Introduction

The vegetal extractivism represents one of the main economy sources of Amazon State southwest region (Brasil, 2012), especially at Juruá river channel, where possibly the low technology extractivism continues to achieve success as a “production method”. The region where the Sustainable Development Reserve of Uacari is located presents high potential for açai species (*Euterpe precatoria* Mart.), a typical Brazilian food product distributed throughout the entire Amazonia.

According to (Tinoco, 2005), regional studies indicate that açai is one of the main income sources and food security. At Juruá, the market situation puts it in equal position with vegetable oils (andiroba, muru-muru and ucuuba) and latex, followed by fishery (pirarucu management) and familiar agriculture (flour production).

Given its chemical and nutritional importance (Brasil, 2006), the commercial interest on açai and its subproducts is rising in Brazil. Internationally, several segments have been using it: the food industry, beauty industry, automotive sector, acoustic industry, and thermic energy generation.

In Brazil açai frozen pulp commercialization has a growth rate of 30% (Homma et al., 2006), and the export exceeds in one thousand tonnes annually.

This study was conducted at Médio Juruá region, within the Sustainable Development Reserve of Uacari, more precisely in Bauana Nucleus, 60 kilometers distant from Carauari (in straight line, the distance doubles in waterway). At Médio Juruá region, companies, such as Coca-Cola, articulate within local productive arrangements to get native products from the Amazon.

In order to attend to this market demand, stakeholders involved with açai need to boost its productive chain to increase the regional production. There are, however,
important challenges related to processing that need to be improved (e.g., safety, hygienic conditions, transportation, and efficiency).

Within this context, Sustainable Amazonas Foundation (FAS), supported by the company Videolar, Bradesco bank, SUFRAMA (Superintendency of Manaus Free Zone), Amazonas Government, AMARU (Association of residents of the Sustainable Development Reserve Uacari), implemented a pilot project in improving açai production in riverine communities at the Sustainable Development Reserve of Uacari, Amazonas, Brazil.

**Objective**

The aim of this project was to test technologies to improve açai production with 50 riverine families at the Sustainable Development Reserve of Uacari, Amazonas, Brazil.

**Material and methods**

Açai production in the studied region has some issues. As aforementioned, safety, hygienic conditions, transportation, and efficiency are the most important.

In regards of safety, it was stated by the riverines that most accidents are caused by lack of equipments and training. Therefore, equipments and techniques were identified and tested:

a. Binoculars;

b. professional slingshots;

c. the açai berries extractor, as known as the “tiradeira” – Trajano, J. (2013, not published) and;

d. climbing equipments (safety belt, climbing chair, carabiner and straps).

The methods of evaluation were:

1. Validate the use of these equipments by the riverine families;

2. Calculate the time taken to climb a tree with mountain climbing equipments.

Regarding hygenic conditions, the project analysed water sources to produce açai pulp considering pH, total density, total acidity and presence of microorganisms.

Considering gathering efficiency, it was compared the usage of açai extractor and without it to measure açai exploitation efficiency in time.

For transporting, it was compared several approaches and materials:

1. Immediate displacement of the fruits in raffia bags
2. Immediate displacement of the fruits in agricultural boxes
3. Displacement of fruits collected two days before with raffia bags
4. Displacement of fruits collected two days before with agricultural boxes

In addition, it was also compared the usage of slingshots to assess fruits’ maturity with climbing without the usage of slingshots. This is deeply link to families’ effort to gather açai berry.

Sensorial analysis based on the pulps’ characteristics

Firstly, it was compared immature and ripe fruits and analyzed on color, taste, smell, and thickness. Different açai pulps were served to the 45 participants during training within this project. Such test was followed by a closed questionnaire to each participant assess each açai sample.
In addition, it was also compared açai samples from several sites, following color, taste, smell and thickness. Such test was followed by a closed questionnaire to each participant assess each açai sample.

Results and discussions

The açai is exploited on most of the communities from SDR of Uacari and the access is exclusively fluvial until Bauana community, where the açai polp beneficiation unit is located. The açai berries are extremely perishable and resist up to a maximum of 24 hours after the harvest, when stored in ambient temperature (Nogueira et al., 2005), reason why some transport and storage tests were conducted, avoiding compromising the products quality.

At Bauana community (SDR of Uacari) was built a rustic unit to benefit the açai and this unit is managed by the graduated students from the post medium course in Sustainable Production.

On the scope of this Project, all the produced pulp was sold to Açaí Tupã Company, located at Carauari County, which is the main raw material supplier to Coca Cola at the region. As a following stage, the structuring of a business model focused on community based entrepreneurship, in which FAS incubator will play the role of Innovation habitat, will be supported. The stages of this communitary company incubation will envolve the local technicians and the institutions who work at the region.

Trainings

The first activity of this work took place in 2013, it was a recognition of açai berry exploitation areas, near the communities in the Development Reserve of Uacari. Also, there was done the first training in good agricultural practices involving fifty riverine families who live along the Juruá river channel and work directly with açai production.

On the second training, the families learned about the açai market, industrialization, regularization of non timber products management, good management practices, pre exploitation activities such as communitary organization, selection and cleaning of exploitation areas, forest inventory and trail openings. In this same training, two different equipments were tested to be evaluated as an alternative to help deciding whether to climb the tree and collect açai berries or not, preventing any waste of time.

During the third training, the participants were able to review what they have learned about good agricultural practices and begin to create new business model plans, to exercise the criativity in proposing solutions for the bottlenecks of various productive chains.

The participants were also able to start the production of açai pulps, using new equipaments such as the depulpers, industrial oven, freezers and also potable water provided by the new artesian well and following the rigor handling, processing and freezing procedures.

Equipment and pulps yield tests

The equipments tested were binoculars, to observe the most external berries, slingshots to drop the berries and verify their maturity and an adapted bunch extractor, called “tiradeira” to analyze the efficiency in extracting açai berries bunches with no need to climb unsafe.

The use of binoculars was not very efficient due to the thick canopy areas in Amazon forest, which makeit difficult to visualize the higher açai berries.
On the other hand, the slingshots were approved unanimously. When some of the fruit's bunches fell down, it was possible to visualize if most of the fruits were immature or ripe. It was a very efficient equipment to verify the açaí berries maturity and decide whether it is worth or not to make an effort to climb the tree.

The açaí berries extractor, “tiradeira”, was functional equipment; however, it was not very efficient. Even though it works, it took more time to assemble the equipment than the regular method of climbing the trees. Also, there were some difficulties in cutting the açaí bunches, probably due to the blade position, resulting in a resistance by the producers in using this equipment. It was not clear whether it took longer to collect the bunches because people were not used to set the equipment faster or if it is really inappropriate for Amazon açaí species.

The climbing equipments were well accepted by the participants. They felt safer with the possibility to be held by the straps in case of slipping. The set of equipments did not influence on the climbing time and the only setback was the difficulty in finding these equipments for sale.
Figure 2. Açaí berry extractor being tested.

**Açaí pulps and different water sources analysis**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Sample</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bauana old well and sanitary water</strong></td>
<td>Açaí pulp</td>
<td>Sample within reference values.</td>
</tr>
<tr>
<td><strong>Bauana old well</strong></td>
<td>Açaí pulp</td>
<td>Sample presented Salmonella above reference values.</td>
</tr>
<tr>
<td><strong>Juruá River</strong></td>
<td>Açaí pulp</td>
<td>Sample within reference values.</td>
</tr>
<tr>
<td><strong>Rain water</strong></td>
<td>Açaí pulp</td>
<td>Sample presented Salmonella above reference values.</td>
</tr>
<tr>
<td><strong>Bauana Igarapé (stream)</strong></td>
<td>Açaí pulp</td>
<td>Açaí pulp</td>
</tr>
<tr>
<td><strong>Bauana old well</strong></td>
<td>Water</td>
<td>The sample presented ph below reference values and Total Iron above Ferro Total reference values. Regarding the heavy metals, the sample is within the reference values.</td>
</tr>
<tr>
<td><strong>Juruá River</strong></td>
<td>Water</td>
<td>Sample presented Coliform at 35°C and 45°C and Total Iron above reference values Regarding the heavy metals, the sample is within the reference values.</td>
</tr>
</tbody>
</table>

Table 1. Comparison among the different sources of water to produce açaí pulps.

According to the analyses, it can be concluded that some of the açaí pulps consumed by the local habitants could be contaminated by *Salmonella* sp. and or
Coliforms, which might be due to either lack of hygiene during açaí processing or inadequate waste disposal on the water.

There were also açaí berries tests to observe whether the time between fruits exploitation and production, ripeness and exploitation site influenced in pulps’ characteristics (color, smell, taste and thickness) and in the yield.

Table 2. Comparison among the sensorial characteristics of ripe fruits and green fruits.

<table>
<thead>
<tr>
<th>Pulp characteristics</th>
<th>Ripe fruits</th>
<th>Immature fruits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Brown/Violet</td>
<td>Greenish</td>
</tr>
<tr>
<td>Smell</td>
<td>Pleasant</td>
<td>Average</td>
</tr>
<tr>
<td>Taste</td>
<td>Good</td>
<td>Tangy</td>
</tr>
<tr>
<td>Thickness</td>
<td>Average/Thick</td>
<td>Thin</td>
</tr>
</tbody>
</table>

Based on the results of sensorial tests, it was clear that the characteristics of ripe fruits result in a more pleasant pulp to the human senses.

Table 3. Comparison among the sensorial characteristics of the fruits processed after 24 and 48 hours of exploitation.

<table>
<thead>
<tr>
<th>Pulp characteristics</th>
<th>0 hs</th>
<th>24 hs</th>
<th>48 hs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>No difference</td>
<td>No difference</td>
<td>No difference</td>
</tr>
<tr>
<td>Smell</td>
<td>No difference</td>
<td>No difference</td>
<td>No difference</td>
</tr>
<tr>
<td>Taste</td>
<td>No difference</td>
<td>No difference</td>
<td>No difference</td>
</tr>
<tr>
<td>Thickness</td>
<td>Thin</td>
<td>Thick</td>
<td>Thick</td>
</tr>
</tbody>
</table>

This test demonstrated that the only consistent difference among the samples was the thickness, higher on pulps from fruits processed after 24 and 48 hours of exploitation.

For time of fruit exploitation influencing in yield test, there were three different samples of açaí berries carried in agricultural boxes: the ones collected and processed immediately, the fruits collected 24 hours before the processing and fruits collected 48 hours before the processing. The fruits collected and processed immediately had higher yield, 43% against 26 and 34% from the ones collected 24 hours and 48 hours, respectively. Also, the use of agricultural boxes instead of raffia bag resulted in higher yield pulp.

The test verifying if the maturity level of the fruits influenced the yield resulted in 43% higher yield for ripe fruits and 26% for immature fruits.

The test for different exploitation areas consisted in analyze the pulps produced with açaí from a floodplain, igarapé (stream) and sandbar. There were no significant differences among these samples, though the pulp of fruits from floodplain area had a slightly higher yield.
Laboratory and new artesian well construction

During March 2015, the forest products processing laboratory and new artesian well, exclusive to the lab activities, were built by local workers, promoting not only generation of local income but also their involvement in all aspects of this initiative.

The Project was designed by Sustainable Amazonas Foundation, but the execution was completely guided by local leaderships and was ended by the end of the month, allowing the tests and new trainings to initiate almost immediately.

This laboratory represents an important advance in productive chains improvement, for it is a good environment to find solutions for some drawbacks, to test techniques, equipments, minor scale model to produce sample of new products. In short, an innovation and solution developer site for the riverine communities.

Açaí pulp production

After the laboratory construction, six graduated students from the Sustainable Production on Protected Areas Course were chosen by FAS and AMARU to do an internship during three months, where they had to manage the laboratory, receive açaí berries from other communities, produce the pulp and sell it to a local company called Açaí Tupã. The students received 1.879 kilos of açaí berries from the local producers. A total of 940 kilos (54,6% of yield) of pulp was produced with water from the new well and frozen during thirty hours on the freezers.

The frozen pulps were transported in a few styrofoam boxes on a boat, to sell in Carauari. A sample of these pulps was sent to a laboratory to examine the quality parameters and the result was adequate for consumption, allowing the students to sell the pulps to Açaí Tupã.

Even though the students were able to deliver the frozen açaí pulps, there was a very important logistic difficulty. The boat used was borrowed from other organization and the expense with fuel was higher than the income proveniente from the pulps sale, making this business model unsustainable.
Açaí is a high importance product for the development of an adequate business model Medium Juruá Territory, but faces logistic and technological problems that need continuous investigation to be contoured. The high fruits perishability, great distances of the region, added value to the product and marketplace warranty are important challenges to be surpassed.

The social innovation at SRD of Uacari is intrinsically related to the organization type and social entrepreneurship developed as an answer to the needs, problems, opportunities and risks faced by existing social stakeholders.

The productive projects are different and creative, preconizing social investments and always structured in a way to involve the theme of social learning and the relational capital. The success, therefore, lies on the identification of indelible and systemic change.

**Conclusion**

- It is necessary to promote continuous and focused trainings in agricultural practices which result in better quality products, such as frozen fruit pulp, and with added value that allows competitiveness in the local and regional market.
- The success of this kind of initiative requires involvement of local population in all the process and stimulus actions to social and productive organization around the açaí productive chain, focusing the producers empowerment and entrepreneurial leaderships.
- Simple collect, transport and storage methods and solutions of fruits have a positive impact on the productive chain as a whole.
- The actions in maintaining the quality pattern, the rigor in good agricultural practices, handling and processing procedures and in handling and freeze the pulps, ensure the adding value, differentiating the product in the market.
- Adequate investments in adapted transport and communication infrastructure would increase the success chances of improvement on the productive chain.

**Bibliography**


