

ANALYSIS OF THE CHANGES IN ECONOMIC ACTIVITIES OF BRAZILIAN FOREST COMMUNITIES AFTER METHODOLOGICAL SUPPORT AND PROVISION OF PRE-FINANCING CAPITAL

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Tropical forests play an important role in mitigation of climate change and are the habitat for traditional and indigenous forest communities. We hypothesised that in order to improve the forest conservation by local inhabitants and to increase their revenue from the work with non-timber forest products (NTFPs), organisational, methodical as well as financial support is required. We concentrated on Brazil nuts as a profitable NTFP. After conducting field research of economic activities in two forest communities of Rondônia, Brazil, we conducted three stages of longitudinal experimental research while applying the Fair Trade concept. We organised a team of Brazil nut harvesters, developed a harvesting strategy, provided pre-financing for the stock creation of Brazil nuts and created a sales plan. Analysis of these interventions suggested that through organisational support and pre-financing, Brazil nut harvesters were able to organise themselves to increase their income and manage new forest territories sustainably. We identified the relationship between external support continuity, size of pre-financing and number of participants, their income as well as the size of managed forest territory. Clear land tenure and technical, organisational and marketing assistance are essential throughout the first years of intervention.

Keywords: Non-timber forest products, forest conservation, small-scale forest enterprise, human capital, pre-financing experiment, Fair Trade concept

INTRODUCTION

Tropical forests are a natural capital of national and international importance. Forests assimilate carbon from the atmosphere and store it in their biomass, regulate the gas exchange between the land surface and the atmosphere, stabilise the climate, conserve many biodiversity features and act as a source of timber and non-timber forest products. Tropical forests are also home for approximately 350 million people most of whom are considered to be poor (Dieterle 2009).

Governments of countries with tropical forests, the international community and the World Bank are undertaking efforts to reduce deforestation mostly through command and control actions. On the other hand, as the case of Brazil shows, very little is undertaken to change the region's colonisation pattern based on cattle raising and plantations—activities which are directly related to deforestation and degradation. Thus, tropical forests continue to be destroyed at an estimated rate of 13 million ha year⁻¹ causing around 17%

of global carbon emissions (FAO 2010, UNEP & INTERPOL 2012). During the United Nations Climate Summit 2014, more than 150 partners signed the 'Declaration on Forests' which calls for cutting the loss of forests in half by 2020 and ending deforestation by 2030 (Anonymous 2014). Around 60 million people of the world's poor are nearly completely dependent on forests and almost 1.2 billion people obtain significant part of their livelihood from non-timber forest product (NTFP) (Dieterle 2009, Vantomme 2011). Therefore, forests play substantial roles in achieving the United Nations Millennium Development Goal of alleviating the number of the poor (Dieterle 2009).

Top-down conservation strategies such as protected human-free forest areas have been questioned during the last two decades because of their negative impacts on social and economic structures of forest communities and unsatisfactory protection of natural resources

(Newmark & Hough 2000, Salafsky & Wollenberg 2000, Spiteri & Nepal 2006). The main reason for the unsuccessful forest protection in protected areas is lack of connection between the forest and the well-being of local inhabitants (Shyamsundar & Kramer 1995). Bottom-up forest conservation approaches by forest communities result in lower and less variable deforestation rates than the top-down conservation strategies (Porter-Bolland et al. 2012, Bray 2013, Ezebilo 2010). Forest communities are considered as the best positioned players to confront the destructive forest use processes (Klooster & Masera 2000).

Certain NTFPs have potential to promote social development in forest communities (Marshall et al. 2006, Shackleton et al. 2011, Tieguhong et al. 2012). There are studies demonstrating the inability of NTFP to lift people out of poverty and the negative impact that overharvesting of NTFP may have on forests (e.g. Bhattacharya & Hayat 2004, Muler et al. 2013, Poschen et al. 2014). Since the rural areas in the tropics and subtropics face a diversity of challenges, the suggested solution for successful development of these areas should be highly customised and adapted to these challenges (Darr et al. 2014).

In this study, we aimed to identify the factors that would lead to local sustainable development in the tropical forest regions. Working with two Brazilian forest communities, we intended to answer the question of whether inhabitants of the communities were able to increase their income and to conserve the forest sustainably through working with Brazil nuts (*Bertholettia excelsa*) as a valuable NTFP. Common literature on NTFP enterprises mostly analysed the status quo of these enterprises. No previous intervention was described nor analysed. Intervention into NTFP-enterprises may include the development of storage and/or processing facilities for NTFP. Analysing an intervention requires several years until results can be seen.

Since August 2008, three phases of the experiment have been initiated within the organisation of Brazil nut harvesters and storage of Brazil nuts in São Carlos do Jamari and Cuniã forest communities, Rondônia state, Brazil. The first phase of the experiment was organising a group of Brazil nut harvesters, storing a stock of nuts with help of initial capital and establishing a sales strategy for stored nuts between the harvesting seasons. It also included negotiation

with middlemen about the selling prices of Brazil nuts in São Carlos do Jamari and Cuniã communities as well as in Porto Velho. This intervention included non-refundable pre-financing as an initial capital for storing the stock of nuts and to sell it between harvesting seasons once the selling price rises. Initial organisational and methodical support was provided. The second phase included continuous support from a technical supervisor who provided refundable investment which had to be paid back after one year. The third phase consisted of refundable investment with limited support from a technical supervisor. These interventions were organised in collaboration between the researchers and the Brazilian non-governmental organisation for the Support and Development of the Riverside Communities in the Amazon Rainforest (NAPRA). Implementing projects in forest communities is a lengthy task with high levels of uncertainty. Thanks to the longevity of the initial intervention, the growing group members and high motivation level of the Brazil Nut Group, more funds could be raised for the established Brazil nut project.

In this study, we presented the outcomes of these investment interventions and the main challenges faced throughout this work. The overall aim of this study was to give the real case scenario estimates on whether non-destructive forest use and social development in tropical forest communities can be achieved simultaneously.

MATERIALS AND METHODS

This research can be regarded as a pilot exploratory study. The aim of this study was to analyse the cause-and-effect relationship between financial, organisational and methodical interventions into the economic activities of Brazil nut harvesters. Analyses also included management of the ecological system of the forest as well as increase in income of local inhabitants.

We chose Brazil as our research region as it has the greatest area of tropical forests in the world and concurrently experiences one of the highest rates of deforestation. Forest communities are located nearby to highly deforested areas in the Rondônia state, Brazil (Figure 1). Brazil nuts is a unique NTFP primarily collected from the wild and its optimal natural regeneration depends on

an intact and healthy ecosystem (Mori & Prance 1990, Ortiz 2002, Zuidema 2003).

Methodical procedure of the Fair Trade concept was applied throughout the study including organisation of a Brazil Nut Group, workshops on sustainable Brazil nut harvesting and good handling practices, setting minimum selling price for the nuts, pre-financing the initial nut sale and supporting the group in the final sale of the products (Von Hauff & Claus 2012) (Figure 2). We first conducted field research of economic activities with Brazil nuts in forest communities and initiated a longitudinal experiment (2008–2015). We were introduced to the communities as members of NAPRA. The treatment group was selected by visiting and inviting all Brazil nut harvesters (28 families) of the São Carlos do Jamari community to participate in the

Brazil Nut Project. No randomisation of the group participants had to be done as all the harvesters could be visited. Due to unsatisfying experiences local inhabitants had with previous interventions, only three Brazil nut harvesters agreed to participate. Of the three, two were from São Carlos do Jamari and one, from Cuniã community who was visiting São Carlos. The non-participating Brazil nut harvesters were considered as control group.

For this study, the first intervention included non-refundable pre-financing with initial support from scientists in the organisation of the enterprise (2008–2009). Subsequently, interventions included two refundable pre-financing cases with continuous (2013–2014) and limited (2014–2015) support from environmental technicians. These interventions were limited

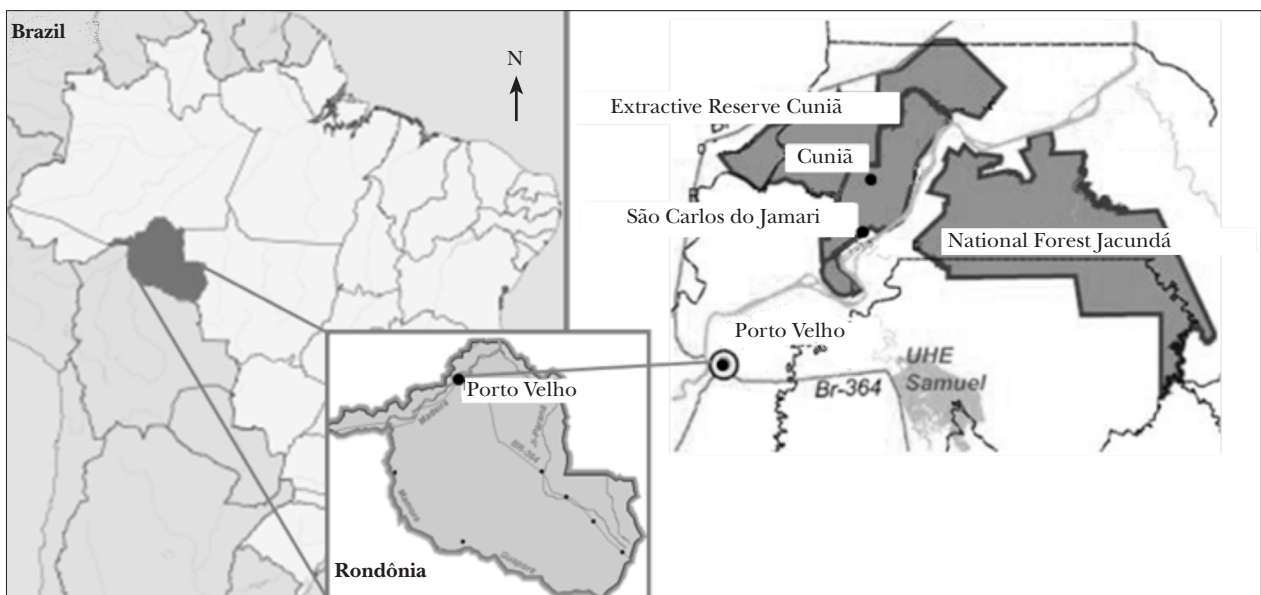


Figure 1 Map of Brazil, state Rondônia and conservation units; modified from Anonymous (2006) and NordNordWest (2009)

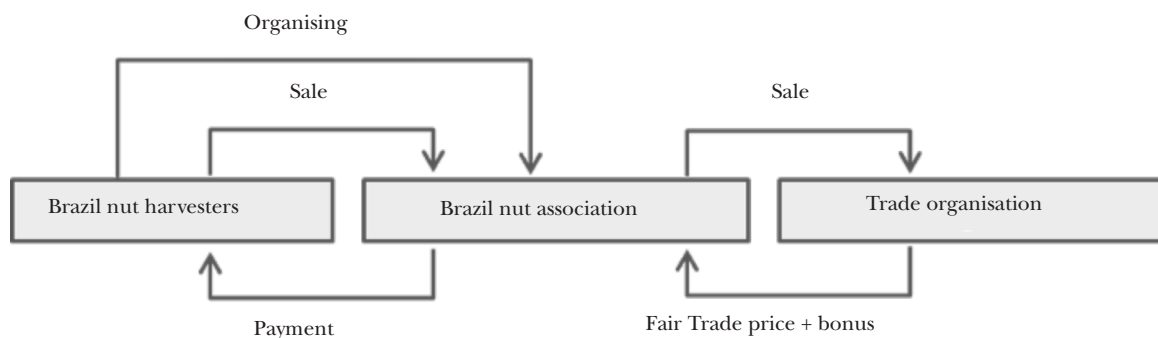


Figure 2 Fair Trade cooperative structure; modified from Nicholls and Opal (2005)

by the pre-financing amounts and the number of participants willing to become Brazil Nut Group members. As only three persons were willing to participate, only one group of Brazil nut harvesters was initiated. Since 2008, new members were joining the group and the subsequent experimental interventions were conducted with the same growing group of harvesters. We analysed and evaluated the results obtained throughout the interventions. The analysed data represented the increase in the number of group members, the possibility of paying back the initial investments, the forest being used for harvesting Brazil nuts and the verbal statement of the harvesters whether they were using the forest sustainably.

RESULTS

Field research

Livelihood

São Carlos and Cuniã were established in the late 19th century by the descendants of rubber collectors who came to this region during the rubber boom, and Indians who were the original inhabitants of these regions. In the year 2010, the population of Cuniã consisted of 83 families (290 persons) and São Carlos, 370 families (1317 persons) (Candido 2010). The main economic activities of the Extractive Reserve (RESEX) Cuniã and São Carlos are the production of cassava flour, harvesting of NTFP (mostly acai berries and Brazil nuts), agriculture and fishing. These products are either used for own consumption or traded with local middlemen who sell them further to the city markets. In 2011, a project was initiated for the sustainable management of black caimans in Cuniã; the caimans were multiplying quickly inside the lake and posed danger to the inhabitants of the community. The population of Cuniã is organised as an association, namely, the Residents Association of Cuniã (ASMOCUN). All economic activities of Cuniã are organised through ASMOCUN. In São Carlos do Jamari, there were four associations but the inhabitants showed mistrust towards the leaders and work of the associations which led to low willingness to participate and become members of these associations (Candido 2010).

Legal situation

The Cuniã region became a RESEX legal entity in 1999. RESEX Cuniã is state-owned but the community has the rights to access, use and extract the natural resources. The local inhabitants of Cuniã region have the right to collectively use the land and they have autonomy over the territory which they have traditionally occupied. On the contrary, the inhabitants of São Carlos live in a chaotic land situation. They find themselves in a mixture of tenure regimes comprising formal owner of the land which is mostly the state and informal landuse of the inhabitants which has evolved historically. A lot of land used by these inhabitants lies within the limits of the RESEX Cuniã and the National Forest Jacundá (Candido 2010).

The creation and localisation of these reserves occurred without participation of the São Carlos inhabitants who have restricted access to areas they have traditionally used. In areas that are outside the limits of the reserves, according to the National Institute of Colonization and Agrarian Reform, most inhabitants do not have any rights to the land they occupy, and if they do, they do not pay taxes. This situation makes the inhabitants of São Carlos unable to ensure their autonomy over the occupied territories for generations.

The majority of the inhabitants of São Carlos' and Cuniã perceive the forest as an important component of their livelihood, a part of their home and a place which provides them food and shelter. The connection to the forest is different in the two communities. If deforestation is taking place nearby the São Carlos do Jamari community, São Carlos inhabitants may realise it but have no information on whether legal or illegal deforestation is taking place and have no means to counteract. Since RESEX Cuniã became a legal entity, there was no record of illegal logging. The total reserve area contains 50,603.84 ha of forest. The Cuniã inhabitants know exactly who is allowed to log trees and how much can be logged.

Economic activities based on Brazil nut example

Brazil nuts is a wild growing NTFP which represents an important source of income for indigenous and traditional inhabitants of the

Amazonian forest communities including São Carlos do Jamari and Cuniã communities. As a wild species, the tree has an irregular natural production with alternating high peaks and low production levels. Harvesting and working with Brazil nuts are traditional knowledge passed down from generation to generation. Currently many young community inhabitants are not willing to assist their fathers in this work because of the low income which does not commensurate the hard work of carrying heavy loads over long distances. After graduating from school, the younger generation often leaves the community to migrate and work in the city.

Unprocessed nuts are sold soon after harvesting to middlemen at the local harbour. Historically, Brazil nut harvesters are used to working independently. The price of the nuts is set by the middlemen and the harvesters do not have the market information on the current price of the nuts and do not negotiate on the price offered. If one harvester does not sell for the suggested selling price, the middleman will buy from another harvester for the price he sets. The harvesters have no means to increase their income because they do not have any other platform to sell their produce.

We suggested that the harvesters store the Brazil nuts after harvesting and sell them between seasons for a higher price. Unfortunately, the inhabitants could not afford to wait and store the products as they had no savings and needed the money immediately. Lack of storage facilities was also a hindrance to support this move. Storing without sufficient air circulation can cause the nuts to produce toxic fungi. The community members could also increase the selling price of the nuts by adding value to the products through processing, receiving certification, marketing, and selling direct to consumers instead going through the middlemen. Adding value to Brazil nuts not only requires investments in storage and processing facilities, but also in attracting engineers and managers. This was not an option for the forest communities because the initial capital for storage or processing of nuts was beyond their means. They also lacked knowledge in organising and selling the products.

We interviewed nut harvesters of São Carlos Brazil on the prices they received for the unprocessed Brazil nuts during the harvesting season and between the seasons and compared the price with those in Porto Velho, São Paulo, Brazil and Berlin, Germany. The differences in

price are presented in Figure 3. The selling price of Brazil nuts depended on the value addition including the shelling and the vacuum packaging and the natural supply of the nuts. In the local market of Porto Velho, when nuts are shelled and vacuum packed, the price can increase more than threefold.

Organisation of Brazil nut harvesters

In July 2008, following the Fair Trade concept, we organised a group of Brazil nut harvesters to improve working conditions and negotiation power of the producers. Although there were only three persons willing to participate in the workshops initially, a strong motivated group has been established since. Good practices for sustainable Brazil nut harvesting have been discussed with the harvesters and adjusted to the preferences of the communities. Following the mouth to mouth propaganda of the motivated core team and the encouraging first year results, more harvesters joined the team, which eventually had 12 members by summer 2009. By the year 2009, one additional member from São Carlos do Jamari joined the group and eight new members came from Cuniã. In 2010, with support from NAPRA, the group was legally registered as an independent association, i.e. the Association of Arts and Brazil Nuts of São Carlos do Jamari and Cuniã.

In 2012, the Association of Arts and Brazil Nuts, with assistance from NAPRA, received financial support from the Ecumenical Coordination Service for the construction of a storehouse in Cuniã. The Brazil Nut Group constructed the storehouse themselves. In the winter of 2013/2014, the São Carlos do Jamari community was flooded completely and the inhabitants had to be evacuated. Meanwhile Cuniã was partly flooded and its people were able to continue working with the Brazil Nut Group, which by then had 20 families as members. The storehouse in Cuniã is located on dry land and not affected by the flood. Throughout the floods, the storehouse was easily accessible by boat. The organisation of the harvesters was the first significant step towards implementation of economic interventions.

Economic experiment

The economic experiment started in 2008 and consisted of three stages, in terms of financing and methodical support including the main

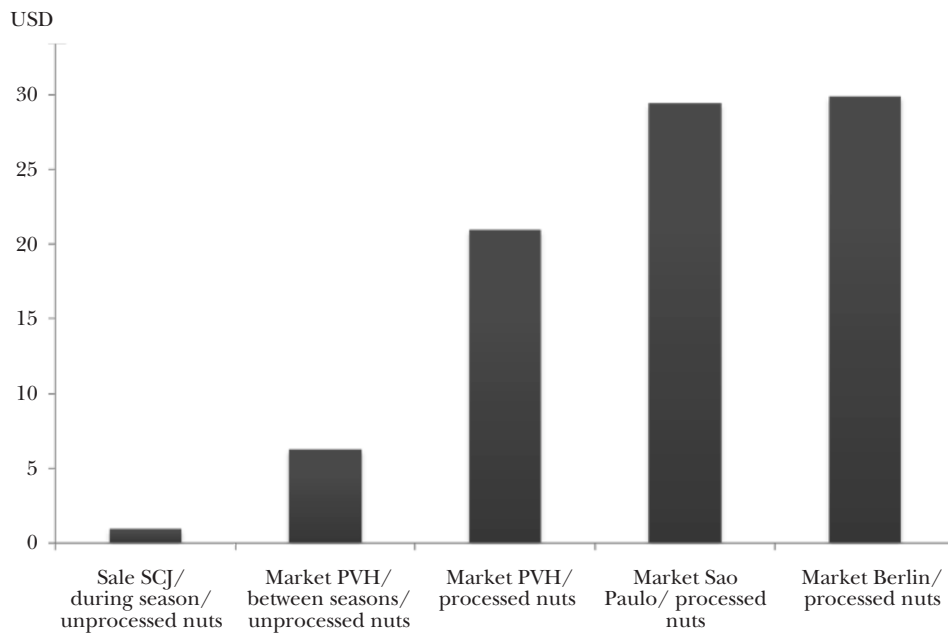


Figure 3 Price of Brazil nut depending on season, processing and selling market per kg (own research results from interviews with Brazil nut traders in 2009); SCJ = São Carlos do Jamari, PVH = Porto Velho; transportation costs are not included

components of the Fair Trade concept such as fixing a minimum selling price for the Brazil nuts, support from producers through provision of pre-financing and initiating reliable trade relationships between the producers and the customers. As the harvesters of Brazil nuts depended on immediate income sale, we provided pre-financing capital for the payments to them immediately after harvesting. This capital allowed the harvesters to store the nuts while waiting for higher selling price between harvesting seasons. The harvesters were supposed to receive the income twice, i.e. first, after harvesting when delivering the nuts to the storage facility, and second, after the final sale to the wholesale buyer between the harvesting seasons.

One member of the group was elected as manager and one as accountant. The rules of the group required to have quarterly meetings to discuss the volume of nuts being stored, how many members collected the nuts, the current market prices and the flow of funds. Three different interventions were undertaken with the growing group of Brazil nut harvesters. The first intervention was initiated in 2008 and 2009. It included non-refundable pre-financing of R\$716 (USD470) in 2008 and R\$3757 (USD2005) in 2009. The second initiative included a refundable investment of R\$5000

(USD2200) with continuous support from an environmental technician in 2013/2014. The third intervention was a refundable investment of R\$40,000 (USD11,600) with non-continuous support from an environmental technician in 2014/2015 (Table 1).

First intervention (2008–2009): non-refundable investment into the self-organisation with initial intervention

In the year 2008, USD470 was given to the Brazil Nut Group with the goal of letting the group members collect the nuts during the season, store the nuts, receive payments with a price difference of R\$2 lata⁻¹ (1 lata is about 10 kg or 20 liter) above the local market price and wait for a higher price in-between seasons for the final sale of the product. By the year 2009, one of first three members had received payments and brought nuts for storage. All three members had difficulties in collecting the nuts because fruit productivity was low in 2008/2009. In-between seasons, it was difficult for the members to decide when to sell the stored nuts. They missed the highest price of R\$22 lata⁻¹ in July 2009 and sold the nuts only in October 2009 at R\$20 lata⁻¹. Due to different levels of humidity and weight variations, lata has proved to be a reliable measurement.

Table 1 Overview of case studies

Investment features	Intervention		
	First 2008–2009	Second 2013–2014	Third 2014–2015
Type of investment	Non-refundable	Refundable	Refundable
Size of investment (USD)	2470	2200	11,600
Source of investment	Private	Private	CONAB
Organiser	Researchers and NAPRA	NAPRA	NAPRA
Support	Initial	Continuous	Limited
Outcome	Funds partly lost	Funds increased	Funds increased/partly lost

Additional pre-financing of USD2005 was given for the continuation of the storage project to the group of 12 members in 2009. The accountant received the funds and was supposed to use them as initial capital to pay harvesters when they brought the nuts for storage. Unfortunately, the banking infrastructure in the remote community region was not developed and the accountant was unwilling to keep the funds at home. He decided to distribute the funds equally between the group members before the harvesting season. The harvesters agreed to deliver the nuts once the harvesting season started. With that, an informal system of prepayment was established because harvesters had the possibility to receive money in exchange for a set amount of nuts to be harvested in the future. The harvesters used the funds mostly for personal needs and purchase of new equipment for work such as machete, boots, knife or improvement of boat (e.g. repairing the motor).

In September 2009, each team member received R\$500 (USD270). In the harvesting season of 2009/2010, the group members were not able to collect sufficient amount of nuts due to the unproductive season. In the harvesting season of the years 2010/2011 eight group members harvested the set amount of nuts, i.e. 50 latas. There was a hitch when two members who had received the funds did not bring in collected nuts nor return the funds. The group was not prepared for such a stumbling block and had no means of how to counteract and reclaim the funds. The problem was solved when the two members in question finally returned the funds they received. In August 2011, the team sold the nuts for R\$25 lata⁻¹ (USD14), making an average profit of R\$500 family⁻¹ (USD286) (Table 2).

The meetings continued until the end of 2009. The manager did not arrange for any new appointment and the group was not informed about the actual financial situation. This has led to increasing mistrust towards the accountant. Since the year 2009, there was no election for the post of accountant or manager. Living in São Carlos, the manager had difficulties commuting to Cuniã in order to control the accountant and to organise group meetings. The funds have since been spent on unclear matters.

Second intervention (2013–2014): refundable investment with support from an environmental technician

In the year 2014, the environmental technician employed by NAPRA raised R\$5000 (USD2200) from private supporters. This fund was used as initial capital. Together with the accountant, the technician paid the harvesters R\$20 lata⁻¹ which was R\$9 lata⁻¹ above the local market price but only when the nuts were delivered to the storehouse. In that way they could overcome the problem of members not harvesting or returning funds. Some of the harvesters were unsatisfied with this approach. They argued that being paid after harvesting made the accountant no different from a middleman. They were also unhappy about not receiving prepayment. On top of that, they were unable to purchase any equipment needed for the next harvesting season. A total of 10 families participated in this programme and accumulated 2 tonnes of Brazil nuts. Immediately after collection they received R\$20 lata⁻¹ and an additional R\$10 lata⁻¹ between the harvesting seasons after the final sale. The harvesters could afford to return the initial capital received (Table 2).

Table 2 Group dynamics and income flow from the sales of Brazil nuts from 2008 till 2015

Group dynamics and income flow	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015
Exchange rate for 1R\$ (USD)	0.64	0.54	0.57	0.64	0.49	0.44	0.44
Investment (R\$)	730	3713				5000	40,000
No. of group members	3	12	12	10	10	20	20
No. of harvesters during season	1	0	8	5	6	10	20
Brazil nuts collected (lata)	50	0	400	100	120	200	2000
Price paid by the middlemen (R\$ lata ⁻¹)	8	0	8	8	8	11	11
Price paid straight after harvesting (R\$ lata ⁻¹)	12	0	12	12	12	20	20
Selling price (R\$ lata ⁻¹)	20	0	25	30	35	30	45
Total income (R\$ lata ⁻¹)	1000	0	10,000	3000	4200	6000	90,000
Additional expenses (R\$ lata ⁻¹)	3	0	3	3	3	3	10
Total additional expenses (R\$)	150	0	1200	300	360	600	20,000
Total revenue (R\$)	250	0	4000	1500	2400	1400	8700
Average revenue (R\$ family ⁻¹)	250	0	500	300	400	140	435

Third intervention (2014–2015): refundable investment with limited support from an environmental technician

In 2015, with assistance from an environmental technician, the team received a credit of R\$40,000 (USD11,600) from the Brazilian National Supply Company (CONAB). This credit was for the stock of products such as Brazil nuts which selling price varied immensely between harvesting and non-harvesting seasons. The Brazil Nut Group managed to harvest 20 tonnes of nuts during the harvesting season of 2014/2015. They received R\$20 lata⁻¹ during the harvesting season which was R\$9 lata⁻¹ above the local market price. As the capacity of the storehouse and the initial capital of this season were high, 20 families of Cuniã were active in harvesting Brazil nuts. The harvesters discovered new forest territories for collection of nuts and were travelling up to one day to reach remote abandoned forest areas for harvesting, including three of the most distant Brazil nut groves. The harvesters acquired greater control over their forest territory.

The technical assistant managed to sell the nuts partly for a price of R\$50 lata⁻¹ and partly for R\$40 lata⁻¹ between the harvesting seasons in 2015. Unfortunately, the technical assistant had to leave the community for two months and a politician from the community

assigned himself as an additional accountant of the group and acquired R\$3000 (USD870) from the group's income. Additional expenses for the sale of the nuts including the cost for packaging and transportation rose from the usual R\$3 lata⁻¹ to R\$10 lata⁻¹ without the support from a technical assistant (Table 2). After the sale, the harvesters could pay back the USD11,600 they received from CONAB and still gained USD191 family⁻¹.

Control group

In the control group, harvesters continued working independently and selling the nuts to the middlemen on the riverbank for the price set by the latter during the harvesting season (Table 2). Once the Brazil Nut Group moved totally to the Cuniã community more Brazil nut harvesters were willing to participate in the group. Around 10 remaining Brazil nut harvesters of Cuniã were not willing to become part of the group. Some of them were related with the middlemen and/or did not wish to sever the relationship. In many cases the middlemen provided capital or the required paraphernalia to the harvesters before harvesting season. Some harvesters regarded being part of the Brazil Nut Group as burdensome especially since the middlemen would buy the nuts directly from their houses. As

the Cuniã community was dispersed around the Cuniã lake, harvesters living nearby the Madeira River preferred selling their products to the middlemen who passed the Madeira River.

DISCUSSION

This research showed that there was a relationship between the pre-financing amount, the number of group members and the observed forest territory. The larger the investment, the more harvesters were willing to become group members and the larger the forest territory utilised for harvesting Brazil nuts. Another relationship existed between the continuity of the technical support and the income of the Brazil nut harvesters. Since the initial establishment of the group in 2008, the group was not able to become independent of the external support. As soon as the support stopped, difficulties emerged such as the acquisition of funds by an outside party or decrease in motivation to continue working. Rural community enterprises only reach maturity after two to five decades of operation (Stoian et al. 2009, Donovan et al. 2006, 2008).

Interventions generated endogenous rural development with increased income for the harvesters, formation of a legally registered Brazil nut association, establishment of new infrastructure such as the storage room in Cuniã and larger forest territory managed by the community. The Brazil nut enterprise can be classified as a form of solidarity economy. The establishment of the Brazil Nut Group and the provision of pre-financing capital has led to new interpersonal relationships as well as social conflicts between group members. There was increasing mistrust towards the accountant and the exclusion of group members for not paying back the funds. According to rural sociology studies, these occurrences are rare (Bell & Newby 2012, Yang et al. 2013). Internal conflicts occurred when the environmental technician had to leave the Brazil Nut Group for some time. To overcome these tensions, the presence of a person who can guide the group throughout the initial phase of enterprise establishment is essential. Technical guidance is also important for obtaining pre-financing in the stock of Brazil nuts. Receiving credits as initial capital was impossible without external support due to the administrative barriers throughout the application process.

The eager participation showed by the people of Cuniã and the transfer of the Brazil Nut Group from São Carlos do Jamari to Cuniã proved the importance of property rights. Similar to the findings by Cunningham (2011) and Donovan et al. (2006), our research showed that granting and enforcing legal access to forest resources are important requirements for the motivation and willingness to work with Brazil nuts as well as to manage the forest sustainably.

CONCLUSIONS

With the help of organisational support and external investments the Brazil nut harvesters were able to organise and discover new forest territories for larger Brazil nut collection and to increase their income. Throughout the interventions and the longevity of the Brazil nut project, continuous external organisational and accounting assistance was required. Human capital such as technical, marketing and organisational assistance was of the essence and equally important as financial capital. A responsible, knowledgeable and trustable person was indispensable in assisting the community throughout the establishment and the first few years of running a small-scale enterprise.

Although the Brazil Nut Group was established in São Carlos, after the first year, through mouth to mouth propaganda most new team members came from Cuniã. Due to clear legal rights, Cuniã's inhabitants were able to receive funds, identify a location and construct a storehouse. The motivation in working and sustainable harvesting was higher in Cuniã due to clear land tenure and a feeling of responsibility for the territory they can legally use.

After the interventions the Brazil Nut Group had explored larger forest territory. The pre-financing capital stimulated the group members to rediscover three abandoned distant Brazil nut groves that they eventually managed. The described interventions showed that the analysed forest communities were willing to accept and embrace changes in their daily economic activities. Although only three members were willing to participate initially, high level of motivation of the group members encouraged more to participate in the programme. In order to develop sustainable sources of income for forest communities, focus should be given to work that deals with various NTFPs. Concentrating on

only one product, as in our case on Brazil nuts, has some drawbacks. The nut is a seasonal source of income which may not be sufficient to sustain the families throughout the year. Also, serious income deficit can arise when the Brazil nut prices drop in a peak year or the supply drops during an unfruitful season as in 2009. As most of the currently economically valuable NTFP are seasonal, the aim should be to establish value chains for various NTFPs which could provide a year-long employment.

Support from the government in the establishment of small-scale forest enterprises is important. This support might be similar to the support provided by the Brazilian government for agriculture and cattle farming including the supply of technical assistance and transportation, financing the stock formation with low administrative barriers and cutting taxes. This support would result in forest conservation and simultaneously lead to increase in income of local inhabitants.

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