

# Analysis Risk and Return in the Cultivation of Tomato Type Salad Hybrid Paron X Alambra

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## ABSTRACT

The context of this article aims to analyze production costs and expectations of return on investment and the risks associated with the production of one hectare of Hybrid Salad Type tomato, from the Paron and Alambra nomenclature, grown in the interior of the city of Mafra / SC, in the region of Planalto Norte Catarinense. The tomatoes Paron and Alambra have an approximate productivity of 5334 cx / hectare, being approximately 22 kg each box, reaching approximately 117.348 kg / hectare. The culture time is around six months, starting in the fifth month the partial harvest of the fruits, ending in the sixth month. It is an applied research as to its nature, descriptive as to its purpose, case study on the strategy to approach the problem. Based on the farmer's production data, the information and data necessary for structuring the projected cash flow in the respective periods were obtained, using a 10% a day TMA. For the analyzes of risks and returns involved, the Multi-Index Methodology was used. The two tomato crops show a high yield. The confirmation of the values is done through the Monte Carlo simulation using the Crystal Ball software, being considered as uncertain variables, or input variables for the simulation, the quantity 5334 cx / hectare for 6 months of tomato cultivation. Among the two varieties of Tomato analyzed in this work, using ROIA as a base, we obtained a ROIA of 12.70% per year for Alambra and 19.16% per year for Paron, which means that the type Paron gives us a greater financial return.

**Keywords:** Costs. Tomato. Risk and Return.

## 1. INTRODUCTION

The fruit known by its popular name tomato, comes from South America more precisely in the regions where are Chile, Peru and Ecuador. From these regions, it expanded over time to the other South American countries. [1]

In the historical context of Brazil, it is known that our Portuguese settlers came in search of new lands, in order to find new sources of raw material and especially spices. The tomato was then a find of the time, one of the fruits that had great appreciation for our colonizers, having its peak of production and

consumption more precisely in the 1950s and 1960s here in Brazil.[2]

In Brazil, it is currently one of the most important economic and food fruits, where its market price varies due to the strong price instability and the lack of production zoning, which regulates the supply and consumption demand of the fruit. In addition to its socioeconomic value, Tomaticultura has been carried out relatively more and more year by year, besides a strong economic relevance in the Brazilian agribusiness, also allowing a relatively high employability rate because it requires a large workforce, since in Many properties the production is carried out manually, accompanied by other cultural dealings.

Tomaticultura has a strong economic relevance in Brazilian agribusiness, since it has an annual turnover of over R \$ 2 billion (about 16% of GDP generated by vegetable production in Brazil).

For its production, it is necessary to take some points into consideration such as: climate, soil preparation and correction, fertilization, water needs, cultivar selection, planting and spacing, and cultural treatments, to be successful in planting, as well as a product Good quality, and therefore excellent appearance, to attract buyers as the industries and end consumers who are extremely demanding. [2]

Tomato production has a high cost, compared to the production of other agricultural crops. The cost of the tomato has a great variability that is estimated in about R \$ 30 thousand to R \$ 55 thousand for each planted hectare. The acquisition of this cost is influenced by the technology used in the production, the form of production and productivity expected to be obtained in the culture, among others.

The Brazilian production is around 59 tons per hectare, or about 5 kg / foot or 245 boxes / thousand feet of tomato, and in the last 20 years productivity has doubled. It is estimated a steady growth year after year. Due to the current technological advances, and the genetic improvements of the seeds, which have been developing more durable species with strong characteristics required of the tomatoes. [2]

Its consumption can be of two distinct forms, being the consumption can be raw or cooked, according to the industrial process employed in the same and suitable in the separation of the pulp with the fruit; With this, one can give innumerable products such as: sauces, pulps, catchups, dried tomatoes, purees, and even

tomato powder, all being present every day in the food of the people, in different forms.

The profitability of tomato cultivation is subject to two primary factors, first the law of supply and demand, which consequently influences the selling price practiced. On the other hand, the quality used in the fruit guarantees a good appreciation of the most demanding consumer, but it has a higher cost by reducing its profit.

Due to the fact that it is a poorly cultivated product in the region, the need arises to demonstrate an analysis with the possibility of future intensification of the activity, so this article aims to analyze the cost of production, expectation of return and risk of tomato agribusiness.

The objective of this work is to establish the technical procedures for the cultivation of the tomato, destined for the Type Salada Alambra and Paron Tomatoes, aiming also the orientation of the farmer by which type of tomato to be cultivated. The analysis was based on the Multi-Index methodology, two sets of indicators, the first being VPL, VPLa, IBC and ROIA, to evaluate the perception of the return of the activity; The second set includes IRR, TIR / TMA Index, Risk Management and Business Risk, aiming to improve risk perception; With application of the Monte Carlo simulator, through the software simulator Crystal Ball.

This article comes in to be divided into five sections. After this contextualization, the second section presents a brief theoretical reference related to the Tomateira activity, tomato production and the sets of indicators associated to the work developed. The third section describes the methodological procedures used in the elaboration of this research. Section four demonstrates the calculations and the analyzes, however, the fifth section presents the appropriate conclusions and suggestions for other studies.

## 2. THEORETICAL REFERENCE

### 2.1. TOMATO CULTURE

Scientifically known tomatoes *Lycopersicon esculentum* as belonging to the family Solanaceae, is a highly nutritious food, being source of various vitamins and minerals and presenting an excellent taste. "Tomato is a dicotyledonous plant, belonging to the class Dicotyledoneae, Tubiflorae order, Solanaceae family, *Lycopersicon* genus, *Eulycopersicon* subgenus, *Lycopersicon esculentum* species. [3].

Belonging to the genus *Lycopersicon*, it is the most popular of olerícolas (plants grown for consumption purposes, in the form of salads) one of the main fruits planted in Brazil and also planted in several countries that has great productivity and consumption like China and the United States, Which are the countries that produce the most, about 30% of world production.

The fruit is berry type, fleshy globular and flattened, the unripe fruit is green and hairy. The ripe fruit color varies from yellow to orange to red. In general, the fruit is round, with a smooth or fluted surface. The seeds are pear shaped, light brown in color.

The production of tomatoes in Brazil involves a series of activities that demand great amounts of energy and human labor. These activities range from seed production to planting, transplanting, soil fertilization, irrigation, fertilizer application, pruning, mooring, plant disease control, and harvesting.

The world harvest of tomatoes in 2010 totaled 151.7 million tons in a cultivated area of 4.42 million hectares with an average yield of 34.4 t ha<sup>-1</sup>. The world's largest tomato producer in 2010 was China (47 million tonnes), followed by India, Egypt and Italy.

China also had the largest cultivated area (925,000 hectares), followed by India, Turkey, Nigeria and Egypt [4].

Among the diversity of species, forms, purposes and flavors, the following species are presented below.

The types of tomato varieties are: [5]

A) Santa Cruz: Hybrid, has undetermined growth, being indicated for cultivation in the open field and protected cultivation. Its plant can reach up to 2 meters in height. It presents fruits with excellent commercial acceptance, with well formed curls, with good tolerance to cracks due to transitions of temperature extremes, its productive potential is on average 11 kg, plant with fruits of 200g.

B) Salad: Hybrid, its habit of growth is indeterminate, being indicated for the cultivations in open field. The fruits are round, firm and of dark red color and bright red. When submitted to transitions from the dry period to the rainy season, they present a reduced cracking frequency. Cultivars of this variety have been improved to be more resistant to transport and storage and these are called "long life", their productive potential is on average 11-12 fruits per plant.

C) Cherry: For in natura consumption, its plant is of high productivity, about 8 to 10 kg of fruits. It has a habit of indeterminate growth, being indicated for cultivation staked and in the open field. Harvesting is done about 80 days after transplanting on land. Number of fruits per bunch is about 8 to 16 round-shaped fruits, weighing on average 10-15g.

D) Italian: This is an elongated tomato, very popular for use in sauces, salads, juices and the preparation of dried tomatoes. It has undetermined growth, being indicated for cultivation in the open field and protected cultivation, with multiple resistance to diseases and with high quality (aroma, color and flavor) of the fruits, characteristics existent in few hybrids in the market. Its productivity comes to be of 11kg / plant, with fruits between 130g to 170g.

The reddish color is obtained thanks to the abundant amount of lycopene found in the fruits. In addition to their nutritional benefits, they are rich in vitamins, including: vitamin A, B vitamins, vitamin C, phosphorus, iron, potassium and calcium, essential for human health and with the added advantage of containing a low calorie .

According to Berlink (2010), the fruit is a good source of vitamins A, B and C. It is also rich in phosphorus, iron, potassium and calcium. In addition to being rich in lycopene, an anticancer agent.

### 2.2. PRODUCTION

For implantation purposes, a lot of commitment should be made at the beginning of planting. To be successful in production, failures and possible initial errors that may occur, must be corrected from the beginning of the deployment. To grow tomatoes, the soil must be deep, loose, permeable, well drained, clayey sand and with pH between 5.5 and 6.5.

The main costs are: fertilization, formicides, fodder, fungicides, herbicides, labor, social charges, maintenance, leasing of equipment and land, crop insurance, soil preparation, third party services, seeds, seedlings, irrigation, chemicals , Depreciation of equipment used in the crop. [6]

In addition to the maintenance costs, other aspects are important to observe for the beginning of a new production, for example: climate, seed quality, occurrence of pests in the region, equipment, inputs and the consumer market that becomes the markets And industries.

The following stages of crop planning and operational steps for tomato implantation are: [5]

A) Soil preparation: It is a stage that requires an extra time and resources application, because it is necessary the preparation with machines and collections for soil analysis. With the results obtained it is possible to determine the fertilization and to make the necessary corrections. In this crop, soils should be light and medium textured, drained and rich in nutrients essential for plant development. The chemical, physical and biological properties of soils should be considered prior to the decision to plant, avoiding areas with a possibility of waterlogging, with a very irregular topography and stains or sand banks, gravel or stones.

B) Correction of soil acidity: Tomato cultivation is considered a temporary crop, and it is important to do an excellent job every year in the soil to obtain success in cultivation. The fruit develops more easily in soils with pH of 5.5 to 6.8, with an availability and appropriate supply of nutrients. The high acidity affects the availability of the nutrients contained in the soil or added through the fertilization, influencing the assimilation of the same by the plants. It is estimated that the average efficiency in the assimilation of primary and secondary macronutrients is 27% when pH is 4.5, and 80% when pH is close to 6.0, which makes liming an essential practice.

C) Fertilization: The main objective of fertilization is to balance the pH of soils, since Brazilian soils have a great acidity, limiting the existence of phosphorus (P), and fertilization in abundance is necessary. The amount of nutrients extracted by tomato plants is relatively low, representing around 10%, the rest remaining in the soil as a residue. The tomato is considered among the vegetables, one of the most demanding species in fertilization. Therefore, knowing the nutritional requirements, the main symptoms of deficiencies and the way to correct them is fundamental to the success of the culture.

D) Production of seedlings: The production of seedlings is a very important phase, as it will be the initiation of the crop. Only those plants that are already grown, strong, well structured and good-looking to be taken to planting should be selected, usually styrofoam trays are used for planting and transporting them.

The production of seedlings can be done in styrofoam trays and has the advantage of facilitating sowing and handling of them; Better sanitary and nutritional control; Facilitate transport to the final location; And reduce the need for replanting. It is recommended to use trays with 200 cells. However, some nurseries have used trays with 288 cells, with a tendency to use trays with up to 400 cells. The seedlings should be uniform, avoiding the use of very small ones, which are easily buried, and of very damp seedlings, which are easily damaged during machine transplantation.

F) Cultural dealings: The tomato presents some different cultural treatments of other existing crops. Irrigation should be few and controlled, weeding should be performed so weeds do not compete with the plant. The weeding can be carried out with herbicide or manual, in some cases the soil cover with dry straw for a better use of moisture. The weeds interfere directly in the development of tomato, competing for water, nutrients, light and releasing allelochemical substances, which affect the germination and growth of the tomato. Tomato planting should therefore be avoided in areas infested with species that contain inhibitory substances, such as *tiririca*, maize grass, silk grass and pigs. Indirectly, weeds interfere as hosts of a large number of pests and pathogens that attack the tomato.

Tomato culture requires attention in the possible appearance of the diseases because they have a very rapid evolution and can

cause great losses. Daily follow-up is necessary to identify possible diseases that may appear in the crop such as bacteria, viruses, fungi, nematodes or physiological damage. Many diseases attack the tomato, causing great reduction of productivity and product quality. Knowledge of the etiology, symptomatology and general control methods allows the early identification and preventive treatment of diseases. For this, frequent inspections are recommended in the crop, looking for to identify the anomalies - like deficient growth, wilt, stains and molds. [5]

G) Harvesting: Harvesting of fruits can be done when the fruits are not ripe yet, because they continue to ripen even when standing outside the foot. Its harvest can be done manually or mechanized, depending on the size of the production and investment of the producer. In its production, the ripening cycle varies, but on average it tends to be between 90 and 100 days. The period required for fruit maturation depends on the cultivar, the climate of the region, the nutritional status and the amount of water available to the plants. When subjected to stress, plants tend to reduce the cycle. Most cultivars planted in Brazil are harvested approximately 110 to 120 days after germination or 90 to 100 days after transplantation. [5]

### 2.3. AGRICULTURAL ACCOUNTING AND COST

In agriculture, the productive process has evolved greatly since the time when man used his forces and the strength of the animals to prepare the plantations. Nowadays, heavy machinery is used in most cases, where the simple formation of the price of these products starts to have more incorporation in their costs.

The identification of the costs involved in the production of a crop plays a vital role within an organization or even for the simple rural producer as regards the analysis of the efficiency of its production.

The standardization of a systematic method of productive costs, will allow a good elaboration of data for possible analyzes of different agricultural areas, strengthening the efficiency of the production.

In order to obtain positive results in agriculture, it is extremely important to carry out a planning and study of the production of the crop to be cultivated. Among the possible tools that help the management, the elaboration of the agricultural costs is able to attend effectively to the managing part of the organization.

In an agricultural area, the farmer or farm manager must see the rural property as a company, with the purpose of understanding for what reason it is producing, what its costs and possible expenses will be, thus aiming at its revenues, able to cover all its costs and Expenditures, aiming at a surplus, which will be the profit of the organization.

The agricultural activity, in relation to the tomato crop, concentrates the revenue during or soon after the harvest of the fruit, period that retains some days of the month of a given year. "Unlike other activities whose distribution is distributed throughout the 12 months". [6]

In this way, the "[...] end of the harvest and, almost always, the commercialization of this harvest, we have the closing of the agricultural year. The agricultural year is the period in which crops are harvested and usually marketed in the agricultural harvest". [6]

Contagiously, the agricultural world has its particular characteristics. Unlike the general accounting of the companies,

the Agricultural Accounting is divided basically in temporary activity and the permanent culture, also known as perennial.

It has its distinct characteristics, which make them private as to their accounting understandings, and the following activities are as follows:

A) Temporary Culture: The temporary crop during its productive cycle is, "subject to replanting after harvesting. [...] After harvesting, they are removed from the soil to be re-planted. [6]

B) Permanent Culture: Permanent culture, "are those that remain linked to the soil and provide more than one harvest and production." It should be noted that considering the culture as permanent, it is recommended to appropriate the costs in formicides, inputs, maintenance, labor, soil preparation, depreciation of equipment, among others. Costs for Non-current Assets as Fixed Assets. [6]

The agricultural product that is the object of study and research addressed in this study, has its characteristics as to its type of accounting classification, the temporary culture, thus being subject to replanting after the end of its harvest. The entire cost of the harvest will be accumulated in the "Temporary Culture" account and, after the harvest, this account will be written off at cost and transferred to a new account called "Agricultural Products", the sub-type being specified as the type of product. [6]

It is also noted the costs that can be incurred after the harvest, which will be the costs to finish the product or to leave it in a condition of consumption and to be sold, these costs can be understood as processing, packaging and all other costs For storage as silage or freezing. [6]

In tomato cultivation, there will be no storage costs as silos, since tomatoes spoil easily and it is not good that they are exposed to heat and not under much weight. Because it is a product of rapid maturation and great consumption, the tomato goes through small processes after its harvest.

The main costs are related to the cultivation of Tomato; Their seeds, fertilizers and fertilizers, pesticides against pests, irrigation system maintenance, labor, machinery used for land preparation and others.

In order to be fully successful, it is essential to know what is being grown, its market influences and the main sources of consumption to which the product is destined, maintaining the main quality and, if possible, reducing unnecessary costs. By convention, agribusiness is apt to consider accounting to be essential for the development of a rural enterprise.

With respect to the rural production costs of the producers, we have the FUNRURAL, Rural Workers' Assistance Fund, which in turn, exempts the rural producer from payments of social contributions as from normal companies, FUNRURAL is a percentage of 2 , 3% applied on the value of the products sold with the Producer's Invoice, and it is up to the purchaser of the merchandise to pay this Withholding Tax, finally, the producer will receive the value of his sales deducted from this 2.3% , Corresponding to FUNRURAL.

FUNRURAL is a contribution that replaces the employer 's share of the social security charge, plus the percentage of the Environmental Risks of Work - RAT, being the special insured the cost of his pension for retirement and other benefits with Social Security. The FUNRURAL contribution is paid by the tax substitution regime, with the percentage being paid to the rural producer and passed on to the Treasury by the purchasers of the production, such as refrigerators and cooperatives. [7]

In case of sale of merchandise, who collects the contribution guide is the company that joined the merchandise of the producer.

Characterizing the rural producer as taxpayer, this total value being discounted in invoice.

## 2.4. MULTI-INDEX METHODOLOGY

The Multi-Index Methodology is intended to support the decision-making process in the acceptance and rejection of investment projects through the use of various indicators. The use of the various indicators compromises more consolidated information than using indicators in isolation.

The Multi-Index consists of using two groups of indicators. The first group is formed by VP (Present Value); NPV (Net Present Value); VPLa (Annualized Net Present Value); IBC (Benefit / Cost Index) and ROIA (Additional Return Due to Investment). However, the second group is formed by the TMA / TIR (Minimum Attractiveness / Internal Rate of Return) indicators; Risk Management and Business Risk. The two groups aim at improving the perception of the project analyzed.

The structure of the Multi-Index methodology consists of: [8]

1. Do not incorporate the risk premium as a spread over the TMA;
2. Express the project's ROIA return as an additional return beyond what would be earned by the application of capital in low-risk securities;
3. Use environmental analysis to deepen the assessment of the risks involved;
4. Confront the expected gains with the perception of the risks of each project.

Although the structure of the methodology has been described, it should be highlighted the incorporation of the risk analysis. Management Risk is designed to evaluate the degree of competence of the management group to successfully carry out the project.

The Business Risk associated with conjunctural and non-controllable factors is intended to qualify, even subjectively, the classic analyzes PEST, 5 Forces of Porter and SWOT.

## 2.5. SIMULATION OF MONTE CARLO AND CRYSTAL BALL

In the simulation of risk analysis, "one type of simulation in a worksheet is the Monte Carlo simulation, which generates random values for uncertain variables, repeatedly, to simulate a model" [9].

Through the Monte Carlo simulation, it is possible to estimate and simulate possible problems that may occur in the development of the project, based on a real system and with the aid of a computational tool, it will be possible to obtain the solution of these possible complex problems, which with only simple Mathematical calculations would not be fully resolved.

The model consists of the representation by a range of possible values or "[...] by a probability density function where the values are not considered as simple values; The distributions are classified as normal, uniform, logarithmic, and triangular [10]. On the other hand, simulation through the Crystal Ball simulator provides greater security and convenience, the data used in it must be reliable. Just as in Monte Carlo Simulation, Crystal Ball is a tool with greater accuracy, where it performs supposed forecasts and risk analysis, reducing doubts in decision making.

Crystal Ball is an easy program to perform forecasting and risk analysis eliminating uncertainty in decision making. Through the power of simulation, Crystal Ball becomes an effective tool in the hands of a decision maker [9].

Through the process carried out on the basis of the application of the Crystal Ball method, one has more security, because in this procedure the projection, the probability of reaching the

profitability of an enterprise is realized, to identify which variables that most affect a forecast, Helping to maintain competitive advantage, unlike other risk analysis and forecasting simulation programs.

**3. METHODOLOGICAL PROCEDURES**

The research is based on its nature in a way that is defined as applied, because it relates the knowledge to a problem with the intention of solving it. [11] This is a documentary research: It is only necessary to consider that the first step consists in the exploitation of documentary sources, which are in great number. There are, on the one hand, first-hand documents, which have not received any analytical treatment, such as: official documents, newspaper reports, letters, contracts, journals, films, photographs, recordings, etc. On the other hand, there are second-hand documents that have already been analyzed, such as: research reports, company reports, statistical tables. [11].

In order to have definitions about the objectives of this research, the procedures take place in a descriptive way, by exposing the costs and main activities of tomato cultivation, maintaining as a focus and aiming always the analysis and interpretation of the levels of return and Risk of Tomaticultura in the cultivated area of 1 (one) Hectare. Rreports that "in this type of research, usually the use of statistical techniques, from the simplest to the most sophisticated." [12]. As for the research procedure, in turn, it is classified as a case study. Case-study research is mainly characterized by the single-case focus study. This study is preferred by researchers who wish to deepen their knowledge about a particular case. [12]

The research on the quantitative approach to the problem is carried out: "[...] is characterized by the use of statistical instruments, both in the collection and processing of data. [12]

It is also a survey, "since it raises information that may be useful for more specific future studies or even to map the reality of a given population or sample of companies in relation to accounting issues. [12]

The work has training with the data of a farmer of the region of São Lourenço, municipality of Mafra, plateau north of Santa Catarina, for the collection of data on the cultivation of Tomato and aims at specific data in specialized references, becoming of character documentary.

The merit of documentary research in studies that involve accounting issues, in the sense of checking past events that may be useful, not only as a record of memories, but also to assist in the present and to glimpse future trends. [12]

The temporality in the methodological process has its characteristic classified as being of a transversal nature, since the data are considered in a certain period of time. The analyzes based on the collected data refer to one (1) Hectare of the tomato crop with quality of productivity, cost methods, storage structures, as well as its commercialization in the locality of São Lourenço, in the municipality of Mafra, plateau north of Santa Catarina.

In order to carry out the data collection, a step-by-step process of the technical process was elaborated for the elaboration of the culture in research. For the best sequential of the activity, a Check List was elaborated following the steps as determined. [12] Check-List is the technique of verifying if the researched population has the necessary elements for the application of a certain theoretical proposal, that is, to operationalize the research.

The data were collected together with a rural producer located in Mafra-SC, through documents presented by the same, and

description of the cultivation process. In this context, following the line of reasoning [12] means to work with all the material obtained during the research process.

The study includes in its synthesis, the costs of the implantation and costing of 1 (one) hectare (ha) of Tomato, Type Salada Híbrido, of the variety Paron and Alambra, considering the culture period of 6 (six) months. It is understood the approach of the initial operational costs, the inputs for soil preparation and planting, manpower to prepare the beds, inputs to prepare the irrigation system and support the cultivars.

For the purposes of the values listed in the following tables, they were collected based on local trade specialized in the agricultural and construction segment. Regarding the Tractor machine time, the average value of the region was used, based on companies and autonomous professionals related to this type of activity.

The techniques used for the costing process were segregated from mechanized and manual operations; As well as the use of machines and equipment only for the preparation of the ground, this cost being the hour machine of the tractor charged in the region.

After the data collected on the basis of the Check List, electronic spreadsheets were used, such as the use of the EXCEL software to calculate and calculate the indicators VP, VPL, VPLa, ROIA, IBC and TIR, used for the analysis of investment in culture Of Tomato.

**4. PRESENTATION OF RESULTS**

The presentation of the risk and return analyzes of the Tomato Cultivation in the Northern Plateau of Santa Catarina, was initially used the Multi-Index methodology, identifying the main viability indicators. Afterwards, Monte Carlo simulation was performed through Crystal Ball software, in which forecasts and risk analyzes were performed by probability.

The costs related to the production of this agribusiness are shown below, taking into account the two types of tomato quality; The Paron and the Alambra. Table 1 shows the implementation costs of both types of tomato.

**Table 1 - Cost of tomato crop production**

MONTH	DESCRIÇÃO	PARON (R\$)	ALAMBRA (R\$)
1	IRRIGATION SYSTEM	41.476,11	41.476,11
1	SOIL PREPARATION (MACHINING)	2.333,80	2.333,80
1	MANUAL PREPARATION OF THE SCOURERS	14.224,69	14.224,69
1	CULTURAL PREPARATIONS AND TREATMENTS	15.766,92	15.326,63
2	CULTURAL PREPARATIONS AND TREATMENTS	13.279,04	13.279,04
3	CULTURAL PREPARATIONS AND TREATMENTS	18.890,11	18.890,11
4	CULTURAL PREPARATIONS AND TREATMENTS	19.466,43	19.466,43

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5	CULTURAL PREPARATIONS AND TREATMENTS	12.106,95	12.106,95
6	CULTURAL PREPARATIONS AND TREATMENTS	11.346,75	11.346,75

Source: Author (2017)

For the purpose of calculating the return and risk indicators, a cash flow was elaborated, where it is possible to observe in Table 2 and 3 the cash flows of Paron and Alambra.

**Table 2 - Cash Flow Paron**

MONTH	OUTPUTS	RECIPES	CASH FLOW
0° MÊS	(73.801,52)	-	(73.801,52)
1° MÊS	(13.279,04)	-	(87.080,56)
2° MÊS	(18.890,11)	-	(105.970,66)
3° MÊS	(19.466,43)	-	(125.437,09)
4° MÊS	(13.947,18)	80.010,00	(59.374,27)
5° MÊS	(15.640,62)	186.690,00	111.675,11

Source: Author (2017)

**Table 3 - Cash Flow Alambra**

MONTH	OUTPUTS	RECIPES	CASH FLOW
0° MÊS	(73.361,23)	-	(73.361,23)
1° MÊS	(13.279,04)	-	(86.640,27)
2° MÊS	(18.890,11)	-	(105.530,37)
3° MÊS	(19.466,43)	-	(124.996,80)
4° MÊS	(13.579,14)	64.008,00	(74.567,94)
5° MÊS	(14.781,84)	149.352,00	60.002,22

Source: Author (2017)

Firstly, for purposes of risk and return indicators of the Multi-Index Methodology, an initial investment of R \$ 73,802.00 for Paron Tomato and R \$ 73,361 for Alambra is considered. In Table 13, calculations were made for the purpose of the risk and return indices, considering the initial investments seen recently, based on a TMA of 10% pa. For a period of 6 months.

**Frame I - Risk and Return Indicators Multi-Index Methodology**

		PARON	ALAMBRA
RETURN	VP	177.267	133.363
	VPL	102.610	53.341
	VPLa	17.602	9.150
	IBC	2,402	1,818
	ROIA	19,16%	12,70%
RISK	TIR	1,46%	0,88%
	Índice TMA/TIR	0,57	0,94

Source: Author (2017)

The expectations of return for investment in the tomato crop, far exceeds the initial investment of everything going well with the production. At this point, it is hoped to reach a maximum production of the feet, reaching 117.348kg / Hectare of both crops. The difference between the initial investments for Paron versus Alambra is about R \$ 440.00 more. Considering a TMA of 10% a.a. About 0.825% a.m. generating Net Present Value of R \$ 102,610.00 for Paron productivity level of 117,348kg / Hectare and R \$ 53,341.00 for the production of 117,348kg / Hectare do Alambra.

In this case, it shows that when choosing the investment, it will recover what would be measured if that capital had been applied in the financial market to 10% pa. Based on the values obtained, an expressive difference between the VLPs is measured. It is advised, then, the advantage of the productivity strategy of the tomato Paron in relation to the strategy of the production of Alambra.

NPV - Net Present Value: With respect to the Net Present Value distributed in annual equivalent amounts for this agribusiness, it is R \$ 17,602.00 for the production of Paron and R \$ 9,150.00 for the level of production of the Alambra, which would be received Investment, as well as investment capital at 10% per year. Regarding the return of tomato agribusiness, it is necessary to continue the analysis to better evaluate this variable.

IBC - Benefit / Cost Index: The IBC indicator measures the expectation of return for each unit of capital immobilized in the exploitation of one hectare of tomato (Paron, Alambra) in the northern plateau of Santa Catarina, to obtain R \$ 1.40 for each R \$ 1, 00 investment in the production of Paron and R \$ 0.82 for each R \$ 1.00 investment for production level of Alambra. It is important to note that the disadvantage of using the IBC alone is that it measures the return to a horizon of 0 and 6 months. A production is considered viable when IB / C exceeds one, as this represents wealth generation.

ROIA - Additional Return Due to Investment: ROIA associated with the exploitation of Paron Tomato is estimated at 19.15% and Tomate Alambra is estimated at 12.70%. It can be observed that the profitability is more expressive for the production of Paron. The ROIA of the production of Paron and Alambra is sufficient to compensate the risk, since the scale is above 1, however it is concluded that the two investments are good because they present a higher ROIA To 1, being considered a High return for both qualities.

TIR - Internal Rate of Return: For definitions of TIR risk indices for the study in question, the Internal Rate of Return found for the production of Paron was 1.46%, exceeding the monthly TMA of 0.83%. In relation to the Alambra, it was 0.88%, surpassing the used TMA of 0.83%, a caveat for the Alambra index is shown to be very close to the percentage of TMA.

TMA / TIR - Minimum Rate of Attraction / Internal Rate of Return: With respect to TMA / TIR, the index of 0.57 presented by the Paron production strategy represents a lower risk for productivity of 117,348kg / Hectare, on the other hand The Alambra production strategy shows an index of 0.94 that represents a high risk for the production of 117,348 kg / Hectare, reinforce the advantage of the strategy focused on the production of Paron in relation to the risk index being higher for The Alambra in the same parameters of cultivated area. The TMA / TIR index allows a better visualization of the risk, on a scale of 0 to 1, where 1 represents maximum risk and 0 minimum, signaling an average risk for the cultivation of Paron and Alto for Alambra, of this agribusiness.

RG - Management Risk: In relation to Management Risk, this indicator proposed is designed to evaluate the degree of competence of the management group to successfully carry out the project. It is associated with the experiences and knowledge of the production and marketing process that the producer has on the subject, it can be considered of 0.70 where it indicates a medium / high risk for the production of Tomatoes of the Paron and Alambra type, due to the Availability of public or private technical guidance in this segment, according to the assessment of the perception of competence and skills. [8]

RN - Business Risk: Regarding Business Risk, it is associated with conjunctural and non-controllable factors and is intended to qualify, even subjectively, the classic analyzes PEST, 5 Forces de Porte and SWOT. The same can also be considered as 0.70 where it indicates a medium / high risk for the Paron and Alambra types, compared to a 0 to 1 scale from the evaluation of the 5 Poder Forces. In an estimation of risk, the value of 0.70 is considered a maximum risk for production, according to the evaluation of the perception of competence and skills. [8]

Through the previous interpretation, the most significant risks are related to the production of the Alambra tomato, as well as the TMA / TIR, Risk Management and Business Risks indicators that are characteristic of tomato agribusiness, however, do not cooperate as determinants In the decision not to invest.

#### 4.1. MONTE CARLO SIMULATION

In the simulation, the quantity of Paron Tomato and Alambra 5,334cx / ha for 6 months was considered as uncertain variables, or input variables for the simulation, for these variables in the recipe formation, 5334 boxes per hectare were used, considering that the Tomatoes are usually sold in boxes of approximately 22Kg, so a total of 117,348kg / Hectare is distributed over the established limit of 22Kg / cx, thus leaving 5,334 boxes marketed at their respective selling prices of each situation, called assumptions.

For the definition of the variables: quantity of cx / ha, the density functions of triangular probability were chosen, being considered the most probable the values originally raised, being estimated the minimum and the maximum in 10%, not being necessary the use of historical data To base the distribution. [8]

As for the variable of the sale price, we opted for the probability density function, since all values between the minimum and the maximum are equally likely to occur, characterizing as a continuous probability distribution.

For forecast variables, NPV (Net Present Value) and ROIA (Additional Return Due to Investment) were chosen.

The number of replicates considered for the executed result was 5,000.

After the simulation was carried out, it was possible to obtain the frequency, minimum, mean and maximum values of the variables, median, variance and standard deviation, among other information.

Figure 1 shows that the average for NPV (Net Present Value) is R \$ 102,590 for Paron tomatoes at 5,334cx / ha, with a minimum value of R \$ 70,552.00 and a maximum of R \$ 139,890.00, shows that the average for NPV (Net Present Value) is R \$ 53,455.00 for the tomato Alambra at 5,334cx / ha, with a minimum value of R \$ 28,734.00 and a maximum of R \$ 81,894.00

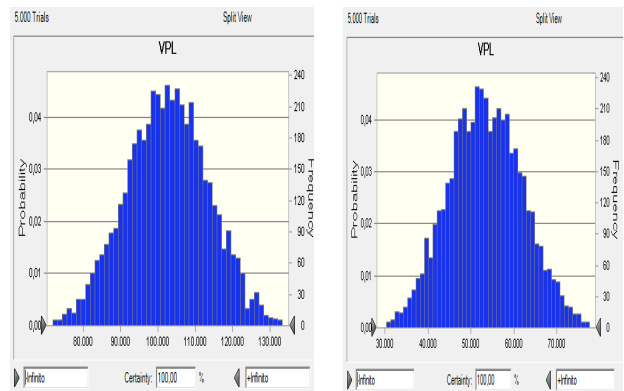


Figure 1 - Frequency graphs and statistics of the output variable NPV - Net Present Value Paron Tomato x Alambra

Source: Author (2017)

Figure 2 shows that the average for ROIA (Additional Return Due to Investment) is 19.15% for Paron cx / ha Tomato, with a minimum value of 14.45% and a maximum of 23.83%, shows that the average for ROIA (Additional Return Due to Investment) is 12.68% for Tomato Alambra cx / ha, with a minimum value of 7.95% and a maximum of 17.5%.

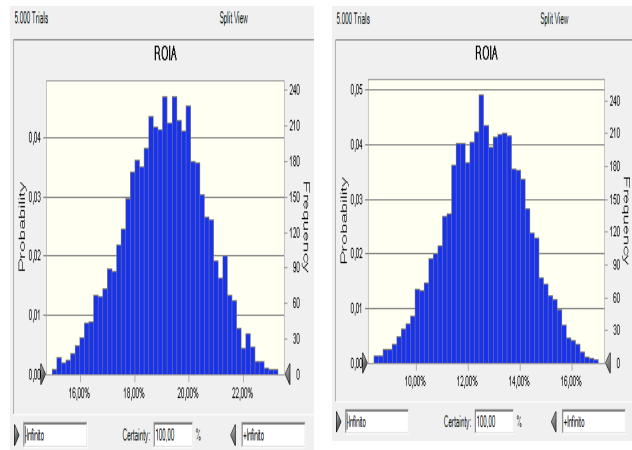


Figure 2 - Frequency graph and output variable statistics ROIA - Additional Return from Investment Paron Tomato x Alambra

Source: Author (2017)

#### 5. CONCLUSION

In the possibility of starting an investment focused on the agricultural area, specifically the Tomato crop, one can clearly and clearly perceive the risks and returns for tomato production, and the comparison of the Paron Tomato versus Alambra types in the plateau region Norte de Santa Catarina / SC, according to the Multi-Index.[8].

Monte Carlo simulation was also performed through Crystal Ball Software. The use of indicators in investment decisions is a way to evaluate investments in return and risk, thus improving the perception of the rural producer in his field of investment.

The profitable characteristics of this agribusiness surprised the expectations expected, because despite its great investment, the revenues from the period supplied the disbursement and balanced

the associated risks, being possible to analyze a return that could be considered high for the Paron Tomato. As for Tomato Alambra, it had a lower profitability than Paron, but is still considered a profitable investment based on its Indices.

Among the two varieties of Tomato discussed in this study, both evidenced that the production strategies of Alambra with ROIA of 12.70% per year did not present better performance when measured to the results of the production strategy of Paron with ROIA of 19,16 %. However, it is necessary to observe, with great caution, that when analyzing the return indices, one must consider several factors that may influence its production, as well as the appearance of new pests and climatic factors, as well as the oscillation of the price of supply and demand.

As for the risk of not recovering the capital invested through the Pay-Back / N index, it was not considered in this work, because it is a temporary crop that is renewed every harvest, and its revenues are earned at the end of the harvest.

Management Risk was considered on a High Medium level scale, which would imply the competence to manage the investment process, as well as the Business Risk that indicated a High risk for the Tomaticultura segment that is evidencing the interference of the climate and from the market.

The data obtained from the Monte Carlo simulation, using the Crystal Ball software, according to the uncertain or variable variables for the simulation, the quantity 5,334 cx / ha for both types of tomato for 6 months, the respective sales prices of Each quality, from each situation called assumptions, it is possible to notice that the VPLa of the option Paron versus Alambra for 6 months exceeds in R \$ 8,452.00, the Paron is also shown better as the TMA / TIR Risk Indexes being Paron 0.57 And Alambra 0.94, showing that the risk for the Alambra tomato is higher.

The results evidenced according to the simulation show that it provides a more concrete analysis for the management of the business risk, although it is not absolute truth.

The case study was carried out in a region in the interior of Santa Catarina that cultivates the tomato of the qualities mentioned above, aiming to attend the maximum productivity; It is advisable to develop this study in other regions, or small farms, under the possibility of obtaining different results, due to the possible variations, such as inputs or seeds, that undergo market changes.

However it is concluded based on the study of data and situations addressed in this article, despite the similar characteristics of the use of its costs, Paron is the type of tomato that has more credibility and appreciation on the part of its buyers.

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