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Viability and Artisanal Production of Bread Fruit Snacks from Ancestral Knowledge

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Abstract---This research aims at the financial analysis and knowledge of the artisanal production of bread fruit snack (*Artocarpus altilis*) from ancestral knowledge. As a methodology, a market research was applied about the highest consumption of snacks in Manabí and interviews with people in the agricultural area that produce this fruit. As a result, it has that most of this fruit is wasted because there is no orderly production and much less consumption, through financial analysis techniques it was possible to specify the feasibility of the fruit snack within zone 4 Manabí and Santo Domingo. Because of that it is concluded that the bread fruit contains a variety of nutritional properties in such a way that it has become a food of the future thus ending the famine in the mute, therefore, the transformation of the bread fruit into snack can contribute to the economic revival and improvement in health as well as to the care of the environment.

Keywords---ancestral knowledge, *Artocarpus altilis*, economic revival, methodology, production.

Introduction

The bread tree also known by its scientific name (*Artocarpus altilis*) comes from the genus of the species *Artocarpus* of the tribes *Artocarpeae* which has a link with the tree family *Maraceae* from Southeast Asia to the region of Polynesia, this tree is found in tropical areas. Areas and especially in the Antilles (Tirado & Piedad, 2015). Its origin comes from the island Of Moluccas and in the Philippines, since its existence was considered as a wild species among plants in that century, this tree of the first colonizers 3,000 years ago began to be used and domesticated (Enrique, 2010). The bread tree since its introduction in Jamaica in 1793, has managed to name it as the food of the future, this has caused several countries to focus on the cultivation and transformation of the bread fruit to end famine in the world (Duarte, 2017). According to Duarte (2017), there are two types of bread fruit around the world, which contains seeds homogeneously and convexly with a weight of 8.5g where 75% is edible. On the other hand we have the fruit of bread without seeds that, having no seeds, its average weight is 1.5Kg. This tree reaches a length of 8 to 20 meters in height and a diameter of 60 centimeters depending on its species and environment, its fruit measures about 10 to 20 centimeters wide, which is mainly used for human and animal consumption (Valdiviá & Álvarez, 2003).

According to Veleva et al (1998), the bread tree is normally seen in tropical and subtropical forests at a temperature of 26 to 27 ° C and is kept in deep and sandy soils spreading by seed, harvesting is done manually by

means of fruits that emerge from their branches in the ripening stage This study detected that the production of this fruit begins at 5 years, which can reach up to 11t / ha / year of fruit for an area of 100 trees. The fruit of bread contains sources of nutrients that make it typical and exclusive, many people in ancient times used its fruit for food and medicine due to its organoleptic properties, in which the scientist, according to [Monreal \(2019\)](#), is made (*Artocarpus altilis*) composed of 25% carbohydrates and 70% water, is rich in vitamins A , B, C, in addition to being a powerful antioxidant, strengthens bones, teeth, skin, hair and improves muscle tone and prevents cardiovascular diseases since it contains photochemicals that protect the heart from atherosclerosis, therefore, the usefulness of this fruit is justified for the nutritional contribution and its production for consumption, while this fruit helps health by preventing diseases ([Ladio & Lozada, 2009](#); [Wang et al., 2007](#)).

In environmental aspects, the fruit of bread as an ancestral production has some advantages, according to the article by [Ruilova \(2017\)](#), the stage of production of the fruit of bread offers benefits for both ranchers and farmers for the energy properties it entails, but also contributes to the improvement of the land as the fertility of the soil through its leaves when falling, its trunk forms like a barrier or curtains that break the winds that help capture CO₂. In this way, the fruit of bread is very efficient through resources and environmental performance. Ecuador has entered into international agreements through the commercialization of raw materials for its high degree of biodiversity and vegetative extension, which makes it one of the fruit-growing countries in the world, but unfortunately there are varieties of fruits such as the bread tree they have has not been exploited so it has no production, much less scientific data that contribute to the transformation of this fruit ([Benítez, 2011](#); [Duarte, 1998](#)).

According to [Hu et al \(2014\)](#), in Ecuador in ancient times, the seeds of the bread fruit were marketed in a cooked way where many Ecuadorians consumed this product, however, due to the industrialization such commercialization and ancestral cultivation, bread fruit snacks were left aside for banana snacks or others inputs as raw material. Currently, Manabí is considered an important part of the agro-industrial sector, so according to [Zambrano \(2015\)](#), indicates the obtaining of flour from the fruit of bread in place of wheat, soybeans, oats, quinoa, barley, among others. To venture into the cooking of cookies and cakes, an important part of this experimentation obtained positive results such as consistency and combinations that can be made with other types of flours, at the same time that it motivates the transformation of said fruit. As for that, the researcher [Castro \(2016\)](#), in his article indicates how economical the production and cultivation of this fruit is, which is similar to corn and wheat base to the rate of return, with the difference that the fruit of bread is the one that fattens more, minerals and vitamins than wheat, which contains more protein.

According to [Zambrano \(2015\)](#), The fruit of bread in Ecuador is not potentially used as human consumption, having a consumption of 25% throughout the Ecuadorian region, its use is more used for nuances and forages of cattle and other animals, fruit of The bread is commonly seen in rural sectors of the province of Manabí, specifically in the canton Chone and in other sectors where there are crops of this tree, but the problem is reflected throughout Ecuador due to large-scale waste due to the low consumption of this ([Nwokocha & Williams, 2011](#); [Lu et al., 2007](#)). Nutritious fruit. Due to the scarcity of wheat and corn for climatic reasons, it is one of the main raw materials distributed in the world. The bread fruit shows a different scenario, which due to its structure makes it a highly reliable food source in terms of climate, economic and with greater nutritional properties, thus promoting the transformation of bread fruit in the future and ending malnutrition in the country and in the world. , since according to [El Universo \(2020\)](#), there are children from 0 to 5 years old throughout Latin America with chronic malnutrition, however, Ecuador ranks second after Guatemala and the Caribbean with 23%. According to [Roberto \(2020\)](#), it is considered that the bread fruit is the food that aims to take care of the environment, contains nutritional properties that would be the solution to the problem of food in the world, and with great potential in crops efficiently and economically. This study aimed to determine the viability and production of ancestral snacks of the bread fruit (*Artocarpus altilis*) from ancestral knowledge ([Muentes et al., 2017](#); [Haque, 2015](#)).

Materials

Localization

The study was located in the parish Andrés de Vera of the canton Portoviejo, province of Manabí, geographically located at the coordinates -1.078, -80.408, as can be seen in Figure 1.

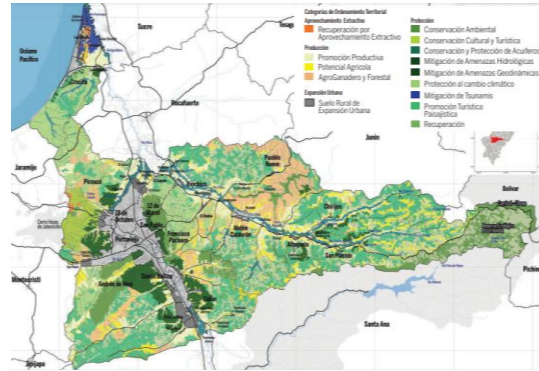


Figure 1. Location parish Andrés de Vera, within the canton Portoviejo
Source: GAD Municipal of Portoviejo

Method

Due to the little existence of scientific data that corroborates this fruit as a product marketed throughout the Ecuadorian region, despite that, we proceed to carry out a market study aimed at the population of the city of Portoviejo, where factors such as data collection techniques made it possible to identify the quality, price and brands of the different snacks distributed in stores and supermarkets, therefore, the projection of demand was made by the method of the least square where it shows values that are estimated in the future, by means of the following formulas. The general least square equation (1) which helps minimize errors in the collected data (Mai et al., 2012; Turi et al., 2015).

$$Ym = a + bx \quad (1)$$

For this it is necessary to identify the values of the constant and the variable b

$$a = \frac{\sum y}{n} \quad (2)$$

$$b = \frac{\sum xy}{\sum x^2} \quad (3)$$

The research was based on the data collection study where the person involved in the knowledge of the preparation of the bread fruit in an ancestral way was interviewed, in order to make the flow diagram through the symbols of the (ILO) International Labor Organization. With the information obtained from the market research, operations were carried out in Excel to determine their feasibility such as net present value (NPV), internal rate of return (IRR) and profit-cost (B/C) presented with the following formula.

$$VAN = Beneficios - costos \quad (4)$$

$$BC = B/C \quad (5)$$

$$TIR = TM + \frac{(TM - Tm) * VAN Tm}{(VANM - VANm)} \quad (6)$$

Results

The market study was carried out which follows an in-depth investigation of the different snack products within the supermarkets of the city of Portoviejo, it is necessary to know the prices, place and necessary quantity that generates the competition between them represented in the table (1).

Table 1
Product offer in Portoviejo

Brand	Commercial/ Shop	Content(g)	Price (\$)
NATURE'S HEART (Snack Antioxidante)	Mi comisariato, tía, Fybeca, Aki	35	0,89
Schullo mix (Semillas y Nueces)	Mi comisariato	125	2,61
Yupi (Snack de papa y plátano)	Mi comisariato, Fybeca	100	1,05

Source: Jurado et al., (2021)

It was considered to obtain information on the growth of the population rate in the province of Manabí by medium of the National Institute of Statistics and census INEC based on the calculation and formulation of the project of the engineer which explains an increase in the projection of the Velasquez & Diana (2016), demand in that year. As displayed in figure 2

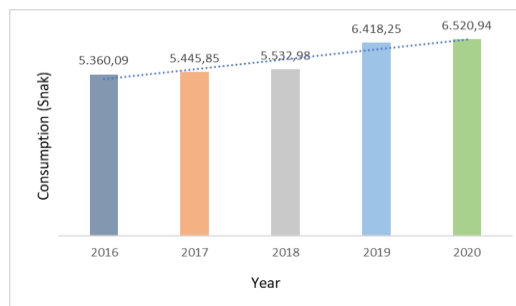


Figure 2. Snack demand in Portoviejo
Source: INEC

According to the data obtained in this research, the calculations of the following table were carried out, in this way the calculation of square minimums was implemented where the projection of this year obtained an amount of 9,181.96 and it is expected that for next year under the great health problem it will increase to 10,290.74 to continuation in the following figure 3.

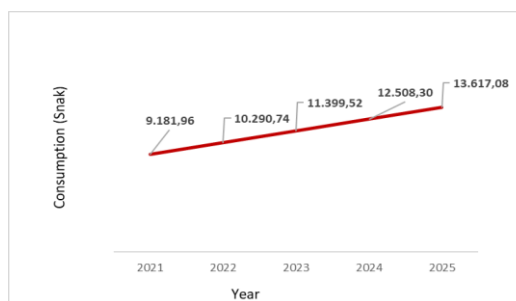


Figure 3. Snack demand projection
Source: Jurado et al., (2021)

Description of the production process of the fruit snacks

The interview was addressed to Mrs. Carmen Alcívar Meza, a native of the Santa Ana canton of the province of Manabí, at the same time she has been working for 30 years in the production of bread fruit, who begins the elaboration of the bread fruit snack with the selection of the fruit in such a way that it meets the specific conditions for the transformation, this must be ripe where its seeds are in development, the next step is the pulped or peeling of the bread fruit which consists of placing the fruit in water and extracting the seeds (Nakagawa et al., 2009; Salameh & Jaber, 2000). Having the estimated amount, proceed to place them in the wood oven at a temperature of 50 ° C for

5 minutes, its function will be to subject the seeds to fire to be able to remove the outer layer that covers it, shown in Figure 4.

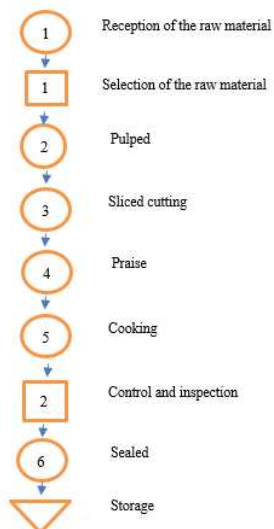


Figure 4. Flowchart of the bread fruit snack production process
Fuente: Jurado et al., (2021)

Financial analysis

For the elaboration of a snack business, certain total investments are incurred, which is understood as fixed investments and working capital, as can be seen in Table 2.

Table 2
Investments

Investments	Total value (\$)	%
Fixed investment	1.607,10	20,74
Working capital	6.142,21	79,26
Total	7.749,31	100,00

Source: Jurado et al., (2021)

Table 3 shows a breakdown of fixed investments, according to the total cost relating to machinery and equipment, other assets or contingencies.

Table 3
Fixed investment

Investments	Valor total	%
Machinery and equipment	819,00	50,96
Other assets	642,00	39,95
Incidentals (10%)	146,00	9,09
Total	1.607,10	100,00

Source: Jurado et al., (2021)

Working capital is that economic value for carrying out current activities in the business, so it includes production costs, administrative and general expenses, as well as sales and promotion expenses, according to table 3.

Table 3
Working capital

Denominación	Time (months)	Monthly value (\$)	Total value (\$)
Production costs	3	1.339,15	4.017,46
Administrative and General Expenses	3	1.036,58	2.109,75
Selling and Promotion Expenses	3	5,00	15,00
Total			6.142,21

Source: Jurado et al., (2021)

Working capital is shown in detail in table (4).

Table 4
Working capital

Description	Unit (g)	Quantity	Unit price (\$9)
Fruit snack	fundas 100	3.000	1,00
Total			

Source: Jurado et al., (2021)

Estimated Sales are shown in detail in the table (5)

Table 5
Estimated sales

Description	Value (\$)
Sales revenue	3.000,00
Total outflows	1.880,74
Net income	1.119,26

Source: Jurado et al., (2021)

Financial evaluation

The results of applying three financial evaluation methods such as the Net Present Value (NPV), the benefit-cost ratio (B / C) and the internal rate of return (IRR), can be seen in table 6.

Table 6
Financial evaluation by VAN, B/C y TIR

Description	Value
VAN	\$2.997,84
B/C	1,29
TIR	59,58,%

Source: Jurado et al., (2021)

According to the data obtained in the financial analysis, it presents the following valuations obtained which consists of a net present value (NPV) of 2,997.84 so it presents a benefit - cost (B /C) of 1.29 in terms of the internal rate of return (IRR) was 59.58%. According to Gabriela (2012), obtained the following result in the financial analysis which presents two different scenarios first mint the optimistic analysis, of a net present value (NPV) of 11,448,572 and a cost benefit (B /C) of a 4.75, as for the internal rate of return (IRR) was determined a 69%, elsewhere the probable scenario showed a net present value (NPV) of 4,116,047 with a cost benefit (B /C) of 2.46 and an internal rate of return (IRR) of 36%.

Comparing production with Peru it is known that this has three productive sectors as economic activity has the primary, secondary and tertiary sector, Lima is considered as one of the largest source of production and manufacturing with a GDP of 30.13% so it is a widely industrialized sector this according to the Inter-American Development Bank, instead Portoviejo does not constitute as a widely industrialized sector this due to lack of resources such as machinery, equipment and lacks training (Jeny, 2019).

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