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PRODUCTION AND MARKETING OF TIMBER PRODUCTS IN THE GREGÓRIO RIVER STATE FOREST COMPLEX (GRSFC), STATE OF ACRE, 2021

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Resumo

Produção e comercialização de produtos madeireiros no Complexo de Florestas Estaduais do Rio Gregório (CFERG), Estado do Acre, 2021. Este estudo objetivou gerar informações econômicas sobre a produção e comercialização da atividade madeireira no Complexo de Florestas Estaduais do Rio Gregório (CFERG), no estado do Acre, no período 2018-2019. Em termos específicos, ele visou: a) Estimar o volume de madeira serrada a ser ofertada por esta comunidade florestal; b) Levantar e analisar os preços FOB da madeira, em tora na floresta e CIF da madeira serrada, praticado pelas firmas madeireiras comercializando com os clientes moveleiros e afins acreanos; c) Contribuir na realização de ações de marketing para a venda da madeira; d) Caracterizar a cadeia produtiva madeireira comunitária e e) Identificar as dificuldades para comercializar a produção madeireira regional. Para tal, foram coletados dados sobre volume das espécies exploradas, preço da madeira, em tora e serrada, praticado na região, assim como dados sobre os integrantes do setor madeireiro local e das suas políticas comerciais-administrativas. Os resultados obtidos permitiram inferir que: a) O manejo florestal sustentável de base comunitária do Complexo Florestal Estadual do Rio Gregório forneceu 2.507,354 m^3 de madeira serrada ao mercado, nos anos de 2018 e 2019; b) O preço será R$ 1,200.00/m^3 CIF movelaria, para todas as espécies; c) As ações de marketing, sugeridas aos empresários madeireiros do CFERG, avaliaram que o produto comercializado era madeira serrada, praticando um preço CIF movelarias e afins, em uma cadeia de distribuição sem a atuação de intermediários e d) A maior dificuldade, para comercializar a madeira, é orçar o custo da exploração, precifica-la e mobilizar os associados para explorar.
Palavras-chave: setor florestal Acreano, produtos madeireiros, manejo florestal sustentável comunitário.

Abstract

This study aimed to generate economic information on the production and marketing of timber in the Gregório River State Forest Complex (GRSFC), in the state of Acre, during the period 2018-2019. Specifically, it aimed to: a) Estimate the volume of lumber to be offered by this forestry community; b) Collect and analyze the FOB forest price for log and CIF furniture factory price for lumber practiced by the Acrean timber firms; c) Contribute to the implementation of marketing actions for the sale of timber originating from the GRSFC; d) Characterize the community timber production chain; and e) Identify the difficulties in marketing regional timber production. To this end, data on volume and price of logs and limber of the exploited species were collected, as well as data on the members of the local timber sector and their commercial-administrative policies. The results obtained allowed us to infer that: a) The community-based sustainable forest management of the Gregório River State Forest Complex supplied 2,507,354 m^3 of lumber to the market in 2018 and 2019 years; b) The price will be the same. for all species sold, R$ 1,200.00/m^3 and the lumber delivered at furniture factory; c) The marketing actions suggested to the timber entrepreneurs of GRSFC assessed that the product sold was lumber, practicing a CIF furniture factory price, in a distribution chain without the involvement of intermediaries and d) The greatest difficulty in marketing the timber is estimating the cost of exploitation, pricing it, and mobilizing the associates to exploit it.
Keywords: Acrean forestry sector, timber products, community-based sustainable forest management

INTRODUCTION

As Morales-Hidalgo, Oswalt and Somanathan (2015) point out, forests play a fundamental role in human survival. These natural resources provide raw materials that contribute to societal well-being, store carbon and help conserve biodiversity. In this context, Verissimo and Pereira (2014) state that the timber sector in the Amazon generates income and employment opportunities for people living in or near the forest, as well as for those working in local processing industries. Consequently, nearly a third of Amazonian municipalities depend on the region's natural resources.

Despite its status as a major contributor to the Brazilian economy, the forestry sector has historically received inadequate attention from public policy. However, the recent surge in demand for forest preservation and restoration has re-established this sector as a prominent entity within the national agenda, thereby establishing a nexus between economic productivity and forest sustainability (Berger & Padilha Junior, 2016).

It is important to note that, according to Brasil (2009), management plans carried out by family farmers, agrarian reform settlers, and traditional peoples and communities are classified as community and family forest

management. Brasil (2011) adds that Timber Forest Management (TFM) is accepted in sustainable use conservation units, such as Extractive Reserves, Sustainable Development Reserves and National Forests. Koury and Vianna (2014) and Espada, Santos and Santos (2019) emphasize that Community-based Sustainable Forest Management (CSFM) brings social and economic benefits to forest communities, providing an opportunity for income generation, food security, recognition of land access and use, and appreciation for extractive families. Therefore, Espada, Santos and Santos (2019) consider the CSFM a strategy to conserve biodiversity and improve the quality of life of the traditional peoples and communities in the Amazon.

As Koury and Vianna (2014) have argued, the development of community-based and family-sustainable forest management is contingent on the empowerment of managers. The more informed they are, the more they will be able to reconcile their traditional knowledge with the legal requirements for commercializing tropical timber. This, in turn, will allow them to negotiate more effectively with actors in the forestry industry, such as extension workers, service providers, timber buyers, public institutions, and other communities. Waldhoff and Vidal (2019) have also argued that the structuring of a Sustainable Forest Management Plan in the municipality of Boa Vista do Ramos, in the state of Amazonas, required a relationship of trust between the institutions and the people involved in the process. To this end, training sessions were held prior to the development of this Plan, which allowed for the maturation of personal and institutional relationships, and better results obtained by the managers. Costa et al. (2018) have argued that a barrier to the good performance of community-based sustainable forest management is the difficulty in marketing and accessing new markets, which reduces its options to regional and restricted markets. This leads to competition with the illegal timber market, mainly at the local level, justifying the search for and access to markets that value legally sourced timber. Thus, the solution lies in improving a negotiation process that allows for better commercial conditions obtained by CSFM, such as prior consultation with potential buyers.

In this scenario, Gonzaga (2005) argues that, in order to enhance competitiveness and generate new markets, the following innovative marketing strategies are essential for the commercialization of timber goods: the development of marketing campaigns focusing on the sale of tropical timber originating from community-based sustainable forest management plans. These plans can be implemented in various ways, such as through global digital platforms, with an emphasis on the sale of log, processed wood, or other differentiated products developed by designers and architects using legally sourced wood as their primary raw material. This approach not only increases consumption among sawmills but also among designers, architects, and others who prioritize the use of legally sourced timber. Alongside these procedures, it is imperative to consider the challenges faced by sustainable forest management and logging in the Amazon, such as transport and distribution logistics. More specifically, in this region, the rainy season between November and April restricts the harvesting period, necessitating greater effort from entrepreneurs to adequately provision the firm with log so that the industry can supply the market with the desired volume of sawnwood. Another challenge to be addressed is the significant distance between the forest, in the Amazon, and the lumber consumer, located mostly in south and southeast of Brazil. Finally, timber entrepreneurs must obtain their log under a Sustainable Forest Management (SFM) regime. Consequently, the timber sector must recognize that SFM, using Reduced Impact Logging (RIL) techniques, is no more costly than conventional logging, and consumers must increasingly be willing to purchase a timber product from an area harvested under an SFM regime.

It is therefore reasonable to hypothesize that, as Acre - State Secretariat for the Environment (SEMA) (2020) state, 85.4% of the natural forest in the state of Acre was still standing in 2019. This resource has the potential, through sustainable forest management, to generate job and income opportunities for the local population. It should also be noted that, according to Acre - State Secretariat for Planning (SEPLAN) (2017), Silva (2022) states that, in 2015, the forestry-timber sector had 2,240 employees, a contingent that can be increased with a more active forestry segment.

The findings of market research have the capacity to facilitate the advancement of forestry-industrial production processes in regions characterized by an extractive vocation. The aggregation of prices and volumes of timber produced in these communities, the enhancement of timber processing, and the examination of its production chain can underpin initiatives that will confer enhanced commercial visibility on tropical timber from community-based sustainable forest management to prospective buyers outside Acre. These assertions are founded on the conclusions of Sills and Abt (2003), who posit that a market study assists in verifying how owners and users of forest benefits value and behave towards the utilization of these natural resources. Conversely, Ribeiro, Villaverde and Silva (2020) posit that, in addressing the market and commercialization, it is judicious to prioritize marketing, also, due to the role it plays in augmenting the demand for timber goods.

However, while studies of the market and marketing in the forestry sector are valid, research focusing on the marketing aspects of timber production in the CFSM is rare. In this context, Silvestre and Silva (2020) argue that, in order to formulate public policies that promote sustainable forest management in the Amazon, these must be based on economic criteria.

The objective of the present study was to generate economic information on timber production and marketing in the Gregório River State Forest Complex (GRSFC) in the state of Acre. The specific objectives of the study were as follows: a. to estimate the timber production chain; b. to identify the difficulties volume of sawnwood to be supplied by this forest community; c. to survey and analyze the FOB prices for roundwood in the forest and CIF prices for sawnwood charged by timber companies selling their clients, who then deliver sawnwood to furniture makers; d. to contribute to the implementation of marketing initiatives for timber sales, and, e. to characterize the community in marketing local timber production.

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MATERIALS AND METHODS

Material

Study Area Characterization

The Gregório River State Forest Complex (GRSFC) was established in 2008 by State Decree No. 3,433/08, and is located in the Acrean municipality of Tarauacá (Acre, 2018).

Acre (2019) reports that the three state conservation units in GRSFC are the Gregório State Forest, covering 212,383.51 ha; the Liberdade State Forest, covering 76,575.89 ha; and the Mogno State Forest, covering 141,449.97 ha. Figure 1 shows the locations of these three state forests.

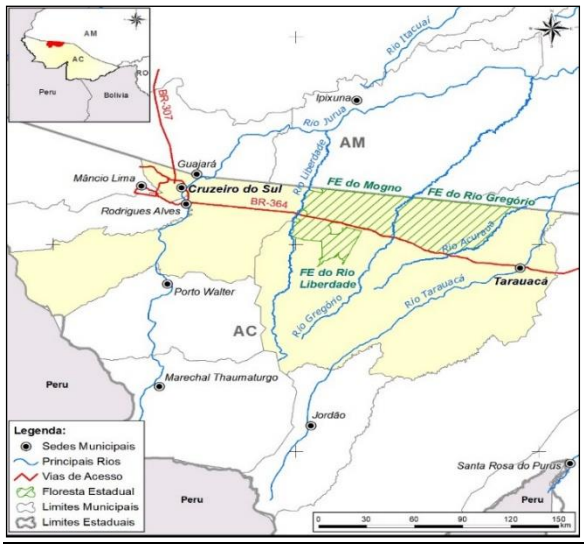

Figure 1. State forests that make up the Gregório River State Forest Complex (GRSFC).
Figura 1**.** Florestas estaduais que compõem o Complexo de Florestas Estaduais do Rio Gregório (CFERG).
Note: Legenda (Subtitle): Sedes Municipais (Municipal Headquarters), Principais Rios (Main Rivers), Vias de Acesso (Access Roads), Floresta Estadual (State Forest), Limites Municipais (Municipal Boundaries), Limites Estaduais (State boundaries)
Fonte: Acre (2019).

The State Government of Acre, together with the agency responsible for the Forest Sustainable Management Plan (FSMP), the Secretariat of Environment and Indigenous Policies (SEMAPI), and the Acre Environmental Institute (IMAC), have indicated that the sale of lumber from the FSMP of the Gregório River State Forest Complex will be primarily directed to the Furniture Centers in the Acrean municipalities of Sena Madureira, Feijó and Cruzeiro do Sul. This will also aim to maintain the legality of licensed companies, reduce logging and transportation costs, and add value to the product.

The five associations that constitute the Gregório River State Forest Complex (GRSFC) have devised a timber management plan and received funding from the Acre Sustainable Development Program (PDSA/Phase II). These associations are the Agroforestry Association of the Gregório River Region and BR-364, the Association of Agroforestry Producers of the Mamoré and Maracanã Communities, the Association of Farmers and Extractivists of the Tauari River Region, the São Francisco de Assis Agroextractive Association of the Liberdade River, and the Fortaleza Acrean Agroextractive Association. The social organization of these associations is represented by its presidents and vice-presidents, who are elected by the community. The Annual Operating Plan (AOP) is individual for each association, as they are distributed across the three State Conservation Units that are part of the GRSFC. Table 1 characterizes the AOPs by State Forest, by Associations/manager number and by area.

Table 1. Characterization of Annual Operating Plan (AOP), in the Gregório River State Forest Complex (GRSFC), 2018-2019.
Tabela 1. Caracterização dos Planos de Operação Anuais (POA), no Complexo de Floresta Estadual do Rio Gregório (CFERG), 2018-2019.

Associations	State Forests	Managers/ Associations	AOP area (ha)
Fortaleza Acrean Agroextractive Association	Fé Mogno	29	254.5670
Agroforestry Association of the Gregório River Region and BR-364	Mogno e Rio Gregório	20	202.6825
Association of Agroforestry Producers of the Mamoré and Maracanã Communities	Mogno e Rio Gregório	18	170.5722
São Francisco de Assis Agroextractive Association of the Liberdade River	Rio Liberdade	18	195.3274
Association of Farmers and Extractivists of the Tauari River Region	Mogno	16	113.9370

Data

In order to identify the species of lumber produced and the forest species harvested at Gregório River State Forest Complex (GRSFC), data were collected from the Acre State Environmental Secretariat (SEMA). Specifically, SEMA consulted documents known by local forestry professionals as "Mirrors" of the individual Forest Exploitation Authorization Forms (AUTEXs) of each association in the Community-based Sustainable Forest Management Plan (CSFMP).

These documents contain data on the volumes of all species harvested in the GRSFC. In turn, price data were those practiced in 2021 in the furniture and related industries in the Acrean municipalities of Sena Madureira, Feijó and Cruzeiro do Sul, where market research was conducted. During this event, data were also collected to develop marketing strategies for industrialized wood products at GRSFC, as well as characterize its production chain.

Method

Determining the Volume of Sawn Timber to be Offered by this Community

The volume of sawnwood from commercial species that is suitable for exploitation by the Gregório River State Forest Complex community was determined on the basis of data provided in the Forest Exploitation Authorization Forms (AUTEX) of the Community-based Sustainable Forest Management Plan. This volume was measured using methods for estimating sawnwood volume. The normative instruction No. 09 of 12 December 2016 was used, as indicated in the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) (2016). This states that the recommended processing/splitting coefficient for converting the volume of timber in log to sawnwood (m^3) (blocks, planks, boards, rods, beams, joists, battens, and battens) is 45% of the yield for all processed species.

Identification and Analysis of Sawnwood Prices in the Furniture Sector

In accordance with the methodology established by Ribeiro, Villaverde and Silva (2020), the arithmetic mean of sawnwood prices in the Acrea market was obtained through price quotations from local furniture manufacturers and similar businesses willing to participate in this study. It is noteworthy that when the state government indicated that lumber from the CFERG Forest Management Plan would supply the Furniture Hubs in the Acrean municipalities of Sena Madureira, Feijó and Cruzeiro do Sul, the businessmen from Rio Branco were not included in this negotiation due to the distance their companies had from the forests to be exploited. Consequently, they did not participate in this lumber price analysis. These facts prove that the choice of these municipalities by the governing body, the Secretariat of Environment and Indigenous Policies (SEMAPI), was based on their proximity to the forests that make up the CFERG and hold the Community Sustainable Forest Management Plan.

As Gonçalves and Silva (2021) report, in the context of the furniture industry in Sena Madureira, there is evidence to suggest that timber consumption is moderately concentrated and highly competitive. This observation is corroborated by Araújo and Silva (2020), who found that furniture manufacturers in Cruzeiro do Sul also demonstrated a high level of competitiveness in terms of timber consumption.

As the marketing strategy centered on companies in the furniture hubs of Sena Madureira, Feijó and Cruzeiro do Sul, price quotations were conducted remotely via WhatsApp, email and phone calls. The data obtained from representatives of these companies was processed in electronic spreadsheets. It is noteworthy that, to ensure the reliability of the data collected, interviewees were informed of the importance of providing prices that closely reflected those actually practiced in the market under analysis, in order to achieve the expected results of the study.

Contribution to Marketing Activities for the Sale of Timber Products

During preliminary contacts with the Secretariat of the Environment and Indigenous Policies (SEMAPI), with the Acre Environmental Institute (IMAC) and with members of the Gregório River State Forest Complex (GRSFC), in the preparation of this research, it was observed that the associations did not engage in marketing actions to commercialize timber production. In light of this finding, the process of adopting marketing activities to promote the sale of timber from the Management Plan at GRSFC was initiated through a series of interviews, consultations with furniture makers and related professionals, potential timber buyers, and associations and communities. This initiative took place during the business roundtable promoted by SEMAPI. Under the guidance of Ribeiro, Villaverde and Silva (2020), it was possible to identify three out of the four marketing mix, namely the pricing policy to be implemented in the commercialization of the timber commodity, the definition of the product to be marketed, and the identification of the form and members of the distribution chain to be used by the associations in the marketing of their sawnwood..

Characterization of the Timber Production Chain in this Community

In order to characterize the timber production chain at GRSFC, the items indicated in the analysis model proposed by Moreira and Santos Filho (2020) were adopted. Thus, the following themes were addressed: a) Input Analysis, which identified and analyzed items such as the origin, volume, and species of roundwood; b) Forest Production, focusing on forest sustainable management and logging activities; c) Industrial Processing, describing the breakdown of roundwood into sawnwood; d) Marketing, defining and analyzing the actions within the distribution channel studied and e) Consumer, identifying and characterizing potential consumers of sawnwood from GRSFC.

Identification of difficulties in marketing local timber production.

As proposed by Costa et al. (2018), an interview was conducted with potential future buyers of timber in order to identify any anticipated challenges within the timber trade. This consultation preceded the negotiation process, thus enabling the formulation of measures to be implemented in order to prevent and be aware of any acts that could have an impact on the sale of this industrialized timber product by the forest communities of the Gregório River State Forest Complex (GRSFC).

RESULTS

Determination of Sawn Timber Volume.

Table 2 reveals the volume, total and differentiated by association, of roundwood, harvested in the period 2018-19, in the Gregório River State Forest Complex (GRSFC).

Table 2. Total volume of log by association at AUTEX, 2018-2019.
Table 2. Volume total de madeira em tora por associação na AUTEX, 2018-2019.

Associations	Volume (m^3)
Fortaleza Acrean Agroextractive Association	1,539.940
Agroforestry Association of the Gregório River Region and BR-364	1,334.761
Association of Agroforestry Producers of the Mamoré and Maracanã Communities	935.558
São Francisco de Assis Agroextractive Association of the Liberdade River	969.236
Association of Farmers and Extractivists of the Tauari River Region	792.403
Total	**5,571.898**

Table 3, in turn, indicates the estimated volume of sawnwood per association.

Table 3. Estimated volume of sawnwood, by association, 2018-2019.
Tabela 3. Volume estimado de madeira serrada, por associação, 2018-2019.

Associations	Volume (m^3)
Fortaleza Acrean Agroextractive Association	692.9730
Agroforestry Association of the Gregório River Region and BR-364	600.6422
Association of Agroforestry Producers of the Mamoré and Maracanã Communities	421.0011
São Francisco de Assis Agroextractive Association of the Liberdade River	436.1562
Association of Farmers and Extractivists of the Tauari River Region	356.5812
Total	**2,507.3547**

Table 4 contributes by informing the volumes of the main species used by the Acre's furniture production.

Table 4. Estimated volume of the eight main species used in furniture production centers in the state of Acre, available for exploration in the sustainable forest management plan, at GRSFC, 2021.
Tabela 4. Estimativa de volume das oito principais espécies utilizadas nos polos moveleiros no estado do Acre, disponível para exploração no plano de manejo Florestal sustentável, no CFERG, 2021.

Main timber species	Log volume obtained from AUTEX (m^3)
Angelim (*Hymenolobium nitidum*)	85,31360
Cedar (*Cedrela odorata*)	110,00610
Cherry (*Amburana acreana*)	17,61180
Cumaru-ferro (*Dipteryx odorata*)	23,29100
Garapeira (*Apuleia leiocarpa*)	479,56560
Ipê-amarelo (*Tabebuia serratifolia*)	273,88840
Maçaranduba (*Manilkara bidentata*)	143,66590
Sucupira (*Diplotropis peruviana*)	79,69000

Identification and Analysis of Sawn Timber Prices in the Furniture Sector

In 2021, two scenarios were identified with regard to the marketing and pricing of sawn timber in the Juruá region, where the GRSFC is located. In the first scenario, the buyer procures the lumber directly from the storage yards, assuming the transportation costs, which characterizes the price charged as FOB yard-to-forest. In the second scenario, the seller undertakes the transportation of the sawnwood to the consumer, which justifies the classification of the price charged as CIF furniture industry. Given this reality, Table 5 shows the average lumber price charged in 2021 for these two scenarios:

Table 5. Average price of lumber in the Juruá region, 2021 (R$/m^3).
Tabela 5. Média de preço da madeira serrada praticado na região do Juruá, 2021 (R$/m^3).

Wood classification	Average FOB price / community	Average CIF price
Soft wood	200.00 - 300.00	500.00 - 550.00
Medium wood	350.00 - 450.00	600.00 - 700.00
Hard wood	800.00 - 900.00	1,200.00 - 1,300.00

Table 6 shows the prices charged for lumber in the capital, Rio Branco, as well as in the Juruá Region, for the species most demanded by the furniture clusters.

Table 6. Prices by timber species played in the city of Rio Branco and in the Juruá region.
Tabela 6. Preço por espécies madeireiras praticados na cidade de Rio Branco e na região do Juruá.

Timber species	Rio Branco	Juruá Region
Cumaru-ferro (*Dipteryx odorata*)	3,000.00 - 3,800.00	1,300.00 - 1,500.00
Garapeira (*Apuleia leiocarpa*)	2,800.00 - 3,200.00	2,000.00 - 1,500.00
Cedro (*Cedrela odorata*)	2,000.00 - 3,000.00	1,500.00 - 2,000.00
Ipê (*Tabebuia serratifolia*)	4,000.00 - 4,500.00	1,500.00 - 2,000.00
Other species: Angelim (*Hymenolobium nitidum*), Cerejeira (*Amburana acreana*), etc.	1,000.00 - 1,500.00	1,000.00 - 1,500.00

The business owners' negotiation proposal, including the prices at which they would purchase timber on the market and the forest species of interest to them, was discussed and presented as a price quote.

It is appropriate to mention that not all potential harvestable species available in the AUTEX databases are of interest to manufacturers in the furniture clusters studied, for the manufacture of their furniture products. Therefore, during the price quote, the species of greatest interest for such purposes in the furniture clusters of Sena Madureira, Feijó, and Cruzeiro do Sul were highlighted.

In addition to the aforementioned points, the results of the study carried out by COOPERFLORESTA in 2018 were released during the business rounds. This study determined the total cost of sawn timber, including cutting, sawing, transporting with a micro tractor, taxes and fees, for the associations covered in this paper. Specifically, for the Association of Residents and Producers of the Chico Mendes Extractive Reserve in Xapuri (AMOPREX), the calculated cost was R$ 672.20/m³, while for the other Acrean associations, the Association of Residents and Producers of the Chico Mendes Extractive Reserve in Brasiléia (AMOPREB) and the Association of Residents and Producers of the Chico Mendes Extractive Reserve in Assis Brasil (AMOPREAB), the value presented was R$ 552.51/m³. It should be noted that, to quantify this value, the cost of timber production in the forest was considered, including the costs of preparing the Sustainable Forest Management (SFM) and the Annual Operating Plan (AOP), the forest inventory, and administration. In addition to these factors, the cost of lumber was calculated, including the costs of logging and forest transportation, training, and the costs to cover taxes.

Marketing Activities

The Business Roundtable, held in July 2021 at the Liberdade River Integrated Environmental Management Unit (UGAI), located in the municipality of Cruzeiro do Sul, aimed to foster initial contact between the presidents of the associations and some members with potential future buyers, entrepreneurs from the furniture hubs. Representatives from the furniture hubs of Sena Madureira, Feijó, and Cruzeiro do Sul participated, due to their proximity to the GRSFC region. This reduced transportation costs for timber sales, boosting the regional economy through the sale of timber from Community Sustainable Forest Management and, most importantly, ensuring a legal raw material. To this end, participants were required to be only licensed entrepreneurs, demonstrating the sale of timber of legal origin. Therefore, entrepreneurs from the Tarauacá furniture hub, due to their irregular registration with regulatory agencies, were not invited to the event.

Timber Production Chain and Marketing

In the course of meetings with the presidents of the associations that hold management plans at GRSFC, certain difficulties were identified with regard to the harvesting and marketing of sawn timber. More specifically, a paucity of knowledge regarding the legislation regulating sawn timber management was noted (this is characterized by low intensity).

Marketing Difficulties Affecting the Sale of Timber Production.

The main challenges reported by all the community representatives interviewed in marketing timber production were: a) Lack of knowledge about timber harvesting and its marketing; b) Market uncertainty (they had no idea who to sell to); c) Lack of knowledge about the costs of logging; d) Determining the price to be charged for the sale of their sawn timber; and e) Lack of interest and participation from managers/lot owners.

DISCUSSION

Determination of Sawn Timber Volume.

Table 2 shows that the Fortaleza Acrean Agroextractive Association and the Agroforestry Association of the Gregório River Region and BR-364 account for 51.59% of the total volume planned for harvesting by the five associations. Furthermore, the Fortaleza Acrean Agroextractive Association holds 27.63% of the volume to be harvested by those associations and is also twice the volume to be supplied by the Tauari River Association.

The Acre State Government, through SEMAPI, sold timber from GRSFC's Community-based Sustainable Forest Management in the Sena Madureira, Feijó, and Cruzeiro do Sul areas. Considering this area is a Low-Intensity Forest Management area, the splitting of the harvested species must occur in the forest before skidding and be carried out by managers from the associations, trained in courses under the Community Forest Producers Cooperative (COOPERFLORESTA)-Secretariat of Environment and Indigenous Policies (SEMAPI) agreement. For the sustainable exploitation of this forest resource to occur, the hiring of external labor is permitted for this and other activities, such as negotiating the payment of fees and documents for the purpose of clearing the harvest. Furthermore, the associations benefiting from the management plan received subsidies from the Acre State Government, including equipment such as portable sawmills, chainsaws, Personal Protective Equipment (PPE), and a “Girico” tractor, among others, to harvest and process timber in these areas.

The information shown in Table 3, as a complement to the figures presented in Tables 1 and 2, provides the physical basis for a revenue projection from the sale of timber managed and harvested by the communities studied in this article. Regarding the volumes indicated in Table 3, when compared to those presented in Tables 1 and 2, it can be seen that the both Fortaleza Acrean Agroextractive Association and the Agroforestry Association of the Gregório River Region and BR-364 have twice the area, as well as twice the total volume, of the Association of Farmers and Extractivists of the Tauari River Region. Furthermore, these values show that each association in the GRSFC's Community-based Sustainable Forest Management offers the market, on average, 501,47 m3 of lumber.

Identification and Analysis of Sawn Timber Prices in the Furniture Sector

In the absence of interest among business owners in the majority of timber species available for harvesting, manufacturers presented their proposed prices per cubic metric for the purchase of this timber in the form of a "combo". Specifically, these entrepreneurs would purchase all available species for harvesting, including low-density wood (commonly called white wood), medium-density wood (used for boards, laths, bindings, etc.), and high-density wood (commonly called fillet or hardwood). The more valuable woods are used to manufacture furniture, doors, windows, etc. in the carpentry shops analyzed.

It is important to note that the volumetric potential of the more valuable woods is low in comparison to the likely harvest volume of all species. More specifically, the more valuable species account for less than 50% of the total forest stock. This fact would increase the cost of harvesting if only these species were harvested, leaving the other species in the forest. In addition, some species do not occur in all forests in the complex, and thus, are not included in the Forest Exploitation Authorization database for all the associations/management areas involved.

Among the woods most desired by furniture industry owners are Angelim (*Hymenolobium nitidum*), Cedro (*Cedrela odorata*), Cerejeira (*Amburana acreana*), Cumaru ferro (*Dipteryx odorata*), Garapeira (*Apuleia leiocarpa*), Ipê (*Tabebuia serratifolia*), among others. Another important point to be highlighted is that the estimated volume of these species in the AUTEX databases demonstrates that limited exploration and commercialization can make Community-based Sustainable Forest Management unfeasible.

However, the proposed commercialization of species via a "combo" system created the possibility of harvesting and selling a larger number of species, increasing forest management revenues in the communities studied. This would not be possible if species were traded individually, as timber species with less acceptance and demand in the market would most likely not be harvested, thus failing to generate revenue.

A comprehensive analysis of all timber species authorized in AUTEX regulations, for the five associations holding the CSFMP, was conducted. The proposed purchase price for sawn timber, in the form of a combo system, presented by entrepreneurs from the Feijó and Cruzeiro do Sul furniture centers, was R$ 600.00/m³ FOB forest.

Representatives from the Feijó furniture centers, in turn, submitted a proposal to pay R$ 1,200.00/m³ for all species. In this case, the timber would be transported by associations/managers to the Feijó carpentry shops, qualifying as a CIF Carpentry price.

As a consequence of the greater proximity of the associations/areas to be administered with the municipalities, the furniture industry entrepreneurs of Feijó wanted to acquire sawn timber from AUTEX suppliers of the Agroforestry Association of the Rio Gregório Region and the Association of Agroforestry Producers of the Communities of Mamoré and Maracanã.

In turn, business owners from the Cruzeiro do Sul furniture hub intended to purchase lumber from communities closer to the municipality, as they hoped to source and transport this timber to the hub. In this case, the closest associations/communities were: the Association of Farmers and Extractivists of the Tauari River Region; the São Francisco de Assis do Rio Liberdade Agroextractive Association; and the Fortaleza Acreana Agroextractive Association.

Finally, business owners from the municipalities of Sena Madureira and Rio Branco did not submit a purchase proposal for this community forest management project, claiming that the volume (m^3) of the species they wished to purchase was low and the distance to the managed forests increased transportation costs, making such a purchase unfeasible.

Marketing Activities

During the Business Roundtable, held in July 2021 at the Rio Liberdade Integrated Environmental Management Unit (UGAI), located in the municipality of Cruzeiro do Sul, it was determined that the marketing mixes to be considered should be characterized by the following attributes: a) The product is already processed timber, not roundwood, and considers all species permitted for harvesting; b) As previously described, the price to be charged will be a FOB forest price or a CIF industry price, depending on who will be responsible for and arrange the transportation of the timber to the industry. This will also be, in the form of a combo, a single price regardless of the species sold; and c) Regarding the distribution channel, it was agreed that this marketing will be a relationship between the producer (managers' association) and consumers (members of the furniture manufacturing centers), without the involvement of intermediaries in this distribution channel. Thus, the marketing margin, previously absorbed by the intermediary, now accrues to the producer. However, as asserted by Cramer and Jensen (1991), it can be deduced that intermediaries play a pivotal role in facilitating the transfer of goods from producers to consumers. This is attributable to the economies of specialization and scale that arise in marketing and production. Consequently, intermediaries contribute to a reduction in total distribution costs.

Timber Production Chain and Marketing

In regard to the harvesting process, due to the low-impact forest management strategy employed, there is an absence of permanent structures, with the exception of the creation of skidding trails and the establishment of small yards for the deposition of sawn timber. The skidding of sawn timber, in the form of blocks and planks, for example, is permitted through the utilization of a small pneumatic tractor. The associations possess the "Girico" micro-tractor and additional equipment that facilitates logging activities, including portable sawmills, chainsaws, machetes, chainsaw chains, PPE, and other equipment subsidized by the Acre State Government, as previously mentioned. The managers have undergone training in planned felling. The trees authorized for felling are accurately mapped in the Annual Operating Plans (AOP), along with the location of skidding trails and the number of trees per lot/Work Unit (WU). Logging will be executed in accordance with the Forest Exploitation Authorization (AUTEX) guidelines. Each association possesses its own AUTEX, which restricts sales to individual sales, with all managers within the community participating in the harvesting process. The transportation of sawn timber to the end consumer within this production chain, likely to the furniture manufacturing centers in the municipalities of the Juruá region, is at the discretion of the associations and managers.

Associations are also permitted to outsource the logging process to a company interested in logging the timber, with the appropriate licenses. Considering that this activity takes place within a conservation unit, logging firms may saw the timber within the Work Units. However, this type of commercialization is not recommended for Community-based Sustainable Forest Management, where the goal is to generate income, jobs, and economic and social development, involving as many people as possible in the community.

The communities of the Gregório River State Forest Complex have not yet commercially harvested timber, harvesting wood only for their own use. For timber harvesting, community managers must follow the recommendations of the Community-based Sustainable Forest Management Plan (CSFMP), which follows two premises: tree custody and custody of the harvested pieces.

Following the felling of trees designated for harvesting, the harvesting team is responsible for marking the log with the tree number, the corresponding slash number, and the WU to which it belongs, in addition to other pertinent information. It is imperative that the tree tag, obtained from the inventory, be affixed to the base of the stump for subsequent verification and inspection.

The pieces produced by splitting the logs must be sorted and cubed before transportation and will be identified by the UT/Lot from which they are harvested, among other information.

Timber forestry exploitation has essential steps to be followed before and after harvesting. Macro-planning includes the demarcation of Work Units (WU), a 100% forest inventory, map production, infrastructure planning, and other steps. The next step is environmental licensing, which involves the preparation of the AOP and the issuance of the Forest Exploitation Authorization (AUTEX). The associations belonging to the management plan located at CFERG have all the environmental licensing documentation, obtained with the support of the agency responsible for the license, the Secretariat of Environment and Indigenous Policies (SEMAPI), and the State Government, through the AUTEX-issuing agency, the Acre Environmental Institute (IMAC). It is worth mentioning that when this project was completed at the end of 2021, the harvesting activity was still pending, an action scheduled to occur in the following months.

The harvesting stages comprise the following: construction of infrastructure (skid trails, small storage yards, etc.); cutting planning; directional felling; skidding planning and tracing; skidding (permitted with the use of a micro-tractor); logging (the sawn timber must be cubed and sorted prior to transportation); transportation to storage yards. The harvesting process culminates in the central yard, where the chain of custody of the sawn timber from each tree is maintained and they are then ready for sale, which constitutes the first post-harvest stage. At GRSFC, sales are directed to furniture manufacturing centers in municipalities proximate to the complex. The decision of whether to transport the sawn timber directly to the consumer, thereby adding value to the product, or to sell it by transporting it to the furniture manufacturing centers at the consumer's expense, rests with the managers.

Marketing Difficulties Affecting the Sale of Timber Production.

It is important to note that the representatives of the associations analyzed are aware of the importance of Timber Sustainable Forest Management in generating income and bringing not only economic but also social improvements to producers in the communities. Furthermore, the business owners expressed optimism about resolving the issues related to identifying the cost of logging and, therefore, establishing a sales price for their products. Moreover, the interviewees plan to mobilize managers to negotiate the sale of sawn timber from the community forest management plan in the Gregório River State Forest Complex (GRSFC).

CONCLUSIONS

It is possible to draw a number of conclusions based on the results of this study:

- The community-based sustainable forest management of the Gregório River State Forest Complex (GRSFC) supplied 2,507.354 m3 of lumber to the market, during 2018 and 2019 years;
- The price will be the same. for all species sold, R$ 1,200.00/m³ and the lumber delivered at furniture factory;
- The marketing actions suggested to timber entrepreneurs in the GRSFC assessed that the product sold was lumber, practicing a price CIF furniture manufacturer, in a distribution chain without the involvement of intermediaries;
- Based on interviews with community managers, it was concluded that the greatest challenge in marketing timber is estimating the cost of harvesting, pricing it, and mobilizing members to harvest.

Finally, considering the dynamics of the forestry-timber sector in the Amazon, we suggest future studies that monitor the qualitative and quantitative aspects of the volumes and prices charged for these harvested species, as well as the marketing strategies adopted by members of the extractive communities of the Gregório River State Forest Complex (GRSFC).

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