (MATSUNAGA *et al.*, 1976), gross margin of the property (BARROS, 1968) and of the different processes: depreciation (BARBOSA; SOUZA, 2007); average total cost (REIS, 2002); profitability, and investment return (RUFINO *et al.*, 2014) (TABLE 1). Fixed and variable costs and land opportunity cost (OIAGEN, 2017) (TABLE 1) were also identified.

Table 1 – Formulas used for the respective analyzed items

Items Analyzed	Used Formulas	References
Total Cost	Variable Costs + Fixed Costs	MATSUNAGA <i>et al.</i> 1976
Gross Margin	Revenue - Total Disbursements	BARROS, 1968
Depreciation	(Initial Value - Final Value) / Lifetime	BARBOSA; SOUZA, 2007
Average Total Cost	(Variable Costs + Fixed Costs) / Quantity Produced	REIS, 2002
Profitability	(Total Revenue - Total cost) x 100 / Total Revenue	RUFINO <i>et al.</i> 2014
Investment Return	Total Profit / Invested Capital	RUFINO <i>et al.</i> 2014
Land Opportunity Cost	Production/ha x Product Price x Area (ha)	OIAGEN, 2007

Source: The authors, 2017.

To calculate the fixed cost it is necessary to calculate the depreciation. The average total cost must be calculated for each productive sector, supporting the administrator at the marketing time. As indicators of real economic situation of the property were discussed the investment return and the profitability. The investment return in the macro process was carried out by the increase in the net worth divided by the initial patrimony. As for the processes it was made a division between capital, according to what is actually used for the

system. The cost of capital opportunity is calculated by simulation of what could be improved if this money were invested in the financial market. This type of cost is able to show the degree of efficiency of production activities. As for the opportunity cost it was calculated as if the land was leased based on a quantity of product stipulated in a contract (OIAGEN, 2017).

All data were tabulated and analyzed using Microsoft Excel, version 2010.

## Results and discussion

After analyzing the cash flow for the year of 2009/2010, it could be observed that the gross margin was BR\$ 16,175.28, demonstrating that the enterprise was able to pay its disbursements. The fixed, variable and total costs reached an amount of BR\$ 440,005.33; BR\$ 368,002.36 and BR\$ 808,007.69 respectively.

The revenues earned in the year from the sale of animals and rice totaled BR\$ 1,142,678.04, recalling that the variation of the productive stock of all activities was considered, obtaining an total profit of BR\$ 334,670.35.

In the study of the balance sheet it was found that the assets went from BR\$ 16,450,826.01

(TABLE 2) to BR\$ 17,714,712.90 (TABLE 3), with an increase of BR\$ 1,263,886.89, referring to the amortization of debts, purchase of machinery and implements and increase in the stock of rice. In livestock, the system occupied an area of approximately 1480 hectares with 267 animals. The categories marketed in that period were: steers, heifers and finished cows. In this case, the gross margin was BR\$ 80,937.11. In fixed, variable, total and average costs per animal, there was a total of BR\$ 101,328.71, BR\$ 100,077.89, BR\$ 201,406.60, BR\$ 754.33, respectively.

Verifying the income from the year on the property, the sale of animals came to a total of BR\$ 238,351.60, being considered the variation of productive stock, resulting in total income of BR\$ 36,945.00 (TABLE 4).

Table 2 – Balance sheet of rural property held in July 2009

Assets		Liabilities	
Circulating		Circulating	BR\$ 2,943,107.17
Money in Cash	BR\$ -3,633.02	Intermediate	
Animals Sale	BR\$ 30,227.36	Long Term	
Animals in Stock	BR\$ 1,053,532.50		
Rice in Stock	BR\$ 408,735.72		
Intermediate			
Machinery	BR\$ 65,000.00	Net worth	BR\$ 16,450,826.01
Implements	BR\$ 37,780.00		
Vehicles	BR\$ 155,280.00		
Fixed			
Land	BR\$ 17,500,000.00		
Buildings	BR\$ 25,000.00		
Improvements	BR\$ 122,009.62		
Total Assets	BR\$ 19,393,932.18	Total Liabilities	BR\$ 19,393,932.18

Source: The authors, 2017.

The breeding of Angus cattle, occupied an area of approximately 400 hectares, working with full cycle and marketing bulls, weaned calves, heifers and mature cows. When analyzing cash

flow (2009/2010), it was observed that the gross margin resulted in the value of BR\$ 3,158.59, showing that the activity was able to pay its disbursements.

The fixed, variable, total and average costs totaled BR\$ 42,102.75, BR\$ 55,673.73; BR\$ 97,777.48 and BR\$ 987.65 per animal, res-

pectively. With the sale of animals, a total income of BR\$ 24,171.41 was achieved (TABLE 4).

Table 3 – Balance sheet of the rural property held in June 2010

Actives		Passives	
Circulating		Circulating	BR\$ 867,472.84
Money in Cash	BR\$ -124,196.46	Intermediate	BR\$ 946,847.70
Animals Sale	BR\$ 11,088.26	Long Term	BR\$ 27,050.00
Animals in Stock	BR\$ 1,035,531.50		
Rice in Stock	BR\$ 467,390.52		
Intermediate			
Machinery	BR\$ 206,300.00	Net worth	BR\$ 17,714,712.90
Implements	BR\$ 157,680.00		
Vehicles	BR\$ 155,280.00		
Fixed			
Land	BR\$ 17,500,000.00		
Buildings	BR\$ 25,000.00		
Betterments	BR\$ 122,009.62		
Total Assets	BR\$ 19,556,083.44	Total Liabilities	BR\$ 19,556,083.44

Source: The authors, 2017.

The breeding of Criollo Horses occupied an area of approximately 20 hectares. The cash flow of this activity reached a negative gross margin of BR\$ 14,098.25, showing that the productive process was not able to cover its disbursements. The fixed, variable and total costs totaled BR\$ 6,985.68; BR\$ 18,604.80 and BR\$ 25,590.48 respectively.

The revenues from the sale of colts and covers totaled BR\$ 15,997.90, being considered the variation of productive stock, obtaining a total loss of BR\$ 9,592.58 (TABLE 4).

The rice crops occupied an area of 90 hectares. In the cash flow for the year of 2009/2010, it was observed a negative gross margin of BR\$ 6,907.12, demonstrating that the productive process was not able to pay off its disbursements. The fixed, variable and total costs resulted in BR\$ 97,616.03, BR\$ 118,016.80 and BR\$ 215,632.83, respectively.

About the water sale for rice cultivation, 650 hectares were marketed for this purpose, destined to areas of third parties, renters and for use in the crops of the farm manager itself.

In the cash flow was obtained a gross of BR\$ 136,897.57, demonstrating that the productive process was able to pay its disbursements. The sale of water has as fixed costs a total of BR\$ 122,163.37. The variable costs totaled an amount of BR\$ 75,629.14. Thus, the total cost is BR\$ 197,792.51. The revenues for the year totaled BR\$ 340,288.08, obtaining a total profit of BR\$ 142,495.57 (TABLE 4).

The area rented for rice cultivation was of 600 hectares, resulting in its cash flow a gross margin of BR\$ 193,701.77, demonstrating that the productive process was able to pay its disbursements.

The fixed, total and average costs totaled BR\$ 69,807.98, BR\$ 69,807.79 and BR\$ 11.63 / bag of rice, respectively. The revenues obtained in the year on the property came to a total of

BR\$ 193,701.77, assuming the value per hectare leased as 10 rice sacks, obtaining a total profit of BR\$ 123,893.98 (TABLE 4).

Table 4 – Revenues, total cost and result of productive processes of the analyzed property

Productive Processes	Revenues	Total Cost	Result
Livestock	BR\$ 238,351.60	BR\$ 201,406.60	BR\$ 36,945.00
Angus Breeding	BR\$ 121,948.89	BR\$ 97,777.48	BR\$ 24,171.41
Rice Crops	BR\$ 232,389.80	BR\$ 215,632.83	BR\$ 16,756.97
Water Sale	BR\$ 340,288.08	BR\$ 197,792.51	BR\$ 142,495.57
Criollo Horse	BR\$ 15,997.90	BR\$ 25,590.48	BR\$ -9,592.58
Land Lease	BR\$ 193,701.77	BR\$ 69,807.79	BR\$ 123,893.98
Total	BR\$ 1,142,678.04	BR\$ 808,007.69	BR\$ 334,670.35

Source: The authors, 2017.

Values found in livestock for fixed, total and average costs are essential to monitor the economic development of the property and also to know the costs involved per animal. To Oaigen *et al.* 2008, determining the cost per animal is the essential tool for a cost effective and efficient beef cattle production.

It was verified that the sale of 225.61 animals was sufficient to pay off the operating cost of this productive system, and the 41.39 remaining animals were responsible for the positive return of 0.33% (TABLE 5). The profitability was 15.50%, which for Rufino *et al.* (2014), represents what each product leaves as a result, after being discounted the value of the costs of its elaboration.

About the breeding of Angus cattle, it was found that the return from the sale of animals was 19.82%, where the profitability was 8.47% (TABLE 5), showing that it increased its equity, and behaves more advantageous than investment alternatives such as savings accounts, where gains are close to 6% per year.

The area occupied by the breeding of Criollo horses was estimated, since they are created extensively with cattle, which prevents an accurate measurement of the area occupied by this activity.

The Criollo horse production system has a return of -59.96% and profitability of -6.15% (TABLE 5); demonstrating that the activity is de-

creasing its equity, being uneconomical for the productive system.

The return achieved by the rice sale and the receiving of 60 hectares of insurance reached a percentage of 7.21% and the profitability achieved 1.69% (TABLE 5), which shows that the activity is increasing its equity, however, was not effective before capital investment alternatives, such as savings accounts and bank deposit credit that reach approximately 6% per year.

The property has an excellent irrigation infrastructure, the main piece, a 11 km long channel, approximately 20 meters wide and 3 meters deep. This facility can be considered as one of the competitive advantages that adds great value to the property, as implements of this magnitude today are embargoed by environmental agencies. This channel is designed to provide water to an area of 2,000 hectares of rice crop.

The sale of water to the rice production showed return of 41.87%, being not possible to calculate profitability, due to the value of the infrastructure being incorporated into the value of land, thus causing distortions in the analysis.

The land lease for rice cultivation showed return of 63.96% and profitability of 2.95% (TABLE 5), showing that the activity is increasing its equity, however, it is not effective against capital alternatives, such as savings account and bank deposit credit.

Conducting an economic analysis of the farm and comparing the productive processes, it was found that the activities may have two classifications: the processes that can offset operating costs (livestock, Angus cattle breeding, rice cultivation, water sale and land lease) and the process that cannot pay its operating costs (Criollo Horse breeding) (TABLE 4).

Checking exclusively profitability, it can be observed that only one of the productive processes can have a better return than other types of investment, compared to savings account that generates a return of 6% per year, which would be the Angus cattle breeding, that reached 8.47%, as shown in Table 5.

Table 5 – Profitability of the productive process in the analyzed property

Productive Processes	Return (%)
Livestock	0.32
Angus Breeding	8.47
Rice Crops	1.69
Water Sale	Disregarded
Criollo Horse	-6.15
Land Lease	2.95

Source: The authors, 2017.

Simulating the lease of 850 hectares for rice planting, corresponding to the entire area that can be used for this planting, and allocating the remaining area for livestock lease, as well as the income of its production assets (livestock,

machinery and implements) in investments such as savings accounts (6% a year) and from the income of the uprisings by the sale of water to 850 hectares, it would reach an amount of capital of BR\$ 892,650.75 (TABLE 6).

Table 6 – Analysis of the capital opportunity cost

Destination	Quantity (ha)	Payment	Total
Lease of land to rice cultivation	850	10 sacks/ha	BR\$ 229,500.00
Lease of land for livestock production	1,650	40 kg of beef/ha/year	BR\$ 165,000.00
Income of production assets	-	6% a.a	BR\$ 85,050.75
Income of water sale	850	18 sacks/ha	BR\$ 413,100.00
<b>Total</b>			<b>BR\$ 892,650.75</b>

Source: The authors, 2017.

Out of this total it should be subtracted BR\$ 170,827.78, representing the pró-labore and part of the fixed costs, which would result in a value of BR\$ 721,823.14, which divided by the net equity provides a profitability of 4.07%, a low value compared to investment alternatives such as savings accounts, where gains are close to 6% per year.

It could be verified after this study that the investment return and the profitability of macro productive process were positive, although there are processes that need improvements in order to have a greater economic return.

To use the cost management as a support tool in making business decisions, it would be of fundamental importance to create standardization in the accounting, the apportionments and the central costs.

The search for greater efficiency and effectiveness in the production system is critical to the economic health and sustainability of the property.

Also, a greater agility by the owners in the marketing of products in order to obtained a remuneration of capital consistent with other business opportunities is of fundamental importance.

## Conclusion

In the evaluated propriety, all the activities showed to be profitable, except for the breeding of Criollo horses.

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