Profitability analysis of backgrounding and finishing of beef cattle in western amazon: a multiple-case study

Análise da rentabilidade de sistemas de recria e engorda de bovinos de corte na amazônia ocidental: estudo de múltiplos casos

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Highlights

Cattle purchase was representative in the Effective Operating Coefficient (79.3%).
The production scale influenced the Total Operating Cost - TOC.
The developed activities were able to cover their current expenses.
The properties were able to afford the monthly disbursements.

Abstract

This study aimed to evaluate the economic profitability of farms for backgrounding and finishing of beef cattle located in the mesoregion of Acre valley, in a multi-case study format. The data used originated from three pre-selected farms from January to December 2018. Data were collected from an inventory of assets and cash flow, which were later tabulated in Excel® software using descriptive statistics through mean, percentage, and standard deviation to present the indicators. The average effective operating cost (EOC) was BRL 1,399,014.34 and the total operating cost (TOC) was BRL 1,444,068.53 and the total cost (TC) was BRL 1,673,860.38. The items that compose the EOC which exerted greater representation on

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the activity costs were the purchase of animals (79.6%), food (7.8%), and labor (5.9%), respectively. Under these conditions, the three properties studied showed positive gross margins, net margins, and positive results, indicating their profitability in the short, medium, and long term, with possibilities for expansion in the region.

Key words: Acre. Production cost. Profitability. Livestock.

Resumo

Objetivou-se avaliar a rentabilidade econômica de propriedades rurais de recria e engorda de bovinos de corte localizadas na mesorregião do vale do Acre, no formato de estudo multicaso. Os dados utilizados foram provenientes de três propriedades rurais pré-selecionadas durante o período de janeiro a dezembro de 2018. Foram coletados dados de inventário de bens e fluxo de caixa, posteriormente tabulados no software Excel® utilizando estatística descritiva por meio da média, porcentagem e desvio padrão para apresentar os indicadores. A média do custo operacional efetivo (COE) foi de R $1.399.014,34 e a do custo operacional total (COT) de R$1.444.068,53 e custo total (CT) de 1.673.860,38. Os itens componentes do COE respectivamente, que exerceram maiores representatividades sobre os custos da atividade foram o de compra de animais (79,6%), alimentação (7,8%) e mão de obra (5,9%). Nessas condições, as três propriedades estudadas apresentaram margem bruta, margem líquida e resultado positivos, indicando sua rentabilidade a curto, médio e longo prazo, com possibilidades de expansão na região.

Palavras-chave: Acre. Custo de produção. Lucratividade. Pecuária.

Introduction

Brazil has the largest commercial cattle herd in the world with 213.5 million head of cattle, according to the (Instituto Brasileiro de Geografia e Estatística [IBGE], 2018). The country produced 10.96 million tonnes of carcass weight equivalent (TCE) in 2018, 12.8% above the previous year. Of this total, 20.1% were exported and 79.6% were destined to the domestic market.

The country also slaughtered 44.23 million heads of cattle this year and is one of the main highlights of Brazilian agribusiness, the GDP of cattle rearing totaled BRL 597.22 billion in 2018 (Associação Brasileira das Indústrias Exportadoras de Carnes [ABIEC], 2020).

The revenue of the agricultural sector in 2019 (Gross Production Value - GPV) was estimated to grow by 1% compared to the previous year, totaling BRL 609.7 billion, mainly driven by the livestock sector with robust growth and a value of BRL 232.9 billion (Confederação da Agricultura e Pecuária do Brasil [CNA], 2019).

In the North region of Brazil, there was an increase of 24% in the number of herds from 2008 to 2018, especially in the state of Rondônia. During the same time, Acre had a herd of about 3 million cattle heads, 93% of which were tagged animals (IBGE, 2018).

In 2018, pasture area in the state of Acre was 1,794,313 ha, with a cattle herd of 2,187,020 (animal units) AU and stocking rate of 1.2 AU/ha, remaining practically constant in the last 5 years (Laboratório de Processamento de Imagens e Geoprocessamento [LAPIG], 2020).

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Most of the farms still follow a traditional system and low zootechnical indices, nearly 90% of the farms in the region are under extensive production system, mostly with grasses of the genus *Brachiaria brizantha, Brachiaria decumbens, Brachiaria humidicula,* and *Panicum maximum* (Barbosa et al., 2015).

In the same period, Acre had a herd of approximately 3 million cattle (IBGE, 2018) with a significant share of 10.5% Gross Domestic Product (GDP) of the state (IBGE, 2017).

These data highlight the importance of beef cattle farming for Acre; however, it is necessary to study and know the zootechnical and economic indices of the production systems, regardless of size, scale, type of labor, or technological level.

Analyzing the activity of beef cattle economically is extremely important, as only then the producer gets to know in detail and use, intelligently and economically, the production factors (Lopes & Carvalho, 2002), other than adopting new techniques and modern procedures to increase production efficiency, seeking to increase the production scale and reduce costs (Nogueira & Bergamasco, 2010).

Based on the above considerations, several researchers have been concerned with studying different aspects of beef cattle backgrounding and finishing, such as nutrition, facilities, carcass quality, genetics, and slaughter age of the animals. However, few have evaluated the economic viability of this activity and the factors that influence its profitability. In the North region, more specifically in Acre, such researches are extremely scarce.

Beef livestock has great economic and social importance for the state of Acre, as it generates jobs, income from agricultural products, and supply to the domestic market and imports (Barbosa et al., 2015). Due to the great importance of beef cattle rearing for the country and the state of Acre, as well as the scarcity of scientific studies on the subject, the objective of this study was to analyze the economic profitability of the activity in the mesoregion of Acre valley; specifically seeking to identify the components that exerted greater representations on final production costs.

Material and Methods

The data used in this study originated from three beef cattle farms located in the mesoregion of Acre valley, municipality of Rio Branco-Acre, in Western Amazon, whose production system was backgrounding and finishing, from January to December 2018.

In this research, two different steps were considered in the information survey:

The first consisted of a complete *in loco* survey of the improvements, machinery, and equipment of the studied properties. The values and service life of each asset were calculated and subsequently allocated to one of the following groups: improvements, machinery, equipment and implements, tools, and livestock.

In situations in which the rancher did not have information regarding the value and date of acquisition of the equipment, machinery, and/or improvements, to estimate the current values, as well as the remaining service life, the assets were analyzed and categorized into four criteria. For the categorization of the goods, the conservation state was analyzed and later classified as: excellent, good, regular, and bad, and the current values were estimated at 100,

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75, 50, and 25%, respectively, of the market values of the new goods. To estimate the remaining service life, the percentages of 100, 75, 50, and 25% were considered, following the methodology of Lopes et al. (2004).

As for the improvements, each one was measured, being assigned a state of conservation, aiming to help estimate the current value. Depending on the area, the state of conservation, and the standard of finishing, a value per m² of construction was estimated. The current value used was the product of the m² value by the area of the improvement.

In the second stage, visits were carried out with the collection of information regarding the income and expenses of each property, individually.

The items that make up the EOC of the production systems were divided into groups: food, animal health, animal reproduction, leases, labor, purchase of animals, administrative expenses (including fees and taxes, general expenses, and freight), energy and fuel, machinery maintenance, equipment, and improvements.

The properties were named in A, B, and C and had characterizations (Table 1).

Property A had a wooden house, a mixed house (headquarters), a covered corral, a shed for inputs and machinery, a tractor, back pumps, an electronic scale, and a chainsaw as improvements.

Property B had wooden houses, covered troughs, a corral, metal sheds, and machinery: a tractor, back pumps, disk harrows, and electronic scales.

Property C had wooden and masonry houses, covered and uncovered troughs, and a management corral, in addition to machineries such as tractors, back pumps, manual scales, chainsaws, seeders, and sprayers.

Table 1
Description of properties A, B, and C (backgrounding and finishing)

Description	A	B	C
Pasture area (ha)	300	680	150
Lease/own	lease	own	own
Food base	pasture and mineral salt	pasture and mineral salt	pasture and mineral salt
Labor (number of employees)	3	4	2

The food base of the three properties is mineral salt and pasture throughout the year. The producers chose to supplement with protein in the dry period.

The data obtained were registered and tabulated in Excel® software, as well as the analysis of the profitability of the production systems. Two production cost structures

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were considered: total production cost, which involves the fixed and variable cost, used by Reis, Takaki and Reis (1999), and operating cost, proposed by Matsunaga, Bemelmans and Toledo (1976).

Results and Discussion

The resources available in the three production systems are shown in Table 2 used in the analysis and discussions of the results found in this research.

Table 2
Available resources in properties A, B, and C (backgrounding and finishing) of beef cattle, in the municipality of Rio Branco - AC (period from January to December 2018), with standard deviation (SD)

Description	A	B	C	Average	Standard Deviation
Value of equity without land (BRL)	1,207,926.00	2,743,831.00	1,529,975.00	1,827,244.00	661,325.80
Value of equity on land (BRL)	-	7,000,000.00	2,000,000.00	4,500,000.00	2,500,000.00
Value of fixed assets without land/ha	BRL 4,026.42	4,035.05	10,199.83	6,087.10	3,082.40
Value of fixed assets on land/ha	-	10,294.12	13,333.33	11,813.73	1,519.60
Total area of the activity (ha)	300	680	150	376.67	265.00
Cattle herd (heads)	1112	2972	480	1,521.33	1,246.00
Labor (BRL/day)	310.22	300.90	35.85	215.66	132.50

Source: Adapted from Demeu (2011).
SD: Standard Deviation.

The average value of landless fixed assets/ha, considering only properties with owned land, was BRL 6,087.10. And fixed assets on land/ha BRL 11,813.73

A different result was observed by Demeu (2011) in a study on the profitability of backgrounding and finishing in the region of Lavras (MG), where the value of landless fixed assets/ha in a production system with its land was BRL 1,664.11/ha. In the same study, the author found a result of fixed assets on the land of BRL 10,000.00/ha.

The animal/human ratio was 414. These values are much higher than recommended by the (Brazilian Livestock Yearbook (Anuário da Pecuária Brasileira [ANUALPEC], 2010) which is 229. Thus, the workforce has been used in 181%, showing efficiency in this production factor. Such a fact is due to the production system in most of the studied farms, which is extensive and has low technology.

Regarding EOC (Table 3), the average value found was BRL 1,399,014.34. The most representative items according to the average

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of the three properties were the purchase of cattle (79.6%), followed by animal feed (7.8%) and labor (5.9%).

In partnership with the Centro de Estudos Avançados em Economia Aplicada [CEPEA] (2019), CNA researched through the *Campo Futuro* Project, in the municipality of Sena Madureira - AC and found a lower EOC value in the same production system (BRL 786,341.99) (CNA, 2019a), In this work, the items that most impacted the EOC were also the acquisition of replacement animals, with a share of 64.9%, followed by expenditure on animal feed (11.6%) and the payment of labor hired (6.1 %).

The purchase of replacement animals must be well planned, preferably taking place in times of a high supply of young animals and low prices. This decision-making will reduce the costs of the activity enabling investments in other sectors.

Lopes, Santos, Magalhães and Carvalho (2007) pointed out that the acquisition of animals has a high percentage in the EOC, and that the rancher should pay more attention to this issue, as a small economy, without neglecting the quality of the animals, represents a considerable reduction of the EOC.

The second most representative item in the EOC was animal feed (7.8%). As noted in third place by Demeu (2011), the item was relevant due to the provision of animal supplementation in addition to mineral salt.

Labor was the third most representative item in the EOC (5.9%) and corresponds to contract, temporary, and technical assistance. On a property in the municipality of Denise - MT, production costs were raised and labor (in the finishing stage) was the most relevant item in terms of costs (BRL 39,600.00 hired labor) representing 24.02% of the total (Cruz, 2019).

The increase in labor efficiency indices, when well planned, leads to the dilution of disbursements with the payroll while the income generated by the property increases. Thus, training people and teams is essential for the success of livestock activity (CNA, 2019b).

The average total revenue (TR) in the three properties analyzed was BRL 1,777,267.44/ year, higher than the average EOC (BRL 1,399,014.34) (Table 4). Therefore, the activity was able to cover its current expenses for the year, with no need for external resources.

The lack of information in the field, or how it is passed on to the producer, is a limiting factor for the expansion of their production. Quality technical assistance helps the producer to solve problems, reduce costs, and correctly manage the farm, becoming essential for the success of the activity (Sant'Ana, 2014). However, only 0.1% of the total cost of the producer was allocated to specialized technical assistance.

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Table 3
Contribution (R$) of each item on the effective operational cost of properties A, B, and C (backgrounding and finishing) of beef cattle, in the municipality of Rio Branco – AC (from January to December 2018)

Specification	A	%	B	%	C	%	Average	%	Standard Deviation
Feed	69,911.40	5.2%	237,688.00	8.6%	20,801.00	27.9%	109,466.80	7.8%	113,725.39
Concentrate	28,595.56	2.1%	215,400.00	7.8%	19,618.00	26.3%	87,871.19	6.3%	110,534.37
Roughage	41,315.84	3.1%	22,288.00	0.8%	1,183.00	1.6%	21,595.61	1.5%	20,075.38
Sanity(?)	10,065.00	0.7%	12,940.00	0.5%	7,774.27	10.4%	10,259.76	0.7%	2,588.37
Reproduction	6,100.00	0.5%	0.00	0.0%	0.00	0.0%	2,033.33	0.1%	3,521.84
Leases	104,400.00	7.7%	0.00	0.0%	0.00	0.0%	34,800.00	2.5%	60,275.37
Labor	119,816.83	8.9%	112,830.00	4.1%	13,085.28	17.6%	81,910.70	5.9%	59,706.85
Labor	113,228.83	8.4%	109,830.00	4.0%	13,085.28	17.6%	78,714.70	5.6%	56,862.15
Specialized Technical Assistance	0.00	0.0%	3,000.00	0.1%	0.00	0.0%	1,000.00	0.1%	1,732.05
Mechanical Services	6,588.00	0.5%	0.00	0.0%	0.00	0.0%	2,196.00	0.2%	3,803.58
Purchase of cattle	969,000.00	71.7%	2,373,944.51	85.7%	0.00	0.0%	1,114,314.84	79.6%	1,193,624.91
Costs	9,163.99	0.7%	11,650.00	0.4%	9,899.91	13.3%	10,237.97	0.7%	1,277.02
Fees and Taxes	595.69	0.0%	0.00	0.0%	4,782.30	6.4%	1,792.66	0.1%	2,606.18
General Expenses	6,951.80	0.5%	9,850.00	0.4%	5,000.00	6.7%	7,267.27	0.5%	2,440.34
Freight	1,616.50	0.1%	1,800.00	0.1%	117.61	0.2%	1,178.04	0.1%	922.93
Energy and Fuel	39,806.79	2.9%	5,609.00	0.2%	13,216.49	17.7%	19,544.09	1.4%	17,955.53
Machine Maintenance	23,676.53	1.8%	15,938.00	0.6%	9,726.04	13.1%	16,446.86	1.2%	6,989.15
Total EOC	1,351,940.54	100.0%	2,770,599.51	100.0%	74,502.99	100.0%	1,399,014.34	100.0%	1,348,664.55

Source: Adapted from Demeu (2011).
SD: Standard Deviation.

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Table 4
Summary of the profitability analysis (BRL) of the beef cattle activity (backgrounding and finishing) on properties A, B, and C, in the municipality of Rio Branco - AC, from January to December 2018

Specification	A			B			C			Average			Standard Deviation
	value	%TOC	%/TC	value	%TOC	%/TC	value	%TOC	%/TC	value	%TOC	%/TC	
Total revenue (BRL)	1,413,305.00			3,497,056.05			421,441.28			1,777,267.44			1,569,778.0
Cattle slaughter	1,413,305.00			1,996,625.25			421,441.28			1,277,123.84			796,373.1
Sale of animals	-			1,500,430.80			-			1,500,430.80			866,274.1
Effective operational cost (EOC) (BRL)	1,351,940.54	100.00		2,770,599.51	96.86		74,502.99	62.15		1,399,014.34	96.88		1,348,664.5
Depreciation (BRL)	-			89,788.81	3.14		45,373.75	37.85		67,581.28	4.68		44,895.3
Total operating cost (TOC) (BRL)	1,351,940.54			2,860,388.31			119,876.74			1,444,068.53			1,372,576.6
Fixed Cost (FC) (BRL)	6,759.70		0.48	525,027.21		15.53	165,727.51		68.35	232,504.81		13.89	265,508.4
Land remuneration (BRL)	-			420,000.00		12.43	120,000.00		49.49	270,000.00		16.13	216,333.1
Remuneration of invested capital (BRL)	6,759.70		0.48	14,038.40		0.42	372.51		0.15	7,056.87		0.42	6,837.8
Investment in goods (BRL)	-			1,200.00		0.04	-			1,200.00		0.07	692.8
Depreciation (BRL)	-			89,788.81			45,355.00			67,571.90			44,895.2
Variable costs (VC) (BRL)	1,392,498.75		99.52	2,854,829.89		84.47	76,738.08		31.65	1,441,355.57		86.11	1,389,690.2
EOC (BRL)	1,351,940.54		96.62	2,770,599.51		81.97	74,502.99		30.73	1,399,014.34		83.58	1,348,664.5
Working capital remuneration (BRL)	40,558.22		2.90	84,230.39		2.49	2,235.09		0.92	42,341.23		2.53	41,026.7
FC+VC = TC (BRL)	1,399,258.46		100.00	3,379,857.10		100.00	242,465.59		100.00	1,673,860.38		100.00	1,586,619.4
Gross margin (BRL)	61,364.46			726,456.54			346,938.29			378,253.10			333,650.0
Net margin (BRL)	61,364.46			636,667.73			301,564.54			333,198.91			288,953.3
Result (BRL)	14,046.54			117,198.95			178,975.69			103,407.06			83,325.1

Source: Adapted from Demeu (2011).
*SD: Standard Deviation.

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The total operating cost (TOC = EOC + depreciation) was the same as the EOC in system A, which occurred because there is no depreciation since it is a lease. Therefore, the average TOC, considering the three properties, was BRL 1,444,068.53, higher than the value found by CNA (2019a) (BRL 935,914.44/ year) in the Campo Futuro Project held in Sena Madureira-AC on a typical property of the region.

Depreciation accounted for 0.00%; 3.14%, and 37.85% of the TOC, from properties A, B, and C, respectively. These results demonstrate that production scale influenced the TOC and, therefore, the profitability and cost-effectiveness of the production systems studied. This is due to the optimization of the physical structure of the company: by increasing the production scale to certain levels, the total operating cost per unit is reduced (Lopes, Santos, Magalhães and Carvalho, 2007).

These values are higher than those found by Lopes et al. (2007) who determined that depreciation represented 1.74% of the TOC in a large production system (3,583 animals).

Analyzing the fixed cost (FC) of this research, the leased property presents lower values (BRL 6,759.70) when compared to properties B and C that worked on their land (BRL 525,027.21 and BRL 165,746.26/ year)

Property A (leased) excludes land remuneration (Included in the calculation due to the need to compensate for the use of land for livestock, in the sense of the cost of opportunity) which represents a large portion of the total cost, so the value ends up being much lower than property B and C.

Fixed costs are composed of land remuneration, invested capital remuneration, the entrepreneur's remuneration, taxes considered fixed (Rural land property tax - ITR and Motor Vehicle Property Tax - IPVA,) and assets depreciation (Lopes & Carvalho, 2002). These costs do not represent disbursements (except for taxes), but rather what the activity should pay to be competitive with other economic activities and not decapitalize the rancher over the years. If these costs are not considered, the rancher could, overall, lose assets and become indebted (Lopes & Carvalho, 2002).

Considering the three properties, the average fixed cost was BRL 232,511.06/ year, and the item that had the greatest impact was land remuneration. For the leased property, the fixed cost became lower since the land remuneration item was not included in this calculation.

This value is high because it is the remuneration of the land production factor. The larger the size of the property (hectare), and the greater the value attributed to the land in BRL (bare land + construction of improvements, buildings, and other infrastructures), the greater this value will be. One way to minimize such effects and reduce production cost is to increase the stocking rate by improving the weight gain of the animals, and/or increasing the amount of AU/ha. (Lopes & Carvalho, 2002).

According to Lopes, Cardoso, Demeu and Dias (2008), once the stocking rate is increased, the land production factor will be optimized, reducing production cost, and increasing profitability. With this practice, these production systems will reduce the fixed cost and, consequently, total production cost, due to the better use of land and goods (inventory), thus "diluting" the fixed costs.

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Concerning the profitability indicators (Table 4), the three farms analyzed had a positive gross margin (average of BRL 378,253.10/ year), and net (average of BRL 320,845.16), and a positive result indicating profit (BRL 91,040.81).

Thus, the properties can afford the monthly disbursements, in addition to exchanging/renovating all improvements, machines, and implements when necessary.

Conclusions

The analyzed properties in this study showed satisfactory results concerning the profitability of beef cattle production in the backgrounding and finishing phase.

The economic efficiency indicators; gross margin, net margin, and positive results, indicate its profitability in the short, medium, and long term. Costs with purchasing animals' food and labor, respectively, are the items that exert the greatest representation on variable costs.

The mesoregion of Acre valley, municipality of Rio Branco-Acre in Western Amazon, showed favorable beef cattle production due to market guarantee, proximity to large centers, land price, and favorable climate, which enable the activity to sustainably expand.

The analysis enlightened knowledge aspects related to the regional particularity of the backgrounding and finishing system. The results obtained are considered capable of helping cattle raisers and technicians to identify factors related to production cost, which can be used as a basis for decision-making.

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