



# Traditional Knowledge of açai (*Euterpe precatoria* Mart. - Arecaceae) usage in the Sustainable Development Reserve - RDS Piagaçu Purus – Amazonas - Brazil

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**Abstract**— The historical reciprocity among traditional populations and the usage of biodiversity in natural environments have outlined the Amazon as one of the richest and most complex socio-ecological systems on the planet. Conservation Units (CU's) are effective strategies to protect biodiversity, although the simple creation does not guarantee its efficiency. Conservation depends on the integration between ecological and social aspects of the forest peoples and the management of institutions involved with the use and protection of biodiversity and environment. In this context, Non-Timber Forest Products (NFTPs) are important elements in the culture and subsistence of traditional populations and can represent significant sources of income. Specifically, the açai palm (*Euterpe precatoria*) is one of the species that stands out in the Amazon, with high cultural and economic values. Given the importance of the species, this research was carried out using traditional knowledge associated with this palm tree, along with residents of three communities of the RDS Piagaçu Purus, to identify and evaluate the uses of parts of the plant of greatest interest to local communities. Within a two-months period, in 2006, information on the diversity of uses and knowledge of the species were collected. It was applied the method of qualitative-quantitative exploratory research, surveying primary and secondary information. The results showed the great potential of açai usage, especially the fruit, which is consumed in the form of wine and the root, in popular medicine, indicating that the species is a key resource for families subsistence besides its high economic and social potential.

**Keyword**— Biodiversity, Ethnobotany, Palm Trees, Conservation Units, Riverside Communities.

## I. INTRODUCTION

Planted and native forests offer diversified, high-quality timber and non-timber forest products to the market, with the possibility of developing other products that, when valued, can improve the quality traditional populations life (LAY, 2008).

Traditional populations are local populations, whose knowledge comes from wisdom about the elements of nature and its dynamics, which are used as a means of survival. The indigenous peoples, quilombolas, riverside dwellers, artisanal fishermen and many other local rural communities, have territoriality in the context of

contemporary urban society (SILVA PIMENTEL and RIBEIRO, 2016).

The historical reciprocity between traditional populations and the use of timber and non-timber products in the natural environment outlined the Amazon, as one of the richest and most complex socio-ecological systems on the planet. Therefore, the conservation of this biome depends on the integration between the ecological and the social aspects of the inhabitants, management of sustainability-concerned institutions, protection of biodiversity and the ancestral knowledge, regarding the use of Non-Timber Forest Products - NTFP's.

NTFP's are a cultural element of great importance for traditional populations and can be considered a significant source of income for them. According to Takeda (2015), the exploitation of forest resources has always played a relevant role in society and the economy, being more intense in tropical countries, which encourage the generations of jobs and income, promoting the development of rural infrastructure and the provision of social services, among others.

In addition to the ecological and economic importance of NTFPs, the literature has increasingly demonstrated the nutritional richness of plants present in the eating habits of traditional populations. Some authors, having theorized and analyzed eating habits of globalized society, show the unawareness and mischaracterization of traditional and regional cuisine with the increase in consumption of industrialized food, which has impacted the nutritional status of urban populations (CERDA, 2014). Other authors also highlight that there are few works that emphasize the plant diversity consumed by Amazonian populations. However, it is remarkable the contribution in a diet that plants, especially wild and cultivated, represent in terms of micronutrients and macronutrients (DUFOUR et al., 2016). In fact, the Amazonian species used in cooking have greater visibility, as is the case of açai, which has nutritional properties that put the specie in the market spotlight.

The national and international recognition of açai, as a source of antioxidants makes it the target of investments and research, which grow every year and also makes it a reference within natural resources for new products and technologies, bringing forth the importance of antioxidant compounds that are present in a large part of the Brazilian flora (SOZO et al., 2016).

The açai tree is native to the Amazon region of Brazil, being one of several species of plants that make up the traditional set of forest products grown in the Amazon estuary floodplain. At the height of the canopy, purple fruits grow in bunches and hand-harvested by collector-farmers.

Açai is one of the most important forest products in Brazil (MATOS et al, 2017; NOBRE, 2017). Data from 2017 indicate that 93.1% of Brazilian açai production comes from the species *Euterpe oleraceae* ("açai-do-Pará"), naturally restricted to the eastern Amazon (IBGE, 2018). But the supply of açai by the species *E. precatoria* has been growing exponentially year by year (IBGE, 2018). Intriguingly enough, until 2018 the species was not considered a source of açai pulp by Brazilian legislation, which recognized açai pulp only as the one extracted from *E. oleraceae* (BRAZIL, 2018). Brazil produces about 220,000 tons of açai of extractive origin. From those, about 50,000 tons came from *E. precatoria*, and the activity generates an income of just over US\$ 150 millions/year (IBGE 2018).

In Brazil, three species of açai palms are well known: *E. oleracea* - native of Pará and Amapá states, which are responsible for most of its commercial production; *E. precatoria* - native of Amazonas; and, *E. edulis* - native of the Atlantic Forest, which was much exploited in an unsustainable way for palm heart extraction. The açai chain involves extractivists, producers, intermediaries, processing industries and artisanal açai beaters (people who process açai in and artisanal way), being of crucial importance to generate income to an expressive group of families of small producers (TAVARES and HOMMA, 2015).

The Conservation Units (UCs) are important açai extraction areas. In 2000, the Federal Government created the National System of Conservation Units (NSCU), which together with The Program for Protected Areas of the Amazon (Programa Áreas Protegidas da Amazonia - ARPA), were responsible for the strengthening and protection of about 60 million hectares in 117 UCs in the Amazon (BRASIL, 2000; MMA, 2019).

This study was developed in order to collect and analyze information on the social and ecological aspects of the use and commercialization of natural resources by riverine communities in the central Amazon, specifically the açai (*Euterpe precatoria*). The objective was to generate basic scientific knowledge in the extractive development by the social organization of residents in the State Reserve of Sustainable Development Piagaçu-Purus (RDS-PP), municipality of Beruri in the state of Amazonas.

## II. MATERIAL AND METHOD AREA OF STUDY

This study took place in the months of November 2006 and February 2007, in two riverside communities located in areas of *terra-firme* forests of Lake Ayapua (Pinheiros and Uixi) and one of Lake Uauaçu in the lower course of the Purus River, in the Piagaçu-Purus State Reserve of Sustainable Development (RDS-PP), Municipality of

Beruri, State of Amazonas, Brazil. (Figure 1). In these communities, açai extractivism is one of the main income source practices of the communities.

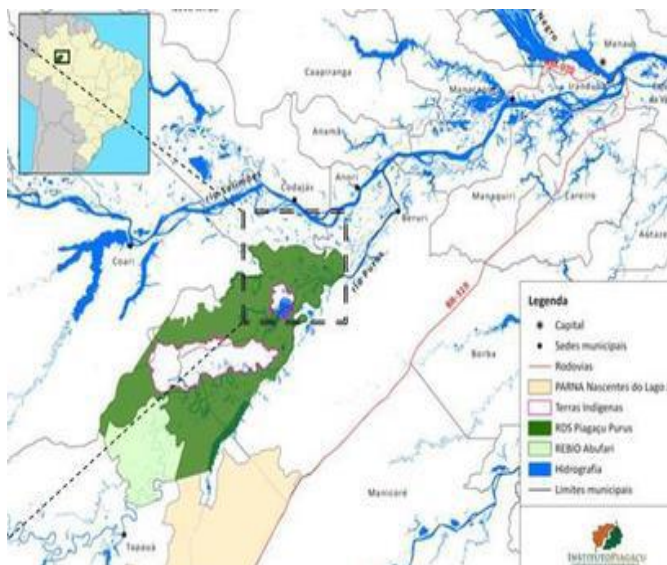


Fig.1: Location of the Piagaçu-Purus Sustainable Development Reserve in the state of Amazonas, Brazil- Highlighted in green.

Source: Inst. Piagaçu (2009).

### 2.1 Data collection

The communities in Lake Ayapuí are called Divino Espírito Santo (Pines) and Nossa Sra. do Livramento (Uixí), and there is also São João do Uauçu, in Lake Uauçu.

For the collection and analysis of information on the social and ecological aspects of the use and commercialization of natural resources in those communities, it was developed forms and conducted interviews to cover the aspects (1) general information; (2) use of plant species; and (3) commercialization of products.

### 2.2 Sampling areas establishment

The phytosociological data of occurrence and distribution pattern of “açazais”, in the community areas, were obtained through a floristic inventory in 60 sample plots, with 20 x 20 meters each, totaling 24,000 m<sup>2</sup> delimited and inventoried.

Twenty sample plots were installed, randomly distributed, in 8 hunting spots in each community. They were distant from each other in approximately half an hour, traveling by boat and far from the headquarters.

In the center of each plot was set sub-plots of 5 x 5m, for the survey of natural regeneration, as used by Marangon *et al.*, (2008), in a semideciduous seasonal forest fragment, and also by Machado (2018), in which was studied the forest dynamics of areas in natural regeneration with different degrees of disturbance. The center of each plot was identified with a 1.20-meter-high wooden stake.

A main trail, with an extension of 100 meters, was opened in the central part of each secondary forests (capoeira) in each community. The secondary forests are the result of a natural process of vegetation regeneration. The plots were installed on the sides of the main trail, on the distance of 20 meter, to minimize the effect of the trail's edge on the vegetation structure in the studied plot.

The total height of each tree was measured with a 5 meters long pole, with identification of each meter.

## III. RESULTS AND DISCUSSION

Literature lists the species of seeded plants that grow in the Amazon forest at an elevation lower than or equal to 1,000m, excluding savannas and dry forests. The data informs the occurrence of 10,674 species in the Brazilian Amazon and 14,003 species in Pan-Amazon (CARDOSO *et al.*, 2017).

Among the results, about 300 species native to the Amazon or introduced, have already been catalogued by the National Institute of Amazonian Research (INPA), as well as their nutritional, medicinal, herbal and cosmetic purposes. These surveys represent less than 3% of known species contained in the Brazilian Amazon (REVILLA, 2001).

In the three communities, 66 species occurred in secondary forests. The açai, occurring in a frequency of 50% in the 15 and 30-year-old secondary forests (Table 1). This frequency is only lower than that of the Brazil nut (*Bertholletia excelsa* Humn. & Bonpl.) with 62.9% of citations. Among all 66 species, 28 (42%) are used in food.

Mostly mentioned in literature, it was found palm trees such as bacaba (*Oenocarpus bacaba*) (32.3%), tucumã (*Astrocaryum aculeatum*) (30.6%) and babaçu (*Attalea speciosa*) (30.6%). Meanwhile, the number of medicinal use species was 26 (39%), including the Brazil nut, açai, tucumã, babaçu, and so forth. Açai has different uses, ranging from medicinal, reported in 46% of the interviews, to handicrafts in only 2%.

Table 1. Different aged species on secondary forests (capoeiras) and their extractivist usages by communities

N	Common Name	Scientific name	Citation frequency (%)	Age of capoeiras		Usages
				15 years	30 years	
1	Castanha	<i>Bertholletia excelsa</i>	62,9	X	X	Food, medicine, coal, canoe caulking and dyeing
2	Açaí	<i>Euterpe precatoria</i>	50	X	X	Food and medicine
3	Bacaba	<i>Oenocarpus bacaba</i>	32,3	X	X	Food
4	Tucumã	<i>Astrocaryum aculeatum</i>	30,6	X	X	Food and medicine
5	Babaçu	<i>Attalea speciosa</i>	30,6	X	X	Food, medicine and construction
6	Palha branca	<i>Attalea attaleoides</i>	24,2	X	X	Construction and handcraft
7	Uixi	<i>Endopleura uchi</i>	19,4			Food and medicine
8	Taperebá	<i>Spondias mombin</i>	17,7		X	Food and medicine
9	Maracujá do mato	<i>Passiflora sp.</i>	14,5			Food
10	Dema	<i>Croton sp.</i>	12,9	X	X	Construction
11	Envira	<i>Cochlospermum sp.</i>	12,9	X	X	Construction, handicraft, reed and birds cage.
12	Urucuri	<i>Attalea excelsa</i>	9,7			Food
13	Unha de gato	<i>Uncaria guianensis</i>	8,1			Medicine
14	Piquiá	<i>Caryocar villosum</i>	6,5			Food
15	Lacre	<i>Vismia sp.</i>	6,5	X	X	Construction and medicine
16	Cacau jacaré	<i>Herrania sp.</i>	6,5			Food
17	Quebra pedra	<i>Phyllanthus spp.</i>	4,8			Medicine
18	Capeba	<i>Pothomorphe peltate</i>	4,8			Medicine
19	Caiaué	<i>Elaeis oleifera</i>	4,8			Animal feed and vegetable garden
20	Carapanauba	<i>Aspidosperma sp.</i>	4,8		X	Medicine
21	Ingazinho	<i>Inga marginate</i>	4,8			Food
22	Pitomba	<i>Talisia esculenta</i>	4,8	X		Food
23	Caferana	<i>Picrolemma sprucei</i>	4,8	X		Medicine
24	Ingá de macaco	<i>Pithecelobium cochleatum</i>	4,8		X	Food
25	Timbó	<i>Derris sp.</i>	3,2			Medicine and fishing
26	Cacau	<i>Theobroma guianensis</i>	3,2	X	X	Food
27	Sucuuba	<i>Himatanthus sp.</i>	3,2	X	X	Medicine
28	Bacuri	<i>Rheedia sp.</i>	3,2			Food
29	Apuruí	<i>Alibertia edulis</i>	3,2			Food

30	Embaúba	<i>Cecropia spp.</i>	3,2			Medicine
31	Batatão	<i>Operculina alata</i>	3,2			Medicine
32	Goiaba de anta	<i>Eschweilera truncate</i>	3,2	X	X	Food and canoe caulking
33	Marupá	<i>Simarouba amara</i>	1,6	X	X	Construction
34	Algodorana		1,6			Construction
35	Pé de Jabuti	<i>Astronium le-cointei</i>	1,6	X	X	Food
36	Araçá	<i>Eugenia sp.</i>	1,6			Food
37	Surucuzinho		1,6			Construction
38	Surucucumirá	<i>Spathelia excelsa</i>	1,6			Construction
39	Jatobá	<i>Hymenaea sp.</i>	1,6			Medicine construction, fishing equipment and panniers bindings (tree bark and trunk).
40	Mari	<i>Poraqueiba sericea</i>	1,6			Food
41	Chichuá	<i>Maytenus guyanensis</i>	1,6			Medicine
42	Capurana	<i>Não identificada</i>	1,6			Medicine
43	Muirapuama	<i>Ptychopetalum olacoides</i>	1,6			Medicine
44	Sorva	<i>Couma macrocarpa</i>	1,6			Food, canoe repairing
45	Saracura	<i>Ampelozizyphus amazonicus</i>	1,6			Medicine
46	Caramurí	<i>Ecclinusa guianensis</i>	1,6			Food
47	Ingá	<i>Inga edulis</i>	1,6			Food
48	Abiu	<i>Pouteria caimito</i>	1,6			Food
49	Japacanga	<i>Smilax spp.</i>	1,6			Medicine
50	Tintarana	<i>Elvasia calophyllea</i>	1,6			Construction
51	Cupuí	<i>Theobroma subincanum</i>	1,6		X	Food
52	Patauá	<i>Oenocarpus bataua</i>	1,6			Food
53	Cipó Titica	<i>Heteropsis flexuosa</i>	1,6			Broom production, panniers, panniers binding
54	Mata-mata	<i>Eschweilera coriacea</i>	1,6	X	X	Construction
55	Cupiuba	<i>Goupia glabra</i>	1,6	X	X	Construction
56	Vassourinha	<i>Scoparia dulcis</i>	1,6			Medicine
57	Cebola brava		1,6			Medicine
58	No name		1,6			Canine drug
59	Abiurana	<i>Pouteria sp.</i>	1,6			Construction
60	João Mole	<i>Neea sp.</i>	1,6			Construction
61	Urtiga	<i>Urticaceae</i>	1,6			Slimming effect
62	Canapú	<i>Physalis angulate</i>	1,6			Food and medicine



63	Muirapiranga	<i>Brosimum paraense</i>	1,6			Construction
64	Arumã	<i>Ischnosiphon sp.</i>	1,6			Panniers crafting
65	Mururé	<i>Brosimum sp.</i>	1,6			Medicine
66	Embaúba branca	<i>Cecropia sp.</i>	1,6			Medicine

X – occurrence in secondary vegetation area (capoeira).

Among the species mentioned by residents and communities, many are the medicinal plants and used in or out of combinations with other species to cure diseases, especially the açai roots (*E. precatoria*). Besides that, all residents interviewed consumed açai wine as a part of their diet.

Considering the nutritional value, açai became the most collected Non-Timber Forest Product in Brazil, yielding the largest NTFP revenue in the Brazilian Amazon (IBGE, 2017), having several possibilities for the use and exploitation of the açai tree (NOGUEIRA, 1989; SHANLEY et al.1998).

Açai is an important and traditional fruit present in the diet of riverine populations and commonly consumed along with cassava flour and sources of protein, such as fish and shrimp. The State Department of Agriculture of Pará (SAGRI) listed the by-products that can be obtained from the pulp and seeds, informing that, the pulp represents 15% of the total weight of the fruit and can be used in the manufacture of ice cream, liquor, jam, nectar, jelly, among others (SAGRI, 2011).

Similarly, to other species and products, the management of açai is a complex activity, given that it consists of several stages, ranging from community organization to manufacturers training, as well as special post-harvest care of the fruits and market notions.

Thus, in order to a community to be successful in the management of açai, it is necessary to have a group of interested families, training the harvesters to climb the palm tree safely, providing good hygiene conditions for the fruits handling soon after harvest, good outlet conditions (by vehicle, boat, railroad branch and others) and the right destination or buyer for the production (WADT et al. 2004; ROCHA & VIANA, 2004).

However, to facilitate the work of the harvesters and without climbing the palm, the INPA in Manaus, Am, has developed tools for the collection of clusters of 20 species of palm trees in the Amazon. The tools have simple technology for easy handling and were made with materials easily found on the market. In order to allow collections of tall palm trees, mechanisms were developed for support, stability and balance of the stem. People or companies

interested in acquiring PALMHASTE, can contact COETI / INPA, by e-mail [ceti@inpa.gov.br](mailto:ceti@inpa.gov.br).

### 3.1 Açai population structure in a secondary forest (capoeira)

*E. precatoria* plants with DBH (Chest Height Diameter) equal to or less than 5 cm (seedlings), occurred in a greater proportion in relation to adults. The number of seedlings and young plants was 5 times greater than the number of adults. These results coincide with those of Rocha (2004) in forests known as lowland and upland “baixio / terra-firme”.

However, in a secondary forest with canopy above 30 m in the Amazon, in the municipality of Manaquiri, Castro (2000) found 232 fertile individuals on one hectare. Interviewees from the three communities reported 66 species as ones stemming from secondary forest. The açai had the frequency of 50% in secondary forest aged 15 and 30 years (Table 1).

Of the ten types of fruit most consumed in the communities, six was from palm trees. Among these, four was used to prepare a thick drink known as “vinho” (wine), which can be consumed immediately or a day after preparation. Cassava flour and sugar may be added. These data show the importance of açai both as a food and income source for rural Amazonian communities (SACRAMENTO et al., 2015).

Among the species mentioned by residents and community members, many are medicinal plants and are used in combination or not with other species to cure diseases, especially the açai root (*E. precatoria*). All residents interviewed consumed açai wine as part of their diet.

### 3.2 The evolution of açai production in the Northern Region of Brazil

The production of most NTFP is concentrated in the northern region, with an emphasis on the açai (93.1%). In 2015, some extractivist products presented positive variation productions when compared to that obtained in 2014. Açai in this case was the most expressive in absolute values due to the growing demand for the product, increasing 9% when compared to the previous year (IBGE, 2016).

NTFP's in 2015 generated just over R\$ 298 million in the state of Amazonas. The production of açai was approximately 39% of the total value produced, with approximately R\$ 116 million (IBGE, 2016)

In the state of Amazonas, the NTFP's segment receives support from the Institute of Sustainable Agricultural and forestry development of the state of Amazonas (IDAM), along with organizations, associations and cooperatives of extractivists. In 2018, 3,435 family farmers/rural producers were said to be assisted in good management practices: extraction, collection, storage, processing and marketing, in activities related to Brazil nuts, açai, rubber, piassava, as well as andiroba and copaiba oils, with the production of approximately 25,000 tons of extractive products (IDAM, 2018).

### 3.3 Marketing

The extractivism practiced in secondary forest, by the inhabitants of the communities, also serves for the commercialization of products such as straw, fruits and others.

Açai used by residents of these communities, 16% of respondents sell the fruit or pulp. The commercialization of the fruit is carried out sporadically and by few families, thus being considered of little importance. Açai is transported by regional boats to the municipalities of Codajás and Beruri.

In the communities of RDS Piagaçu-Purus, the sale of açai was concentrated in a smaller number of community members, according to the seasonal variation. However, market pressures could cause a super exploitation above the rate of the resources renewal, but this does not happen because the traditional populations of the Amazon culturally produce for their own subsistence.

Thus, the use and trade of these resources is fundamental for the families' subsistence and is also associated with the commercial relations network which presents barter as the main base.

The barter transaction in the 3 communities continues to have striking characteristics, such as nonmonetary commercialization in the exploitation relationship between salespeople and customers.

The commercialization relies on the merchant known as "regatão", which means river trader, who does not have fixed customers or that does not require exclusivity, even if some community members deliver their whole production to this marketing agent. Therefore, Sacramento et al. (2015) regard it important to highlight, in this context, the relevance of açai as a source of income for rural Amazonian communities.

## IV. CONCLUSION

The diagnosis with residents of traditional communities of RDS Piagaçu Purus, in the state of Amazonas, shows that the species of açai (*E. precatoria*) is especially important as food, medicine and a source of economic income for the families of the Conservation Units.

The use of açai fruit, mainly consumed in the form of wine, and the roots in popular medicine, indicates that the species is a fundamental natural resource in the subsistence of families and has high potential for local economic development.

A determining factor for the production of açai, in general, is the availability of young male labor, since the collection of the fruits depends directly on the climbing of the palm stem, to reach the brunches and with the use of equipment craft called "peconha", which depends on skill and physical effort, but with the risk of accident.

To improve the açai fruit collection process, it is necessary to invest in regular training in harvesting and to encourage the purchase of safety equipment.

Alternatively, mechanization of the harvest is indicated, in areas planted or not, with motorized artifacts or with collection equipment, which can prevent the climb of the palm stem, to harvest the fruits with less risk of accidents.

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