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Pequi (*Caryocar coriaceum* Wittm.) extrativism: situation and perspectives for its sustainability in Cariri Cearense, Brazil

Extractivismo del pequi (*Caryocar coriaceum* Wittm.): situación y perspectivas para su sostenibilidad en Cariri Cearense, Brasil

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Abstract

Considering the plant richness of Chapada do Araripe, Brazil, the pequi (*Caryocar coriaceum* Wittm) extractivism occurs as an important activity that affects the economy and social life of the main cities of Cearense Cariri, although there is little knowledge about its current situation and sustainability perspective. The aim of this work is to collect information regarding actor relationships involved in the pequi extractive activity, relating them to the sustainability dimensions. This study was carried in the Barreiro Novo camping site, located in the state highway CE 060 in the Jardim-Ce municipality. Semistructured questionnaires were used with pequi collectors to establish a socioeconomic profile, besides using the participant observation method, pictures and content analysis in order to relate and identify the sustainability in this environment. Extractivism activity in the Chapada do Araripe region is something cultural, which has a special vision towards environmental issues that generates income for extrastivist families. However, the region needs policies for improving social conditions (water and sanitation in the camping site) and keeping the tradition without missing the environmental perspective.

Keywords: Agricultural waste; community; regional development; oil; NTFP; FLONA.

Resumen

En Chapada do Araripe, región del Brazil con una gran riqueza vegetal, el extractivismo del pequi es una importante actividad que abarca la economía y la vida social de las principales ciudades del Cariri Cearense. Sin embargo, aún existe poco conocimiento sobre su situación actual y perspectiva de sostenibilidad. El objetivo de este estudio es recoger información sobre la relación de los actores involucrados en la actividad extractivista del pequi, y relacionarlos con dimensiones de sostenibilidad. Este estudio se llevó a cabo en el Campamento Barreiro Novo, localizado en la ruta estatal CE 060 en el municipio de Jardim-Ce. Se aplicaron cuestionarios semi-estructurados a los recolectores de pequi para formar un perfil socioeconómico, además de utilizar el método de la observación participativa, fotos y análisis de contenido como forma de relacionar e identificar las dimensiones de la sostenibilidad introducidas en ese ambiente. La actividad extractivista del pequi en la región de Chapada do Araripe es algo cultural que posee una visión especial en relación al enfoque ambiental y que genera ingresos para las familias que la practican. Sin embargo, la misma precisa de políticas para mejorar las condiciones sociales (agua y saneamiento en el campamento) y para preservar la tradición sin perder el punto de vista ambiental.

Palabras clave: Residuos agrícolas; comunidad; desarrollo regional; aceite; PFNM; FLONA.

Introduction

Extractivism is the name given to the removal of non-timber forest products, such as latex, resins, oils, nuts, among others, which have great sustainable use perspectives. Among the species included in this perspective we find pequi (*Caryocar coriaceum* Wittm), a plant native to the Brazilian northeast found in the Chapada do Araripe region; this region, due to its geographical characteristics, has a rather humid and rainy climate in comparison to other areas in the northeastern region; moreover, it is considered a favorable region for pequi production.

In the Chapada do Araripe region, the Araripe National Forest (FLONA) area is located covering an area of 262.37 hectares and a perimeter of 138 kilometers belonging to the municipalities of Crato, Barbalha and Santana do Cariri in the State of Ceara. This conservation unit was the first national forest created in Brazil with a vegetation coverage known as "cerrado" or Brazilian Savanna; in this area vegetation cover transitions between semi-evergreen rainforest and cerrado (IBAMA, 2010). FLONA is a conservation unit created in 1946 by the Federal Government, aiming to protect fauna and flora, adjusting also the interaction between conservation of natural resources and the extractivism activities carried out by ca. 20 communities who live nearby, and that historically have extracted pequi (Gonçalves, 2008).

Moreover, most of the people living in Chapada do Araripe obtain their income from pequi extractive activities, which occurs during the collection period from December to April. Families of extractive communities near the Chapada establish camping sites in precarious situations around the rainforest to facilitate fruit collection and trading; furthermore, these activities are passed on from one generation to the next.

Despite the information that can be obtained on pequi extractivism activity, there is still little awareness of the current situation and perspectives for its sustainability in the Cearense Cariri.

The pequi is a species of socioeconomic importance that include a set of activities as collection, transportation, processing, trading and consumption of the fruit "in natura" and its derivatives.

Considering the above mentioned, the aim of this study is to observe the relationships between the actors involved in all steps of the pequi extractive activity, from collection, to transportation, processing and selling, but always relating them to the sustainability dimensions.

Material and Methods

Characterization of Barreiro Novo camping site

This work was carried out in the Barreiro Novo camping site, located on the state highway CE 060, in the municipality of Jardim-CE; the site is considered a landscape unit located at the border of the Araripe National Forest (FLONA). This is however, the location where collectors usually build small mud shacks covered with straw to camp, in order to optimize pequi collection activities during the entire period, facilitating access to the intended vegetal resources.

Residents from the community of Cacimbas (07º 29' 36.9" S, and 39º 22' 02.6" W) located in the municipality of Jardim Ceará, in the region of Chapada do Araripe, live in this camping site. Furthermore, Chapada do Araripe is located among the borders of Ceará, Pernambuco and Piauí states, and is comprised of various vegetal formations, each having specific biotic and abiotic factors including: semi-evergreen rainforest, transitional vegetation between rainforest and cerrado, carrasco vegetation, and rainforest with fire incidences (IBAMA, 2010).

It is under the perspective of evaluating the potential of pequi exctractivism in the region of Cariri and considering a sustainability dimension interface, that the aim of this study is to understand pequi extractive activity carried out in the Barreiro Novo camping site. Moreover, this camping site, with a capacity for 20 families, is comprised by residents from the community of Cacimbas, located in the city of Jardim, in order to improve the activity conditions and increase family income.

Pequi extractivism and its sustainability

This study is both qualitative as well as quantitative, and according to Minayo (2009), these approaches are complementary, considering that the reality of both interacts dynamically. The frist step in this study, is to collect information about the pequi extraction activity in the Araripe National Forest, whilst focusing on understanding the reality of the extracting workers that settle in the Barreiro Novo camping site during collection times. In this point, we want extraction workers to talk about their daily life, their working practices and the sustainable development of the region. It is worth mentioning that before taking any step, a previous recognition of the site was carried out observing viability traits of the study site, practices performed by the extracting actors and pequi removal periods.

Information was registered using notepads and photographic cameras. During data collection,

semistructured questionnaires were applied to the pequi collectors in the Barreiro Novo camping site. Questionnaires were used to establish the socioeconomic profile of pequi collectors, gathering the following information: marital status, age, average family income and schooling level; in addition to the existing problems regarding crop cultivation, e.g. saleablility of derivative pequi products, monetary profit through pequi sale, difficulties while extracting the fruit and what is done with the residues of their activity.

Social and cultural sustainability

As pequi extraction is part of the culture of the people of the region, fruit extraction is an annual and fixed activity in their calendar, included as well in their traditional celebrations. Thus, the intention is to gather more information about the reality of this activity under the perspective of the extractive workers, relating this to socio-cultural factors such as popular knowledge, beliefs and values of these actors with the already known concepts of sustainability, through observation, pictures and interviews, which is considered a modality of interaction that takes two or more people.

Environmental sustainability

Interviews considering the observations carried out as well as pictures taken, led to gathering enough data —that with the use of a content analysis technique— to address environmental impact regarding deforestation, pollution, vegetation endangerement and final destiny of garbage throughout the pequi extractive activity at Barreiro Novo camping site.

Economic sustainability

In order to accomplish the research objective in this study, income profile of the extractive workers had to be established, as well as the forms (in natura/oil/almond) in which pequi is sold and the way in which trading occurs, i.e. through pictures, news and interviews.

Results

Social and cultural dimension

The community of Cacimbas is one of the biggest and oldest settlements compared to other communities that are part of the Araripe National Forest (FLONA) and the Area of Environmental Protection of Araripe (APA-Araripe), and that have as residents, a considerable number of extractive workers; these actors have historical memories and experiences in relation to the beginning of the practices in the region, which according to the campers, happened probably at some point during the eighties.

Some decades ago, the camping site was established inside the forest, carrying out their activities in an unsustainable way to the native forest, and therefore, as a preventive measure, IBAMA (for its acronym in Portoguese) [the Brazilian Institute of Environment and Natural Renewable Resources] prohibited people to stay for long periods of time in the area, as well as to use oxens and carts within the protected area. Thus, a mobilization was carried out by all the residents to prevent this tradition from dying; then, a local politician touched by the fight of the community, donated lands that are located at the surroundings of FLONA, besides the CE 060 highway, and planted the first stone for the creation of the Barreiro Novo camping site.

Furthermore, this camping site is basically the home of extractive workers during the pequi collection period, as entire families move there. Men are responsible for the hard work of transporting and selling pequi, and women, with the help of children, are responsible for entering the forest to collect fallen pequizeiro fruits and for their processing, i.e. “rolling” and oil production.

Rolling consists in separating the stones from the peels, and with the help of a knife, the peel is cut in two parts; care must be taken not to cut the stone, and then, when a light pressure is applied, the stone is detached (Figure 1). Oil can be extracted from the stone or the almond, i.e. the desired part is taken to a large pan and cooked for hours until it is possible to manually separate the oil from the residues.

Figure 1. Extractive worker performing pequi rolling in Barreiro Novo camping site in 2016.

In this study we interviewed 14 families in the community of Cacimbas that had already settled taipa (a material made of soil and earth) tents in Barreiro Novo camping site. Interviewees were

extractors from any age group until 70 years of age. When questioned about access to school, the oldest respondents answered that they were not literate, but others had completed high-school.

Living at the camping site means the continuity of their activities, i.e. those learned from their families since early childhood, and others that are continuous to improve projects in the location. This is especially true when there are financial resources accessible and compatible with their needs, as well as someone able to help and think about these improvements; these can be simple things such as the improvement or the complete modification of the uncomfortable taipa tents into taipa houses, that would increase safety conditions for families, as well as the possibility to obtain better water quality for the area and for their extraction activities.

In this regard, the social dimension aims at improving condition equality, i.e. access to goods, and good quality on basic services for a decent living.

Moreover, results showed that only three families questioned the fact that they were part of an association and they complained about the work developed by it within the community; they claimed that it is difficult to use the equipment provided for pequi processing.

When the pequi collection period ends, it is marked by a cultural event known as the traditional "Pequizeiros Ranch Party" that in 2015 was celebrated the 22-23 of March. During these two days different activities as a Holy Thanksgiving Mass is celebrated regarding pequi collection, there are 48 hours of forró and an oxen catch competition, i.e. traditional activities of farms from Serra do Araripe (moutain range), where cowboys of the region are invited to catch an oxen that has been released.

In this aspect we can see the cultural dimension interlacing itself with the social dimension. However, in order to reach this integrated dimension, it is necessary to have policies that value, spread and ensure that everybody has access to what states to be traditional, both in the urban as well as in the rural environment. This reality was highlighted during the celebration, in which pequi collectors could be distinguished from neighboring city dwellers, as they gathered and exchanged experiences, celebrating one more year of collection. Moreover, this was a space for celebrating, giving thanks, reuniting with friends and family, and being cheerfully interlaced with the local culture. In Figure 2A and 2B we can see pictures of the traditional cowboys on their horses, the pequizeiros and many people having fun during the "Pequizeiros Ranch Party".

Figure 2. "Pequizeiros' Ranch Party", 23 of March 2016. (above) Pezquizeiros and local people; (below): traditional cowboys.

Environmental dimension

In order to establish the environmental interactions in the camping site, testimonies of family members settled at the field site were essential, as they are the main environmental change actors, with their activities related to the extractivism in a higher or lower degree, depending on the rationality (degradation or sustainability) of their techniques.

The knowledge these actors have is formed throughout the history, from sustainable local resources management forms, together with symbolic formulations and local practices learned from the exchange of knowledge among generations. Moreover, it is impotant that these values are not lost solely because biodiversity was not properly valued and also due to role redefinition of each actor in this process, and fully valuing cultural differences.

Moreover, interaction of campers with the local community is of great importance, considering that it is essential for the good relation with the local fauna and flora, as they spend a considerable amount of time inside the native forest collecting fruits.

Some of the interviewed, while talking about the forest and the way they see their relationship with nature, consider the forest as their home, a place where they will spend their whole life, where they have learned to deal with life, and where they make a living. They however regret the decrease in the amount of pequi collected as it was lower than in the previous year, and argue about the rules established by IBAMA, hoping that local authorities tackle this issue.

Nevertheless, the IBAMA 9.985 prohibition of the 18th of July 2000, which prohibits practices or activities that hinder natural regeneration of the regional ecosystem, established that the entrance of cattle in the forest became impossible; this was however, a common practice carried out by extractors because the oxes opened the way in the forest so the collectors could easily mobilize to pequi areas. When this prohibition was established, many complaints arose as it became the main obstacle for their extractive activity.

Furthermore, another difficulty reported by extractors was the lack of drinking water at the camping site, which makes the stay of extractive workers, their families and their oil extraction production much harder. To solve this issue, the community is supplied with water by tank trucks; however, this is seldom done because women usually are the ones in charge of getting water that is used for drinking, cooking, personal hygiene and pequi oil production.

All these issues aforementioned express the need to link these with a rationality dialog that includes the sustainability dimension, in order to urgently generate adequate actions to deal with the current environmental situation, announcing models that can positively influence the actors involved.

Furthermore, the residues resulting from this extractivism activity are an issue of warning, as they accumulate around the camping site, behind the tents, and in short term, inside the forest causing discomfort, such as bad smells and slurry residues (dark liquid with nauseating smell, resulting from biologic, chemical and physical processes within organic residues), as well as the propagation of insects and other pests, for the people who stay at the camping site; moreover, this will at some point cause environmental imbalance and will show an unpleasant image of the FLONA surroundings.

In this sense, when questioned whether extractors knew about the use of these residues in agriculture or for animal diets, all claimed they knew about their use in agriculture as a compound or through incorporation to the soil, and for porcine and bovine feeding. By cross-checking this information, it was possible to establish that there is a neglect to solve this residue problem from both sides, i.e. from the extractive workers side, and from the public authorities side, considering that both sides know methods to solve this problem.

Economic dimension

In order to understand the economic dimension of pequi extraction, the aim was to characterize the selling procedure of pequi fruits in the Barreiro Novo camping site, besides other family activities carried out in the off-season period. Extractive activities are economically feasible when the production, productivity and income are kept through time, even in face of social and ecological pressures.

Extractive activity performed at the camping site in the period from December to March is focused on pequi collection. According to the interviewees, collection period 2015/2016 was not good and the reasons stated are either lack of rainfall or the forest is more dense than in the previous years.

Families that settle in the camping site are comprised by people of all ages finding even extractors of 70 years of age; each family has in average five family members, of which at least three contribute to family income. Moreover, it is possible to note from the interviewes carried out, that pequi collection activities involve both spouses.

In addition, all the pequi collected is sold at the camping site. The fruits are stacked very close to the CE 060 highway (Figure 3), so drivers that pass by can see the produce and if interested, they stop and buy the product. This is one of the reasons why the camping site is so attractive for the families, as it makes product selling easier.

Figure 3. Selling pequi at Barreiro Novo camping site located on the state highway CE-060 in 2016.

Another important feature regarding pequi commercialization is processing; all the families that live in the camping site carry out fruit rolling, which generates higher income over the product. On the contrary, families who produce pequi almond oil are just a few and they mention that this is basically an activity carried out by women, and even older women are able to elaborate oil; however, as it is a laborious activity, younger women tend to not want to engage in this activity

When male interviewees were asked about what is more viable, i.e. selling pequi in natura or processed, they claimed that they preferred trading it in natura because processing is laborious and it also falls into the category of women responsibility. Oil extraction is a laborious activity because women mentioned that it is necessary to cook the fruit for one hour and then grate it. Once it has been grated, it has to be placed in water over the fire. After ca. fifty minutes the oil can be separated from the water with the help of a bowl; then the oil is bottled and can be sold. However, pequi extractors mentioned that the almond oil is purer as it is visualy clearer and the almond needs to be removed from inside the fruit. Such activities demands care and experience because the fruit has thorns between the pulp and the almond (Figure 4).

Figure 4. Pequi cooking for oil production, Barreiro Novo camping site in 2016.

Only one of the collectors was willing to tell us about the profits obtained in the collection period during year of 2014 (the last year prior to the interview), this collector reported a profit of ca. R$10.000 (ten thousand BRL) attributing this value to almond oil sale; this is a much more expensive product and was sold to a company outside the State. However, all the collectors of the community reported that the pequi collection for year 2014 was significantly better than the one achieved in 2015.

However, even though they have this product nearby, the extractive workers reported that only the non-traded fruits that are not used for oil extraction are destined for their own family consumption, showing there is no equity regarding consumption and selling.

Extractivism takes about 70 % to 80 % of the family income (Figure 5), having as complementary income government assistance programs such as Bolsa Família, social security, livestock, which was mentioned to a lesser extent, and agriculture, recalled by every family interviewed.

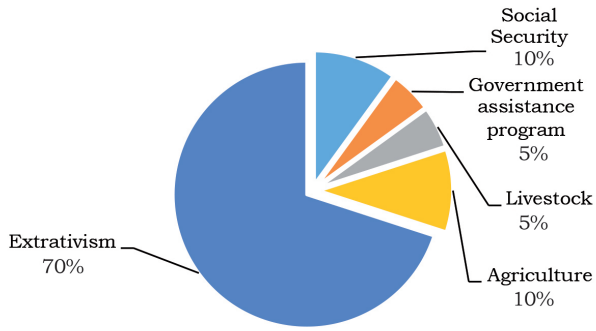

Figure 5. Income profile of average extractive worker families at Barreiro Novo camping site.

Discussion

Social and cultural dimension

The importance given by the collectors to the camping site is a tradition; they frequently recall in conversations that they settled there since childhood and that such practices occurred longer before they were even born. This information agrees with the work published by Gonçalves (2008), who studied the pequizeiros or pequi extractors of Chapada do Araripe.

This idea and explanation extractors have regarding their practice shows that culture is much more than knowledge regarding people and it is even more than just inheritance; it is in fact the accomplishments of a population being everlastingly acknowledged. Laraia (2006), says that culture, more than genetic inheritance, determines the behavior of men and justifies its implementation. This is a cumulative process, resulting from all past experience of previous generations. Such processes either limits or stimulates the creative action of the actor involved.

Furthermore, reaching progress towards sustainability is clearly a choice made by

societies, organizations, communities and individuals. Considering that it takes various choices, changing is only possible if there is a strong engagement of society. In order to achieve such a purpose, according to Sen (2010), it is necessary to end poverty, tyranny, deprivation of economic opportunities and neglecting public services, intolerance or the excessive interference of repressive states.

Regarding association of extraction workers, few complained about the work developed by the association within the community; they claimed that it is difficult to use the equipment provided for pequi processing. On the other side, maybe the association had difficulties in really obtaining an effective participation of the community, especially in task divisions regarding equipment use for pequi processing. Thus, even though it is assumed that in associative practices "us", i.e. the collective must overcome "I", i.e. the individual to assure the communal interests, this dinamic does not always happen reality (Veiga & Rech, 2001). As a general rule, there are still many difficulties for the associates especially when referring to empowerment, i.e. to "feel like owners", which means, according to Rech (2005), getting involved with their common destinies, sharing the decisions of group interests.

In summary, the sustainable development forces society to think in the long term and to acknowledge its place inside the biosphere. The concept provides a new perspective of how the world is seen, and this new way has shown that the current ways of human activities are inadequate to meet the current demands. Moreover, such ways are seriously threatening the life perspectives of future generations (Bellen, 2010).

Environmental dimension

Environmental sustainability in productive processes states that as they are human generated activities, these must protect, avoid degradation, cause minimum negative impact in the environment and, if possible, recover the natural resources used (Marcatto, 2006). Moreover, environmental sustainability is based on the maintenance and recomposition capacity of ecosystems against human abuse (Campolina, 2005). Likewise, Leff (2004) reinforces a crucial point: local environmental management is based on the environmental knowledge of the communities.

Following these ideas, the actors of this research were questioned about what is done with pequi residues; most extractive workers reported that they throw away both oil sludges as well as peels to the surrounding camping site environment. However, others reported that they make soap with the sludges or use it to feed animals, and the peels are used as fertilizer, being thrown on crops without any previous decomposition process.

Ecological sustainability is an issue that raises less controversy, after all, it is related to a certain balance and maintenance of ecosystems and abiotic resources, as well as genetic conservation and climate integrity (Foladori, 2002). Whilst the most efficient environmental policy is the one that creates the conditions through pricing processes, so the economic agents "internalize" degradation costs they cause. Ensuring the "sustainability" would be, ultimately, a problem of intertemporal resources allocation between consumption and investment by rational economic agents, whose motivations are fundamentally maximizing utility (Romeiro, 2012).

Economic dimension

Martins (2006) and Marcatto (2006), discuss that the sustainability of sociocultural factors must be built in a democratic and participative way, in ways that knowledge can be shared. This is also linked to the possibility of the community accessing soil, water and other resources and products. It is also important to consider that the activities performed create jobs and satisfies basic human needs such as food safety, housing and life quality, preserving culture and genetic resources.

Conclusions

When pequi production period ranging from December to April begins, the habits of many residents of the Cacimbas community changes as they need to settle nearby FLONA to be physically closer to fruit collection and selling sites; this scenario pictures the connection that extractive workers have with this culture and with the camping site, emphasizing associations with other campers, even if these are not always free of obstacles.

In addition to being a cultural practice, pequi collection activities also have significant family economy participation, and is considered the main source of income for members of Barreiro Novo camping site; these families sell pequi in natura as well as processed (oil, almond and as stones, i.e. peeled).

This activity has a very strong environmental dimension, but there are still some points to be worked on, such as lack of selective waste collection and the reuse of pequi residues by campers. Even though they know at least one use for the pequi peels, the extractive workers

do not perform any; this leads us to believe that there is lack of interest from their part in solving this problem. An alternative for this problem is using the residues (peels) for a substrate to be later used for horticultural seedlings.

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