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Accounting Analysis Of The Investment And Economic Projection Of A Hydroponic Tomato Production Plant

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Abstract

The conservation of tangible and intangible resources (capital, raw materials, time, etc.), is one of the greatest challenges for industrial engineers today, since consumers have more demanding needs and in which the cost-benefit must be the best. If we add to this the easy access to information that each of the participants of the economic cycle have, it generates a more challenging situation than what can be foreseen initially. According to the above, the present investigation contemplates the design of an investment and budget analysis proposal for a tomato sauce plant, which seeks to be a focus of innovation and economic development in the region, in addition to the proper use of available resources, implementing the best techniques and tools currently available, an added value that the project has is the implementation of an organic growing environment, 100% friendly to the environment and the health of consumers.

Keywords: competitor; costs; design; design; investment; assembly.

1. Introduction

The need to satisfy the levels of food consumption by humans has been a determining factor for the industries specialized in these areas, these companies have been implementing and standardizing value processes in the creation of foods with high levels of nutrients, vitamins or other properties, leaving aside the use of chemicals or some components harmful to consumer health. Leaving aside the use of chemicals or some components harmful to the health of the consumer.The standardization of these

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processes has brought with it an inclusion of all internal sub-processes of the organization such as: Transportation, receiving, facility and infrastructure capacity, storage, processing, preservation, and customer service. Thanks to the multiple theories of organization and production, the progress of those entities that have opted for this path has been significant, allowing an added value in the market and therefore a great variety of highly qualified products.

In Colombia, the food industry sector is on the right track, which is why there is an opportunity to generate a proposal that benefits the region economically and socially. For (Montes, 2019), director of the ANDI Food Chamber, the food industry in the country grew 5.21% for 2019, noting a favorable projection for next year, this increase is due in part to the increase in the minimum wage and the purchasing power of each consumer.

Considering that the geographical and water extensions of the country are favorable for obtaining raw materials and inputs needed in the transformation processes. Such is the case of Norte de Santander, a department that is lagging behind at the industrial level due to misuse of resources and lack of support from the government, which has generated a lack of opportunities and economic backwardness for the inhabitants of the region. In addition, if we add to all this the international crisis and the migration of Venezuelan people in the capital city, we can see a not very discouraging panorama, since unemployment rates have shot up more than normal, generating poverty and a number of negative indicators. This is why the responsibility is greater, since real solutions must be sought to mitigate this series of impacts and in part help the economy to generate positive indicators.

According to the above, it is necessary to propose multiple alternatives and initiatives, such as the creation of companies developed from ideas of university students in the region, these new entities seek not only to improve the situation of the region, but also to innovate the market with the implementation of more efficient techniques and methodologies, which facilitate decision making and resource optimization. To innovate implies the fulfillment of a multiple series of steps, in which the route of action of the new company must be planned, among these steps the location and design of the facilities stand out, since this is a factor that in most of the cases provides a competitive advantage, speeding up the production and delivery times of the product.

This research sought to identify and recommend the resources to be invested, the design, dimensions and distribution of a hydroponic tomato plant, which in the future will be the solution to the problems already exposed.

2. Article structure

2.1 Research hypothesis

In the short term is investing in a hydroponic tomato plant a profitable business idea from an accounting perspective?

2.2 Research Context

This research will include the elaboration of an accounting analysis of a tomato production plant, which had a self-supply of raw material (tomatoes), through the implementation of its own hydroponic crops. For this purpose, a route of action has been traced, in which an analysis of identification of relevant aspects of the macro and micro investment of the factory is carried out, gathering the necessary information for this; besides taking into account formats and knowledge provided by previous research on the subject.

As a complement to this economic analysis, trivial and essential factors that can positively or negatively affect new investments in the production plant were established, where materials, labor, machinery, etc., are a fundamental axis of the operational design.

In the development of the research, limitations were found in the sanitary situation of COVID, since the field work could not be carried out, in the same way the little implementation of the hydroponic technique in the region limited the obtaining of data on the production density and the capacity of such crops. As these adversities appeared, they were overcome with the help of bibliographic sources, the use of office tools such as video calls and social networks, as well as data from books or documents related to the topic.

2.2 Frame of reference

The background information used in this research as documentary support is shown below.

Title	Description	Level	Authors	Source
Design of the tomato processing industry (Thesis submitted for the degree of Agricultural Engineer).	This project was based on the design of a tomato processing plant located in Caparroso (Navarra) in which dimensions were developed in the facilities that serve the production and the necessary spaces in the plant to carry out production and service activities. The contribution of this work to the development of the project was the identification of theoretical aspects related to the investment in production plant, identifying relevant characteristics in each one.	International	(Sagredo Loitegui, 2015)	Repository Public University of Navarra
Design of a tomato paste plant in Moche, Peru, with a sustainable development alternative. (Research article, presented at the graduate school UCV. District of Víctor Larco Herrera, Perú)	The purpose of this research project was to design a tomato paste production plant in the district of Moche, Trujillo, Peru, given the potential of the land for agricultural products, such as tomatoes. The plant design included: market research, plant sizing, project engineering, plant layout and location, and environmental impact assessment. The work provides information on the design of a plant, as well as the engineering of the project in terms of investment costs and expenses. It also provides important terminology regarding the concept of sustainable production, which is one of the essences of hydroponic cultivation.	International	(Mendez, 2013)	Science and Technology Magazine, Trujillo University of Peru.
Plant design proposal for the Dulcemia Gourmet company, to increase installed capacity. (Work submitted for the degree of Industrial Engineer)	The objective of the project was to make a plant design proposal to increase the production capacity of the company Dulcemia Gourmet, taking as a basis the most representative product lines of the company, since through them an improvement of the internal processes would be achieved and at the same time to appreciate improvements in the fulfillment times of the orders, increasing the customer - company relationship, which is important for the fulfillment of the goals set. By means of the simulations in PROMODEL, it is evident the decrease in the percentage of use of machines that at the beginning were part of the bottlenecks during the process and thus avoid overuse of machines. With the information obtained from this degree project, it is evident how an infrastructure proposal can be presented according to a future demand and therefore give a plant design to operate in the face of such demand. In addition, some factors related to the plant distribution are evidenced.	National	(Rivera, 2017)	Vitela institutional repository (Universidad Javeriana, Valle del Cauca)
Investment proposal, design and plant layout for a company producing Tectan sheets and tiles from recycled Tetra Brik. (Work submitted to pass the course Design and Plant Layout)	The work was structured based on the search of a lot in 3 different sectors of the department, in which some real and not real aspects were evaluated, from this the lot was identified, which favored the design of the production plant of tiles and sheets. The distribution was carried out according to current regulations and guidance from the teacher in charge of the subject. This work contributed to the development of the project, the methodological structure and the systematic development of each of the activities involved in the distribution and design of a new plant.	Regional	(Ortiz, Granados, & Quintero, 2019)	Francisco de Paula Santander University

2.3 Economic performance of the sector

Cúcuta is the central hub of the most important economic activities in the region, being the center of collection and distribution of most of the goods with the different national markets. The metropolitan area of the city is home to a large percentage of the native population, who see commerce, mostly governed by informality, as a profitable source of economic and family support. This is why there is little industrial presence in the sector.

To enter more in context, it is important to note that the leading companies are the construction and mining companies, which in recent years have been the great standard bearers of economic development in the region, due to the existence of minerals and land with attractive characteristics either in clays, coal, or highly commercial properties and uncommon in other regions. In part this favors the economy of the department, since there is a source of legal employment and exchange of goods, however, this year (2020), it has been evidenced according to data provided by the (DANE, 2019), the mining sector in the region presented a decrease of 54% of its production, due to the almost 42 days of armed strike and other factors, bringing massive layoffs and increased informality in the city and its metropolitan area.

Currently, there are food sector companies that are leaders in the region, but they are not enough to reduce the unemployment and informality rate in the department; there is no large manufacturing plant in Cúcuta and its metropolitan area focused on the production of tomato sauces. The industrial backwardness in the region is mostly due to the lack of interest in promoting industrial strengthening policies that facilitate and contribute to the creation of new manufacturing companies that generate employment for the population. According to the Annual Manufacturing Survey (EAM), published on December 6, 2019 by the (DANE, 2019), released figures on industrial production in the sector, the creation of food products showed 5.1% in which 10.9% of the labor force is employed; these are low figures that should be taken into account to take action on these.

Tomatoes also stand out as the second most transitory product in the region for human consumption, with a percentage of 17.9%. In addition to this, the manufacturing industry of Norte de Santander, including the food sector, has a GDP of 5.6% as of March 27, 2020. It is important to add that the economic growth for the department in manufacturing industries has registered a growth of 3.4%. As mentioned above, the economy generated by the food industry in Norte de Santander would be an important alternative to accelerate the economic growth of the sector and therefore provide benefits in terms of employment and development to the inhabitants of the region, since there is no good tomato sauce manufacturing plant in the department.

2.4 Domestic market opportunities

The businessmen of Norte de Santander struggle daily to survive in a highly fluctuating market with very little margin for error, this is also accompanied by the desire to turn Norte de Santander into a leading department in the Colombian industry.Cúcuta as the capital and economic hub of the region, has not yet been able to overcome the multiple problems, already mentioned above (inflation, unemployment, migration, etc.). Since the percentage of industries dedicated to the elaboration of tomato sauces is very low, if not null, there is a great opportunity to undertake a project that is favorable since the essential resources for development exist, only the capital is lacking, which is the most important thing to start and the most difficult to obtain, the government and some entities are favoring these initiatives, some of these programs are the fund undertake of the Sena, from the ministry of ICT, it is established that there is opportunity to invest in the region, since through the decrees 752 and 753 of 2014, from the ministry of industry and tourism, free zones are established with investments amounting up to 1.6 million. In addition, due to the growing informality of the city, there is a large amount of fast food sales, which generates a high demand in dressings or sauces necessary for the preparation of their products, which is a great opportunity to establish a potential consumer market. However, the sale of tomato as a fruit for cooking or other purposes may be a viable alternative for the company if sales of sauces are not the desired ones at the beginning.

2.5 Competition in the sector

Although in the department there are few, if not almost none, ketchup and dressing production plants, which is understandable because the commercial interests of the region revolve around other types of activities, since these require less investment and compliance with regulations, This is why regionally there is no company that presents competition in this area, however the high demand for this type of products in the fast food sector and others has staged a competition between marketers on a larger and smaller scale, where brands such as Heinz, Fruco, Mavesa, etc. stand out. Which are consolidated brands both nationally and internationally, food production is very strong in regions such as Santander, Cundinamarca, Valle del Cauca.

With the above, it can be concluded that market policies should be oriented to achieve regional recognition as a leading company in the manufacture of tomato sauce, thus achieving the attention of new and larger local or national customers, since initially the search for job stability may be the main objective of the company, since the future is uncertain, as there are multiple variables that may affect or contribute to this development.

3.Method

The methodology used in the development of the research was practical-descriptive. "Descriptive research comprises the description, recording, analysis and interpretation of the actual nature and composition of the phenomena; descriptive research works on factual realities, and its fundamental characteristic is to present us with a correct interpretation". (tamayo, 2004).

In this same sequence of ideas, a series of practical activities are proposed, which seek to obtain first-hand information, that is to say, information obtained by direct observation and information from people knowledgeable about the subject (businessmen and researchers). For this reason, much of the information for the analysis and direction of the project was obtained through field work; however, bibliographic information will also be extracted, which will facilitate the retention of certain theoretical concepts.

4. Results

In any manufacturing or production process, the identification of suppliers of both inputs and raw materials favors the optimization of resources and production times, which is why for this new production sauce it is necessary to identify all these external agents that in one way or another have an impact on the production process. "Suppliers are the center of activities and processes of most companies" said Peter Smith at the time, for the OFS portal, it is important to note that the company wanting to be self-sufficient, ie itself produce or grow the raw material (tomatoes), will not have the problem on this side, however to implement the hydroponic cultivation will require a certain amount of inputs (minerals) needed for the preparation of the aqueous solution, which is the backbone of the hydroponic process.

However, it is necessary to include in these aspects those suppliers of greenhouse construction materials, since they are the backbone of the production of raw materials, plastics and other tools related to the design and distribution of the plant, since it is part of the company's action plan to know all these aspects. Without leaving aside those companies that provide essential services for the operation of the company. It should be clarified that the needs of the new plant are very broad, therefore the evaluation of suppliers will be carried out in a general way, the suppliers that can meet the production needs are the following.

Through the investment proposal of the new factory to be located in the Department of Norte de Santander and which is proposed with the objective of contributing to the creation of business and the participation of entrepreneurs to encourage the growth of the economy of the region, three alternatives

for the location will be analyzed through the geographical areas of the region, which are Cúcuta, Los Patios and Villa del Rosario, these being the capital and municipalities of the metropolitan area. The macro location was accompanied by the determination of the most important location factors, which can directly or indirectly influence the choice of the appropriate sector to develop the economic activity. In this case, a weight of interest was used, which was valued as a percentage of one to one hundred, multiplied by a consideration factor of one to ten. When the factors of interest were added together, they resulted in the most appropriate municipality or zone for the plant's needs, all according to the subjective assessment of the analysts, who, in this case, are the authors of the research.

Analysis of hybrid seed suppliers for the harvesting of raw material for the tomato sauce plant.

Table 2. Seed supplier analysis

Criteria	Weight	Supplier 1		Supplier 2	
		Active Agro		Syngenta	
		Calif	Pond	Calif	Pond
Location	**20**	**40**	**8**	**30**	**6**
Product quality	**20**	**20**	**8**	**30**	**6**
Volumes	**10**	**40**	**2**	**15**	**1,5**
Prices	**20**	**40**	**8**	**20**	**4**
Customers	**10**	**20**	**2**	**15**	**1,5**
Delivery times	**10**	**20**	**2**	**15**	**1,5**
Terms of payment	**10**	**20**	**2**	**15**	**1,5**
Total	**100%**		**32**		**22**

Source: Own elaboration

After knowing each of the suppliers that supply certain elements to the tomato sauce plant, it was found that for some of these supplies several purchase alternatives are established by different companies. In order to obtain a specific decision to purchase from suppliers, an analysis of criteria was made through a qualification, which in turn weights a result giving a winning alternative. In this case, the most definitive criteria for determining a good option were the location of the supplier, the quality of its products and the prices it offers, without leaving behind other criteria that complement the evaluation.

In the case of nutritious seeds for the cultivation of the raw material in the production of tomato sauce, it was decided between the company Soluciones Nutritivas located in Valle del Cauca and HidroInver in the department of Huila, where through these criteria to evaluate a better rating was obtained for the Valle del Cauca company since it was more flexible in terms of prices and presented a better quality of its products, this rating was estimated at 37 points against 22 of the other. On the other hand, for the hybrid seeds of the product, the company evaluated between the company Agro Activo of Medellin and Syngenta of Bogota, where after identifying and evaluating each criterion very well, it was obtained that the best supplier thanks to the quality and accessibility in prices is Agro Activo, which scored 32 against 22 of Syngenta.

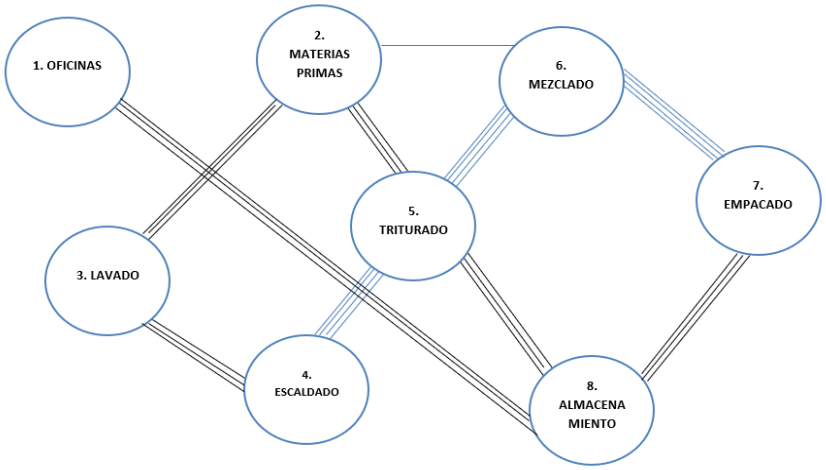
An element that is also used in the plant are cardboard boxes for the deposit of finished products, for the decision of the best supplier, the plant made an evaluation between Compañía Colombiana de Corrugados and Cartón Packing Studios S.A., where the determining factor was the price and the proximity of the supplier, obtaining a score of 32 points for the company from Barranquilla Cartón Packing Studios, while the company Corrugados in Bogotá had 27 points. Baskets for storing raw material and products in process are a necessary material in production. Homecenter was the best supplier for acquiring this item because of its convenient proximity and the excellent quality of the

products it offers; for this reason it obtained a score of 36.75 points; Mac.Plast, on the other hand, scored 26.75 points. Finally, one of the plant's work implements that yielded several alternative suppliers was forklifts for transportation, in this case MaderPlast in Bogotá and Homecenter in the city of Cúcuta were evaluated, choosing the company that is in the same region of the plant, quality and prices, which obtained 33.75 points against 26.25 of the other supplier brand.

4.1 Location of company areas with respect to minimizing travel costs and absenteeism

Once the suppliers and the investment required for each necessary material were determined, it was necessary to order the locations within the plant in order to reduce operating costs, for this purpose an SPL relationship model was used, in which each area of the company was analyzed and the relationship with the others with respect to the total cost, this format was used as an economic support, which would reduce production costs and therefore increase the company's profits.

Figure 1. Minimization of operating costs through reduction of movements



Source: Own elaboration

5. Conclusions

The previous research proposed the analysis of the investment required for the creation of a tomato sauce production plant in the region, for this a series of location studies are conducted, which are focused on determining the most favorable place for the plant, after this a series of analysis of factors that in one way or another may affect or infer in the performance of the plant in the future are performed. It is important to emphasize that the raw material in this proposal will be obtained by a hydroponic cultivation method, which is oriented to the optimization of resources and the increase of production. Hydroponics is a means of cultivation that does not require soil and therefore the use of chemical pesticides, which are responsible for water pollution and consumer health. Initially, the company will have 40 greenhouses, which is the exact amount to ensure production. It should be added that based on the fluctuations that occur daily worldwide, the design of the plant is oriented to withstand organizational and productive changes that allow it to survive and progress in the regional market.

In order to reduce costs, both productive and logistic factors were analyzed, starting with a description of the production process, machinery, inputs and raw materials required to produce tomato sauce. This is why the following is a description of the production process (Garizao, 2018), the most relevant phases of the process are the following. Selection and procurement of raw material. Tomatoes come mainly from farms, organically grown and farmers endorsed by the corresponding organism. It is very important that the tomatoes selected for bottling (cutting) have the right shape, color and size, but even more

important are the characteristics related to their intrinsic quality such as acidity, sugar content and dry matter. For this reason, the types of tomatoes most commonly used to make sauce are pear tomatoes and salad tomatoes, because they have less water inside and are better used.

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