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Research Article
Return Expectations and Perceived Risks in the Establishment of a Business Unit of Cashew Nut Processing in Rio Grande do Norte State, Brazil

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Abstract
This study aims to identify the expected return and the perceived risks in the establishment of a processing unit and commercialization of cashew almond nuts with capacity to process up to 10,800 t year^{-1}, in the city of Apodi-RN, Brazil. This study is classified as applied regarding its nature; descriptive and explanatory regarding its objective and case study regarding the strategy of problem approach. For conducting it, data were collected about initial investment, expected demand, production costs and selling price. Based on this information and by using the multi-index methodology, were estimated the returns indicators and the risks perception of the of this business unit. The main advantage of this methodology is to use the almost risk-free rate to discount the projected cash flow; to measure the project risks in a scale from zero (very low risk) to one (high risk); to discuss each one of the five type of risks (decision, payback, operational, management and business risks) and by using, a perceptual map, to confront the expected return with the perceived risks to accept, or not, the project under analysis. The results points out to an additional return on investment (ROIA) of about 13.7% per year above the Almost Risk Free Rate (ARFR = 7%). This return is considered medium/high for Brazilian standards. The risks perception, except the operational risk, pointed out to be compatible with the expected return. In order to check out the indicators robustness, a variation of ±15.0% (triangular distribution) was inserted in the main parameters (sales, price and variable costs) over the most likely scenario. The results obtained by using the Monte Carlo method and the Crystal Ball software point to p (VPL≤0) ≈ 0 corroborating with the decision to invest in this agribusiness. This study highlights as its main contribution the multidimensional analysis of the risks linked to investment in agriculture.

Key words: Return and risk, cashew nut, multi-index methodology, agriculture, Brazil

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

The cashew (*Anacardium occidentale* L.) tree is a tropical plant; its genesis is in Brazil, especially in the Northeast, which accounts for over 95% of national production, it is an agricultural crop of great economic importance (De Abreu *et al*., 2013). The top producers are the states of Ceará, Piauí, Rio Grande do Norte and Bahia (Embrapa Technological Information Agency, 2011; De Figueiredo *et al*., 2016). The fruit of the cashew tree is a perfect ingredient to improve, perfume, enrich and differentiate recipes, due to its exotic appearance, pleasant fragrance and unique flavor. The nutritional value of the almond (kernel) and the cashew pulp has great potential for economic development in Northeastern Brazil (Angelis, 2013; Fontes *et al*., 2013), as shown in Fig. 1.

During the dry season in Northeastern Brazil, cashew means a key source of income for farmers. Its production takes place in the off season of the other cultivated species, which can be considered a specific and strategic attribute in minimizing the income seasonality and labor employment (Pessoa and Leite, 2014).

According to Teixeirense (2014) in the report of the National Supply Company (Conab) and the Brazilian Institute of Geography and Statistics (IBGE), the cashew nut yield in natura/2014 had a production of 185,297 t; representing a volume 74.2% higher than the 2013 yield, even with a reduction in the planted area (Table 1).

With regard to foreign trade of the cashew nuts, from January to September, 2014, 13,568 t were sold, totaling 88.23% of shipments that occurred in the same period of the previous year. The main buyers of Brazilian cashew nuts are: US (35.67%), the Netherlands (18.37%), Canada (10.71%) and others (35.25%).

The cashew tree is found almost in all Brazilian territory. However, the best conditions for its cultivation are found on the Northeastern coast. Commonly in Brazil, the cashew apple or false fruit is used as raw material for the production of juices, ice cream, various sweets, liquor, honey, jams, cajuína, carbonated soft drinks and spirits (Institute Caju Northeast, 2014). Nearly, 100% of the fruit is used; it feeds at least four production chains: Juice, industrial dye, almond, chestnut liquid and the fruit are even sold in natura to the final consumer.

Cashew is composed of 10% chestnut and 90% peduncle (cashew apple). Although, the use of the peduncle in the industrialization process is approximately 12%, it is mostly used in the processing of whole juice (Paiva *et al*., 2000a). The cashew nut is formed by shell, testa skin and almond (kernel). The main use of the shell, which means 65-70% of the weight of the nut, is the extraction of its liquid to be used as fuel in the industry itself and as fertilizer (Camara, 2010). In addition,

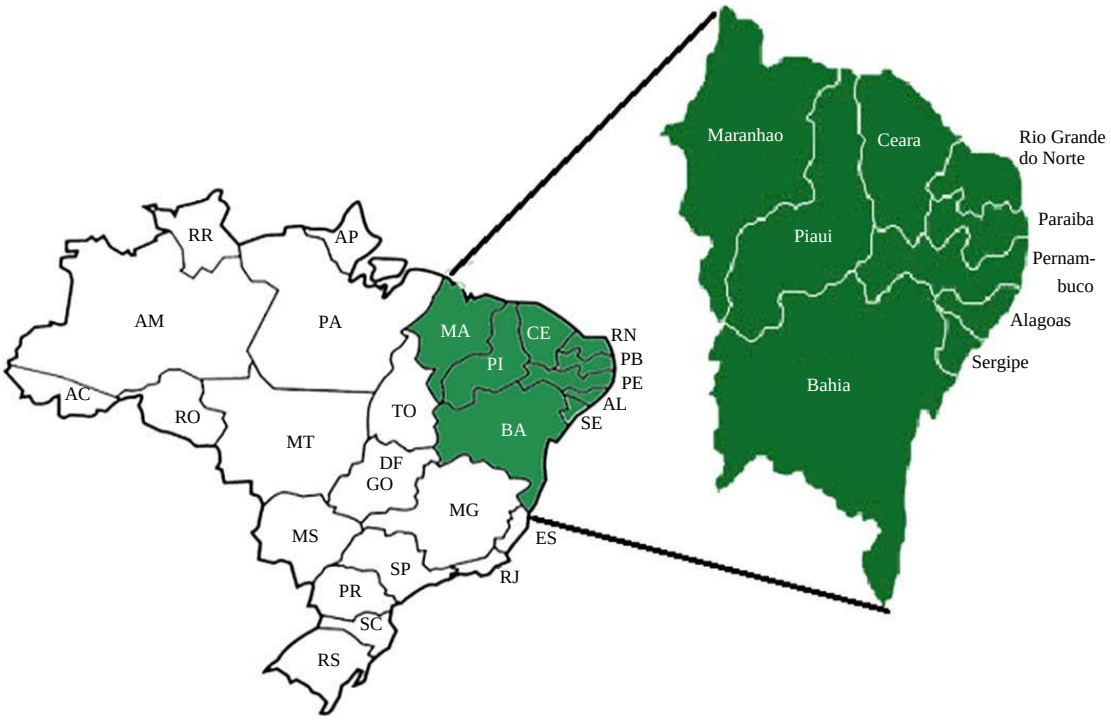

Fig. 1: Map of Brazil highlighting the Northeast region, the main producer of cashew

Table 1: Cashew nuts in natura-area, productivity and production (harvests 2013/2014)

	Harvested area (ha)			Harvested area (ha)			Yield (t)			Participation state/Brazil (%)	
	Crop year			Crop year			Crop year			Crop year	
Brazil/region-state	2013a	2014b	Variation (%)	2013c	2014d	Variation (%)	2013e	2014f	Variation (%)	2013	2014
Brazil	644.651	635.914	-1.4	165	291	77	106.398	185.297	74.2	100.0	100
Nordeste	644.651	635.914	-1.4	165	291	77	106.398	185.297	74.2	100.0	100
Maranhão	14.438	14.438	0.0	345	371	8	4.980	5.354	7.5	4.7	2.9
Piauí	94.835	94.835	0.0	136	329	143	12.863	31.222	142.7	12.1	16.8
Ceará	391.073	382.339	-2.2	136	263	94	53.067	100.680	89.7	49.9	54.3
Rio grande do norte	113.882	113.868	0.0	247	339	37	28.109	38.221	37.1	26.4	20.8
Paraíba	4.040	4.040	0.0	254	293	16	1.025	1.185	15.6	1.0	0.6
Pernambuco	3.424	3.424	0.0	609	848	39	2.085	2.905	39.3	2.0	1.6
Bahía	22.959	22.970	0.0	186	235	26	4.269	5.400	26.5	4.0	2.9

*Estimate, Source: Conab report Oct/2014, Teixeirense (2014)

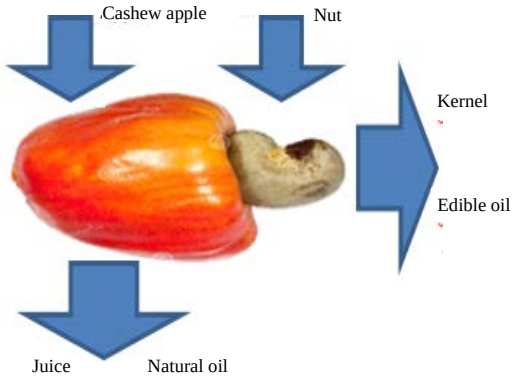

Fig. 2: Cashew fruit and its productive chains

the Cashew Nut Liquid (CNL) represents approximately 25% of total raw cashew nuts and along with its by-products, conceived through a number of chemical reactions, is used in the production of paints, varnishes and enamels, insecticides, fungicides, pigments, plasticizers, antioxidants, adhesives or binders for wood particle boards and cork agglomerates (Lima, 1988; Rodrigues, 2006). Figure 2 shows this chain.

The testa skin makes up 3% of the total nut. Some items in its formation make it very appropriate for feeding poultry and cattle. It can also be used in the production of paints and for obtaining the residual CNL and is also the source for heat energy, fertilizer and manufacture of compressed products (Medina, 1980; Holanda, 1988; Moreira *et al*., 2016). The edible part of the cashew nut is 28-30% of its total. It is composed of two ivory colored cotyledons and after processed; the average yield is only 21% (Paiva *et al*., 2000a). The composition of the cashew nut (Fig. 3).

Brazil is in third in the world rankings in the cashew nut cultivation, in natura, as well as in the supply of its almonds (kernel). The country is known today because of the quality of this product and especially, for the credibility of its suppliers (Cramer, 1999; Carneiro, 2014). The authors point out that, in the Northeast, the cashew productive chain generates more than 300 thousand jobs disseminated in agricultural, industrial and service activities.

With regard to the export of the nut, due to the drought, the results have been negative. In 2013, the state of Rio Grande do Norte totaled in the first half of this year, the value of 12.9 million, resulting from its commercialization on the external market. However in 2014, the first five months of the year, that amount dropped to 9.5 million, representing a decrease of 26.14% sales, 2014. For 2015, there is a production estimate of 20,000 t of cashew nut to the state, which represents a decrease of 60% compared to normal yield (Franca, 2014).

According to Carneiro (2014), the industrial park for the processing of this fruit is concentrated in Northeastern Brazil and the units are distributed as follows: Ceará, Rio Rio Grande do Norte and Piauí. The processing capacity is 420 t of cashew (kernel) almond per year and 45 million ton year^{-1} of the liquid of the nut (CNL) (Carneiro, 2014). The raw material used by the processing industry is the cashew nut in natura, which the Cashew Nut Almond (CNA) and the CNL are extracted. These products are intended for external trade.

Depending on climatic conditions, there may be significant variations in production from one year to another. Despite harsh climate conditions since the year, 2012, the state of Rio Grande do Norte, where the investment will be made, ended the first five months of 2014 with a surplus of 11 million dollars. Fresh melon and cashew nuts are among the fruits that top the lists of exports in Rio Grande do Norte (Lopes, 2014). Even being among the products most exported by Rio Grande do Norte, the cashew nut was responsible for the negative variation in the export list of fruit production (Anonymous, 2014).

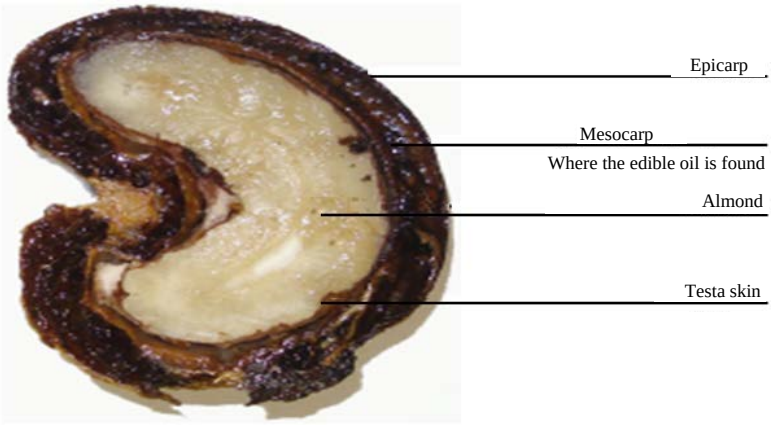

Fig. 3: Cashew nut structure

An important boosting factor of the cashew nut production was the creation of cashew cultivation support fund (FUNCAJU), which aims to direct federal funds for technological support, workforce qualification and expansion of the cashew production chain (Sindicaju, 2013). It is worth noting that this action was crucial to the productive performance of this sector. From its conception, activities such as financing and the modernization of the agribusiness sector, the export trade strengthening, the protection of the internal and external market price, rights and improvements ensured for rural workers, encouraged the increase in productivity. The development of research related to qualification and the increase in cashew production, are close realities, in this segment (Sindicaju, 2014).

The production process of cashew almond is an example of a joint production, from the same raw material, cashew nuts in natura and then to a common production process. The result is more than one product not severable before the separation point and corresponding to the genesis of the joint costs.

The joint production takes place with almost all natural products in the agroindustry. It is mainly characterized by a continuous production, which has the following steps: Drying, weighing, classification, storage, cooking, cut, greenhouse, humidification, peeling, selection, frying and final inventory. The selection of almonds is performed during the course of the process. The categorization is carried out based on the physical integrity: Color, size and defect. This results in 14 kinds of whole nuts, nine kinds of nut pieces, nine kinds of brown granulated nuts and two types of flour (Martins, 2003).

Given the importance of this cultivation to the northeast and the Brazilian agribusiness (Kureski *et al*., 2015), this study aims to identify the return expectations and perceived risks in the establishment of a processing unit and commercialization of cashew almonds (kernels), with capacity to process up to 10,800 ton per year in the city of Apodi, in the state of Rio Grande do Norte, Brazil.

Despite the diversity of possible products and by-products, the product and market differentiation strategy will be used: It will focus on the domestic market with a differentiated product type export in color and size with carefully selected whole almonds, export packaging in the 150 g cans with differentiated design. This will be the flagship of sales with expectation of matching 80% of the revenues of this segment. The substandard almonds, above, will be vacuum packed in bags of 150 g and targeted at regional internal market as well.

To identify the return expectations and the perceived risks, the multi-index methodology proposed by Souza and Clement (2012) was used. This is done by means of two sets of indicators: The first represents the return indicators and comprises Present Value (PV), Net Present Value (NPV), Annualized Net Present Value (ANPV), Benefit Cost Ratio (BCR) and additional return on investment (ROIA). The second set creates a multidimensional discussion of the perceived risks of the proposed regulation and consists of MRR/IRR index (decision risk → p (NPV≤0)), payback/N-ratio index (risk of non-recovery of invested capital), Revenue Commitment Rating (RCR) (operational risk), management risk and business risk. The Monte Carlo method and the Crystal Ball software are used in a complementary fashion to improve the perception of the risks associated with the project under analysis.

MATERIALS AND METHODS

This is an applied study regarding its nature, it is descriptive and explanatory in relation to its objective and a case study regarding the strategy used in the problem

Table 2: Selection of multi-index

(i)	The use of an Almost Risk Free Rate (ARFR) to discount the projected cash flow and with it, eliminate the primary discussion about how much should be the risk premium to overlap the pure MRR (minimum attractive rate of return)
(ii)	The use of several indexes to compose each of the two dimensions analyzed: NPV, ANPV, BCR and ROIA for the dimension of return and MRR/IRR index, pay-back rate/N, equilibrium revenue/total revenue index, management risk and business risk for the risk dimension
(iii)	In this methodology if NPV>0 or IRR>MRR, it only means that, the discussion on the feasibility of the investment project must go on
(iv)	Present the expected real gain (ROIA) above the opportunity cost or ARFR and force the confrontation with the perceived risks
(v)	Each of the risk indicators are measured on a continuous scale from zero to one (1 = Maximum perceived risk) and then categorized, according to established criteria, as low, low to medium, medium, medium to high or high
(vi)	The methodology makes use of the Monte Carlo method for better understanding of some types of risks, especially the ARFR index/IRR, payback/n index and the equilibrium revenue/expected maximum revenue index
(vii)	According to Kreuz *et al.* (2004) the acceptance of the investment project should be the result of the confrontation between ROIA and the perceived risks

Source: Souza (2013) and Souza and Clement (2012)

Table 3: Total investment

Description	Amount
Investment in fixed assets in the industrial area	157,360
Investment in fixed assets in the administration area	10,740
Investment in fixed assets in the commercial area	9,460
Investment in fixed assets for shared use	40,340
Investments in working capital	83,850
Pre-operating expenses	23,200
Total	324,950

Table 4: Unit variable cost

Specification	Cashew nut type 1	%	Cashew nut type 2	%
Raw material	0.21	5.22	0.21	10.40
Packaging	3.50	87.06	1.50	74.26
Cooking gas	0.05	1.24	0.05	2.48
Vegetable fat	0.10	2.49	0.10	4.95
Salt	0.05	1.24	0.05	2.48
Electricity	0.11	2.74	0.11	5.45
Total (R$)	4.02	100.00	2.02	100.00

approach, it is documental with semi-structured interviews for the data collection procedures and quantitative for the data analysis (Sampieri *et al.*, 2006; Lakatos and Marconi, 2009). In order to better understand the production chain of this agribusiness, market research, field research, discussions with researchers in the field were carried out. It was also estimated the initial investment, demand, fixed costs, variable unit costs and the selling price. This information made up the database relevant to the analysis of the profitability and the risks inherent to the establishment of a business unit for processing cashew nuts in the town of Apodi-RN, Brazil.

The information and data collected were systematized in a cash flow, designed for a 10 year period. The multi-index methodology was used for the analysis of return and risk involved in this investment decision. Souza (2013) and Souza and Clement (2012) argue that the selection of Multi-index is mainly due to (Table 2).

The use the Crystal Ball software made possible to process prices, quantities sold and unit variable costs as random variables and better understand the likelihood of different scenarios.

RESULTS AND DISCUSSION

After analyzing the market potentials and the minimum capacity, the initial investment in fixed assets, initial working capital and pre-operating expenses were estimated. It was also considered the form of financing the investment with its own resources and third parties. Table 3 shows the details of resources needed to establish this business unit.

Industrial processes evolve over time, bringing better quality, lower operating costs and competitive advantage. Paiva *et al.* (2000b) emphasize the importance of the inclusion of new technologies in equipment and processes that help produce whole almonds with light coloring and better quality, in order to optimize technical parameters such as production efficiency, reduced time, temperature and security devices. In this perspective, the business unit project carefully planned a mix of its industrial assets to maximize the efficiency of the production process.

The initial working capital was estimated to cover three months of fixed costs and to support major operating expenses. The primary investment remains estimated at R$ 324, 950. Part of this capital (R$276, 207) will be sought from BNDES (Brazilian Development Bank) with an annual interest rate of 11.00%, payable in 60 months with a grace period for the first year, with interest payment during that period.

According to Bornia (2009), the variable cost is mainly related to the use of costs in support of short-term decisions, which will be deducted from the unit revenue for obtaining the profit margin, which represents the remaining portion of the purchase price to cover expenses, fixed costs and generation of profit when the product is sold. From that standpoint, variable cost (Table 4) is identified as raw material, packaging, cooking gas, vegetable fat, salt and electricity. It was decided to consider direct labor as a fixed cost, since it is not linked to variations in production volume.

In the multi-index methodology, the construction of the cash flow is made from the projection of the profit and loss

Table 5: Projected values (R$ 1,000) by using variable costing

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Quantity-150 mg can	20.000	25.000	34.000	44.000	52.000	59.050	60.000	60.000	60.000	60.000
Price (R$)	18	18	18	18	18	18	18	18	18	18
Quantity-150 g bag	4.000	5.000	6.800	8.800	10.400	11.810	12.000	12.000	12.000	12.000
Price (R$)	10	10	10	10	10	10	10	10	10	10
Gross sales	400	500	680	880	1.040	1.181	1.200	1.200	1.200	1.200
(-) Tax-simples	29	37	55	71	91	105	106	106	106	106
= Net sales	371	463	625	809	949	1.076	1.094	1.094	1.094	1.094
(-) Variable costs	90	113	153	199	235	266	271	271	271	271
= Gross margin	280	350	472	610	714	810	823	823	823	823
= Variable expenses	20	26	35	45	53	60	61	61	61	61
= Net margin	260	325	437	565	661	750	762	762	762	762
(-) Fixed costs	151	258	330	398	462	438	446	453	453	453
(-) Fixed expenses	175	175	175	175	175	175	175	175	175	175
= EBITDA	-66	-107	-67	-7	24	137	141	134	134	134
(-) Financial expenses	29	26	18	11	4					
= Profit	-95	-133	-85	-19	20	137	141	134	134	134

Table 6: Project cash flow (in R$ 1,000)

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cash inflows	367	494	661	871	1.023	1.179	1.197	1.201	1.200	1.260	
Cash outflows	480	719	728	897	1.018	1.044	1.059	1.066	1.066	1.077	
Cash balance	0	-113	-226	-67	-26	5	135	139	135	134	183
(+) Depreciation	20	24	33	40	48	53	54	55	55	55	
(-) Amortization	69	69	69	69							
(-) Fixed assets	218										
(-) Pre-operating expenses	23										
(-)Working capital	84										
(+) Financing funds (Banks)	276										
(+) Residual value	114										
(=) Investor cash flow	-49	-93	-271	-104	-55	-16	188	193	190	189	351

(income) statement (PLS) in accordance with principles of direct costing/variable costing. Garrison *et al*. (2007) argue that in variable costing, profit of a period is not affected by changes in inventories, it varies in the same direction as sales. According to the authors, the total amount of fixed costs explicitly appears in the income statement, identifying that the absolute value of the fixed costs need to be guaranteed, so that there is actual profit for the company. Thus, the net operating profit of the variable costing is closer to net cash flow.

From this perspective, Souza and Clemente (2012), it is sales and not production that boosts the company. Based on this argument, the budget projections (variable budget) were carried out, along with projections for the financial year income statements for a 10-years period (Table 5).

The projection of the income statement is the basis for the construction of the projected cash flow. For the projection of cash inflows, a marketing strategy with 40% up front, 30% in 30 days and the remaining 30% in 60 days was considered. For cash outflows related to payments of suppliers, the payment system was agreed in 50% up front and the remaining 50% in 30 days. The expenses related to taxes, contributions, costs and variable and fixed expenditures were also noted. These expenses were posted monthly for a period of 10 years. Table 6 shows the cash flow.

Project financial analysis: As discussed in earlier sections, the multi-index methodology provides two sets of indicators for projects return and risks analysis. These two sets are shown in Table 7.

Net Present Value (NPV): The business unit required an investment of R$ 324,950. The expectation is for returns higher than if the investment is made in the securities market (MRR 7% pa). The amount R$ 127.418 only indicates that there is more gain in the decision to engage in the business but it is not enough to sustain the decision to invest. This decision depends on the magnitude of the gain and the perception of risks associated with the venture. One should not consider this indicator as a determinant to support an investment decision. According to Souza and Clemente (2012), no number is good or bad, unless it can be compared

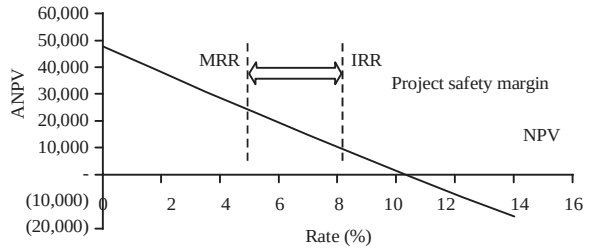

Fig. 4: Relation NPV, IRR and MRR

Table 7: Indicators of multi-index methodology

Parameters	Values
Return	
Present value	176.161
Net present value	127.418
Annualized net present value	18.141
Benefit/cost index	3.61
Additional return on investment (ROIA)	13.71%
Risk	
Internal rate of return (IRR)	10.99%
ARFR/IRR Index	0.64
Payback	6.5
Payback index/N	0.65
Equilibrium revenue/maximum revenue	0.71
Management risk	0.40
Business risk	0.46

Source: Research data

to some reference. A deficiency in this indicator is that the gain of the project is presented to an atypical period, in this case, 10 years. Usually annual or monthly parameters are used.

Annualized Net Present Value (ANPV): *Mutatis mutandis*, the ANPV has the same interpretation of the NPV but expressed in a unit time, easier to be analyzed. In this case the ANPV is only the annual equivalent of NPV and remains estimated at R$ 18.141. According to Souza and Clement (2012) this indicator facilitates the decision-making process because it is more practical for the decision maker to think in terms of annual earnings than in retained earnings over several periods. The common deficiency of NPV and ANPV lies in the fact that both express return in absolute monetary values rather than relative values, customary in the market (Kreuz *et al*., 2008).

Benefit/Cost Ratio (BCR): The BCR R$ 3.61 expressed in current monetary values, the expected real return, after 10 years, for every $ 1.00 invested capital. In other words, it is expected a profitability of 261% in 10 years. Souza and Clement (2012) point out that, this is a return greater than expected if the capital had been invested at an annual rate of 7% pa (MRR) during the period considered. The BCR aims to partially correct the deficiency of NPV and ANPV calculations, which is to express the return in absolute terms (Kreuz *et al*., 2008). The BCR when taken in isolation does not allow, at least immediately recommend the proposed project since the expressiveness of its value may be masked by the time frame of 10 years.

Additional return on investment (ROIA): According to Souza and Clemente (2012), ROIA is the best estimate of profitability for an investment project. It is also point out that an indicator that might facilitate the analysis because is in the same unit time of MRR. In the case of this project, ROIA of 13.71% per year is a surplus of what would have been the return if the capital had been invested at an annual rate of 7%. To invest in this agribusiness the expectations are that the opportunity cost (7% per year) is recovered, resulting in a real additional of about 12% per year. The significant result for this agribusiness, is corroborated by the results of other studies in agricultural products in which the same methodology was used: About 36% for tomatoes (Souza *et al*., 2004), 19% for garlic (Kreuz *et al*., 2003) and 16% for wine grapes (Kreuz *et al*., 2004). This additional return of 12% per year is what should be confronted with the perceived risks to guide the decision to invest.

ARFR/IRR index: In multi-index methodology (Souza and Clemente, 2012), unlike the classical methodology, IRR is used as an indicator of risk and not return. By dividing MRR/IRR, what is sought is an approximation measure between these two random variables. Thus, this indicator is used as a proxy $p(VPL \leq 0) \approx p(MRR/IRR > 1)$. This relation is shown in Fig. 4 in which IRR is only a limit to the variation of MRR. In the case of this project, a MRR/IRR index equal to 0.64 points and according to Souza (2013) and Harzer (2015) the $p(VPL \leq 0) \leq 0.05$ implying low decison risk.

The simulations performed by the Monte Carlo method, using Crystal Ball software, effectively signaled $p(VPL \leq 0) \approx 0.045$ compatible with the result indicated by Souza (2013) and Harzer (2015).

Payback/N ratio index: The period required to recover the capital invested in this project is 6.5 years. The payback rate/N 0.65 accentuates the risk perception of the project, due to the fluctuations of raw material supply. In this kind of agribusiness was expected a faster recovery of invested capital i.e., three to four years. One of the advantages of using

Table 8: Management risk

Competences	Percepção
Financial aspects	0.60
Industry trends or segment	0.60
Production process and Innovation	0.60
Negociation with stakeholders	0.70
Positioning strategies	0.50
Average	0.60
Perceived management risk	0.40

Source: Adapted from Souza and Clement (2012)

this indicator according to Kreuz *et al*. (2008) allow comparability between different projects. In this case, the index found is considered a medium/high risk without the recovery of invested capital.

Management risk: It is also measured on a scale from 0-1, this indicator refers to the competence of managers to operate innovate and create competitive advantage for this agribusiness already in its first years of activity (Wauters *et al*., 2014). According to Souza and Clemente (2012), the knowledge and experience accumulated over the production process, marketing process, distribution channels and especially experience gained when conducting negotiations help the business in turbulent and bad times. In case of this business unit, entrepreneurs have experience and knowledge to understand aspects related to product quality levels, strategic positioning towards competitors and marketing efforts needed for creating value. The identification of competence will be sought in the initial phase of the project aimed at a differentiating positioning of product and market. Crucial to the success of this agribusiness is to establish a network with local farmers to ensure supply of quality raw materials. Accordingly, in addition to a resource-based view also, it is important to focus on developing skills needed to manage this relationship network. Considering the expectations of the management group regarding the skills needed for the first years of activity, according to the opinion of entrepreneurs, themselves and it is possible infer a management risk equal to 0.40 as shown in Table 8. The proposed scale in multi-index methodology this risk is rated low/medium.

Business risk: The simplicity of the production process, low investment required and the expressiveness of the profitability of this investment are incentives for new entrants. On the other hand, the fact that the internal market is still little explored indicates ample growth potential for this agribusiness. To improve the perception of the associated risks, some strategic issues were identified such as the structure of competition (Wauters *et al*., 2014; Rusnakova, 2015), dominant players in the market. The possibility of new entrants, substitute products, behavior of consumers of the product, strength of suppliers, as well as strategic positioning history of direct competitors. This information was improved with results of interviews with agribusiness professionals. Souza and Clemente (2012) point out that the business risk is associated with cyclical factors and not to controllable factors that affect the project environment. In addition to the concern focused on the market, weaknesses and threats relevant to this agribusiness, considered the climatic conditions of the region that jeopardize the supply, price and availability of raw materials and strength of the established competitors. Depending on weather conditions, there may be significant variations in production from one year to another. According to Teixeirense (2013) the cashew nut yield in 2012 was considered atypical due to the climatic severity. Even with this situation taking place since, 2012, the Rio Grande do Norte state closed the first five months of 2014 with a surplus of $ 11 million (Lopes, 2014). Still, in 2014 even being among the best-selling products abroad in Rio Grande do Norte, cashew nuts was the item responsible for the negative change in the export basket of fruit production exports, 2014. Thus, considering the PEST analysis, Porter's 5 forces and weaknesses and threats of the SWOT analysis is an average risk perception (0.46) for the Business Risk as shown in Table 9.

Operational risk: The Operating Breakeven Point (OBP) identify the revenues needed to support the project operating expenses. In accordance with Souza and Clemente (2012), just as important as determining the OBP is to analyze its position on the maximum level of activity, which is identified by the minimum between productive capacity and maximum market demand. This relative positioning is called Degree of Revenue Commitment (DRC) and the closer this positioning is to 1, the higher the operational risk of the project will be. Table 10 shows the DRC for each year of activity emphasizing that the first years of activity are the most critical. For the classification of the perception of operational risk is recommended the figures obtained in the third or fourth year, it is expected that at this stage the project is in the maturity phase. Therefore, the project operational risk would be 0.92 (Table 10). This justifies the amount of capital working of this project.

Summary of indicators: Despite the expressiveness of the expected return (ROIA equal to 13.7 per year), two determining factors are observed for reflections on the recommendation of the project: The estimated time of

Table 9: Business risk

Pest		Porter's 5 forces		SWOT	
Aspect	Perception*	Aspect	Perception*	Aspect	Perception*
Political-legal	0.25	Entrants	0.60	Weaknesses	0.40
Economic	0.50	Substitutes	0.50	Threats	0.80
Sociocultural	0.40	Suppliers	0.70		
Technological	0.40	Clients	0.50		
Demographic	0.20	Competitors	0.70		
Mean	0.35	Mean	0.60	Mean	0.60

Perceived business risk = 0.52, *Scale of 0-1 where zero indicates no risk and maximum risk, Source: Souza and Clement (2012)

Table 10: OBP and DRC

Years	Revenue	Fixed cost	Fixed expense	Variable cost	Variable expenses	Variable expenses	DRC
1	400.000	151.110	203.467	90.250	20.400	354.577	0.89
2	500.000	257.869	283.502	112.812	25.500	541.370	1.08
3	680.000	329.705	348.101	153.424	34.680	677.806	1.00
4	880.000	398.133	409.291	198.549	44.880	807.424	0.92
5	1,040.000	462.361	178.436	462.361	53.040	640.797	0.62
6	1,181.000	437.892	174.516	266.462	60.231	612.408	0.52
7	1,200.000	446.144	174.516	270.749	61.200	620.659	0.52
8	1,200.000	453.029	174.516	270.749	24.000	627.544	0.52
9	1,200.000	453.029	198.064	270.749	24.000	651.093	0.54
10	1,200.000	453.029	198.064	270.749	24.000	651.093	0.54

Table 11: Expected return and risk perceived

	Low	Low/Medium	Medium	Medium/High	High
Retorno (ROIA)	←				
Financial risk (MRR/IRR)					
Pay-back/N					
Operational risk (DRC)					
Management risk					
Business risk				↓	

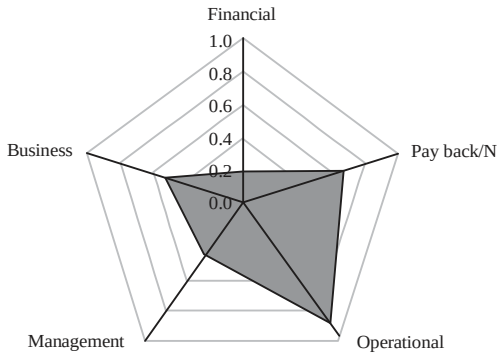

Fig. 5: Perceived risks

6.5 years to recover the invested capital (pay back/N) and four years of activity to have recovered almost (92%) all revenues used to pay costs, expenses and taxes. Figure 5 shows the balance between the risks analyzed and Fig. 6 shows the comparison of the expected return with the perceived risks.

The idea that high returns are achieved by accepting higher risks does not parameterize the ideal trade-off between them. In Table 11, it is observed that, except for operational risk, other risks are consistent with the expected return, i.e., are enveloped according to the multi-index methodology. In this case, the decision to invest depends on the degree of propensity to risk of the management group. To assist the decision, a scenario analysis is performed. For the composition of such scenarios, a variation in the cash flow of each period was considered, about ±15% of the most probable amount according to a triangular distribution.

The Monte Carlo Method and Crystal Ball software (version 11.1) were used to perform the simulations and thus

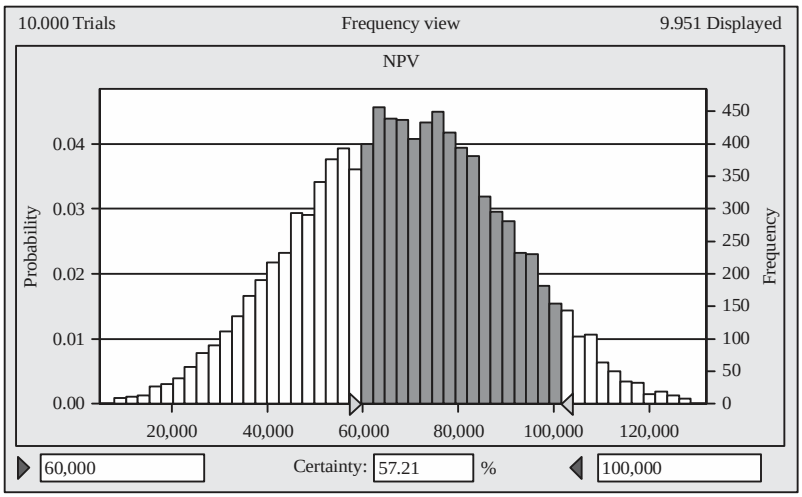

Fig. 6: NPV probability distribution

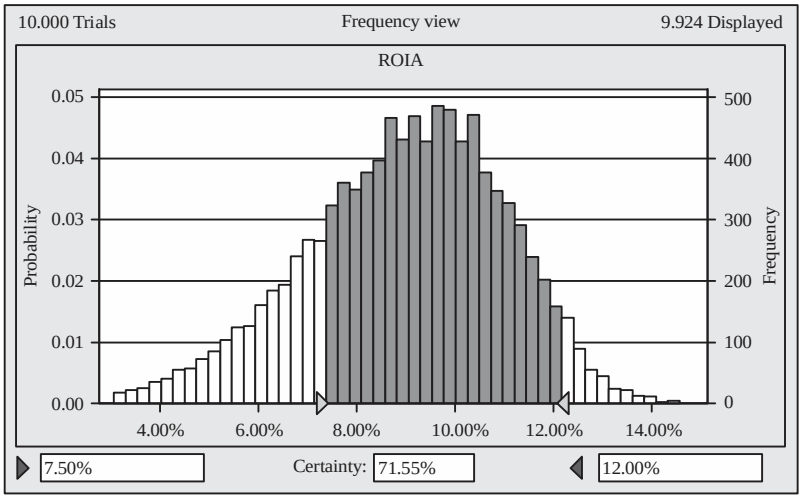

Fig. 7: ROIA probability distribution

determine the probability of some critical events. It is observed that the p (NPV≤0) is nearly zero (Fig. 6) and NPV greater than R $ 60,000 presenting probability of 0.7.

With respect to the return indicator (ROIA), it is observed that the probability of folding the profit, i.e., to recover 7% of the capital cost and another 7% return on invested capital is more than 0.80. Figure 7 illustrates this situation.

DISCUSSION

Regard to the international market almonds, India and Vietnam are Brazil's main competitors, being responsible for the highest volume in world trade. In the domestic market, cashew almond industrialization is concentrated in three states of the Brazil northeastern region: Ceará, Rio Grande do Norte and Piauí. About ten firms produce 90% or more of chestnuts marketed in the region. Despite of the importance of this agribusiness and its oligopolistic feature, there are not similar studies on the expected return with systematic and explicit analysis of the risks. Since, the firm intention is to follow a competitive strategy focused on product differentiation (exportation quality for domestic market) all the similar regional agribusinesses are both rival firms and investments opportunities. In order to evaluate the expected return it is worthwhile to have information about some other studies carried out: Dourado *et al*. (1999) and Santos *et al*. (2008) studied the return of a mini processing plant of cashew nut and found ROIA equal 8.58 and 24.55% per year, respectively. Pessoa *et al*. (2000) by studying the cashew cultivation under irrigated and dryland found ROIA equal

1.85% per year, Araujo (2008) studied the return dwarf cashew cultivation in the state of Sao Paulo found ROIA equal 31.13% per year. One should remember that the cashew nuts are only part of the cashew chain agribusiness implying distinct returns at each level of this chain. Another important point is the risk perception. Except for the operational risk (equilibrium revenue) at the first three years, the other risks perceptions are compatible with the expected return. The robustness of the results were checked out through Monte Carlo Simulation and it is concluded, as expected that the p (NPV$\leq$0) $\approx$ 0.

Although, for this project, risks are most prominent in the first three years of operation and this risk can be mitigated with properly sized working capital. Furthermore, the agribusiness cashews chain presents a yearly ROIA of 31% (Araujo, 2008). Recently, Rego *et al.* (2015) presented a study about the use of natural dye cashews for food industries. The expected yearly ROIA was 33%. In synthesis, the cashew production chain is profitable.

CONCLUSION

This study aims to apply the multi-index methodology in order to identify the return expectations and the perceived risks in the establishment of a processing unit and commercialization of cashew almond nuts in the city of Apodi-RN, Brazil. The project under review has significant aspects of risk management, combined with an internal market prone to growth. However, some risks related to climate conditions in the region were observed. Another determinant factor for the increased risk of this business corresponds to the significant volume of substitute products, barriers related to tax and taxation, labor, social security and export and import policies of African cashew nut.

Another important point that must be emphasized refers to the large participation of third party resources in the business, which also contributed to the project risk. In such conditions, the project's return is observed in year 6 and the recovery of invested capital would be from 6.5 years of operation, with the fact that the business will have almost all of the revenues allocated for operating expenses up to the 4th year of activity. However, the decision to undertake business triggers a substantial gain since it exceeds the income provided by MRI and generates an increase of over 12.0%, that is, the decision to undertake more than doubles the annual income.

Of all the five types of risks analyzed (decision, operational, pay-back, business and management) only the operational risk (equilibrium revenue/expected maximum revenue) is not compatible with the expected return (ROIA). This may be explained by level of fixed costs carried out in the production process and deserve strongly follow up. Therefore the return of the project is consistent with the risks perceived except for operational risk.

To support the decision-making process the Monte Carlo method was used for the generation and analysis of scenarios. The main critical event p (NPV$\leq$0) shows virtually zero probability of occurrence while the probability of the event double the gain p (ROIA$\geq$7%) is around 0.8.

The analysis points out the need for an active and aggressive management regarding the demand increase, strict control of operating costs and strengthening of the partner network, with emphasis on the suppliers of raw materials. These actions are necessary to mitigate operational risk. Subject to the initial conditions the management group is able to decide for the implementation of the project under review.

It is important to consider that the processing almond cashew nuts are only part of the cashew agribusiness, which has distinct profitability at every level of the production chain. However, the study notes that only the market of cashew nuts makes the investments unattractive vis-à-vis other alternatives on the market.

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