



BIBLIOMETRIC STUDY: THE AÇAIZEIRO (*Euterpe oleracea*) IN THE MUNICIPALITY OF MAZAGÃO, AMAPÁ STATE

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ABSTRACT

The açazeiro (*Euterpe oleracea*) is a palm tree found abundantly in the floodplain region of the municipality of Mazagão - AP. It stands out for the peculiarity of its fruits, being one of the most consumed foods by the population of Amapá and a large part of the Amazon. The present study aims at the bibliographic survey of the researches carried out with the açai fruit in the city of Mazagão - AP, as well as presenting its properties and benefits, in addition to describing the processing of the fruit, from its planting to availability to the market consumer. Over the years, açai has ceased to be a food for the consumption of riverside dwellers, becoming a fruit much appreciated by the market, reaching large national and international centers due to its health benefits due to the richness of its components and its great nutritional value. The açai fruit contains essential lipids and minerals such as calcium and potassium, in addition to being rich in anthocyanins.

Keyword: Açazeiro, Açai, Mazagão, Amazonia.

1. Introduction

The municipality of Mazagão, located in the south of the State of Amapá, is part of the Amazon Estuary and comprises a territorial area of 13,294.778 km² and an estimated population of 21,206 inhabitants (IBGE - INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA, 2018). With a predominance in lowland area, it has an important tool that guarantees soil fertility, which is the dynamics of the tides, which transport a significant amount of sedimentary material daily, resulting in a high content of nutrients (HIRAOKA, 1992). This tool offered by nature, brings important benefits for açai plantations in the floodplain region.

With growing demand in the market, the açai fruit is one of the most appreciated regional products in the Amazon estuary. After research carried out and the identification of the

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nutritional properties of the fruit, the interest in its consumption increased considerably, enabling the generation of income for several local producers and riverside dwellers. The appreciation of the product on the market due to the “fame” that it acquired over the last few years for being considered of high energy and nutritional value, only brought positive results. In Amapá it has not lost its traditional essence, but each day it is gaining more space in the consumer market in Brazil and the world. Thus, there was a need for changes in the form of exploration and management of açai trees, which was no different in the region of the municipality of Mazagão.

Its nutritional properties make it an important food for those looking for a healthy lifestyle, in addition to being highly appreciated by the cosmetic market.

Various works have been carried out by institutions such as SEBRAE (Brazilian Service of Support to Micro and Small Enterprises), SENAR (National Service of Rural Learning), EMBRAPA (Brazilian Company of Agricultural Research) with the communities of the municipality of Mazagão, in order to promote courses, lectures and meetings, aiming at guiding small açai producers regarding the correct management of açai. This measure guided the producing community in order to enhance the production of açai fruits.

Thus, we conducted a research aimed at the bibliographic review of the works carried out with the açai fruit in the region in the municipality of Mazagão, State of Amapá, using Google Scholar searches and other relevant sites, in order to understand the characteristics of the fruit, in addition to to identify its importance for the economic growth of the municipality of Mazagão.

2. Theoretical Foundation

2.1. Brief description of the municipality of Mazagão

Located in the south of the State of Amapá, the municipality of Mazagão is part of the Amazon Estuary and comprises a territorial area of 13,294.778 km² and an estimated population of 21,206 (Twenty-one thousand, two hundred and six) inhabitants according to data from IBGE (Brazilian Institute of Geography and Statistics). Mazagão borders the municipalities of Santana, Porto Grande, Pedra Branca do Amapari, Laranjal do Jari and Vitória do Jari.

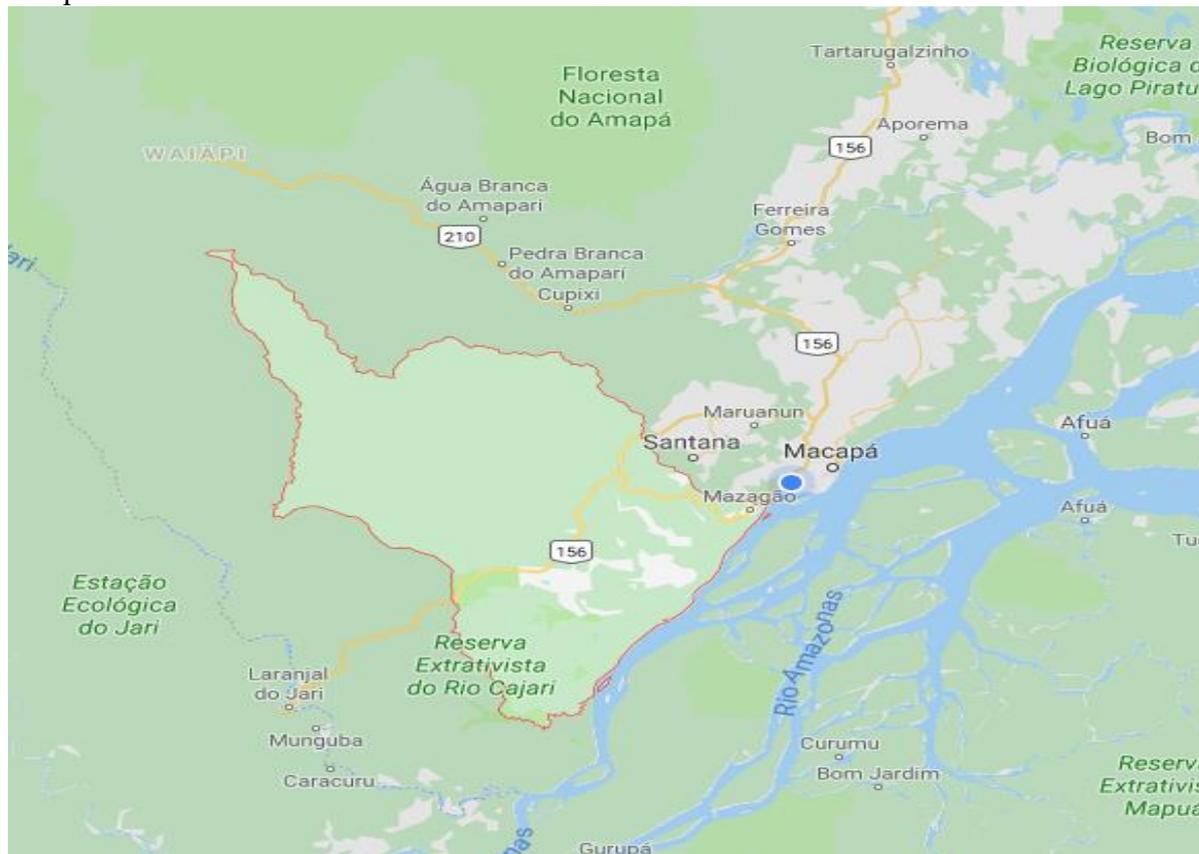
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Also according to IBGE, the municipality of Mazagão belongs to the Intermediate and Immediate Geographic regions of Macapá, comprising the metropolitan region. Due to its geographical position, the Amazon estuary is considered a typically tropical region, due to its low latitude and warm climate, and the municipality of Mazagão is in this context.

Economically, in the extraction, the culture of Brazil nuts, the extraction of wood, the extraction of latex and the extraction of açai and manufacture of heart of palm are important. Below is a map of Mazagão:

Figure 1 - Mazagão Municipality Map

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SOURCE: Google

2.2. Mapping of studies carried out in the municipality of Mazagão with Açazeiro (*Euterpe Oleracea*)

In a research carried out on 05/02/2019, in Google Scholar, covering a period of 5 (five) years, established between 2015 and 2019, we were able to identify about 74 (seventy-four) publications related to *Euterpe Oleracea*, which are also related to the municipality of Mazagão.

The research deals with the analysis of açai, the fruits of açai, chemical and nutritional composition of the fruit, benefits for food and health, studies on the planting and management of açai, etc. To better understand what is being researched, the following is a table with the main researches carried out, separated by year, research title and authors:

Table 1: Main research carried out with açai (*Euterpe Oleracea*)

YEAR	TITLE
2015	Agroforestry Arrangements in the context of Agroecology: The Case of Farmers in the Region of the Middle Maracá in the Municipality of Mazagão, Amapá - Hilaires Lima Maciel ¹ ; Daniel Santos De Assis; Gilberto Ken-Iti Yokomizo.

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2015	Lowland forest bats in the Amazon River estuary, State of Amapá, Northern Brazil - Isaias Jorge de Castro; Fernanda Michalski.
2015	Modeling the height, volume and taper of the stem of Calycophyllum Spruceanum Benth. Employing regression and artificial neural networks - Breno Henrique Pedroso de Araujo
2015	Comparative morphology of two Abiuranas (Pouteria Spp. - Sapotaceae), trees native to the forest of the Estuary, Amapá, Brazil - Caroline Da Cruz Vasconcelos
2015	Dynamics and spatial distribution of Pentaclethra Macroloba (Willd.) Kuntze (Fabaceae) in lowland forest in the Amazon Estuary - Adelson Rocha Dantas
2016	Agronomic evaluation of the fruit production of a population of açazeiro on dry land, Mazagão - Larissa Kelly da Gama Favacho; Silas Mochiutti and Francisco de Oliveira Cruz Júnior.
2016	Way of life and the management of açazeiros in the floodplains of the Mazagão River, municipality of Mazagão-AP, Brazil - João Ramos de Matos Filho
2016	Sensory acceptance of açai drink after fruit heat treatment - Valeria Saldanha Bezerra; Otniel Freitas Silva; Leandro Fernandes Damasceno; Alexandra Mara Goulart Nunes Mamede; Lourdes Maria Correa Cabra.
2016	Estimates of genetic parameters for fruit characters in açai trees in Amapá - Gilberto Ken-Iti Yokomizo; Silas Mochiutti; José Antônio Leite de Queiro; , George Reis dos Santos; Renan Gomes Furtado; Ancelma Pereira Brandão; Irecê Bezerra Necklaces.
2016	Morphological characterization and fruit production of açazeiro populations established in Mazagão - Amapá - Francisco de Oliveira Cruz Júnior
2016	Structure, composition and diversity in floodplain tidal and igapó forests and their relationship with edaphic variables and the flood period in Amapá, Eastern Amazon, Brazil - Marcelo de Jesus Veiga Carim.
2017	Ethnobotanical knowledge of agroextractive communities on the use of forest species from the Amapaense floodplains - Ana Margarida Castro Euler; Eneida Silva do Nascimento; Juliana Eveline dos Santos Farias; Marcelino Carneiro Guedes; Ana Cláudia Lira Guedes.
2017	Floristic composition and phytosociology of riparian forest in a section of the Pirativa river, Santana, Amapá, Brazil - José Policarpo Miranda Junior; Ryan da Silva Ramos; Salustiano Vilar da Costa Neto; Sheylla Susan Moreira da Silva.
2017	Phytosociological analysis of forest fragments of the extractive reserve of the Cajari River, Northern Amazon João da Luz Freitas, Raullyan Borja Lima e Silva, Adriano Castelo dos Santos, Francisco de Oliveira Cruz Júnior, Erick Silva dos Santos, Maurício Alves Sardinha.
2017	The effect of thermal, chlorine and ozone treatments on survival of escherichia coli and Salmonella Spp. in Açai Berries - Valeria Saldanha Bezerra ¹ , Eduardo HM Walter, Otniel Freitas Silva, Izabela Alves Gomes, Leandro Fernandes Damasceno, Ivan Alcântara, Lourdes Maria Correa Cabral.
2017	Local productive arrangements and development - Carlos Wagner de A. Oliveira; José Augusto V. Costa; Gabriela Maretto Figueiredo; Alessandra Ribeiro de Moraes; Ricardo Batista Carneiro; Iedo Brito da Silva.
2018	Structure and valuation of Euterpe Oleracea in a lowland forest in the Amazon - Brenda Larissa Goudinho dos Santos; João Ricardo Vasconcellos Gama; Renato Bezerra da Silva Ribeiro; Rose Kelly Fernandes dos Anjos; Karla Mayara Almada Gomes; Lucas Cunha Ximenes; Lia de Oliveira Melo.
2018	Arboreal floristic composition in an extractive reserve in Amapá - João da Luz Freita; Raullyan Borja Lima e Silva; Francisco de Oliveira Cruz Junior; Patrick de Castro Canterbury; Tonny David Santiago Medeiros; Erick Silva dos Santos.
2019	The use of medicinal plants in the riverside community of the Mazagão river in the Brazilian Amazon, Amapá, Brazil: Ethnobotanical and Ethnopharmacological studies - Rosângela do Socorro Ferreira Rodrigues Sarquis; Icaro Rodrigues Sarquis; Caio Pinheiro Fernandes, Gabriel Araújo da Silva; Raullyan Borja Lima e Silva; Mario Augusto Gonçalves Jardim; Brenda Lorena Sánches Ortiz; José Carlos Tavares Carvalho.
Source: Google Scholar	

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2.3. Açai fruit and its chemical and nutritional characteristics

The açai fruit is considered a food with high nutritional value, as it is rich in minerals and proteins, in addition to containing a high caloric value, with a high percentage of lipids. In addition, it is rich in anthocyanins, which are the natural pigments that give the fruit its typical color and act as natural antioxidants by eliminating free radicals (EMBRAPA, 2005).

Used as a main meal by riverine people in the Amazon, açai can be beaten in a machine suitable for this purpose, popularly known as mixers or pulpers. However, the custom of the riverside, due to not having access to technologies, is to extract the pulp with the use of hands, kneading the fruits, generating a thick liquid called açai wine, which is consumed with the flour 'tapioca water or flour, which is also consumed as an accompaniment or complement to other meals. It is very common to observe in the Amazon the custom of taking açai and eating fish or shrimp at the same time, in addition, we can also observe the custom of taking açai in the late afternoon, many local families maintain this custom. In addition to pulp extraction, açai oil can also be extracted,

Much appreciated as an energy drink in other regions of the country, where it is mixed with other fruits, such as bananas and strawberries, in addition to oats, granola and others, açai is also found in the form of ice cream in several places in the country. For some people, mixing açai with other foods enhances the absorption of its nutrients. There are several health benefits due to the richness of its components, but it should be consumed in a moderate way as it is considered a very caloric fruit.

In order to understand its properties, we present in the table below its chemical composition and its nutritional value:

Table 2 - Chemical composition and nutritional value of açai

COMPOSITION	UNITY	QUANTITY IN DRY MATTER
Ph	-	5.80
Dry matter	%	15.00
Proteins	g / 100 g ¹	13.00
Total lipids	g / 100 g ¹	48.00
Total sugars	g / 100 g ¹	1.50
Reducing sugars	g / 100 g ¹	1.50
Fructose	g / 100 g ¹	0.00
Glucose	g / 100 g ¹	1.50

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Sucrose	g / 100 g ¹	0.00
Crude fibers	g / 100 g ¹	34.00
Energy	kcal / 100g	66.30
Ashes	g / 100 g ¹	3.50
Sodium	g / 100 g ²	56.40
Potassium	g / 100 g ²	932.00
Calcium	g / 100 g ²	286.00
Magnesium	g / 100 g ²	174.00
Iron	g / 100 g ²	1.50
Copper	g / 100 g ²	1.70
Zinc	g / 100 g ²	7.00
Phosphor	g / 100 g ²	124.00
Vitamin B1	g / 100 g ²	0.25
Vitamin E	g / 100 g ²	45.00
Dry matter; ² calculation by difference		

Source: Rogez (2000)

2.4. The forms of management and production of açai in the municipality of Mazagão

Abundant in a lowland area, the açazeiro is considered one of the native species of greatest economic importance for the region of the Amazon estuary, which is why, in the municipality of Mazagão, it is largely responsible for the local socioeconomic movement. For many years the consumption of açai was considered a cultural habit in states in the northern region, being consumed mainly by the riverside population of much of the Amazon. Even today, it is one of the main foods of several families and is included in daily meals.

The practical guide for managing açai groves for fruit production, a work carried out by EMBRAPA researchers in 2012, describes in simple language how to carry out the management of açai groves: “Managing the forest environment, to transform it into a grove, that is to say combine açai with other plant species in the forest using techniques, work and ecological awareness. With certain management operations, the açazal produces more fruits, hearts of palm, wood and other products with better quality. A well-managed açazal should have, in one hectare, more or less 400 (four hundred) clumps, with five adult açai trees in each clump, 50 (fifty) palms of other species and 200 (two hundred) trees. This quantity of plants can guarantee high production of fruits and hearts of palm, with a minimum change in biodiversity. The proper combination of trees, açai and other palm trees well distributed in the area, in addition to maintaining forest diversity, is the key to the success of the management of the açazal. ”

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According to Matos Filho, JR (2016), the main actions taken by producers in the municipality of Mazagão, in order to increase productivity in their açazais and obtain palm hearts as a by-product, are carried out through management as follows: enrichment with açazeiros by means of planting and sowing, clearing the area, thinning the stipes and thinning the forest. Handling is carried out manually, without using machines, following cultural and family tradition.

For the maintenance of the açazal, according to the guidelines of the practical guide for the management of açazais for fruit production (EMBRAPA 2012), the clearing of unknown plants and periodic cleaning of the clumps must be carried out, always keeping 5 (five) productive açái trees in each an. It is important to leave the regrowth in the clumps, in sufficient numbers, to replace the adult açái trees that reach a height that makes harvesting difficult.

According to the guide, the expected results with minimal impact management are:

- The considered increase in the production of açái fruits while maintaining forest diversity;
- The periods of longer harvests, with a reduction in the off-season periods. The harvest period is increased from 2 (two) to up to 7 (seven) months throughout the year;
- Ease and greater security when harvesting fruits;
- Improvement in the producer's living conditions, the greater productivity of the açazal provides an increase in income;
- It provides an increase in the generation of jobs and income in the urban area of the State;
- The increase in exports of açái derivatives.

On 06/17/2019, the Government of the State of Amapá published Decree No. 3,325 / 13, which establishes the procedures for the licensing, monitoring and inspection of areas subject to forestry in the State of Amapá. In its Chapter IV, Section IX, the forest management plan for native açazais is evidenced. This plan mentions in its Article 74, that “the exploitation of native açazais(*Euterpe oleracea*)will be allowed through the adoption of driving and handling techniques duly authorized by the competent state agency. ” Thus, procedures are implemented for the management of açái groves, allowing conscious exploration and the use of

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appropriate techniques, which is notorious to realize that it favors not only biodiversity, but also local production.

Research carried out by Matos Filho, JR (2016) in the municipality of Mazagão identified four types of management as described below:

1. **Intensive Management:** in this type of management, all vegetation in the area is eliminated, keeping only açai trees in place. This procedure aims to increase light penetration and reduce competition with other species;
2. **Intermediate Management:** three stipes are left on average per clump, and species with no economic value are eliminated. It is the least aggressive type of management, since other species are conserved;
3. **Moderate Management:** it is characterized by the withdrawal of some species that are not desirable by riverside dwellers, in order to facilitate walking through the forest;
4. **Without Management:** only the harvest is carried out, and the family supplements the income by doing other activities.

The interactions of the riverside with nature occur intensely in the municipality of Mazagão. At harvest time, the extraction of açai fruits is intensified, and in the off-season, management is carried out in the areas that predominate the native açazais, with cleaning and complementary activities to provide for the families (MATOS FILHO, JR, 2016).

For a better understanding, below we describe the production of açai in the municipality of Mazagão between the years 2007 to 2017:

Table 3 - Production of açai in the municipality of Mazagão

MAZAGON	
YEAR	AMOUNT PRODUCED (tonnes)
2007	320
2008	384
2009	406
2010	413
2011	463
2012	415
2013	426
2014	457
2015	488
2016	503
2017	510

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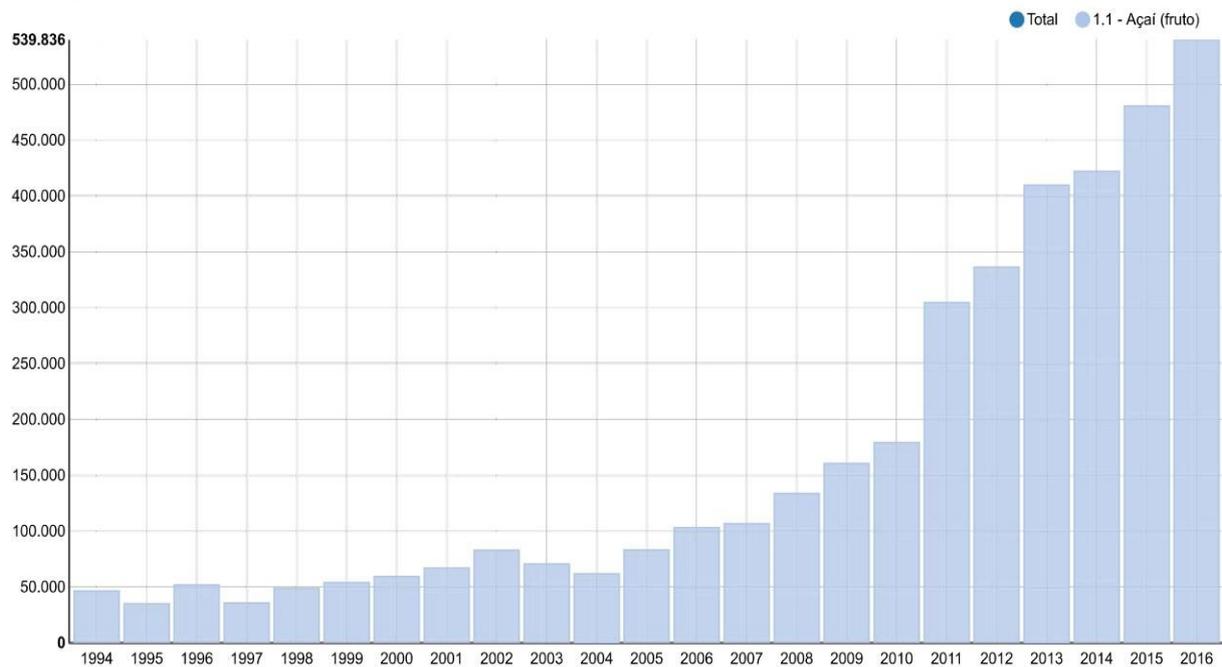
Source: IBGE (2017)

Açaí production has been increasing over the years. The increase is due to the improvements implemented that make it possible to make better use of fruit production. According to data from IBGE (Brazilian Institute of Geography and Statistics), the production of açaí in 2010 was almost 200,000 (two hundred thousand) tons, in 2016 it reached 539,836 (five hundred and thirty-nine thousand, eight hundred and thirty-six) tons having a significant growth in production.

We noticed that the increase is due to the growing acceptance of the açaí fruit by the national and international consumer market. Below, we present a graph of the IBGE that depicts production in Brazil, in tons, in the period from 1994 to 2016, where we can see the gradual growth of production:

Graph 1: Quantity of açaí produced in Brazil:

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Source: IBGE

Analyzing the graph above, we realized in 1994 that there was a production of almost 50,000 (fifty thousand) tons. In 2011, there was a considerable growth in production, reaching 300,000 (three hundred thousand) tons. In 2016, production reached more than 500,000 (five hundred thousand) tons.

The trend is that production will continue to increase, due to the acceptance of the fruit in the market that has been growing on a large scale. When analyzing the research that has already been carried out in the Mazagão region, we realize that the increase in production is also due to the forms of management that have been implemented in the regions that produce açai.

2.5. The consumer market and the acceptance of açai fruit

The consumption of açai has been gaining space in the market, mainly the foreign market, which is expanding due to the properties recognized in the fruit and also due to the “fame” that it has gained in recent years. Even knowing the market growth and acceptance of the fruit, it is important to note that local consumption is quite intense, in addition to

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consumption in riverside communities, since açai is part of the dietary routine of the population of Amapá.

Starting to accept the fruit outside the Amazon region, we realized that it is widely used as a natural energy drink. It is interesting to note that in the Amazon there is a popular saying that says that it has a reputation for making people sleepy and lazy, a different thought in other regions of the country that use it as an energy drink.

There are several places in the country that offer the frozen product mixed with other foods ranging from fruits, to products rich in fiber and oilseeds. In the international market, it is already quite appreciated and can be found in countries like the United States, France and Japan.

3. Methodology implemented

The research was carried out using information retrieval in Google Scholar with bibliographic review of studies and publications carried out with the fruit of açai in the municipality of Mazagão, State of Amapá. Some sites were also used to enrich the research and served as a support for a better understanding of the studied product, in addition to offering important information for carrying out the research work.

4. Conclusion

This study makes us realize that a lot of research has been done on the fruit of açai. The works and research carried out in the municipality of Mazagão are diverse in order to study the fruit.

We identified that some institutions such as SEBRAE (Brazilian Service of Support to Micro and Small Enterprises), SENAR (National Service of Rural Learning), EMBRAPA (Brazilian Company of Agricultural Research) carry out constant work of transferring information, training and research with the community with the objective of guiding producers and other people involved in the production of açai, worrying about the correct management in order to bring benefits to those involved. The orientation work carried out provides communities and producers with a concern for the studied product, from planting to making it available to the market.

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We realized with the research, that it is necessary to establish strategies of production and supply of the product to the market, in order to make the most of the use of the açai fruit and its natural properties. We know that it can be sold in several ways: natural fruit pulp (called açai wine) that is used for local and immediate consumption, frozen pulp, popsicles, ice cream, cooking, cosmetics, products used by natural medicine and many other variations.

There is a vast market to be reached and if everyone involved is involved in this process, there will be great economic growth for the municipality of Mazagão and for the State of Amapá.

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