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ARTICLE

Costs and financial viability of blueberry production in Pelotas

Custos e viabilidade financeira da produção de mirtilo cultivado em Pelotas

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Resumo: O cultivo do mirtilo é uma atividade econômica recente no Brasil. O sistema produtivo e comercial ainda precisa de melhorias, principalmente para oferecer regularidade, qualidade produtiva e transparência de custos e preços. Não se tem conhecimento de estudos dedicados a analisar a viabilidade econômica da produção de mirtilo nas condições brasileiras. Portanto, o objetivo deste trabalho é levantar os custos e analisar a viabilidade econômico-financeira desta cultura em uma fazenda localizada em Pelotas (RS). A coleta e análise dos dados seguiram o procedimento adotado pela Matriz de Análise de Política e os indicadores de viabilidade utilizados foram o Valor Presente Líquido (VPL), a Taxa Interna de Retorno (TIR) e o *Payback*. Os resultados mostraram um custo de produção de US$ 7.394,61 por hectare ou US$ 2.310,88 por tonelada e viabilidade financeira na produção, dado que o VPL para o período de 10 anos foi de US$ 26.214,81, a TIR de 26,36%, a renda líquida foi de US$ 7.180,25 hectare/ano-1 e o *Payback* foi de 4,9 anos. Desse modo, a produção de mirtilo no sul do RS é lucrativa e a cadeia produtiva pode receber novos investimentos, segundo as condições tecnológicas e mercadológicas indicadas neste estudo.

Palavras-chave: *Vaccinium spp.*, investimentos agrícolas, economia, pequenas frutas.

Abstract: Blueberry cultivation is a recent economic activity in Brazil. The productive and commercial systems still need improvement, especially to maintain the regularity of quality and productivity and the transparency of costs and prices. There is no study dedicated to analyze the economic viability of blueberry production under Brazilian conditions. Therefore, the objective of this study is to survey the costs and analyze the economic and financial viability of this crop in a farm located in Pelotas, state of Rio Grande do Sul (RS), Brazil. The data collection and analysis followed the procedure adopted by the Policy Analysis Matrix, and the viability indicators were net present value (NPV), internal rate of return (IRR) and payback period. The results showed a production cost of US$ 7,394.61 per hectare or US$ 2,310.88 per ton and financial viability for production, since the NPV for the 10-year period was US$ 26,214.81, the IRR was 26.36%, the net income was US$ 7,180.25 hectare/year^{-1}, and the payback was 4.9 years. Therefore, blueberry production in southern RS is profitable, and the production chain can receive new investments given the technological and market conditions of this study.

Keywords: *Vaccinium* spp., agricultural investments, economy, small fruits.

1. Introduction

Blueberry is an important berry, a premium fruit of the Ericaceae family and the *Vaccinium* genus (Luo et al., 2018). The world production of blueberries is 525,620 tons over 120,000 hectares (ha), and the main producers are the USA, with 255,050 tons, and Canada, with 164,205 tons (Food and Agricultural Organization of the United Nations, 2018). The blueberry shrub is not

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a widespread species in Brazil; it was introduced in the country in 1983 by Alverides Machado dos Santos, a researcher who brought a collection of plants to the Embrapa Clima Temperado, located in Pelotas, state of Rio Grande do Sul (RS). The first commercial initiative in Brazil took place in Vacaria, RS (Fachinello et al., 2011).

Brazil is a potential blueberry producer because some factors favor its production in the country, such as the possibility of production out of the northern hemisphere season and the availability of water and appropriate land to grow its shrubs (Cantuarias-Avilés et al., 2014).

Furthermore, this culture has the potential to expand in Brazil triggered by consumers' interest, which has grown over the supply. Technically, the activity is already known to be viable (Antunes et al., 2008; Pasa, et al., 2014), but constant innovation in the value chain and/or progressive gain in economies of scale as well as price volatilities may have drastic consequences on farmers' profitability. Therefore, analyzing production costs is essential to evaluate blueberry competitiveness (Lopes et al., 2012).

This study aims at analyzing the economic viability of blueberry production in Southern Brazil. Since this activity is still being consolidated in the region, fruit farmers show a constant demand for its viability in their attempt to diversify or broaden their businesses. Additionally, there are many studies focused on the economic-financial evaluation of fruit activities in Brazil (Kreuz, et al., 2005; Ronque et al., 2013), but none of them has addressed blueberry so far. Therefore, this study is pioneer and has a relevant empirical impact. The production cost of blueberries was studied meticulously, and based on these results this study evaluated the financial viability of cultivating the species by adopting as a model a conventional system recommended by agricultural studies and research.

Production costs estimates are important administrative instruments that enable the identification of risk factors and the development of more realistic agriculture diversification projects. The study will provide key information for decision makers, especially farmers, as to whether or not they should continue to invest in the blueberry business. Furthermore, there is an absolute absence of financial feasibility studies of this economic activity under the local conditions in Brazil.

The objective of this study was to evaluate the costs of production, revenues and viability of blueberry production in Southern Brazil. With this purpose, the study was carried out by analyzing a real production system adopted by farmers in Pelotas, RS, which might be relevant as a guideline for rural extension organizations and other agricultural public policy agencies (Guiducci et al., 2012).

2. Theoretical basis

The investment analysis studied the use and allocation of resources over time and evaluated which outcomes a given project brings to its investor. The results of an investment are influenced by inflation, interest rates, and capital cost, since the entire amount invested must have some remuneration in the future to compensate for the fact that it is not immediately consumed (Oliveira et al., 2017). According to Rebelatto (2004), the investment analysis aimed to help professionals from different areas to make fast and safe financial decisions. Conducting an investment analysis is crucial to knowing the costs and other performance indicators, such as margins and profitability.

2.1 Costs and economic indicators

The economic evaluation may be carried out in different ways, but it is usually based on the following basic concepts: a) annual fixed cost (AFC), which consists of fixed input costs over a year; b) annual labor cost (ALC), represented by the permanent and occasional labor cost over a year; c) annual intermediate inputs cost (IC), also called variable cost; d) total cost (TC), which is the sum of the three costs (fixed, labor and intermediate inputs) involved in the production process; e) gross revenue (GR), constituted by the annual value referring to the production to be commercialized; f) gross profit (GP), generated by the difference between the gross revenue and the annual input cost plus the annual cost of labor [GP=GR-(IC+ALC)]; g) net profit (NP), generated by the difference between the gross revenue and the total cost (NP=GR-TC); h) profitability percentage (PP), which is the ratio between the gross profit and the gross revenue (PP=GP/GR x 100); i) contribution margin ratio (CMR), which represents, as a percentage, the difference between variable costs and the gross revenue by the formula CMR=[(GR-IC)/100]; and j) break-even point (BEP), which is the ratio between the annual fixed cost divided by the contribution margin (BEP=AFC/CMR) (Guiducci et al., 2012; Oliveira et al., 2017).

According to Gonçalves et al. (2017), in the short term, there are important groups of costs, three of which should be highlighted: variable, fixed, and total. The first group is comprised of a variation that depends on the production level of any good in a company. In a blueberry-producing farm, Gallardo & Zilberman (2016) reported that labor costs are the most impactful. It seems that this category of variable cost is in fact the most representative in any fruit-growing farm (Ponciano et al., 2004). Therefore, variable costs are inputs, such as fertilizers, agrochemicals and temporary labor for harvesting or pruning. Fixed costs do not depend on their changes, on the production quantity, or on raw materials. They include expenses associated with permanent labor, insurance, depreciation, and land rental. Finally, the sum of fixed and variable costs results in the total costs. In general, agricultural markets are highly volatile due to the prices paid for inputs (Lobos et al., 2015). As a result of this, the economic conditions and profitability of agricultural investments can vary considerably.

2.2 Investment analysis

Measured values of revenues and costs can lead to the net profit (NP) associated with a given product. Starting from NP, which is obtained by the difference between GR and TC, important indicators of economic efficiency, such as profitability percentage (PP), can be analyzed (Lazzarotto & Fioravanço, 2011). However, an investment may be defined as a cost incurred in the present to yield benefits in the future.

All techniques of investment analysis are based on the concept of cash flow (Olivo, 2008; Oliveira et al., 2017). It should be a planned cash flow or an estimate of future gains or losses, since the investment project has not been implemented yet. In short, an investment analysis aims at verifying whether the project cash flow has economic-financial viability (Souza Junior et al., 2019). A well-administered cash flow enables a company to improve its capacity of generating resources and, consequently, decrease financial costs, since it reduces the need for finance working capital (Gawde et al., 2018). Cash flow is connected to a company's activities in a broad sense, including all the cash inflows and outflows of the businesses it conducts. Thus, it works as a tool for liquidity management, defined as meeting financial obligations in due time (Silva, 2012; Santos et al., 2019).

With the cash flow and using a minimum attractive rate of return (MARR), which represents the minimum rate of return, a company should start a project to keep the market value unchanged (Souza Junior et al., 2019). The analyst may generate important financial indicators, such as the net present value (NPV), the internal rate of return (IRR) and the discounted payback period (DPP). The MARR may also be understood as the opportunity capital cost, and it is also referred to as the hurdle, cutoff and benchmark rates, in addition to the minimum acceptable return rate (Souza Junior et al., 2019).

The DPP indicator is the number of years needed to recover the original investment made in the blueberry orchard. It is usually used as a discounted payback, which is the number of years needed to recover the original investment, considering net cash flows discounted by the MARR (the cost of capital) (Guiducci et al., 2012). In the case of fruit farms, some authors have found payback as long as ten years, but this varies according to yield variability, input and output prices and the macroeconomic interest rate. For blueberry farms, the payback has been found to vary from five to six years (Núñez, 2009; Asănică, 2019).

The NPV consists of calculating the present value of cash flow terms and adding them to the initial investment. Then, by using a minimum attractive rate of return, the total value is discounted. This method considers the total flow with outgoings (investments) and incomings (returns) discounted by the attractive rate (Olivo, 2008; Casarotto Filho & Kopittke, 2000).

The NPV formula is defined as follows:

$$NPV^{1} = II + \frac{CF1}{(1+k)^{1}} + \frac{CF2}{(1+k)^{2}} + \frac{CF3}{(1+k)^{3}} + \ldots + \frac{CFn}{(1+k)^{n}} \quad (1)$$

[1] II = initial investment; CF = annual cash flow; i = interest rate, n = investment time horizon, and k = the minimum attractive rate (11.00% per year).

The internal rate of return (IRR) is the discount rate in which NPV is equal to zero. The investment is attractive when the IRR is higher than the investor's MARR (Veras, 1999; Gitman, 2004).

$$0^{2} = I.I. + \frac{CF1}{(1+IRR)^{1}} + \frac{CF2}{(1+IRR)^{2}} + \frac{CF3}{(1+IRR)^{3}} + \ldots + \frac{CFn}{(1+IRR)^{n}} \quad (2)$$

[2] II. is the initial investment and CFs are annual cash flows.

3. Material and methods

Technical production coefficients were found in a farm during the 2016/17 production cycle, in a commercial orchard located in Pelotas, in the southern mesoregion, in RS (31° 39′ 54″ S, 52° 32′ 13″ W and 120 m altitude). According to Monke & Pearson (1989), this farm stands out as a model property, due to good production rates and its production and marketing strategies. Its production system has the highest efficiency standard and is used in the chain market for analyzing technology and cost structure (Lopes et al., 2012).

Furthermore, other factors contributed to choose the selected blueberry farm as the model, such as the recommendation made by technical experts from Embrapa and Emater-RS. In addition to consulting chain agents, information was also collected from publications about the blueberry production system and financial indicators.

Primary data collection was carried out by means of non-structured interviews, which were based on integrated spreadsheets of the Policy Analysis Matrix (PAM) method inserted in the Microsoft Excel® program. Thus, these were collected directly in the farm, and the secondary data were found in the theoretical references and on databases available.

The initial investments, such as general inputs and mean values of fruit sales, were collected to represent the mean of the last five years, discounting the observed minimum and maximum values to effectively obtain the average and avoid any extreme volatilities.

The O'Neal blueberry cultivar was evaluated in this study due to its adaptability to the regional environmental conditions and acceptability in the fresh fruit market. The spacing suggested by the survey was 3 x 1 m, which results in a density of 3,333 plants per ha. The whole area comprises 4 ha of blueberry shrubs, corresponding to one third of the total area of the rural property. The management and cultural treatments were carried out according to technical recommendations for this culture (Antunes & Raseira, 2006). The harvesting of fully mature fruits was conducted manually, and production was done using localized and drip irrigation systems with surface pipes.

The investment time horizon or useful orchard life considered in this study was ten years. This was based on the notion of obsolescence, since after ten years a significant part of the capital goods may be replaced (Lazzarotto & Fioravanço, 2011) and changes in the economic and technological scenario may take place.

Operational expenses were the costs common to all blueberry farms, such as expenses related to the use of fertilizers, pest and disease control, pruning, harvesting and administration. Cultural treatments were carried out at times and frequency required by the culture, since they are related to plant development. With regard to labor expenses, US$ 19.10 was considered the daily average, which is a regional value.

Revenues resulted from sales of fresh and/or frozen fruits at the end of every season. Although blueberry shrubs start to yield fruits in their first year, they were destroyed before maturation to favor full plant development. Between the second and the fifth year, the plants usually increase production gradually; then, they reach maturity and full production with a maximum mean productivity of 3,200 kg.ha^{1} (Table 1).

Table 1. Fruit production of a blueberry crop in Pelotas, RS, over the first ten years

Fruit production (kg.ha^{1}) in ten years									
1	2	3	4	5	6	7	8	9	10
0	1,120	1,600	2,400	3,200	3,200	3,200	3,200	3,200	3,200

Source: Research data.

Regarding the cost of fixed capital, a MARR of 11% per year and depreciation of goods under use were employed to establish the opportunity cost of expenses, and the results led to the analysis of production financial viability. Thus, a cash flow was elaborated considering all cash outgoings and incomings. Data on investments, technological components of innovation in production, coefficients of revenue and paid and received price values were incorporated into the cash flow with a 10-year planning horizon.

After elaborating the cash flows, levels of financial viability were evaluated and these encompassed three indicators: NPV, IRR and DPP. Clemente & Souza (2008) suggest that the IRR should be the net return obtained by the application of the invested capital to long-term and low-risk bonds compatible with the investor's profile. In this study, the return was 11% per year over the base interest rate – SELIC – in the same period.

Considering the present economic instability in Brazil and to enable comparisons of costs and viability with international production, the American dollar was the currency used in this study. On April 7, 2020, the value of the commercial dollar was R$ 5.22 (buying and selling).

4. Results and discussion

This section is divided into two parts. The first discusses the structure of costs associated with blueberry production in a conventional system and with economic efficiency. The second part analyzes the financial viability results in blueberry production.

4.1. Structure of production costs

Table 2 summarizes the total cost in three groups: annual fixed or permanent cost, labor cost, and input cost. Cost components include all elements of depreciation. Therefore, this represents the total cost, rather than the mere operational cost or the producer's effective expenditure.

Table 2. Effective costs of blueberry production in a conventional system in Pelotas, RS, per ha

Description	US$/ha
1. Fixed Cost	**2.179,10**
Brick barn 288 m^2	214.55
Greenhouse - 2x10 m^2	0.12
Tractor - 275 HP	114.22
Irrigation system	28.19
Brick pump house	2.10
Three-disc plough	0.36
Eighteen-disc harrow	0.29
Fertigation motor - 0.5 HP	1.21
Ridger machine	0.03
Hydraulic turbine sprayer - 400 L	0.03
Disc ridger machine	0.57
Motor pump - 15 HP	3.86
Four-wheeler tractor trailer – 2,500 kg	0.54
2.4-m wide motor grader	0.01
1.6-m wide rotary mower	1.03
Back brush cutter	0.58
Back brush cutter	0.34
Lime spreader	0.15
Gator tractor	71.52
Orchard (implementation)	1,587.03
Ground cost (rental)	152.38
2. Labor cost	**3,887.94**
Permanent labor	2,380.95
Social security	1,190.48
Temporary labor	221.27
Technical support	95.24
3. Variable cost (intermediate inputs)	**1,327.57**
Interest cost (9% per year)	24.00
Agrochemicals	320.00
Fertilizers	188.49
Sawdust	444.44
Fuel and maintenance	350.63
4. Total cost	**7,394.61**
5. Cost per ton	**2,310.89**

Source: Research data.

The initial investment of the project, which aimed at growing four ha of blueberry shrubs, was US$ 127,619.04 excluding the land costs. It includes fixed capital expenses (machines, tools, equipment, facilities, greenhouse to yield seedlings) and the cost of orchard implementation.

The highest costs were the tractor (275 HP), which was US$ 31,746.03, the construction of a brick barn (288 m^2), which cost US$ 31,746.03, and the Gator tractor used for harvesting the fruit, which cost US$ 19,047.61. The farm analyzed in this study has three employees who are paid US$ 634.92 per month. All workers have been legally hired and the Brazilian labor laws (CLT) have been respected. The process of blueberry harvest is completely manual, which requires temporary workers.

Variable costs are basically composed of fertilizers, such as NPK, ammonium sulfate, calcium nitrate and urea; agrochemicals; biological pesticides; fuel; machines; equipment maintenance; and sawdust to renovate the orchard every year. This equipment has the highest cost, US$ 444.44 per year.

It should be highlighted that the operational cost including intermediate inputs and labor costs were US$ 5,215.51 ha year^{-1}. In the Ñuble region, south-central Chile, the maintenance cost of an orchard in conventional production is about US$ 2,265.00 ha year^{-1}, an amount influenced by the size of the orchard and its management (Montalba et al., 2019). This difference may be due to the distinct levels of blueberry production between both countries. Chile experts have highly specialized blueberry producers, which enables productivity gains and a better allocation of financial resources.

Considering the price of US$ 4.76 per kg, the contribution margin is US$ 3.13, which results in a break-even point (BEP) of 1,553 kg ha^{-1}. In other words, at least 1,617 plants per ha are needed to avoid production loss. According to Sheng et al. (2015), in the results, all units produced and commercialized beyond the BEP are associated with their contribution margins for the profit. This means that the higher the operational level in quantity, the higher the profit.

Table 3 summarizes the results of economic efficiency of blueberry production, such as the costs, revenues, percentages of participation of all costs in the total cost, and the net profitability of the blueberry produced in a conventional system in Pelotas and commercialized in Porto Alegre.

Table 3. Results of economic efficiency of blueberry produced in Pelotas, RS, and commercialized in Porto Alegre, RS

Description	US$ per ha
Total production cost (fixed costs + variable costs + labor costs)	7,394.61
Production cost per ton	2,310.89
Total revenue (3.2 tons ha^{-1} production; US$ 4.76 per kg of fresh fruit)	15,232.00
Taxes (2.3% of the revenue)	350.37
Net profit (total revenue – total production cost – taxes)	7,187.25
Profitability	47.16%
Break-even point (% of production)	48.53%
Participation of fixed cost in total cost	28.48%
Participation of labor in total cost	52.57%
Participation of variable cost in total cost	17.95%

Source: Research data.

The cost of labor represented 52.57% of costs, since it is highly influenced by the harvesting, which is still completely manual and depends on a great amount of work. Fixed costs represented 28.48% of the total cost, and the cost of intermediate inputs, also called variable cost, accounted for the lowest value — only 17.95%. In countries where production has already been consolidated, mechanical harvesting is being introduced and has the potential to relieve the burden associated with relying on human labor for harvesting (Gallardo & Zilberman, 2016), which significantly decreases labor costs (Waters et al., 2008).

A study conducted in Brazil, in another region of RS, by Núñez (2009), also concluded that the largest part of the total cost was the labor cost, which represented 56.27% of the total cost of production. In fact, production cost highly depends on labor, but also on the distance from the farm to the consumer market, as pointed out by Colombo & Cavichioli (2019).

The importance of labor cost in determining the result of the systems is a direct reflection of the high demand for this point along the productive blueberry cycle. Therefore, as with other fruits (Ponciano et al., 2004), blueberry is a labor-intensive crop, which means that it can also generate great social benefits by creating jobs.

4.2. Analyses of financial viability

Table 4 shows the cash flow (incomings and outgoings) and Table 5 shows the NPV, IRR, and payback calculations estimated for the 10-year period. These flows are important because producers can evaluate, for instance, the volume of their own financial resources and/or from other resources that must be available so as not to jeopardize the efficiency of their businesses (Lazzarotto & Fioravanço, 2011).

Table 4. Incomings, outgoings, and cash flows of blueberry production in a conventional system in Pelotas, RS

Items	Year									
	0	1	2	3	4	5	6	7	8	9
Incomings	-	5.333	7.619	11.428	15.238	15.238	15.238	15.238	15.238	15.238
Outgoings	13.333	5.217	5.217	5.217	5.217	5.217	5.217	5.217	5.217	5.217
Cash flows	-13.333	116	2.401	6.211	10.021	10.021	10.021	10.021	10.021	10.021
Discounted cash flows	-13.333	105	1.985	4.666	6.844	6.222	5.656	5.142	4.674	4.249
Sum of discounted cash flows	-13.333	-13.227	-11.242	-6.575	268	6.491	12.147	17.290	21.964	26.214

Source: Research data.

Table 5. Results of the indicators for blueberry cultivation in Pelotas.

Indicators	Results
IRR	26.36%
NPV	U$ 26.214,81
Payback	4.9 years

Source: Research data.

Since the MARR was 11%, a positive NPV of US$ 26,214.81 is expected within a ten-year period. In other words, the minimum return required by this type of business, whose production is subject to natural risks in addition to those related to credit and the market, must enable investors to recoup implementation and maintenance expenses, pay for the established MARR and generate surplus cash. Considering the estimated NPV, this is the case of the project under analysis.

The IRR achieved was 26.36%, which means that the investment has a higher return than if the capital was applied annually at the same interest rate in long-term bonds. Thus, it shows the financial viability of this production system. A similar study carried out in Argentina on a farm producing O'Neal and Misty blueberry shrubs, whose fruits were exported to the North-American market, showed that the IRR was 30.70% (Molina et al., 2010). Since the results in

Southern Brazil are similar to the ones found in Argentina, there is evidence of how attractive this activity is to Brazilian farmers, even though blueberry production is much more developed in Argentina than in Brazil.

The return time (discounted payback period) of the total initial investment occurred after 4.96 years. In a similar study carried out in the north of RS, Núñez (2009) estimated for the O'Neal and Misty cultivars that the DPP would occur only after 6.11 years of starting the project. Additionally, Asănică (2019) indicates a turnaround time close to 6 years for an intensive blueberry orchard under a study in Romania. Then, the rapid return on an initial investment in a blueberry orchard in the city of Pelotas is impressive, showing the great potential for the development of this culture in the region.

Blueberry production in the region of Pelotas has a great market potential, both for commercialization in the local market and for export to other countries in the near future. The present study concludes by means of the indicators NPV, TIR and payback that it is feasible to produce blueberries in Pelotas; it is an alternative for crop diversification, which may become an important source of income for fruit farmers. The region is well known by their large number of family farmers, and many of them are fruit growers, producing mainly peaches. Blueberry could be one more option of cultivation to integrate a larger portfolio for investments and, consequently, reduce market and production risks.

5. Conclusion

This economic analysis of production costs, revenues and financial viability of investments made in blueberry production in a conventional system in Pelotas, RS, Brazil, showed that the production cost was US$ 7,394.61 per ha, or US$ 2,310.88 per ton. Production was found to be technically and financially viable, since profitability reached 47.16%. The discounted net profit (MARR= 11% per year) was US$ 7,180.25 ha year^{-1} after stabilization of production, the IRR was 26.36% and the return of the investment occurred after 4.9 years. Considering that the MARR was 11%, the resulting NPV of the study was US$ 26,214.81 per ha over a period of ten years.

References

Antunes, L. E. C., & Raseira, M. C. B. (2006). *Cultivo do mirtilo* (*Vaccinium spp.*) (99 p.). Pelotas: Embrapa Clima Temperado.

Antunes, L. E. C., Gonçalves, E. D., Ristow, N. C., Carpenedo, S., & Trevisan, R. (2008). Fenologia, produção e qualidade de frutos de mirtilo. *Pesquisa Agropecuária Brasileira*, *43*(8), 1011-1015.

Asănică, A. (2019). Estimation of the economic efficiency of blueberry according to the production system. *"Agriculture for Life, Life for Agriculture" Conference Proceedings, 1*(1), 255-259.

Cantuarias-Avilés, T., Silva, S. R., Medina, R. B., Moraes, A. F. G., & Alberti, M. F. (2014). Cultivo do mirtilo: atualizações e desempenho inicial de variedades de baixa exigência em frio no estado de São Paulo. *Revista Brasileira de Fruticultura*, *36*(1), 139-147.

Casarotto Filho, N., & Kopittke, B. H. (2000). *Análise de investimento* (9. ed., 458 p.). São Paulo: Atlas.

Clemente, A., & Souza, A. (2008). *Decisões financeiras e análise de investimentos* (6. ed., 186 p.) São Paulo: Atlas.

Colombo, R. H., & Cavichioli, F. A. (2019). Custo de produção na cultura da goiaba. *Revista Interface Tecnológica*, *16*(1), 470-479.

Fachinello, J. C., Pasa, M. S., Schmtiz, J. D., & Betemps, D. L. (2011). Situação e perspectivas da fruticultura de clima temperado no Brasil. *Revista Brasileira de Fruticultura*, *33*(1), 109-120.

Food and Agricultural Organization of the United Nations – FAO. (2018). *FAO statistical database*. Rome: FAO. Retrieved in 2019, April 3, from http://www.fao.org/faostat/es/#data/QC

Gallardo, R. K., & Zilberman, D. (2016). The economic feasibility of adopting mechanical harvesters by the highbush blueberry industry. *HortTechnology*, *26*(3), 299-308.

Gawde, S. U., Panda, A. C., & Ingale, D. (2018). Study of camel rating system in banking supervision-a case study of Nepal Bangladesh Bank Ltd. *American Journal of Economics and Business Management*, *1*(3), 74-96.

Gitman, L. J. (2004). *Princípios de administração financeira* (10. ed., 610 p.) São Paulo: Pearson Addison Wesley.

Gonçalves, G. V. B., Vaz, R. Z., Vaz, F. N., Mendonça, F. S., Fontoura Júnior, J. A. S. D., & Castilho, E. M. (2017). Análise de custos, receitas e ponto de equilíbrio dos sistemas de produção de bezerros no rio grande do sul. *Ciência Animal Brasileira*, *18*, 1-17.

Guiducci, R. C. N., Lima Filho, J. R., & Mota, M. M. (2012). *Viabilidade econômica de sistemas de produção agropecuários: metodologia e estudo de caso* (535 p.). Brasília: Embrapa.

Kreuz, C. L., Souza, A., Schuck, Ê., & Petri, J. L. (2005). Avaliação econômica de alternativas de investimentos no agronegócio da uva no meio oeste catarinense. *Revista Brasileira de Fruticultura*, *27*(2), 230-237.

Lazzarotto, J. J., & Fioravanço, J. C. (2011). Produção de morango em sistema semi-hidropônico: estudo de caso para avaliar indicadores econômico-financeiros e riscos associados. In *Anais do III Convibra Administração – Congresso Virtual Brasileiro de Administração* (pp. 1-16). São Paulo: Convibra.

Lobos, G., Mora, M., Saens, R., Munoz, T., & Schnettler, B. (2015). Including risk in economic feasibility analysis: a stochastic simulation model for blueberry investment decisions in Chile. *Revista Brasileira de Fruticultura*, *37*(4), 870-882.

Lopes, M. R., Belarmino, L. C., Oliveira, A. J., Lima Filho, J. R., Torres, D. A. P., Talamini, D. J. D., & Martins, F. M. (2012). *Matriz de análise de política: metodologia e análise* (227 p.). Brasília: Embrapa.

Luo, B. S., Gu, R. H., Kennelly, E. J., & Long, C. L. (2018). Gaultheria ethnobotany and bioactivity: blueberry relatives with anti-inflammatory, antioxidant, and anticancer constituents. *Current Medicinal Medicine, 25*(38), 5168-5176.

Molina, N., Taiariol, D., Delssin, E., & Serial, C. (2010). *Producción de arándanos en corrientes, análisis técnico y económico* (20 p.). Corrientes, Argentina: INTA Estación Experimental Agropecuaria Bella Vista.

Monke, E., & Pearson, S. R. (1989). *The policy analysis matrix for agricultural development.* (279 p.) Ithaca: Cornell University Press.

Montalba, R., Vieli, L., Spirito, F., & Muñoz, E. (2019). Environmental and productive performance of different blueberry (*Vaccinium corymbosum* L.) production regimes: conventional, organic, and agroecological. *Scientia Horticulturae*, *256*, 108592.

Núñez, E. E. (2009). *Viabilidade econômica da produção de mirtilo* (Trabalho de Conclusão do Curso). Escola Superior de Agricultura "Luiz de Queiroz", Piracicaba.

Oliveira, I. P., Belarmino, L. C., & Belarmino, A. J. (2017). Feasibility of production system of strawberry in semi-hydroponic recirculating. *Custos e @gronegócioonline, 13*(1), 315-332.

Olivo, R. L. F. (2008). *Análise de investimentos* (157 p.) São Paulo: Alínea.

Pasa, M. D. S., Fachinello, J. C., Schmitz, J. D., Fischer, D. L. D. O., & Rosa Júnior, H. F. D. (2014). Desempenho de cultivares de mirtileiros dos grupos rabbiteye e highbush em função da cobertura de solo. *Revista Brasileira de Fruticultura*, *36*(1), 161-169.

Ponciano, N. J., Souza, P. M. D., Mata, H. T. D. C., Vieira, J. R., & Morgado, I. F. (2004). Análise de viabilidade econômica e de risco da fruticultura na região norte Fluminense. *Revista de Economia e Sociologia Rural*, *42*(4), 615-635.

Rebelatto, D. (2004). *Projeto de investimento* (229 p.) Barueri: Manole.

Ronque, E. R. V., Ventura, M. U., Soares Júnior, D., Macedo, R. B., & Campos, B. R. S. (2013). Viabilidade da cultura do morangueiro no Paraná-BR. *Revista Brasileira de Fruticultura*, *35*(4), 1032-1041.

Santos, M. A., Souza, D. H. O., & Ribeiro, K. C. S. (2019). Sustentabilidade econômica de uma empresa brasileira do setor de carnes: valuation sob condições de risco da Marfrig Alimentos SA. *Revista Razão Contábil & Finanças, 7*(1).

Sheng, Y., Zhao, S., Nossal, K., & Zhang, D. (2015). Productivity and farm size in Australian agriculture: reinvestigating the returns to scale. *The Australian Journal of Agricultural and Resource Economics*, *59*(1), 16-38.

Silva, E. C. (2012). *Como administrar o fluxo de caixa das empresas – guia de sobrevivência empresarial* (6. ed., 252 p.) São Paulo: Atlas.

Souza Junior, W. D., Baldissera, J. F., & Bertolini, G. R. F. (2019). Análise de opções reais aplicada na diversificação da produção rural no estado do Paraná. *Revista de Economia e Sociologia Rural*, *57*(2), 253-269.

Veras, L. L. (1999). *Matemática financeira* (3. ed., 259 p.) São Paulo: Atlas.

Waters, E. K., Scagel, C. F., & McLean, C. (2008). A survey of Vaccinium cultural practices in Australia emphasizing implications for mycorrhizal infection. *International Journal of Fruit Science*, *8*(1-2), 109-124.

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