Financial analysis of family babaçu collection in Brazil

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Introduction

This study analyzes the costs and revenues associated with the collection and sale of babaçu palm coconuts (*Attalea speciosa Mart* and/or *Orbignya phalerata Mart*), a product with many uses and of great social value (Shanley and Medina 2005), by a typical family in the Medio Mearim microregion, which is in the state of Maranhão and falls in a zone of transition between the Amazon, Cerrado and Caatinga biomes (Figure 1). Cost-benefit analysis was performed for the 2016/2017 babaçu harvest season (one annual cycle) for a family with the Green Value tool to: 1) analyze the financial viability of the family's collection and sale of babaçu products; and 2) determine the usefulness of the tool in generating financial information on this productive activity and identify ways in which the tool should be adapted for this purpose. The local organization, Associação em Áreas de Assentamento no Estado do Maranhão (ASSEMA), founded in 1989, was our partner in this study.

Babaçu production and its economic importance

Babaçu palms grow in secondary forests and several municipalities have passed laws that allow babaçu nut collectors to collect the coconuts under certain restrictions on public and the private lands of others. Babaçu products are a significant source of income for more than 450,000 rural families in Brazil (Teixeira 2008), especially women, who are called "babaçu breakers" (*quebradeiras de babaçu* in Portuguese) for their role in opening the coconuts to remove the seeds. In 2015, 77,955 tons of babaçu seeds were produced in Brazil, which represented 7% (R $ 107.7 million) of the total value of non-timber forest products sold in 2015 (IBGE 2016a). The state of Maranhão produced 94.5% of the volume of babaçu seeds in the country, and within the state, the Medio Meriam region accounted for 41% of the country's total production; other babaçu-producing states are Piauí, Tocantins and Pará (IBGE 2016b). Production areas overlap with those with a poverty rate above 50% (COPENAT and INEB 1981, IBGE 2017).

With the intention of increasing the profitability of the sale of socio-biodiversity products (products that are extracted from nature and of social importance), the federal government implemented a Minimum Price Guarantee Policy in 1966 (Decree-Law No. 79). This policy provides families who sell babaçu seeds a subsidy equivalent to the difference between the market price and a minimum price. The minimum price for the 2016/2017 harvest was set at R $ 2.49 / kg (CONAB 2016a) and the market price in the study area was R $ 1.70, resulting in a subsidy of R $ 0.79; the minimum price for 2017/2018 will be 2.87 kg. To have access to the subsidy, the families or the cooperative they sell to must register with the federal government, and families must submit official documents, such as identity cards and a formal invoice for the sale of seeds (CONAB 2016b).

The babaçu harvest occurs in the study area between July and December, with the peak volume of seeds available between September and November (Carraza et al., 2012; MAPA 2012). A small volume is collected between January and April. Coconuts are transported to the collectors' homes in baskets carried by donkeys. At the house, the coconuts are stored in a simple structure. The coconuts are usually opened by women with basic instruments, such as a machete and a stone. The seeds are transported by the family to the local market and sold to an intermediary or cooperative. The babaçu shell or husk is often used to produce charcoal for family use and/or for sale. The other members of the family help with transporting the coconuts, producing charcoal, and selling the products. Some families use artisanal methods to manually extract the oil from the seeds and then sell the oil, which often ends up used by the cosmetics and food industries.

Figure 1-Map of the Médio Mearim region.

There are several ways in which the efficiency of producing babaçu oil and charcoal could be improved with the use of machinery and new technologies, which could increase income as well. Much is known about the costs of extracting babaçu seeds and oil in the industrial supply chain, but there is a lack of information on the operational costs of a babaçu collector, the first link in the chain.

Methodology

The Green Value Tool

The Green Value tool offers a simplified six-step method for monitoring and analyzing costs and revenues for small forestry and agricultural initiatives (Figure 2). It consists of a User's Guide and a series of pre-formatted worksheets (in a spreadsheet software) used to record and analyze data. Each worksheet corresponds to one of six steps. A summary sheet (Step 5) presents all costs and revenue in a single worksheet and provides the results for various indicators, such as cost per activity, cost per input type, total cost, cost per unit sold, net income (profit), and rate of return. The idea is that producers and their partners can monitor and analyze costs and revenues throughout the year, use annual results to make management decisions, and see how the results change over the next few years. Green Value program materials are publicly available at www.green-value.org.

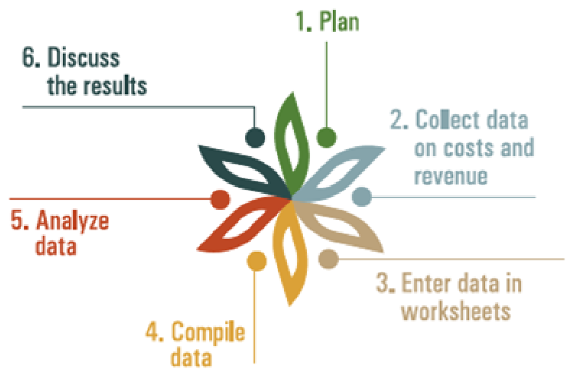

Figure 2. The six steps in the Green Value method.

The case study

This case study presents a financial analysis of a family enterprise that claimed to derive all its income from babaçu. Its socioeconomic profile is similar to many families in the region (Figure 3). The data were recorded during the three months of peak coconut production: August to October 2016. During this time, the family collected 10.62 tons of coconuts in their collection area of approximately 5 ha, or 2.12 tons per ha. The family sold the seeds to middlemen and generally does not have the necessary documents to access the minimum price subsidy program. The family also sold a portion of the babaçu shells to an intermediary who in turn sells them to a brewery, and made charcoal out of another portion of the bark to use to for cooking the family's food. Currently, the family does not sell charcoal despite confirming that there is high demand for it in the region and that it can be profitable.

Figure 3. A "quebradeira de babaçu" in the study region. (Photo: Max Roncoletta)

Given the potential impacts on family income of having access to the government subsidy for babaçu nuts and diversifying the products sold, we evaluated the economic viability of two scenarios: (1) the sale of seeds and shells to intermediaries (current situation); and (2) the sale seeds of seeds to a company to receive the legal minimum price and charcoal made from babaçu shells to an intermediary. We also included in scenario 2 the cost of technical assistance that ASSEMA could provide to improve the efficiency of charcoal production.

The productive activities analyzed were: pre-harvest (preparatory activities); collection of coconuts; opening the coconuts; and transport and sale of the seeds. As the family has no additional costs to administer the production and sale of babaçu products, in scenario B we included the costs of technical assistance as administrative costs.

Inputs for production

The entire family is usually involved in the babaçu production activities, and in this study this includes an adult couple and their three adolescent children. The family noted the hours worked per person in each activity. As the family did not have much experience in completing forms, the technical team worked with the family to record an inventory of all the materials and equipment used in babaçu seed and charcoal production. The team then entered the data in the corresponding Green Value worksheets.

Assumptions

Several assumptions were made about the production and the sale of babaçu products to facilitate this study. These included:

- A forest inventory implemented by ASSEMA in April 2017 in the region where the family collects nuts found an average coconut production of 2.14 tons per hectare per year - slightly more than the volume collected by the family in the three months monitored for this study. As babaçu coconut collection usually continues until April, we assume that the family collected at least 10.72 tons in their five ha area (2,14 kg/ha multiplied by 5 ha).
- We assumed that the family would be able to extract and sell 750 kg of seeds by the end of the harvest in April, or 7% of the 10.7 tons of coconuts collected (Teixeira 2008) (Table 1, Figure 4).
- After extracting the seeds, we estimated that the remaining byproduct, equivalent to 93% of the original weight, is comprised of 8% waste and 85% shells.
- We estimated that the family sold 70 kg of shells in scenario A and used some of the shells to produce 24 sacks of charcoal which were used by the family (the costs of charcoal production were not included because it was for family use).
- In scenario B, we assumed that the family used all the shells to produce charcoal, and that the yield of charcoal was 25% (this conversion was measured by the technicians with the family) (Table 1). That's equivalent to 2,276 kg, or 152 15 kg-sacks. We assume the family sold 128 sacks at R$ 17/bag and used 24 for cooking.
- The work of the couple and their children is not usually remunerated for these activities, but to include the value of their efforts in the cost calculations, we chose to multiply the hours worked for each person by an hourly rate based on the typical rate in the region of R$ 50/day.
- For the "Open the coconuts" activity, the family managed to extract between August and October only 342 kg of the 750 kg of seeds we assumed they could extract. So, we extrapolated the costs of labor and materials/services to match the volume of 750 kg. For the total cost of labor, we used the average volume produced per hour (1.3 kg/hour) to estimate that a total of 576 hours (or 72 full days) would be needed to produce 750 kg of seeds. We use this value to calculate the total cost of labor. For materials/services, we multiplied the amounts of the two items used in this activity by 2.2 (750 kg / 342 kg = 2.2).
- We assumed that the mother worked 9.3 months to open the coconuts to extract the seeds. We calculated this based on:
    - She worked 40 calendar days for the "Open the coconut" activity during the three months (13 weeks) of data collection, which is equal to three calendar days per week or 5.14 hours per calendar day.
    - We divide the total number of hours for this activity, 576, by 5.14, and gives us the equivalent of 111.9 calendar days.
    - If we divide the 111.9 calendar days by 3 days / week, we have 37.3 weeks, which is equivalent to 9.3 months.
- We also calculated an increase in the hours worked by the father to sell the seeds and make charcoal over the 9.3 months, based on the hours worked in the months that were monitored.
- This family does not receive technical assistance, but in scenario B we included the costs of technical assistance from ASSEMA for two half-day visits a year. The family would not necessarily have to pay ASSEMA for this assistance, but it would be an input that should be considered in financial analysis just the same.

Figure 4. Babaçu nuts collected from the babaçu palm forest in the background. (Photo: Max Roncoletta)

Table 1. Conversion rates for babaçu products

Product	Volume
Coconut	10.712 kg
Seeds (7% de coconuts)	750 kg
Shell (85% de coconuts)	9.105 kg
Charcoal (25% de shells)	2.276 kg

Results and discussion

The costs per activity and the total cost per scenario are presented in Table 2 and Figure 5a. The difference between the two scenarios was the additional costs in Scenario B of making charcoal (R$ 924 or R$ 7.22 per bag) and the cost of technical assistance (R$ 346 included in administrative costs) for two half-day visits. The activity “Open the coconuts” was the most expensive because of its high labor cost, which represented 77% of the total cost in scenario A, and 61% in scenario B. In general, with respect to cost per type of input, labor was responsible for approximately 90-92% of the total cost in both scenarios (Figure 5b).

Table 2. The costs related to the production of nuts and charcoal made from the babaçu shells for the two scenarios.

				Scenario A		Scenario B	
Activity	Labor	Materials / Services	Machinery / Equipment	Total Scenario A	% of total cost	Total Scenario B	% of total cost
Pre-collection	63	35	7	105	2%	105	2%
Nut collection	586	156	61	803	17%	803	13%
Open the nuts	3 598	70	62	3 730	77%	3 730	61%
Make charcoal	800	124	-			924	15%
Sales	211	-	-	211	4%	211	3%
Administration	239	97	10			346	6%
Total	5 497	482	140	4 849	100%	6 119	100%

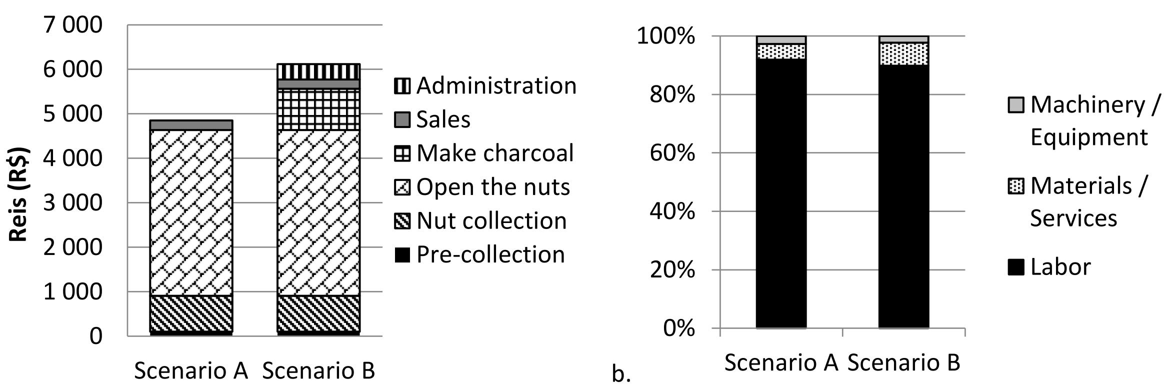

Figure 5. (a) The cost per activity and the total cost per scenario, and (b) The proportion of total cost by type of input.

Table 3. The revenues and yield rates per scenario and price of babaçu seeds sold.

Income source	Scenario A, R$ 1,70/kg	Scenario B, R$ 1,70/kg	Scenario B, R$ 2,49/kg
Nuts	1 275	1 275	1 868
Shells	245		
Charcoal		2 176	2 176
Total (R$)	1 520	3 451	4 044
Net income (R$)	-3 332	-2 671	-2 076
Rate of return	-69%	-44%	-34%

Table 3 shows that the production and sale of babaçu products was not viable, i.e., the income generated did not cover the costs involved, for either of the scenarios. In scenario A, which represents the current situation of the family, with a market price of R $ 1.7 per kg, the rate of return was negative 69 percent (-69%). The sale of shells helped, but it was not enough. In scenario B, the situation was better due to the income from the sale of charcoal, but the rate of return was also negative for the sale of seeds at R$ 1.70 and at R$ 2.49, the legal minimum price set by the government to help cover costs. Even with the minimum price for 2017/2018 of R$ 2.87/kg, the rate of return would be negative 34 percent (-34%). Although the calculated rate of return for the family's current situation is negative, in reality the family has a positive cash flow because it does not pay the costs of labor or technical assistance.

As mentioned, the value of the time worked by the family that we included as labor costs was significant. **If we exclude the labor costs to analyze cash flow for the family**, or the money actually spent, **the rate of return for scenario A is positive 289%** and net revenue (profit) is R$ 1,129. In scenario B, upon excluding labor costs, the rate of return and net revenue, respectively, increase to 301% and R$ 2,590 at the nut price of R $ 1.70/kg, and 403% and R$ 3,183 at the nut price of $ 2.49/kg. In this case, the net revenue represents the amount left over to pay the family labor costs.

We can use these alternative net revenues to calculate the real value received per working day and compare the result with two references: the informal local daily wage (R$ 50) and the daily rate based on the legal minimum salary for a full-time worker (R$ 39, or $ 860/22 days) (Table 4). For scenario A, the family received the equivalent of R$ 12.69 per day, which represents 25% of a local daily wage and 33% of a minimum legal wage per day. For scenario B with access to the minimum legal price of R$ 2.49/kg for nuts, the family received the equivalent of R$ 30.31 per day, which represents 61% of a local daily wage and 78% of a minimum legal wage per day. These results show that in scenario B access to the minimum legal price benefit and the sale of charcoal instead of shells almost tripled the wage received for a day's work, but the wage was still insufficient. This indicates that the family needs to find ways to reduce costs and increase babaçu-related income.

Table 4. The remuneration per day of work

	Scenario A	Scenario B*
Total number of days worked[1]	89	105
Total Income received[2]	1.129	3.183
Income received per day (R$)[3]	12,69	30,31

* The calculations for scenario B used the price/kg of seeds of R$ 2.49.
[1] The total number of hours worked by the entire family in all productive activities divided by 8 hours/day.
[2] Net revenue minus the cost of family labor.
[3] The total income received divided by the total number of days worked.

Challenges for using Green Value

The family was responsible for collecting labor data, and the ASSEMA technicians were responsible for collecting the rest of the data and entering all data in the Green Value worksheets under the supervision of an external consultant (Max Roncoletta). The study identified several challenges with respect to the use of Green Value and identified some solutions.

- The family had difficulty using the worksheets they were given to record data, in part because it was the first time they had recorded cost and income information in forms. In response, ASSEMA technicians worked with the family to develop simpler formats. For example, the family used a blank calendar month printout and wrote for each day worked the name of the activity, the time worked, and the volume produced.
- Data quality was another challenge. The adult female in the study reported she had difficulty remembering to make notes every day, and the volumes of coconuts and seeds were estimated, not weighed – even though she had access to a balance.
- The use of the Green Value worksheets in Excel presented some challenges for the technicians, for example, the need to move from one worksheet to another to record different types of data confused the technicians and required a lot of attention. A recommendation is to review the worksheets with the technicians each season before they begin using them to enter data. In this study, frequent monitoring and follow up communications by the consultant was important to verify that data were entered correctly and answer questions.
- Finally, given the results of the analysis, it was difficult for technicians to find economic arguments to justify the collection and sale of babaçu products, and to prepare to talk to others about the results. The consultant helped the team think about how to motivate families to reflect on the results and make decisions to improve their income from babaçu products.

Conclusions and recommendations

Conclusions

Despite the importance of babaçu products to the income for thousands of families in northeastern Brazil and the government's intention to make the activity profitable with a minimum price subsidy, the use of the Green Value tool with a typical family in the region revealed that the production and sale of babaçu nuts and other basic products is not feasible when that value of labor invested is considered. Access to the minimum legal price and the diversification of products sold are fundamental to increase revenues, but the costs must be reduced as well. To reduce the need for labor and improve income the family should seek technical assistance and invest in the adoption of new technologies.

Second, the Green Value tool was very useful for ASSEMA to generate financial data for the first time based on real data for babaçu production by a family. At the same time, several ways of improving the application of the tool with rural families were identified, especially the simplification of the labor worksheet used by the family.

Finally, with respect to the impact of the application of the tool, being able to clearly see the costs and income results prompted the family to think about how to improve things for the next harvest. In addition, the use of Green Value has helped ASSEMA recognize the importance of understanding the costs of production as well as the potential impact on family income of product diversification.

Recommendations

To reduce costs for the family:

- Share the use of an additional donkey with neighbors to reduce the number of trips for coconut collection and maximize labor efficiency.
- Use a mechanized or semi-mechanized process to open coconuts.
- Partner with ASSEMA to receive technical assistance, especially to increase the efficiency of charcoal production.

To increase income for the family:

- Sell other products related to babaçu, such as shells, charcoal, and oil.
- Partner with COPPALJ, a cooperative in the region that buys seeds, and take advantage of the cooperative's help in accessing the minimum legal price subsidy.

To improve the use of the Green Value tool:

- Rural producers' partners should work with families to simplify the labor worksheet.
- For future studies, it is important to provide families with clocks, timers, and scales for more accurate data.

For the continued development of Green Value:

- Adapt the Green Value worksheets to a simpler interface, such as an application for a smartphone.
- Promote the use of Green Value along with content covering specific economic and financial topics, which are important for utilizing of the results of analyses with tool. Examples include cash flow analyses, accounting, economic analysis of forestry projects, and financing.
- Create a table with a summary of the production indexes that can be generated using the tool, such as total days worked, total hours worked per activity, volumes produced, value of working capital, initial investment value.

For ASSEMA:

- Use Green Value for financial analysis of other productive activities in the region, too, such as fruit pulp and dairy operations.
- Use Green Value for current projects to analyze the economic and social impacts of the use of public resources.

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Bibliography

CONAB and INEB. 1981. Mapeamento das ocorrências e prospecção do potencial atual do babaçu no Estado do Maranhão. São Luis: Companhia de Pesquisas e Aproveitamento De Recursos Naturais (COPENAT) e Fundação Instituto Estadual do Babaçu (INEB). 69 p.

CONAB. 2016a. Normas Específicas de Babaçu (Amêndoa) – Extrativista - Safra 2016/2017. Comunicado CONAB/MOC N.º 014, de 15/07/2016. Brasília: Companhia Nacional de Abastecimento (CONAB).

CONAB. 2016b. Política de Garantia de Preços Mínimos para Produtos da Sociobiodiversidade. Segunda edição. Brasília: Companhia Nacional de Abastecimento (CONAB). 32 p.

IBGE. 2016a. Produção da extração vegetal e da silvicultura – 2015. Vol. 30. Rio de Janeiro: IBGE. 46 p.

IBGE. 2016b. Diretoria de Pesquisas, Coordenação de Agropecuária, Produção da Extração Vegetal e da Silvicultura 2015. http://www.ibge.gov.br/home/estatistica/economia/pevs/2015/default_xls.shtm. Acessado 7 de junho do 2017.

IBGE. 2017. Cidades database. https://cidades.ibge.gov.br/v4/brasil/ma/sao-luis/pesquisa/36/30246?detalhes=true. Acessado 8 de junho do 2017.

MAPA. 2012. Série boas práticas de manejo para o extrativismo sustentável orgânico. Babaçu : Attalea spp. MART. Brasília: Ministério da Agricultura, Pecuária e Abastecimento (MAPA)/ACS. 24p.

Shanley, Patricia and Gabriel Medina. 2005. Frutíferas e Plantas Úteis na Vida Amazônica. Belém: CIFOR, Imazon. 300 p. il.

Teixeira, Marcos Alexandre. 2008. "Babaçu—a new approach for an ancient Brazilian biomass." Biomass and Bioenergy. 32(9): 857-864.