



Cost of opportunity: economic competitiveness of community forest management by land use

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ABSTRACT: The structuring of a consolidated forest economy in the Amazon region would be an unprecedented contribution to the conservation and socioeconomics of the rural community. Therefore, the objective of this work was to conduct a literature review on the economic competitiveness of multiple-use community-forest management by land use in the Amazon region and thus elucidate the main causes and possible solutions for strengthening and enhancing a family-based forest economy in the region. Studies reported that despite the importance of the forest, the financial attractiveness of forest production under community-forest management was relatively limited when compared to other land-use options, such as agriculture. This was due to a set of factors, such as high initial or administrative costs, the demand for constant subsidies, low product prices, big challenges regarding infrastructure, and the long and bureaucratic process involved in obtaining the documentation necessary to establish a management plan. Thus, to effectively opt for forest management, it is necessary to focus on the planning of exploration, production control, insertion of new technologies and, forestry policy that aim to realize an orientation for multiple forest uses within the communities.

Keywords: management, family production, multiple use.

Custo de oportunidade: competitividade econômica
do manejo florestal comunitário em relação aos usos da terra

RESUMO: A estruturação de uma economia florestal consolidada na região amazônica seria uma contribuição sem precedentes para a conservação e benefícios socioeconômicos a comunidade rural. Assim, este trabalho teve como objetivo realizar uma revisão bibliográfica sobre competitividade econômica do manejo florestal comunitário de uso múltiplo em relação aos diferentes usos da terra na Amazônia, elucidando as principais causas e possíveis soluções para o fortalecimento e valorização da economia florestal de base familiar na região. Logo, os estudos relatam que, a atratividade financeira da produção florestal dada pelo manejo florestal comunitário é relativamente limitada quando comparada com outras opções de uso da terra, como por exemplo, a agricultura. Isto se deve a um conjunto de fatores tais como: os insumos iniciais ou administrativos são altos, a demanda por subsídios constantes, os preços para os produtos são geralmente baixos e grandes desafios em termos de infraestrutura, além dos processos longos e burocráticos envolvidos na obtenção da documentação para o estabelecimento do plano de manejo. Deste modo, no intuito de se oportunizar de fato ao manejo de floresta é necessário focar no planejamento da exploração, controle da produção, inserção de novas tecnologias e política florestal que vise realizar junto às comunidades uma orientação para uso múltiplo da floresta.

Palavras-chave: gestão, produção familiar, uso múltiplo.

1. INTRODUCTION

The Amazon, with an extension of more than 5 million km² and a population of about 23 million inhabitants, harbors an ethnic and cultural diversity as well as a variety of plant and animal species, given its diverse ecosystem, thus resulting in an immense and complex biological diversity (SNIF, 2016).

From a regional development point of view, this great diversity presents unprecedented challenges in terms of infrastructural needs, planning, execution and dissemination of appropriate technologies by research, teaching, and extension and foment institutions that use approaches and practices that are compatible with territorial reality (KANASHIRO, 2014).

Given the diversity of groups and interests, the participation of local (community) people in these processes is essential for the success and adoption of sustainable production practices. This is because the premise of community social organization is a key point for the development of any policy that seeks local development and social welfare.

Nowadays, there is a growing interest in making local development compatible with environmental conservation (ESPADA; SOBRINHO, 2014; SIST et al., 2014; MENEZES et al., 2015; MEDINA et al., 2015). One of the main mechanisms used in these discussions has been community-forest management (CFM), which is based on the assumption of conservative use and is associated with social, economic, and environmental development. The premise is that this management modality can strengthen territorial management and forest governance and generate income through the planned use of different types of forest resources (PINTO et al., 2011).

However, studies have pointed out that despite the great importance of the forest for the livelihood of those who reside in the area (particularly the poorest producers), family producers who survive mainly on forest products are relatively rare. Apparently, the forest has the potential to generate additional income but not as the sole family income; this makes it difficult to consolidate farming activities (POKORNY et al., 2014).

The direct economic benefit of logging or multi-use CFM is well below the economic benefit of intensive agricultural production systems. The main activity of family farmers in the Amazon is still agriculture, whose activity represents the main annual economic income, which is important for food security (SIST et al., 2014; PIKETTY et al., 2015). The income derived from CFM is complementary and is usually obtained only once, but it still presents an important source of income and can promote sustainable forest management when properly managed (SILVA et al., 2015).

Thus, smallholder farmers in the Brazilian Amazon are the main participants in sustainable forest management. Although multiple-use community-based forest management is in the process of expansion and consolidation, this land-use system is considered to be a viable method of increasing community income while fostering local and regional development (GUARIGUATA et al., 2012; PIKETTY et al., 2015; SILVA et al., 2015). However, the potential role of multiple-use forest management and incorporation in agrarian generation systems is still poorly understood and documented (SIST et al., 2014).

Thus, the main challenge is to outline and implement public policies that adhere to the reality of the Amazonian rural environment. Another challenge is to introduce new ideas and technologies in the rural environment as well as maximize profit and minimize the cost and environmental impact, so that community- and family-management activities in the Amazon can be promoted.

Given these assumptions, the objective here is to carry out a bibliographic review of the economic competitiveness of multiple-use CFM for different land uses in the Amazon.

2. MATERIAL AND METHODS

A bibliographic review was carried out through access to government websites and official publications (books, theses, dissertations, and scientific articles). Economic competitiveness

of multiple-use CFM for many land uses in the Amazon was discussed, and the main causes and possible solutions for strengthening and enhancing a family-based forest economy in the Amazon were elucidated.

3. RESULTS

3.1. CFM in Amazon

For the Amazon region, the sustainable use of forest resources is essential for its development. Among its benefits are a reduction in the rate of deforestation, economic development through the provision of products and services, and perhaps most importantly, the conservation of forests given their essential environmental function and effect on climate balance (PINTO et al., 2011).

Community and family-forest management is gaining considerable visibility due to its importance for the conservation of natural resources coupled with the generation of economic wealth and social benefits. Although some authors point out weaknesses in forest management processes, mainly timber production (MEDINA; POKORNY, 2011; SIST et al., 2014; PIKETTY et al., 2015), CFM is considered to be a promising option for generating work and income and stimulating local development combined with the sustainable use of forest resources (SIST et al., 2014).

CFM was conceptualized, according to De Camino (2002), as management that is under the responsibility of a local community or a broader social group and one that establishes long-term rights and commitments to the forest, including management activities. It can be executed by third parties provided that the plan remains under the responsibility of community producers or family members; the latter is responsible by way of co-management and cooperation between communities of rural producers (owner of the management plan) and the logging company (service provider).

In a 2009/2010 survey on community and family-forest management (CFFC) initiatives in six legal Amazonian states, 1,213 CFM initiatives were identified, of which 902 dealt with timber forest management and at least 311 dealt with non-timber forest products (NTFPs). Amazonas was the state with the highest number of logging CFMF initiatives, followed by Pará, Acre, Rondônia, and Amapá (PINTO et al., 2011).

The development of a productive sector in rural Amazonian communities, based on sustainability criteria, represents a public policy strategy that fulfills several objectives, as follows: i) an improvement in the living conditions of these populations; ii) the search for economic independence; iii) reduced migration to urban areas; iv) forest preservation; and (v) food security.

Due to the diversity of contexts, participants, objectives, and strategies involved in CFM, it has been difficult to find a definition that could encompass the diversity of experiences and CFM cases in the Amazon.

3.2 Community-management success and failure cases in the Amazon

Timber and NTFPs are of great importance to many households, both for subsistence and local commercialization. However, most of the region's producers, with the exception of some indigenous groups and extractive communities, are mainly engaged in agriculture and animal husbandry and can be more defined as farmers, although almost all households in the region

work with trees within and outside of the forest (GUARIGUATA et al., 2012; SIST et al., 2014; PIKETTY et al., 2015).

Pokorny et al. (2014) studied the diversity of livelihood strategies in the Amazon, and they observed that rural families followed a specific strategy characterized by a complex combination of different production and income-generation activities. They identified about 22 main activities, which could be classified into four categories: agriculture; agroforestry systems; forest extraction; and the use of rivers, mainly for fishing. In almost all cases, farmers grew food (90%) and forage species (75%). Almost half of the households owned livestock or raised small animals. The use of forest products was also important, and more than 80% of households collected firewood and extracted NTFPs for commercial purposes. Wood-extraction activities were identified in 42% of the families.

Thus, to evaluate the economic competitiveness of multiple-use CFM of agricultural and livestock economies in the Amazon, it is necessary to analyze CFM success and failure cases in the Amazon.

Pokorny et al. (2014) mentioned that the forest contribution is proportionately higher for financially poorer families and those living in more remote areas. However, there are situations in which the forest generates significant revenues, in particular through the commercialization of NTFPs.

One well-known example is families that sell Brazil nuts (*Bertholletia excelsa* Humb. & Bonpl.) in Northern Bolivia. Almost half of the global production of nuts is from this region and amounts to 18,000 tons of shelled chestnuts a year. A household study of peasants and indigenous people in three communities showed that for most families, cashews were the main livelihood component regarding both input (30% of total work time) and benefits (40% of total income). For some communities near Riberalta (Bolivia), chestnuts represent up to 70% of a family's income and can generate revenues of up to USD 1,600 per year (IPHAE, 2007; MENEZES et al., 2015).

Another example is the case of PAE Ecuador families in Brazil, in which, besides the chestnut, rubber production has gained importance due to the state's minimum price policy. For a few families, trees in agroforestry systems and plantations of NTFPs also contribute significantly to their income (POKORNY et al., 2014).

However, Sist et al. (2014) evaluated the income contribution of multiple-use forest management for small farms in the Eastern Amazon and observed that the highest average annual yield generated by multiple-use management would be R\$ 2,841, of which R\$ 856 would be from wood and R\$ 1,985 from andiroba oil, which has a sale price of R\$ 80. This is close to that generated by the most basic agricultural activity (R\$ 3,000); however, the goal is five times lower than that generated by pepper. In addition, it is not economically feasible during periods of low fruit production, a time when income is lower.

If communities have large areas of primary forests and they enter into negotiations with timber companies, timber can also be an important source of income, as is the case of communal forests of indigenous groups in Peru and Bolivia, extractive reserves in Brazil, and the current form of cooperation adopted in the Amazon (PORKONY et al., 2014; SILVA et al., 2015).

Despite the importance of the forest, specifically for poorer families, financial analyses of CFM that focused on timber production are limited compared to other land-use options (ESPADA; SOBRINHO, 2014).

Piketty et al. (2015) evaluated the community-management of more than 426 families and found that only 74 of them could have earned additional annual income above a minimum wage. This can be considered to be a relatively small amount given that 80% of the land is under forest management.

Sist et al. (2014) observed that the average annual income from logging remained modest compared to the income of agriculture: R\$ 856 versus R\$ 8,669. This represents an average of R\$ 13 ha⁻¹.year⁻¹ versus R\$ 633 ha⁻¹.year⁻¹ or USD 7 versus USD 346 ha⁻¹.year⁻¹.

However, even if the income generated by logging activity is considered low, the income from logging operations received by each farmer, usually at a single time, represents a significant amount of money, from R\$ 10,620 to R\$ 61,320 or USD 5,800 to USD 33,508. This can be used to implement more intensive and productive family-agriculture systems, invest in new alternatives for more sustainable agricultural practices that consider soil conservation, and cover costs for legal technical support necessary for integrating sustainable forest management into agricultural production systems. This respects the sustainability and polycyclic character of management (SIST et al., 2014).

Drigo et al. (2013) reported that the income generated by a farmers' cooperative generated an annual economic benefit of USD 1,921 per farmer. Although the authors did not consider administrative costs (inventory costs, elaboration of the forest management plan, annual operational plans, and contracting a forest engineer, that is, administrative procedures necessary for forest management approval by state authorities) as it was financed by a government program.

Humphries et al. (2012) found large variations in the internal rate of return on small-scale forest management. It varied from 12%, 2%, to -48%. In this case, economic viability was lower due to the high administrative costs in these operations.

Porkony et al. (2014) studied the feasibility of timber used by families in Bolivia, Peru, and Ecuador and showed that the monetary value of the forest depended very much on the context. For example, if markets are too far away and are difficult to access or if forest companies control the markets, as is often the case at region boundaries, the producer is unable to generate high revenues from standing or processed tree sales.

Even in the Macas region of the Ecuadorian Amazon, where markets are close and the large stock of commercial timber generates income expectations of up to USD 1,300 ha⁻¹ (taking advantage of commercial trees only once), in practice, they receive only up to USD 15 ha⁻¹.year⁻¹ (GATTER; ROMERO, 2005).

Medina and Pokorny (2008) analyzed the most promising CFM experiences in the Brazilian Amazon. They revealed that only four large-scale community forestry initiatives with lower verticalization (Ambé, Costa Marques, and Mamirauá) managed to remunerate the and still generate net revenues. Some initiatives (Oficinas Caboclas, Pedro Peixoto, Porto Dias, and PAE) managed a financially positive result if the daily pay was not considered, indicating that they can only remunerate the workforce below the amounts currently paid. However, other initiatives (BVR, Mamirauá with a portable sawmill and chainsaw, and Pedro Peixoto with a chainsaw) could not cover operational costs without external subsidies, even if they were considered to sell to markets that pay higher prices than the local market.

According to the authors, the initial investment required to acquire equipment and machinery for field operations and enable producers to manage their forests according to the legal framework is between US 20,000 and USD 800,000, depending on the size and complexity of the production arrangement. One of the most important observations was that forest management productivity by families and small-scale producers was significantly lower compared to business extractions; small initiatives showed up to 75% lower productivity than companies.

This phenomenon of lower community productivity compared to corporate production is a structural characteristic of family performance, given the particular interest in maximizing labor remuneration rather than profit, the value of leisure time (breaks), the importance of other productive activities (such as agriculture), or other horizontal forms of work, such as outsourcing the workforce from a nearby city (PORKONY et al., 2014; ESPADA; SOBRINHO, 2014).

Successful and unsuccessful experiences lead to the following extremely important conclusions: 1° CFM greatly enhances timber and non-timber use; 2° success and failure cases were all linked to social organization and government policies that seek to promote the system; and 3) CFM can be a viable solution for the entire Amazon. Therefore, there is a need for research and community development to produce an income. As such, failure cases should only serve as an example for other regions during the implementation of a CFM system (MENEZES et al., 2015).

3.3. Causes of low community-management competitiveness in terms of agricultural economy

In the analysis of success and failure of community-management cases, studies showed that the financial attractiveness of forest production was low compared to other land-use options, such as agriculture.

This was due to a set of factors: high initial cost due to the need for land regularization and organization of community documentation, establishment of a census inventory, sustainable forest management plan, and infrastructure. Also, product prices were low because of competition with illegal products (MEDINA; POKORNY, 2011; POKORNY et al., 2014). As a consequence, the vast majority of producers were far from achieving the ideal high incomes calculated by researchers and technicians.

Drigo et al. (2013) estimated that the initial CFM (administrative) costs exceed USD 100,000, while Medina and Pokorny (2008) estimated the initial costs of eight Brazilian Amazonian forest enterprises to be from USD 20,000 to USD 800,000 (unadjusted for inflation). Such administrative costs are the main constraint to family-forest management communities in the Brazilian Amazon. Humphries et al. (2012) conducted a financial analysis of three CFM projects; they showed that the projects' financial viability was fragile and that they needed subsidies or access to credit to cover the fixed costs of their employees.

Moreover, community forestry needs to be seen as a forestry business that works toward the perspective of a well-managed enterprise. Thus, it is necessary to invest in vocational education focused on management and cooperation with different institutions and companies, appropriate to the reality of the different participants involved, to promote investment in community economic initiatives with access to

credit (AMARAL NETO et al., 2011; LENTINI et al., 2012; MEDINA; POKORNY, 2014; ESPADA; SOBRINHO, 2014).

Humphries et al. (2012), Drigo et al. (2013), and Piketty et al. (2015) reinforced the idea that the main difficulties for CFM's financial viability was access to a precarious market, the low price paid for timber, the current legal management framework that does not favor family production, and poor internal and external road conditions that significantly increased transport costs.

The long and bureaucratic process involved to obtain legal documentation is an obstacle for many community members. Also, market terms are still unfavorable for CFM projects, and despite the efforts of the federal government to combat illegal logging, local sawmills still provide illegal timber, and legal timber prices do not get a share of the market in this situation.

The agricultural economy, in turn, is the opposite of the forest economy; it has high price liquidity, has all of the incentives in its implementation, and generates profit in a short space of time, and the market can be entered easily. Thus, it is strongly competitive not only with CFM but also with other activities such as cattle raising, which is also a strong competitor to forest management, since raising livestock often becomes the main objective and is considered to be a saving by community dwellers in the Amazon.

4. DISCUSSION

4.1. Possible solutions for strengthening and increasing the value of family-based forest economies in the Amazon

Menezes et al. (2015) suggested the following to strengthen and enhance family-based forest economies in Amazonia and to promote viable management systems:

1) Describe the management system - List all practices developed (from forest to market), identify how the activity is organized (family, groups of families, and community), know the markets and their implications, and know the rules of use or possibility of its construction.

2) Verify framing-Identify the fundamental elements of each part of the management system and interpret them according to the structural concepts of forest management. This exercise often demonstrates to the technician that communities do forest management.

3) Think about improvements -If the community wants to work on improvements, let them plan and consolidate the proposals their way, according to their conditions.

In addition, one of the ways to valorize and strengthen the forest economy is to form networks of partnerships and projects to encourage activity. Unlike previous projects that injected large financial resources, they do not currently have back-end funding but have the technical and financial contribution of each partner (ESPADA; SOBRINHO, 2014).

The results of these agreements allow communities and families to resolve their conflicts and prevent predatory exploitation that may lead to a scarcity of resources that are vital to their way of life.

Currently, one of the alternatives commonly adopted by producers in the Amazon to increase their forest income without the burden of significant initial investment costs is partnerships with logging companies, which assume a mixed characteristic, i.e., they are a result of co-management and cooperation among communities of producers (holding the management plan) and

the logging company (service provider) (CRUZ et al., 2011; SILVA et al., 2015).

However, in practice, partnerships between logging companies and farmers are informal (without legal agreements) and, in most cases, they favor the firms that pay very low prices for standing trees (SABLAYROLLES et al., 2013; SIST et al., 2014)

Menton et al. (2009) reported that enterprise-community partnerships generally brought about improvements in household income without compromising the harvesting of NTFPs. However, management skills are needed for communities to manage the resources of these partnerships and to seek better market prices for the sale of lumber.

The capacity of political-institutional articulation with different participants can promote progress in the management of natural resources and local development (SOUZA; VASCONCELLOS, 2012).

Another important point, given the limited potential of the proposed systems, is payment for environmental services and carbon sequestration to ensure financial attractiveness, which is vital to awaken the interest of the family producer. However, it is worth mentioning that this model is almost never operated by family farmers in the Amazon because it is a bureaucratic activity with high initial costs, making it more accessible to large producers and entrepreneurs (MENEZES et al., 2015).

To improve the income of small farmers, investment in research and development is needed to support the integration of agriculture, livestock, and the forest (PIKETTY et al., 2015).

The best way to overcome difficulties of access to the precarious market and the poor price of wood is a public policy that guarantees minimum wood prices from CFM participants, as it can strengthen (and protect) market access and reduce speculation.

A minimum price policy could be the first step to increase CFM potential in the Amazon and allow for a more efficient use of public funds. Also, the current legal framework for forest management should be simplified, and some degree of flexibility is required to improve smallholder investments, i.e., simpler and more flexible procedures are needed to reduce the high transaction costs for obtaining authorization and increase the participation of small producers in forest management.

Finally, in order to strengthen the forest economy, it is necessary to take into account the current conditions of smallholder communities (low investment capacity, lack of knowledge of technical forestry, and incipient market formation with high costs) and favor mechanized and intensive selective harvesting practiced more by local and medium-sized enterprises than small-scale management (SIST et al., 2014).

Therefore, it is crucial to review existing legislation and policies to address the specific small-scale management needs of small-scale farmers and forest communities in the Amazon.

Research on the financial benefits of cost sharing and sales with cooperatives and producer groups, benefits of enterprise-community relations, and innovative forms of land use are also recommended to reduce costs and maximize productivity income for communities.

5. CONCLUSIONS AND RECOMMENDATIONS

The structuring of a consolidated forest economy in the Amazon region would be an unprecedented contribution to conservation associated with increased local governance.

However, this literature review has confirmed that the commercial potential of multiple-use forestry compared to other land-use alternatives is restricted. In addition, the long bureaucratic processes involved for obtaining legal documentation.

Thus, research in the forestry sector needs to focus on planning exploration, production control, insertion of new technologies and a forestry policy; aim to carry out a multiple-use orientation with the communities to decide on appropriate forest management; and apply more sophisticated techniques that facilitate cost reduction, minimize environmental impacts, and generate a regular income.

What do you get out of it? Mainly, it is the control of field activities and reduction in exploration costs, environmental impacts, and methodologies to conserve national and state forests. Adequate management of the new standards would facilitate key technological innovations in addition to providing economic, environmental, and social sustainability. Now is the time to analyze the situation and invest in planning, politics, and forestry vocation.

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