RESEARCHING SUSTAINABILITY OF HARVESTS JOINTLY WITH LOCAL STAKEHOLDERS IN AMAZONIAN FLOODED FORESTS: LINKING SCIENCE WITH ACTION

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ABSTRACT

The Rufford Small Grant foundation supported the completion of a five-year collaborative research process between a forest ecologist and a riverine community. At the present report, I describe the entire collaboration process, outline relevant research results and describe research catalytic repercussions. Initially, this partnership was conceived to jointly generate ecological information to develop sustainable forest-based livelihood systems in flooded forests of the Amazon estuary. The local forest managers of this community (former rubber-tappers) had a history of organization, having previously worked together to guarantee rights to their land and resources. With the support of a development non-governmental organization, an ongoing social movement shaped by local institutions (rural associations and unions) articulated the creation of a Sustainable Development Reserve in which the riverine community is now embedded. Activities and participation evolved through gradual stages of learning, leading to unexpected outcomes. Community members were engaged in selecting research species, mapping forest types and species distributions, and conducting ecological studies. A subset of the community (local monitors) had greater participation, acting as volunteers to collect data, participate in a research training program, and analyze, interpret and disseminate results to their community. Preliminary findings demonstrated that ongoing management practices were far from sustainable, and that NTFP (non-timber forest product) resources were not being used efficiently. This collective learning experience catalyzed a transformational shift towards more sustainable resource use locally, and helped community members negotiate more favorable terms of engagement with markets and political forces. The report describes: (1) how a cohesive research group formed, (2) how an effective exchange of information from different knowledge systems (Western science and traditional ecological knowledge) developed, and (3) how this fresh understanding drove a new vision for management and action strategies.

1. Collaborative research implications: a review

Collaborative and participatory research methodologies are designed to incorporate local knowledge and to involve local people throughout different stages of research. It has been

acknowledged that policy recommendations resulting from such research approaches are more likely to be accurate, recognized and implemented by local people who were actively engaged on the research process (Cavalheiros et al 2000; Verlinden & Dayot 2005; Fernandez-Gimenez et al. 2006). Briggs and Sharp (2004) argue that participatory approaches converge on a positive way forward in that they take greater account of the specificities of local conditions, draw on the knowledge of a population who have lived experience of the environment in question, and provide people with ownership of the development process.

According to Fisher (2000), local people's participation can play an important role in environmental problem solving, questioning the ways in which participatory and scientific planning can systematically be integrated, as well as how participatory local inquiry can be designed to enhance the larger political decision structures of a society. Indeed, participatory research has been advocated within the implicit notions of relationships between power and knowledge since it is bound to challenge deep-rooted power inequities (Gaventa & Cornwall 2001). As such, it can be developed as an empowerment strategy designed to help citizens in their struggles, to better understand and confront the realities and choices that shape their own concerns (Fisher 2000).

Social learning has been defined as an approach and a philosophy that focuses on participatory process of social change, and encompasses a belief in the potential for social transformation (Wilson and Morren 1990; Woodhill and Rölling 1998; Wollenberg et al. 2001; Mutimukuru at al. 2005). Woodhill and Rölling (1998) recognize the need to actively apply social learning in ways that lead to sustainable futures, arguing not for the approaches that use and transfer scientific knowledge, but the facilitation of learning through making things visible, supporting people in reconstructing realities through experimentation, dialogue, observation and meaningful experience. Wollenberg et al. (2001) highlight the convergence of different knowledge systems to the learning process, including knowledge in the form of values, capacities, perspectives, methods and stores of historical experience; they argue that participatory research can stimulate social learning by bringing different groups together through a conscious and deliberate cycle of inquiring, observing, reflecting, planning and acting. Complementarily, Woodhill and Rölling (1998) suggest a research agenda that requires a participative and collaborative approach to academia, but more importantly within the

communities and organizations that are directly confronted with the need to improve their praxis of environmental management.

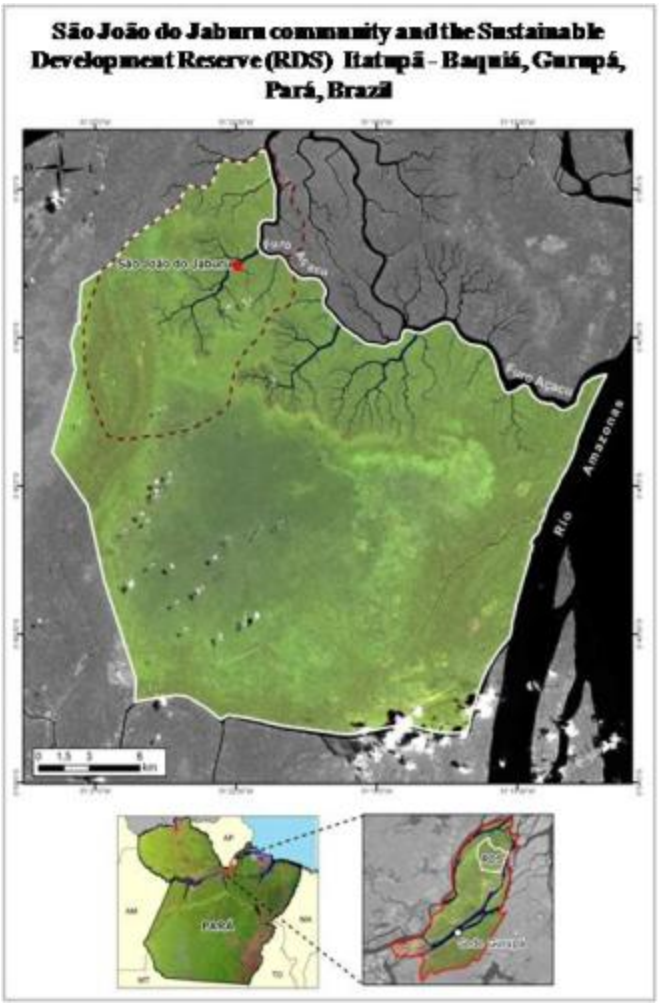
When the process is opened to include new voices and perspectives, the assumption is that policy deliberations will be more democratic, and less skewed by knowledge of the more powerful (Gaventa & Cornwall 2001). According to the same authors, challenging power structures involves using and producing knowledge as a way that stimulates popular awareness of the issues that affect their lives, and consequently, research and knowledge may serve as strategies of awareness building, liberating education, promotion of critical consciousness, and overcoming internalized oppressions.

2. Project location and regional context

The Amazon estuary region has a long history of local forest use by riverine communities, spread throughout its river and stream systems. In these areas, isolation and water regime dictate the dynamics of social and economic relations of people living within its forests (Queiroz et al. 2004). The rubber-based economy dominated this region since the 19th century, with some additional income from other non-timber forest products that were exported to Europe. With the end of the Amazonian rubber era in the mid 1950s, a new period began with important socioeconomic consequences: the intensification of timber and palm heart extraction (Oliveira 1991). Nowadays, the economy is centered on extraction of timber and the fruit and palm heart of açaí (*Euterpe oleracea*).

In Gurupá - a county situated in the estuary region of the Amazon basin - a strong grass-roots movement emerged in the 1980s and created the Gurupá Rural Workers Union. Members of this movement engaged in a successful and well-known struggle against timber enterprises that were trying to illegally displace local people from their lands. In the early 1990s, this movement allied with an activist non-governmental organization (FASE – Federation of Educational and Social Assistance Organizations), and started a process of land titling. Through those efforts, the Itatupã-Baquiá Sustainable Development Reserve was created, along with other multiple-use reserves that integrate sustainable development with conservation of forests.

The community of São João do Jaburu consists of approximately 50 families who each manage individual parcels within approximately 14,000 ha of the reserve. Having gained land tenure security, community members are now focusing their efforts on resource use. They are aware that their current resource use patterns, particularly those based on tree felling for timber and palm heart, have been generating serious negative impacts on the ecology and productivity of the forest ecosystems on which their livelihoods depend.



3. The collaborative research process

As an action researcher, in 2005, I started collaborating with the São João do Jaburu community to explore the ecology of tree species that sustain local livelihoods and to jointly develop guidelines for best forest management practices. Research activities were embedded in a larger project, funded by the European Union (called “Bridging the Divide: Enhancing Forest

Tenure, Management and Marketing in the Brazilian Amazon"), of which the overall objective was to contribute to conservation of locally-valued biodiversity and improvement of the standard of living of forest dependent people. After 2007, I started a Master's program at the University of Florida, and not only did I continue to be engaged on this project but also it became the focus of my academic research; in 2008 I received the 1st RSG and in 2009, the 2nd RSG, which were fundamental to the continuity and completion of the project. Community members were engaged in all stages of the research process: selecting research species, mapping forest types and species distributions and conducting ecological studies. A subset of the community served as local researchers and had greater participation, acting as volunteers to collect data, build research skills, and disseminate results to their community. In the section below, each phase of this collaborative research process is described.

Species selection

At community meetings conducted in October 2005, local residents were asked to identify and list forest species that are economically and culturally important for the livelihoods of this and other communities throughout the Amazon estuary. In the first list, they came up with 94 species, including trees, palms, vines and herbaceous. After discussing the difficulties of conducting reliable ecological studies for so many species, they were asked to reduce that list to the most crucial species, and they ended up listing 28 priority species, which were divided into: 21 tree species (with either timber or non-timber, or both uses), 7 palm species. In addition, the community prioritized a multiple-use species, andiroba (*Carapa guianensis*), of which we have been conducting more detailed ecological studies (including a novel sampling design to investigate seed production in flooded forests). Because of its broad geographic range, high timber value and non-timber use, andiroba plays a crucial socio-economic role in thousands of communities occupying the Amazon basin.

Participatory mapping

The next step was then to conduct participatory mapping to assess, in a geographic scale, the general patterns of the priority species selected (such as distributions, densities, management

practices) as well as other related information (forest types, harvest intensities). Participatory mapping workshops were conducted in November 2006 with around 30 people in attendance. I started explaining what a map is, how they are created, what is its importance and broad usefulness, and why local people are key actors in the process of creating maps that are useful for their realities and needs. I explained what satellite imagery is, and then presented the satellite images of the Sustainable Development Reserve with its surroundings (1:50,000 scale) and another satellite image on the area of the target community, also with its surroundings (1:20,000 scale). We subsequently started an exercise of situating the reference points on the map and understanding their localization at the image scale. Once they were well situated and familiarized with the images, we started identifying the map elements, such as different tonality of colors (i.e. representing different land covers). Finally, we started the process of covering the community satellite image with transparent writing paper where the community members started to draw and delimitate the features to be mapped. Throughout this process, they discussed how to create patterns and determine the appropriate terms to be used for each component being mapped. In that way, using a layer at a time, we created different thematic maps such as forest types, harvest intensities, resources distribution and uses. We discussed the ecological aspects of the information being approached, for instance why forest types are different, what makes them different (soil conditions, tide influence, altitude, species composition and abundance, etc), why some species occur in certain forest types rather than others, what are the uses and management implications and so on. The participatory mapping process as a whole not only provided a wide amount of information to be used in the ecological research, but also provided a strong channel of communication and understanding between community members and research agents. After these workshops, the participatory maps were digitized at a geo-processing lab, and the result of this is a set of 33 thematic maps comprising distribution of forest types, harvest intensities, and species patterns of distribution, densities and management practices.

Local monitors: the emergence of a research group

We needed to decide collectively how community members would actively participate in ecological data collection. Forest inventories are generally conducted by a forester or forest technician with the help of two or three field assistants. However, because of the collaborative

nature of our intervention, we concluded that it would not be strategic to hire community members as field assistants, for a couple of reasons: first, providing "jobs" to community members would likely provoke jealousy among local residents and the feeling that *they* (community members) are working for *us* (external researchers), and the goal was to create an atmosphere of all of us working together to generate information useful to the sustainable development for the community as a whole; second, the development non-governmental organization, FASE, that had been working successfully in collaboration with dozens of communities in the Gurupá region, had long been using this approach of not paying community members to conduct local surveys, claiming that payments generally create a paternalistic, rather than collaborative interaction. Therefore, we discussed with the community that we needed volunteers to help us with the ecological surveys in the forest but that they would decide who would participate. The community then decided that it would be up to community members to volunteer, and in the meeting, eight of them expressed their willingness to be local monitors. All of them were male and most ranged from 18 to 22 years old, with the exception of a highly experienced leader - Codó (Manuel Cordovaldo Chaves de Sousa). Besides the obvious purpose of gathering ecological information, the idea was that this interaction with the local monitors would forge the exchange between scientific and traditional ecological knowledge and by getting more involved in the research process, they would serve as "knowledge multipliers" within the community.

Participatory forest inventories and ecological studies

Forest inventories were conducted to generate basic ecological information (such as densities, population structures, timber volume per hectare, etc) to develop improved management strategies, while the Andiroba production studies would serve as a model for assessing and comparing timber and non-timber harvests sustainability. Forest Based on a previous participatory mapping exercise four forest types were indentified in the community of São João do Jaburu – *Baixio*, *Restinga*, *Igapó* and *Terra Preta*. The main attributes used to differentiate each forest type were tidal influence, species dominance/composition, and edaphic conditions. Six 1-ha (500 x 20 m^2) plots were installed within each of the four forest types, totaling 24 ha inventoried. Within each selected plot, we installed a 500-meter reference baseline and sampled 10 m on each side of this baseline. The following data were collected for all individuals among the selected species ≥10 cm dbh (diameter at breast height): (1) dbh; (2)

estimated commercial height; (3) liana load; (4) crown illumination; (5) crown form; and (6) canopy position.

A different sampling scheme was used to investigate *C. guianensis* fruit production. Because floodplain forests of the estuary region are subjected to weekly high tides that penetrate the forest and carry seeds downriver, we could not count fallen fruits to estimate production. Therefore, we used two sampling regimes in all three forest types: (1) an extensive sample of the population of trees ≥10 cm dbh (507 trees sampled) with monthly crown observations of fruit production; and (2) a smaller intensive sample of 49 fenced-off individuals in which fruit fall was counted bi-weekly. For each of the 507 total trees of the extensive sample, we assessed the six tree-level variables previously described and conducted monthly monitoring to estimate fruit production. First, we estimated the total numbers of fruits in each tree crown by counting with binoculars all fruits in the visible portion of the crown. Then, we estimated the proportion of the crown counted, to arrive at the extrapolated estimate of the total number of fruits in the entire crown. To verify extensive sample estimates, a subsample of 49 trees (intensive sample) was selected and monitored bi-weekly to count fruit production. The ground below the crowns of the 49 selected fruiting adults was cleared of underbrush and fenced off using nylon fishing nets. Nets were secured below-ground at close intervals to prevent seed escape and exclude seed predators (mostly rodents) from consuming seeds once fallen. The same observations of fruit production used on the extensive transects were applied to the intensive trees, providing a means of relating visual estimates from the intensive sample to those from the extensive method.

The conditions under which we conducted data collection throughout the floodplain forest types were quite harsh: often times we had to canoe for many hours until we would get to the place from where we would start walking; very frequently we had to work throughout the mud in swampy forests (like *Igapó* and *Baixio* forest types) and also with the water level high up to our chest. Moreover, to be reliable, field measurements must be very accurate. Interestingly, however, despite all such hard conditions, a very good working atmosphere emerged among this field crew. Even though local monitors were not getting formally paid (they volunteer on behalf of the community), they not only displayed extraordinary engagement and interest, but they also sustained this enthusiasm and hard work throughout the many months of data collection. Their traditional knowledge and ability to work in the forest were fundamental for the success of the ecological data collection: they are experts in identifying species, in recognizing forest type

features, in situating themselves spatially, in counting fruits up in the crown of the trees, and so on. On the other hand, some aspects of the research design and methodology did not make much sense to them, i.e., "why do we have to select and monitor *"500"* andiroba trees - can't we just pick up a few and monitor the production?"; "why do we have to take such highly accurate measurements - why does all this data collection have to be so precise..?" Consequently the need and potential of conducting a training program on applied forest ecology and research (where we could discuss both forest ecology and research methods with the local monitors) became readily apparent. I then started to meet with them during the weekends (in between forest inventories and production studies) and this was when our training program began to take place.

Training program with local monitors

These training sessions started in a non-structured way; we began with open conversations about what we were doing and why. Why are we measuring all these trees? Why are we quantifying andiroba fruit production? What useful information are we going to get from it? What is research? For what is it useful? What is a research design? What is a sample? What is the importance of the sample size? How will the accuracy of the data collection determine the reliability of the results, and consequently the correct understanding of the reality; how will it, in turn, affect the decision making process according to the information assessed? We then moved on to discuss the general field of forest ecology in more in depth and discuss what ecological information is useful for planning sustainable management (such as species densities by forest type, population dynamics, growth, reproduction, regeneration strategies, etc). In that way, we were able to make a direct and clear link between forest management in the context of their reality and our ecological research being conducted. As an indirect result from these training exercises, local monitors dramatically improved their performance in data collection; they started to discuss research and ecology during field work in the forest and to call each other's attention to the accuracy of the measurements; in addition, the collaborative spirit seemed to have strengthened even more, and they developed a sort of identity as "community local researchers," acquiring increasing respect from the community as a whole.

A brief description of findings

Overall, results evidenced clear differences of forest resources availability by forest type, thus validating their traditional ecological knowledge on forest type distinctions (assessed using the participatory maps). We divided the results per types of use, which were basically the following: (1) timber; (2) açaí palm; (3) andiroba; and (4) other NTFPs. We organized them in numbers (estimates per hectare and per forest type), maps (participatory mappings), some economic comparisons, and management scenarios. We also compared the levels of extraction, contrasting the actual resources' stocks with the amount of resources they were extracting for commercial and subsistence purposes. In sum, preliminary results demonstrated that: (1) in general, timber was being harvested in very clearly unsustainable patterns; the results demonstrated that, at current harvest levels, in just a few years many families would not have any available commercial stock of the many timber species; (2) the palm heart harvest was dramatically unsustainable: the numbers demonstrated that in areas where they were extracting palm heart (more than 60% of community lands), there were around 50% lower densities than in areas less intensively harvested for palm heart; the data from the inventories corroborated with the information acquired from the participatory maps. Moreover, a rough economic analysis demonstrated that, despite the high intensive palm heart harvesting, the activity was also *economically* unsustainable: one *palmito* of the highest quality, which represents *one açaí tree* was sold to the middle man for only R$ 0.70 (the lower quality *palmitos* were sold by R$ 0.25). Such analyses demonstrated that they would profit incredibly more by selling the açaí fruit instead of the palm heart, but debt relations between community families and the middleman (who also provided them with basic goods from the city), prohibited local families to have management and commercialization autonomy (regarding which product to sell, how much and for whom); (3) from the andiroba seed production study, it was possible to estimate total seed production by andiroba populations within the community forest lands, and contrast production with the total amount of seeds harvested by the community. The contrast was stark: the community was collecting less than 1% of the total seeds produced by the forest. This result illustrated that the community could increase seed extraction and oil production without significantly impacting andiroba populations; increased production in turn promise to increase family incomes and improve prospects of preserving community forests. We found high densities of a range of NTFP species throughout community forest types; furthermore, the

andiroba scenario could also be echoed by many other economically valuable NTFP species that have both densities and production levels similar to andiroba.

Processing, validating and communicating research results

Following up our training program conducted with the local monitors, once the data collected in the forest (after 17 months of field work) were entered and organized, I conducted some "results analyses and interpretation" classes with the local monitors. I started by projecting our data sets in *excel* spreadsheets using Power Point, with all information collected in the forest. They first got familiarized with those files, what each entry meant, what each column and line represented. Then, we started playing with the data, filtering each information we wanted to assess: by species, by forest type, by family, etc, i.e.: "let's see how many *buriti* trees per hectare there are in the *baixio* forest type; now let's extrapolate it to Domingos' (one of the monitors) property and estimate the total number of trees his family possesses; "now, let's calculate the amount of *virola* commercial timber stock per hectare (m^3/ha) in the *Terra Preta* forest type; let's extrapolate it to André's (another monitor) property, and see the total stock of commercial *virola* timber his family possesses; now, let's see how much they are extracting and evaluate if it is sustainable or not..." We spent entire afternoons playing with the data; we went further and started to make and interpret graphs, construct tables, management scenarios, and they would suggest what to look at and how, which scenarios we could build with the data that would make sense to their reality; they took the lead in explaining to each other, in discussing the results, their interpretations and management implications. In this way, local monitors helped me to display the results and prepare a presentation to the broader community in a way that other community members that were not so closely involved with the research would be able to understand its meanings and relate them to their livelihoods and management practices.

Using the results presentation constructed jointly with the local monitors, we conducted workshops with small groups, such as local leaders (where we would focus more on issues like timber and palm heart), women's group (where we would concentrate more on andiroba seed production results and management scenarios, and other NTFPs), and then we finally organized and conducted a one-day meeting with the entire community, in which together with the

monitors, we went through the entire progression of research, including research goals, activities, methods, interpretation of findings, and management implications.

Overall, the results presented caused lively debates regarding current and future resource use strategies. The açaí dilemma (palm heart vs. fruit commercialization) was one of the hottest topics: they started to discuss how much impact the palm heart activity was causing directly (many families do not have enough fruit production for commercialization and consumption) and indirectly (they perceive the decrease in game and fish availability due to palm heart harvesting); they also debated about the power relations with the middleman: "*he is becoming richer, while we are only inflaming our debts and destroying our forests*.." From the timber analyses, they concluded that only following the legislation was not enough to guarantee sustainability and that at that pace not only would their children and grandchildren lack this valuable resource, but that they would not have commercial timber stocks within a few years. It was clear to them that if they wanted the timber activity to be sustained over time, they must substantially decrease harvest intensities and conduct a more careful harvest planning. Both andiroba and other NTFP's results sparked a reflection on how much these activities are ecologically benign compared to timber and palm heart harvests, and they were simply astonished by the tiny proportion of andiroba seeds extracted by the women's association for andiroba oil production. All the information presented seemed to have provoked in them a willingness to move towards improved resource use patterns. They had so many points of discussion that one day was not enough for them to debate about their local management patterns. For that reason, they decided to schedule a meeting a few days later, to discuss what courses of action to take.

Repercussions

They met that same week, and continued the discussions through many other subsequent meetings. Their starting point of discussion was that their resource use patterns were far from sustainable, and while they were overharvesting palm heart and timber, their vast abundance of NTFP resources (including açaí fruits, andiroba, *virola*, *murumuru*, *pracaxi* seeds, *buriti* fruits, etc) were not being used efficiently. However, they also concluded that a sustainable resource use pattern coupled with better livelihoods was not impossible. They posed questions such as:

How can we plan a sustainable forest management? How can we replace the predatory palm heart activity by a sustainable açaí fruit commercialization? How can we rely less on the timber and get more income from the NTFPs products? They determined the following courses of action to take:

1. Palm heart

They decided to develop a strategy to stop or substantially reduce palm heart harvesting activity. But because of the deep rooted power dynamics with the middleman, it seemed to be a very tall (if not impossible) order. During the discussions, they asked: "*To stop selling palm heart to the middle man we must first pay off our debts, but how can we possibly do this if we sell the palm hearts at such low prices and buy basic goods from the city at such high prices? There is no mathematics that allow for that!*" Someone had the idea of inviting the middle man for a meeting, to explain this situation and pressure him to increase the palm heart price; but others argued "*of course he is not going to come to this meeting!*" Then, someone suggested: "*So let's do a surprise meeting with him.*" I was just watching these discussions and I confess that I seriously doubted that this surprise meeting would actually happen. But it happened, a few days later (the next day the middle man came to buy the production). Strategically, I decided not to attend this meeting, but I waited when they came back to hear what happened. Some leaders told me that when the middle man arrived, one of them said he wanted to talk to him and brought him to a place (behind the community church) where everybody was gathered, and they said: "*We are calling you here today because we did some research, and we found out that the impact of the palm heart activity is very serious and if we continue harvesting it at this pace, we will end up not having anything. In addition, this activity is illegal and we are within a recently created Sustainable Development Reserve, so very soon IBAMA agents will be around enforcing the legislation. So, we are here to let you know that we will stop supplying the palm heart production.*" According to them, the middleman got very worried and started arguing that they all owed money to them, that by no means could they could stop harvesting palm heart and so on. But they went on and said: "*This is why we are calling you here, because we want to pay you back, but for this to be possible, you have to increase the palm heart price, from R$0.70 to R$1.00.*" The middleman then argued that it was not possible at all, that he had a boss, and that he only gets 5% profit and so on. Finally, they replied "*This is your problem, for this price, we*

are not selling our palm heart anymore." A week later, the middleman was paying the price they asked.

2. Açaí

They agreed on how strategic it would be to increase the açaí fruit production, as this would both reduce the pressure on the impacting activities, and increase their income through a sustainable-based activity. To be able to stimulate families to increase açaí fruit production, they had the idea of increasing the price by eliminating one intermediary of the commercialization chain. There are other middlemen (not the same who buy palm heart production), who go from house to house buying the açaí fruit production; they take it to the Amazon river and sell it to a *geleira* (ice boat), which in turn takes it to sell at the big cities' ports (such as Macapá and Belém). Then, they decided to organize the production and sell it directly to the *geleira*, but the production of the São João do Jaburu community alone was probably not enough to supply a *geleira*, so they formed two committees: one to mobilize other communities to join them, and the other to go negotiate with the *geleira*. During these mobilizations, the middlemen who buy açaí production stared to pay R$10 more for the açaí 40 *saca* (bag with 40 kilograms of fruit).

3. NTFPs

They decided to organize production and seek markets for a range of NTFP products available in their forests. However, unlike timber, palm heart and açaí products, the markets for NTFPs (such as andiroba oil, *buriti* oil, *murumuru*, *virola*, and *pracaxi* seeds, etc) are still very incipient, consisting of a few cosmetic and pharmaceutical companies that generally buy the production from cooperatives, rather than from each household individually (as they are traditionally accustomed). Then they asked me if the project could put them in contact with some companies. Just by coincidence, in those days I got a message by radio communication saying that the coordinator of the broader project in question, together with a member of the European Community (the funder), would visit the São João do Jaburu community to monitor project activities. So I suggested: "*why don't you present the problem and ask for their support?*" Thus they decided to prepare a presentation for these visitors. They discussed what to present and how, prepared posters, trained the day before and also the morning before the meeting.

When the NGOs and European Union visitors arrived and sat at the meeting, the community members started to display the posters one by one, describing their occupation

history, including the rubber based economy that they were embedded until 1950s and 1960s, the subsequent shift to timber and palm heart activities driven by strong market forces, their struggles to secure the land and their history of social organization (that also resulted in the Sustainable Development Reserve in which they are part of). Through this sequence, they developed a rationale to report that at times when the economy was based on NTFPs (rubber and forest seeds that were exported to Europe), forest resources were conserved and they had abundance of fruits, timber, game and fish resources; while during these 40 year of timber and palm heart based economy, they witnessed a dramatic decline in forest and water resources, attesting that oftentimes they have trouble in meeting their basic needs for food. They indicated that the project helped them to realize how unsustainable their current resource use patterns are, and suggested that if the project wants to meet its goal of conserving forests and improving local peoples' wellbeing, they should help them find and establish markets for a range of NTFP species (such as andiroba, *buruti*, *ucuuca*, *pracaxi*, *taberebá*, rubber, and others).

The visitors were astonished by the clarity of the presentation and the strength of the arguments. They were impressed by how these local residents were able to put the project in question in perspective with their historical facts as well as their precision of tailoring that with their desire to make changes and work for sustainable futures. They agreed with the strategy of seeking NTFP markets, and promised that they would help the community making contacts with potential NTFP buyers.

Some perceived changes

After these events, the project developed a strategy to support NTFP commercial activities. As a consequence, in that same year, the community collected and commercialized one ton of *murumuru* seeds; they organized collective activities (called "*comissão do murumuru*") to collect seeds in the forest. In the following year, on top of *murumuru*, they commercialized over three tons on *virola* seeds (*ucuuba*), and received workshops from a cosmetic company (Beraca) to extract *buriti* oil. The company also visited the community many times and helped the community get their production certified. In addition, community members reported a dramatic decrease in palm heart harvesting and significant increase in açaí fruit commercialization (which also resulted in modest increases in their income). We also noticed that marginalized groups

within the community (those families that would never attend any meeting and were the ones that most harvested palm heart) started to actively participate in the community collective action. The interest in the participatory research process also seemed to have increased, since our research group (local monitors) grew from 8 to 20 and diversified to include leaders and women.

4. Final note

In this report I have described how the collaborative research conducted at the São João do Jaburu community has catalyzed social change and a clear shift towards more sustainable resource use. In the course of an inclusive participatory approach, local partners were engaged at multiple stages of research and planning of resource use: species selection, participatory mapping, field data collection, scientific training, results interpretation and dissemination. Through this process, trust was built, perspectives and knowledge were shared, and platforms for collective learning were developed. Results obtained through such strong community engagement were quickly integrated into the community, often causing lively debate about current and future resource use. This collective learning experience catalyzed a transformational shift towards more sustainable resource use locally, and helped community members negotiate more favorable terms of engagement with markets and political forces. I believe that it was the participatory approach to research and resource use that allowed research results to be quickly integrated into the community planning, and that this inclusive approach may be an innovation that leads to real change in how communities think about resource management and NTFP marketing. It was not merely a set of scientific data that convinced the community to change the resource use patterns, but rather our data (which combines science with traditional ecological knowledge) - their data. In contrast to top-down models, this approach could be replicated widely and generate positive impacts at regional scales.

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