

## Financial Feasibility Analysis of the Cultivation and Processing Of Salsa Cassava - Case Study in BELA Vista Do TOLDO - SC

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### Abstract:

**Background:** The article aims to analyze the economic viability of the production of parsley cassava in a rural property located in the municipality of Bela Vista do Toldo – SC which is located in the northern plateau of Santa Catarina. The estimated production of parsley cassava is 16,500kg per ha, being a 12-month long cycle crop)

**Materials and Methods:** The methodology adopted as nature was applied research, with descriptive objective and case study in approaching the problem. The cultivation information was carried out on a property located in the interior of the Municipality of Bela Vista do Toldo, in the locality of Lagoa do sul, and cultivation data were collected and used for cash flow formation and the AMR (Average Rate) was used as a basis. of Attractiveness) the value of 3%pa For the analysis of risk and return, the multi-index methodology was used.

**Results:** After the analysis of the three marketing methods, dirty parsley parsley, washed parsley parsley, washed parsley parsley on the 500gr tray, and in the comparison between crops, other factors such as marketing and market should be taken into account, which is why the parsley dirty parsley presented a ROIA value of 0.68%, Cassava parsley washed 0.41%,

**Conclusion:** With the realization of three possible methods of commercialization of the parsley cassava, it can be seen that the cost of parsley cassava is relatively low due to the fact that the use of pesticides is relatively low and little mechanized. Most of the processes are carried out manually, such as planting, weeding and harvesting. The cost of parsley parsley to be sold needs to have an added value, such as only washed or, as suggested, sold in 500gr trays, generating a pleasant appearance for the consumer. The cost analysis was positive for all marketing methods, but in comparison between them it can be said that washed cassava has a high investment because it needs structure for machinery and employees to carry out the washing process, making it a product with high cost and it can be seen in the indicators that the washed parsley cassava is very similar to the dirty cassava, in which it is sold directly from the harvest to the processing industry. The third method, which is the parsley parsley in the 500gr tray, which uses the washed and selected parsley parsley inserted in a tray destined for the correct portion for consumption, presents expressiveness in the indicators making it more profitable and with a reduction of risks for the producer, according to if on the indicators,

**Key Word:** Multi-index analysis, Monte Carlo, Mandioquinha-salsa, economic feasibility.

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### I. Introduction

The culture known in various parts of Brazil as celery potato, baroa potato, potato fúza, potato chicken, parsley potato, Swiss potato, baron, baroa, carotote, yellow carrot, parsley, originated in the Andes region, has become a product much appreciated by Brazilians and also produced in a large part of Brazil (PÁDUA, 2010);(SANTOS,1998).

Cassava is a product cultivated in a rudimentary way, using a lot of labor, being one of the main reasons for it to be inserted in family farming as a supplement to income, which is why the cultivation has a long cycle, taking 12 months from planting to harvest. making it a product with a slow economic turn.

Concerning marketing, the parsley has a very peculiar characteristic in its flavor and also presents rich nutrients that make it up with its high calcium content, its level of iron, potassium, proteins, carbohydrates, fiber and ascorbic acid. It highly recommends for lactating women, children, the elderly, people who have recently undergone surgery and are in recovery and sick, children's diet, athletes and not to mention its pleasant flavor and easy ingestion. (FURLAN, 2016) (Almeida, 2000)

The economic viability of an agricultural crop has a degree of importance because a small property needs to have a main source of income crop and several small crops to complement its income, through this

view the article aims to analyze through multi analysis. -Indices the risk and return indicators of the cultivation of parsley cassava in Bela Vista do Toldo – SC.

Through multi-index analysis and compared with Monte Carlo analysis performed in Crystall Ball software, being divided into two groups, first group VP (Present Value); NPV (Net Present Value); VPLa (Annualized Net Present Value); IBC (Benefit/Cost Ratio) and ROIA (Additional Return on Investment). The second group has the following indicators TMA/TIR (Minimum Rate of Attractiveness/Internal Rate of Return); Management Risk and Business Risk (Souza and Clemente, 2008). One can identify positive indicators for the cultivation of parsley cassava, such as the TIR (Internal Rate of Return) which presented a value for the commercialization of parsley cassava in the value of 2.17% for parsley cassava sold in kg but washed worth 1,

## **II. Theoretical Framework**

### **2.1 FAMILY AGRICULTURE**

Family farming has great significance in the economic and social development of Brazilian agricultural productivity, with the diversity of production carried out in small rural properties, as author Wanderley (2000) cites:

[...] family farming was officially recognized as a social actor. Previously seen only as the rural poor, low-income producers or small producers, family farmers are now perceived as having a different conception of agriculture, different from and alternative to the dominant landowners and employers' agriculture in the country.

The banner of family farming was raised through many struggles in favor of small rural producers and through public policies the PRONAF National Program Supporting Family Farming was created. right and access to financial support through financial institutions at low cost to have access to agribusiness that today has a large contribution from family farming. (MATTEI, 2014) (WANDERLEY, 2000).

After being recognized, family farming gained great economic significance, in the agricultural sense of 2017 (IBGE, 2020) showed that 77% of Brazilian agricultural establishments are family farming compared to non-family farming and demonstrates that family farming represents 23% of the cultivated area in Brazil, the value of approximately R\$ 107 billion reais in the economy represents 23% of all Brazilian agricultural production.

Through the support of public policies, it opened a range of opportunities for family farmers with the industrialization of some products and production varieties, The author Fornazier & Waquil (2013), highlights that:

Agricultural production increasingly has to meet market demands in search of better marketing results. Thus, producers and agribusinesses need to change production patterns that were tolerable in other periods, but are no longer accepted. If before, farmers were only concerned with producing and placing their product on the market, it becomes more frequent for the market to demand products with various standards, both with measurable characteristics such as color, size, as well as how it was produced, if it respects social conventions, environmental standards, among others.

Family farming has a very important characteristic in the state of Santa Catarina, data from the 2017 Agricultural Census (IBGE, 2020) shows that 78.1% of rural establishments in Santa Catarina are classified as family rural properties. Santa Catarina in the last thirty years has faced a great advance “modernization” of agriculture, strengthening the mercantile economy, with the great growth of commodities, small producers no longer have corn, soy and beans as their main income and realized that they would need to reinvent to be able to stay in the market, through the threats coming from the big ones. The producer had the need to “Generate value” to his product, opting for vegetables, fruits produced organically and selling them in open markets. (FERRARIA, 2013)

### **2.2 CASSAVA SALSA (ARRACACIA XANTHORHIZA)**

The parsley cassava (xanthorhiza arracacia) is a plant originating in the Upper Andes, more precisely in Colombia, Venezuela, Ecuador, Peru and Bolivia, and brought to Brazil by Colombians and produced mainly in the Brazilian Midwest (PÁDUA, 2010). The parsley is widely cultivated in much of Brazil but because it has several different names it is confused, Santos (1998, p 9) noticed different names such as: potato-celery, potato baroa, potato-fiuza, potato-chicken, parsley potato, swiss potato, baron, baroa, carotote, yellow carrot, parsley parsley.

The parsley cassava does not have a great productive expressiveness in Brazil because it is a rudimentary crop that needs little use of fertilizers, agricultural pesticides and machinery, requiring labor in both planting and harvesting processes that should not be used with machinery. because the product has sensitive skin.

The cultivation of parsley-cassava has the advantage of the rusticity of the plants. However, economically significant losses can occur when basic crop management care is not taken. Among them, the most critical are: repeated cultivation on the same land, use of poor quality seedlings, cultivation in unfavorable

climatic conditions for the crop, inadequate soil preparation/fertilization and uncontrolled irrigation (GRACIANO et al., 2006).

A large part of the production of parsley is carried out by family farming and uses small production spaces to cultivate parsley and is grown as a complement to the family's income. (PÁDUA, 2010), (JÚNIOR et al., 2008), (SANTOS, 1998).

The industry and the market are looking for products with adequate standards such as size, uniformity, dry matter and reducing sugar content and absence of damage and defects and these are characteristics that depend on other factors such as climate, soil, plantation management, cultivating and post-harvest as transport (PÁDUA, 2010).

The production of parsley cassava has a market to be aggressively explored by the market because of the nutritional factors it has.

Cassava or parsley potato stands out for its high calcium content, and also for its level of iron, potassium, proteins, carbohydrates, fiber and ascorbic acid. It is very appreciated for its pleasant flavor and easy digestion, being recommended for nursing women, children, the elderly, people who have recently undergone surgery and are recovering and sick. (FURLAN, 2016)

The consumption of parsley has many benefits for children with very rich nutrients, as highlighted by Almeida (2000) in addition to being easily digestible, it has a high energy value in the house of 80% starch, together with the ideal amount of vitamin A, calcium, phosphorus and iron. -ideal for consumption in children's diet, the elderly, athletes and consumers who eat products rich in vitamins and minerals.

### **III. Material And Methods**

The research carried out has the foundation that is defined as applied, which is why it has a clear relationship with knowledge along with the problem, with the objective of solving it. Gil (2008).

When it comes to the style of research performed, it is documentary research that according to the author Gil (2002) highlights that the similarity between bibliographic and documental research is very evident in the development, which changes in the context that documental research the data did not undergo any data processing, having as examples, company reports, notes etc.

For the definitions related to the description, the descriptive procedure was adopted to expose the costs and the main activities related to the cultivation of parsley, the author highlights that the descriptive procedure:

Descriptive research has as its primary objective the description of the characteristics of a certain population or phenomenon, or the establishment of relationships between variables. There are numerous studies that can be classified under this heading and one of its most significant features is the use of standardized data collection techniques, such as the questionnaire and systematic observation (GIL, 2002, p. 42).

The research procedure is classified as a case study as mentioned by the author who in the case study method takes into account the understanding of the entire matter to be investigated, in this case all aspects are investigated, through the main objective of the procedure is to explain the systematic analysis of the facts relating them to multiple variables.

The quantitative approach is carried out with characteristic of the use of statistics the author describes the quantitative approach as:

[...] quantitative approach, as the statistical techniques and instruments used for research are subject to the researchers' subjectivity; the questionnaire used by social scientists with a quantitative approach is produced according to their interests; the theme they choose, the problems they decide to solve, the theory they use, everything passes through the scrutiny of their subjectivity. (MARCONI; LAKATOS, 2017)

The execution of the work was carried out together with data from a producer located in Lagoa do Sul in the municipality of Bela Vista do Toldo, which is located in the northern plateau of Santa Catarina. Data collection took place through interviews and analysis of documents and spreadsheets. The analysis was carried out based on 1 hectare of cultivation of parsley cassava, analyzing costs, quality, cultivation methods and also the commercialization of the product.

To perform the analysis, it was based on the multi-index methodology proposed by the authors Souza and Clemente (2008), has the function of supporting investment decision-making, based on the use of indicators, further consolidating the information, as the authors divide the indicators into two groups, the first group formed by VP (Value Gift); NPV (Net Present Value); VPLa (Annualized Net Present Value); IBC (Benefit/Cost Ratio) and ROIA (Additional Return on Investment). The second group has the following indicators TMA/TIR (Minimum Rate of Attractiveness/Internal Rate of Return); Management Risk and Business Risk.

To accurately analyze and prove the multi-index methodology, Monte Carlo simulation was used using Crystall Ball software. The Monte Carlo methodology as author CHARNES (2007) highlights that it is simulated through the use of electronic spreadsheets generating random values for uncertain variables and repeatedly to simulate the model. Crystall Ball software is a software that simulates forecasts and analyzes in

order to avoid uncertainty and transform it into an effective and efficient decision-making tool(CHARNES, 2007, p. 1).

#### IV. Result

Data collection occurs through a research plan where several questions were raised to be analyzed, in order to understand the cultivation process, costs and the methodology adopted in the commercialization of the parsley cassava.

The data were collected together with the rural producer of Bela Vista do Toldo to obtain information on the cultivation, through documents, spreadsheets, teaching materials provided by the producer and which he uses as a basis for cultivation.

Through the analysis, a summary of the implementation and maintenance costs for 1 hectare (ha) of parsley cassava is presented, considering the 12-month cultivation period and the 36-month cash flow period. The marketing analysis was analyzed with three hypotheses of being commercialized, parsley parsley soiled directly from the plantation to the company that carries out the processing, parsley parsley washed through machines on the rural property and parsley parsley washed and packaged in 500gr trays ready for marketing in the market.

For the calculation basis, the values were collected based on the local trade specialized in agricultural stores. The base for calculating the tractor was used the lease amount practiced by the community and companies in the sector. The production cost technique was based on labor and mechanized operations. The mechanized method is only used at the beginning of cultivation to prepare the soil and make the straw and the application of fertilizers and manure. As the cultivation of parsley cassava is archaic because it is a sensitive plant, it uses a lot of labor for planting, maintenance and harvesting. The irrigation process is automated through aspersion using water from an artificial lake, but the cost of water is included in the cost of irrigation.

After collecting the costs, the Excel spreadsheet software was used to analyze the indicators VP, NPV, VPLa, ROIA, IBC and TIR, through the analysis of investments and costs of planting parsley cassava.

The presentation of costs, which will be presented below, was based on the cultivation of parsley cassava, taking into account the cultivation base that the producer uses on his property and also three possible marketing methods and their due costs.

The presentation of table 1 below shows the initial month with the necessary investments to start the cultivation.

**Table1: Soil preparation cost**

0th MONTH OF IMPLEMENTATION OF CASSAVA CROPS			
PREPARATION OF THE SITE			
DESCRIPTION	THE AMOUNT	PRICE R\$)	TOTAL (BRL)
SOIL PREPARATION - SUBSOILER	2.00	BRL 150.00	BRL 300.00
SOIL PREPARATION - GRADING GRILL	2.00	BRL 150.00	BRL 300.00
SOIL PREPARATION - MAKE MUCHÃO	2.00	BRL 150.00	BRL 300.00
LABOR FERTILIZATION COVERAGE (HOUR / TRACTOR)	2.00	BRL 150.00	BRL 300.00
FERTILIZER 02/20/20 KG	200.00	BRL 1.70	BRL 340.00
<b>SUBTOTAL</b>			<b>BRL 1,540.00</b>
DESCRIPTION	THE AMOUNT	PRICE R\$)	TOTAL (BRL)
SOIL PREPARATION LABOR (TIME/MAN)	6.00	BRL 11.15	BRL 66.88
<b>SUBTOTAL</b>			<b>BRL 66.88</b>
<b>TOTAL</b>			<b>BRL 1,606.88</b>

Source: Authors (2021)

Soil preparation is one of the first investments to be taken into account in cultivation, being almost the only process that uses the tractor to do the job. The soil preparation is carried out in a mechanized way with the use of tractor and agricultural implements, the value of the HOUR/TRACTOR is stipulated by providers that perform this type of service. The calculation basis used to calculate the value of HOUR/MAN was to use the salary value of R\$1500.00 with unhealthy conditions and other charges as required by law, so we present Table 2 with the costs related to labor.

**Table 2 - Labor price calculation**

LABOR - EMPLOYEE		
MIN. SALARY REGIONAL SC	1	BRL 1,500.00
INSS	1.50%	BRL 22.50
FGTS	8%	BRL 120.00
VACATION	9	BRL 166.67
INSS VACATION	1.50%	BRL 2.50
FGTS VACATION	8%	BRL 13.33
13th	12	BRL 125.00
INSS 13th	1.50%	BRL 1.88
FGTS 13th	8%	BRL 10.00
<b>TOTAL</b>		<b>BRL 1,961.88</b>
MONTHLY BUSINESS HOURS		<b>176</b>
<b>HOUR VALUE</b>		<b>BRL 11.15</b>

Source: Authors (2021)

The next step is the planting of the parsley cassava, the planting is done manually through the seedlings that are extracted from matrixes of the plantation itself. The author Balbino et al. (2018) highlights the seedling extraction and preparation process as follows:

1. Selection of mother plants in the seedling production field;
2. Highlight of the tillers;
3. Washing to remove impurities;
4. Disinfection with active chlorine;
5. Rinse to remove excess chlorine;
6. Shade drying; and
7. Basal cut with stilet.

The basis for calculating the cost of seedlings, the value of planting, was taken into account the labor for preparation processes and other input costs. In the first month, the irrigation process begins, calculated at an average of 40 minutes a day to keep the soil at the appropriate moisture level for the plant. The use of irrigation recommended for the plant is through sprinkling in order to wet the leaves and also contributes to the reduction of aphids and mites. Right after planting, one or two daily irrigations are recommended until rooting and soon after this period can be according to weather conditions. (BALBINO et al., 2018). For calculation purposes, the irrigation time was calculated equally for all months, reason that rainfall can vary between periods. Below is the spreadsheet with the costs for the first month of cultivation.

**Table 3 - Planting**

1st MONTH OF CASSAVA SALSA CULTIVATION			
CULTURAL PREPARATION AND TREATMENTS			
DESCRIPTION	THE AMOUNT	PRICE R\$)	TOTAL (BRL)
SEEDLINGS FOR PLANTING	35,000.00	BRL 0.30	R\$ 10,500.00
FERTILIZER 25/0/25 KG	100.00	BRL 1.90	BRL 190.00
POTASSIUM CHLORIDE KG	50.00	BRL 1.90	BRL 95.00
IRRIGATION (min)	1200	BRL 0.17	BRL 204.47
<b>SUBTOTAL</b>			<b>BRL 10,989.47</b>
DESCRIPTION	THE AMOUNT	PRICE R\$)	TOTAL (BRL)
PLANTING LABOR (HOUR/MAN)	64.00	BRL 11.15	BRL 713.41
LABOR FERTILIZATION COVERAGE (HOUR / TRACTOR)	4.00	BRL 150.00	BRL 600.00
<b>SUBTOTAL</b>			<b>BRL 713.41</b>

<b>TOTAL</b>	<b>BRL 11,702.88</b>
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Source: Authors (2021)

The third month of planting has a re-application of fertilizers and fertilizers so that the plant has adequate development, follows the presentation in Table 4 with the costs of application of fertilizers and fertilizers. And in a few months, manual weeding between the plants is also carried out to eliminate weeds. In the fifth month, the use of herbicide is used to help eliminate weeds and delay the rebirth of new ones, increasing the time between weeding.

Table 4 - Application of Fertilizers and Fertilizers

<b>3rd MONTH OF CASSAVA SALSA CULTIVATION</b>			
<b>CULTURAL PREPARATION AND TREATMENTS</b>			
<b>DESCRIPTION</b>	<b>THE AMOUNT</b>	<b>PRICE R\$)</b>	<b>TOTAL (BRL)</b>
FERTILIZER 02/20/20 KG	200.00	BRL 1.70	BRL 340.00
FERTILIZER 25/0/25 KG	100.00	BRL 1.90	BRL 190.00
POTASSIUM CHLORIDE KG	50.00	BRL 1.90	BRL 95.00
IRRIGATION min	1,200.00	BRL 0.17039	BRL 204.47
<b>SUBTOTAL</b>		<b>BRL 829.47</b>	
<b>DESCRIPTION</b>	<b>THE AMOUNT</b>	<b>PRICE R\$)</b>	<b>TOTAL (BRL)</b>
FERTILIZING LABOR (HOUR / TRACTOR)	2.00	BRL 150.00	BRL 300.00
FERTILIZING LABOR (HOUR/MAN)	12.00	BRL 11.15	BRL 133.76
CAPINHA LABOR (HORAHOME)	24.00	BRL 11.15	BRL 267.53
<b>SUBTOTAL</b>		<b>BRL 701.29</b>	
<b>TOTAL</b>		<b>BRL 1,530.76</b>	

Source: Authors (2021)

Manual weeding takes place in the ninth and eleventh month to facilitate harvesting in the twelfth month. Harvesting is carried out manually using hoes that remove the roots from the earth, placing them in boxes and being transported for processing. The cultivation time is twelve months, the harvest can start in the eleventh month and extend until the fourteenth month, it is not necessary to harvest all of it in the same period. For calculation purposes, the entire harvest in the twelfth month was used to make the calculation more objective.

Below is Table 5 with the last month of cultivation, with a presentation of the last costs including labor for the harvest, based on one hectare (ha).

Table 5 - Harvesting Cassava Parsley

<b>12th MONTH OF CASSAVA SALSA CULTIVATION</b>			
<b>CULTURAL PREPARATION AND TREATMENTS</b>			
<b>DESCRIPTION</b>	<b>THE AMOUNT</b>	<b>PRICE R\$)</b>	<b>TOTAL (BRL)</b>
IRRIGATION min	1,200.00	BRL 0.17	BRL 204.47
<b>SUBTOTAL</b>		<b>BRL 204.47</b>	
<b>DESCRIPTION</b>	<b>THE AMOUNT</b>	<b>PRICE R\$)</b>	<b>TOTAL (BRL)</b>
HARVEST LABOR (HOUR/MAN)	400.00	BRL 11.15	BRL 4,458.81
<b>SUBTOTAL</b>		<b>BRL 4,458.81</b>	
<b>TOTAL</b>		<b>BRL 4,663.28</b>	

Source: Authors (2021)

The total cost of cultivation is the sum of all costs arising from each month being the total amount of R\$ 22,729.11 being the total cost of cultivation for the first year as shown in Table 6 and remaining the cost for the next cycles that were calculated. According to the rural producer, the amount produced on his property is, on

average, 16,500 kg of parsley per harvest. Using as a basis the quantity produced on the farmer's property and the total value of the crop costs, we obtained the cost value per kg of parsley cassava of R\$1.38.

**Table 6 - Total crop costs**

TOTAL CULTURE COSTS	
month 0	BRL 1,606.88
month 1	BRL 11,702.88
month 2	BRL 204.47
month 3	BRL 1,530.76
month 4	BRL 204.47
month 5	BRL 1,104.47
month 6	BRL 204.47
month 7	BRL 204.47
month 8	BRL 204.47
month 9	BRL 472.00
month 10	BRL 204.47
month 11	BRL 472.00
month 12	BRL 4,663.28
<b>TOTAL COST</b>	<b>BRL 22,779.11</b>

Source: Authors (2021)

After analyzing the costs, the cash flow was developed with the disbursement due each month, the use of irrigation generates a cost in which part of it is water used from a tank or artesian well and electricity, but for the calculation of costs it was established the disbursement of payment of the total cost of irrigation. Three cash flows were developed with three marketing methods, the first marketing method for parsley cassava, taken directly from the planting area and sold directly to the processing industry. As shown in the cash flow in Table 7 the cash flow was developed for thirty-six months which makes an accurate analysis of the cash flow, reason that the cultivation is of long duration and only one cycle is not enough for the risk analysis.

**Table 6: Dirty parsley cassava recipe**

Description	Production quantity Kg	Unit cost	Unit Sales Value kg	Amount
Dirty Cassava	16,500	BRL 1.38	BRL 2.00	BRL 33,000.00

Source: Authors (2021)

**Table 7: Cash flow Cassava Parsley Dirty -**

cash flow summary			
Month	Exit	Input	Balance
0 to 12	-34792.23	33,000.00	-1,792.23
13 to 24	-22,434.69	33,000.00	8773.08
25 to 36	-21,772.23	33,000.00	20,000.85

Source: Authors (2021)

The second method of marketing is the processing of parsley potatoes in order to add value and sell directly on the market. The sale of parsley potato in the markets happens with it clean, through this an analysis was carried out to verify the viability of the producer to wash the parsley and sell it directly to the market in kg. Table 8 shows the investments needed to wash the parsley cassava on the same property.

**Table 8:** Investment in parsley cassava washing

INVESTMENT	QTY	ITEM S.	UNIT VALUE	AMOUNT	YEARS DEPRECIATION	TOTAL ANNUAL DEPRECIATION VALUE
WASHING MACHINE WITH 500KG ENGINE WORK TABLE	1	UND.	BRL 15,000.00	BRL 15,000.00	10	BRL 1,500.00
2.90X70X88MT STAINLESS STEEL WORK TABLE	1	UND.	BRL 1,963.00	BRL 1,963.00	5	BRL 392.60
2.90X70X88MT STAINLESS STEEL WORK TABLE	1	UND.	BRL 1,963.00	BRL 1,963.00	5	BRL 392.60
10M X 2M X 1.5M WASH TANK	41	M <sup>2</sup>	BRL 115.00	BRL 4,715.00	10	BRL 471.50
48LT PLASTIC STORAGE BOX	500	UND.	BRL 34.00	BRL 17,000.00	5	BRL 3,400.00
<b>TOTAL INVESTMENT VALUE</b>				<b>BRL 40,641.00</b>	<b>TOTAL</b>	<b>BRL 6,156.70</b>

Source: Authors (2021)

Washed parsley has an added value by selling directly in the market, the cost of washed parsley cassava includes the cost of the dirty parsley and operating costs such as a washing machine and staff, with two employees being calculated to select the product and another to operate the cassava washing machine as shown in Table 9.

**Table 9 - Cost of fresh cassava parsley product**

PRODUCT COST - CASSAVA SALSA LAVADA			
DESCRIPTION	QTY	UNIT COST	TOTAL COST
SALSA POTATO	16,500	BRL 1.38	BRL 22,779.11
WASHING MACHINE	33	BRL 92.06	BRL 3,037.82
MACHINE OPERATOR EMPLOYEE	66	BRL 29.73	BRL 1,961.88
SELECTION EMPLOYEE	51.5625	BRL 76.10	BRL 3,923.75
		<b>TOTAL</b>	<b>BRL 31,702.55</b>
		<b>TOTAL KG</b>	<b>BRL 2.13</b>

Source: Authors (2021)

The cash flow of the parsley cassava, which is shown in Table 10, has the addition of only the investment for the processing and the cost of washing the parsley cassava washing process. The beneficiation process adds value to the product, making it a competitive and easy-to-market product. The market value of fresh cassava on the market is on average R\$ 3.50 ready for sale. In the case of processing, a 10% loss is calculated in the selection, so the total amount in the calculation is 14,850 kg.

**Table 10: - Washed parsley cassava cash flow**

cash flow summary			
Month	Exit	Input	Balance
0 to 12	- 80,656.39	51,975.00	- 28,681.39
13 to 24	- 27,848.32	51,975.00	- 4,554.71
25 to 36	- 27,848.32	51,975.00	19,571.97

Source: Authors (2021)

The third method of commercialization that was structured for the producer is focused on large markets that seek to offer ease to their customers, based on this proposal, a product was prepared that is marketed in 500gr trays consisting of clean and selected parsley parsley. The investment for the product is only the addition of a sealing machine for the trays and the acquisition of inputs such as Styrofoam trays, film and labels, totaling an estimated production of 29,700un of trays, as shown in Table 11.

**Table 11 - Cost of parsley parsley, washed and packaged**

PRODUCT COST - CASSAVA SALSA WASHED AND PACKAGED TRAY 500GR				
DESCRIPTION	THE AMOUNT	ITEMS.	UNIT COST	TOTAL COST
WASHED CASSAVA	14,850	KG	BRL 2.09	BRL 31,058.13
Styrofoam TRAYS	30,000	UND.	BRL 0.32	BRL 9,600.00
10KG ROLL PACKAGING FILM	10	UND.	BRL 170.00	BRL 1,700.00
TAG	30,000	UND.	BRL 0.15	BRL 4,500
PACKAGING EMPLOYEE	440	HOUR MAN	BRL 11.15	BRL 4,904.69
<b>TOTAL</b>				<b>BRL 51,762.82</b>
<b>TOTAL TRAY</b>				<b>BRL 1.74</b>

Source: Authors (2021)

The development of the cash flow related to the third marketing method has a higher revenue value than the others, which is why the trays are sold in 500gr and with a relatively low cost and the tray's trading value is R\$3.00 for the market. The cash flow is shown in Table 12 below:

**Table 12: Cassava cash flow Parsley tray 500gr**

cash flow summary			
Month	Exit	Input	Balance
0 to 12	- 84,739.20	89,100.00	4,360.80
13 to 24	- 46,858.66	89,100.00	46,602.14
25 to 36	- 46,858.66	89,100.00	88,843.48

Source: Authors (2021)

For purposes of analysis of the multi-index methodology, we adopted the initial investment of 12,357.54 for the method of cultivation of cassava soiled parsley, value of 52,998.54 for the washed parsley cassava method and the value of 54,138.54 for the 500gr tray method. The risk and return analysis based on the above values for the calculation was used as a basis for the TMA of 3% per year. The result of the indices is shown in Table 13 below.

**Table 13 - Multi-Index Analysis**

INDICATORS	VALUE			
	DIRTY CASSAVA	SALSA	CASSAVA WASHED	SALSA CASSAVA TRAY 500GR
RETURN	PRESENT VALUE OF THE INVESTMENT CASH FLOW	-76,156	-132,331	-171,523
	PRESENT VALUE OF BENEFIT CASH FLOW	97,042	153,607	263,326
	NET PRESENT VALUE	20,886	21,276	91,803
	HA/YEAR EQUIVALENT NPV	607	619	2,670
	BENEFIT/COST INDEX	1.27	1.16	1.54
	ANNUAL ROIA	0.68%	0.41%	1.20%
RISK	INTERNAL ANNUAL RETURN RATE	2.17%	1.03%	3.95%
	TMA/TIR INDEX	0.12	0.243	0.06
	ANNUAL PAY BACK	3.00	3,000	3.00
	PAY-BACK/N INDEX	0.6	0.6	0.6

Source: Authors (2021)

## V. Discussion

The cassava cycle is 12 months with an estimated production of 16,500 kg approximately as the producer reported. Considering the average rate of return of 3% pa and what is worth 0.25% pm, generating as a result the following values in the NPV index (net present value) for parsley cassava soil the value of 20,886,

washed 21,276, and 500gr tray 91,803. The average attractiveness rate shows that if the value had been invested in the financial market at 3% pa and the same compared to the investment in parsley parsley, analyzing the parsley parsley on tray 500GR has a very expressive return compared to other types of marketing.

The IBC (Benefit/Cost Index) is an indicator that measures the expected return for each unit of capital immobilized in the exploration of parsley cassava in the Planalto Norte Catarinense. The results of the IBC in the methods showed the following results: R\$ 1.27 for each R\$1.00 invested in the trade of the dirty parsley cassava, for the clean cassava the IBC is R\$1.16 for R\$1.00, and for the 500gr parsley cassava tray is worth R\$1.54 for R\$1.00. Demonstrating that the best return among all is the parsley cassava to be sold on a 500gr tray and then the dirty parsley cassava. The ROIA (Additional return arising from investment) is 0.68% for the dirty parsley parsley, 0.41% for the washed parsley parsley and 1,

The IRR (internal rate of return) of 2.17% for the dirty parsley parsley, whereas for the washed parsley it was 1.03% and for the 500gr tray of parsley parsley the value of 3.95%, demonstrating the return of parsley cassava in the 500gr tray is larger than the TMA.

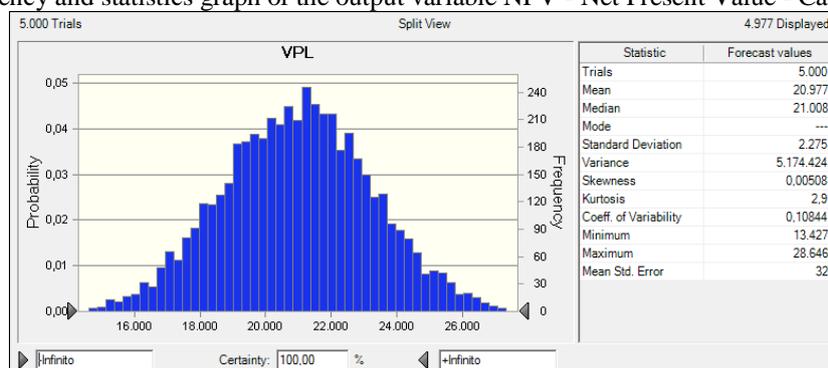
The TMA/TIR (Average Rate of Attractiveness / Internal Rate of Return) index is intended to demonstrate the risk of the investment, the closer to 0, the lower the risk and the closer to 1, the greater the risk, in the analysis performed on the indicators of TMA/TIR is 0.12 for the dirty parsley cassava, 0.24 and the parsley cassava in the 500gr tray, 0.06 demonstrating that the parsley cassava in the 500gr tray has the lowest risk among the others.

The payback, which is the index that shows the time it takes to recover the investment, we can analyze that all three models correspond to 3 years to recover the investment and the payback/N index shows that the value is 0.6 reason that it was stipulated 5 years to recoup the investment, using the index of 0 and 1 for payback/N this demonstrates a medium high risk for the return on the investment.

The use of Monte Carlo analysis has the issue of establishing through the simulation with uncertain variables, and input variables, for the simulation the following variables were used: parsley cassava in kg and the selling price. To define the variables: production of parsley cassava in Kg, the choice was the triangular probability density functions, considering the most original known, with the minimum and maximum being estimated at 10%. As for the variable selling price, we opted for the probability density function. To calculate the forecast, the following variables were adopted: NPV (Net Present Value) and ROIA (Additional Return on Investment). The number of repetitions considered for the executed result was 5,000.

With the execution of the Monte Carlo analysis, it was possible to generate frequency graphs with maximum, minimum and average values of the variables and among other information. In Figure 1, the graph generated of the NPV (net present value) for the "dirty parsley" cassava demonstrates that the NPV value generated in the multi-index analysis is smaller than in the Monte Carlo analysis, but being close, with a maximum value of 28,646 and the minimum value of 13,427.

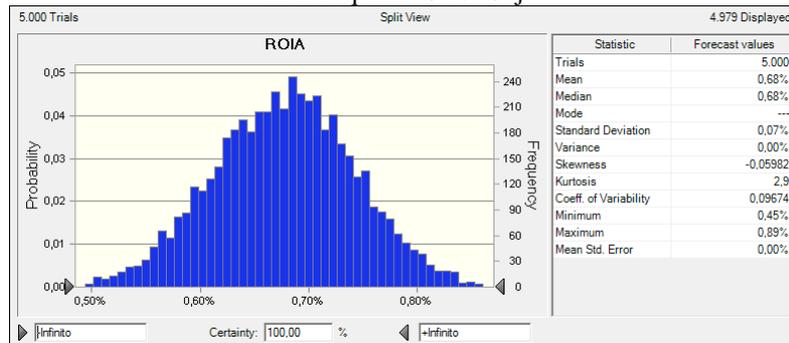
Figure 1 - Frequency and statistics graph of the output variable NPV - Net Present Value - Cassava Salsa Suja



Source: Authors (2021)

Figure 2 shows the ROIA (Additional Return on Investment) shows that the multi-index value is equal in Monte Carlo, being a reliable result.

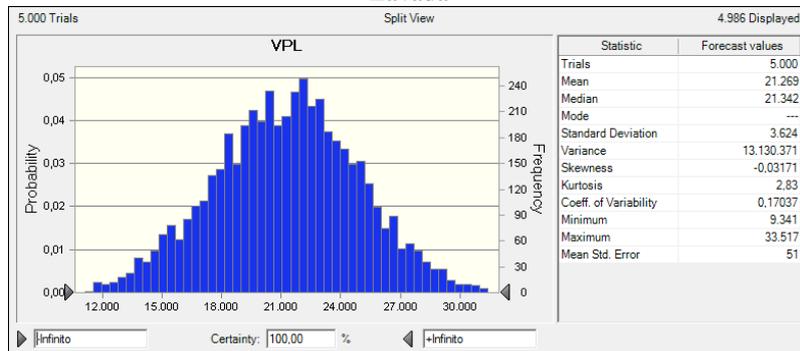
**Figure 2** – Frequency and statistics graph of the output variable ROIA – Additional Return on Investment – Mandioquinha Salsa Suja



Source: Authors (2021)

The next analysis performed was related to the washed parsley cassava which resulted in the following graphs. Figure 3 shows that the NPV value in the multi-index analysis is smaller than the Monte Carlo analysis, considering the minimum value of 9,341 and the maximum value of 33,517.

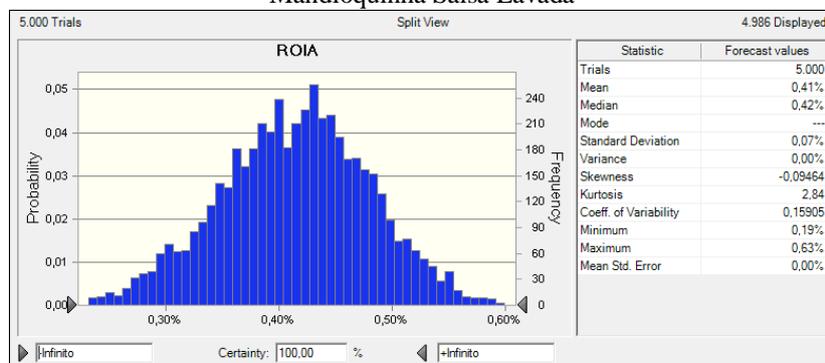
**Figure 3** - Frequency and statistics graph of the output variable NPV - Net Present Value - Cassava Salsa Lavada



Source: Authors (2021)

The ROIA analysis carried out on the clean parsley cassava showed the following analysis. Figure 5 shows the value calculated in the multi-index analysis is the same value found in the Monte Carlo analysis, considering the minimum value of 0.19% and the maximum value of 0.63%.

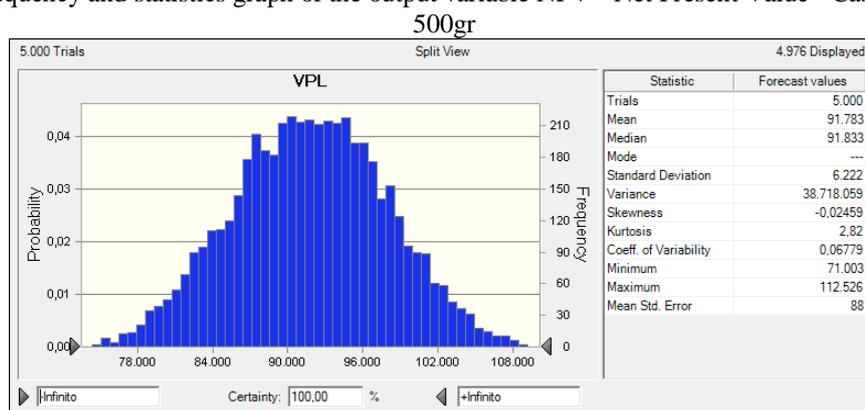
**Figure 4** – Frequency and statistics graph of the output variable ROIA – Additional Return on Investment – Mandioquinha Salsa Lavada



Source: Authors (2021)

In the model of carrot parsley on a 500gr tray, the results found in the multi-index analysis and compared to Monte Carlo were as follows: in Figure 5 it shows the lower NPV than in the multi-index analysis compared to Monte Carlo, being considered the minimum value of 71,003 and maximum of 112,526.

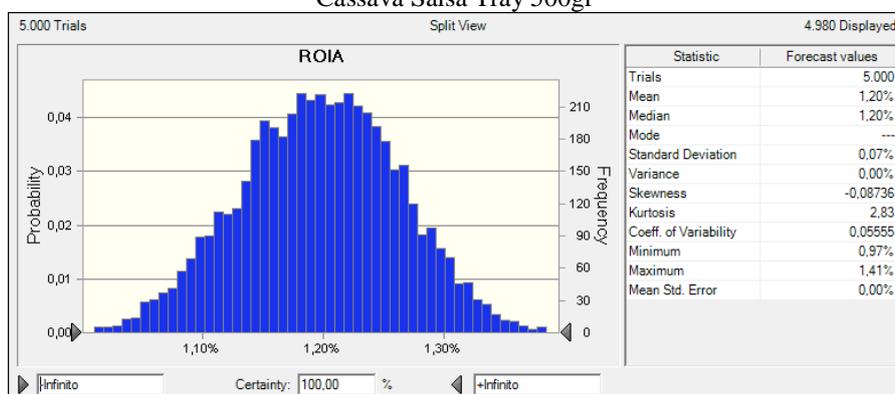
**Figure 5** - Frequency and statistics graph of the output variable NPV - Net Present Value - Cassava Salsa Tray



Source: Authors (2021)

In Figure 6, where the ROIA analysis is shown, it shows that the index value in the multi-index analysis is equal to that of the Monte Carlo analysis, resulting in data reliability.

**Figure 6** – Frequency and statistics graph of the output variable ROIA – Additional Return on Investment – Cassava Salsa Tray 500gr



Source: Authors (2021)

## VI. Conclusion

The possibility of starting the cultivation of parsley cassava on the rural property has the very peculiar characteristic of production, being a rudimentary crop which does not generate expressiveness in numbers and also that the cultivation has a long cycle, making the financial cycle difficult. The parsley cassava is a cultivation carried out in family farming in small areas of land, many of these families have a main income crop and others as secondary, which is the case of the parsley cassava.

With the realization of three possible methods of commercialization of the parsley cassava, it can be seen that the cost of parsley cassava is relatively low due to the fact that the use of pesticides is relatively low and little mechanized. Most of the processes are carried out manually, such as planting, weeding and harvesting. The cost of parsley parsley to be sold needs to have an added value, such as only washed or, as suggested, sold in 500gr trays, generating a pleasant appearance for the consumer. The cost analysis was positive for all marketing methods, but in comparison between them it can be said that washed cassava has a high investment because it needs structure for machinery and employees to carry out the washing process, making it a product with high cost and it can be seen in the indicators that the washed parsley cassava is very similar to the dirty cassava, in which it is sold directly from the harvest to the processing industry. The third method, which is the parsley parsley in the 500gr tray, which uses the washed and selected parsley parsley inserted in a tray destined for the correct portion for consumption, presents expressiveness in the indicators making it more profitable and reducing risks for the producer, according to if on the indicators,

The case study carried out was analyzed the issues related to costs pointing out the economic viability of the production of parsley and commercialization both in dirty mode and in the 500gr tray, but it is still necessary a market analysis to really analyze the acceptance of commercialization of parsley on the tray by consumers in the regions and also an analysis of the storage of this product and how long it can be on the shelf,

which is why parsley has the negative characteristic of low shelf life and this can hinder the process of commercialization

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