



Analysis

Effects of Economic Dependence and Cooperative Behavior Over Participation in Monitoring the Impacts of Natural Resource Trade

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ARTICLE INFO

Keywords:

Community-based management
Pro-environmental behavior
Non-timber forest products
Participatory monitoring

ABSTRACT

Community-based management and participatory monitoring of natural resources have been advocated as better strategies because they are cheaper than externally-driven alternatives and promote pro-environmental behaviors. However, the successful implementation and sustainability of such initiatives depends on resource users' willingness to engage. Some studies claim that resource users will only participate and invest their time in management when the financial benefits received exceed the costs. However, evidence suggests that people cooperate and may volunteer even when not directly rewarded. We evaluated whether economic benefits earned from resource exploitation or cooperative behavior better explained the likelihood of people's voluntary participation in monitoring. We studied an Amazonian forest community in Brazil, who harvested and traded a commercially-important non-timber forest product (NTFP), and gathered data using the following procedures: a survey applied to 166 adults in order to estimate people's NTFP dependence, cooperative behavior and intention to engage in monitoring tasks; and the implementation of pilot-monitoring tasks to observe who participated. Based on mixed-effects regressions, the results indicated that both factors can predict intended and actual participation, although cooperative behavior was a stronger and more consistent predictor. Thus, fostering community cooperation may outcompete financial benefits in ensuring engagement in natural resource management.

1. Introduction

Community-based management of natural resources, in general, and participatory monitoring, in particular, have been advocated as essential strategies to improve the sustainability of natural resource use (Berkes, 2010; Danielsen et al., 2005). When governance is decentralized and local stakeholders are involved in managing natural resources, such as through monitoring and evaluating the outcomes of their actions, they become more aware of the impacts impinged (Ballard et al., 2008; Fröde and Masara, 2007), get empowered and better informed about the resources' conservation status (Holte-McKenzie et al., 2006; Setty et al., 2008), and are more likely to change their behavior and to follow rules that restrain natural resource exploitation (Danielsen et al., 2010; Larson and Svendsen, 1996).

However, the implementation of participatory management and monitoring of natural resources assumes that local inhabitants would eagerly be involved and would put their time into related tasks. Yet, this assumption has frequently proven wrong because individuals may not volunteer to participate. Reasons underlying refusal or lack of interest

in participating include a broad range of factors including, among others, a distrust in government agencies and regulations (Staddon et al., 2015; Trimble et al., 2014), opportunity costs involved (Evans and Guariguata, 2008), or a lack of the required skills (Reed, 2008).

Furthermore, engaging in volunteer natural resource management has high opportunity costs, since it takes people's time and effort away from other productive activities, and does not necessarily result in personal and immediate benefits (Evans and Guariguata, 2008). Therefore, one could expect that participation would only occur if its benefits are clear and exceed incurred costs. Presumably, those who receive higher economic returns from the resource trade or whose livelihoods are highly dependent on its use should have higher incentives to engage in management activities (Lise, 2000; Maskey et al., 2006). Nevertheless, there are contrasting evidence for these assumptions, since there are other studies that linked these contexts with lower levels of participation (Gichuki and Macharia, 2003; Jumbe and Angelsen, 2006).

This conflicting evidence suggests there are factors that may affect people's participation other than the economic benefits received from

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the exploited resource. Indeed, several factors were shown to influence people's participation in natural resource management and monitoring (e.g. Aswani et al., 2013; Bell et al., 2008; Bruyere and Rappe, 2007; Ellis and Waterton, 2004; Gichuki and Macharia, 2003; Roggenbuck et al., 2000). For instance, personal characteristics, such as gender and age, can influence people's participation in natural resource management and monitoring (Aswani et al., 2013; Gichuki and Macharia, 2003). Concerns about environmental changes and the desire to contribute to environmental health are also personal drivers of volunteering in environmental projects in general (Bruyere and Rappe, 2007; Johnson et al., 2014; Ryan et al., 2001).

Since engaging in volunteer monitoring brings about potential benefits to the community's well-being but entails personal costs without the guarantee of individual gains, people's participation can be seen as an example of cooperative behavior, i.e. working on behalf of a group (Tyler and Blader, 2000). Thus, it is possible that, besides other personal factors, more cooperative individuals are more inclined to participate, regardless of the benefits they earn from the resource.

Although there are a vast number of studies about economic drivers of pro-environmental attitudes in general (e.g. Kotchen and Reiling, 2000; Mankad and Tapsuwan, 2011; Tonglet et al., 2004), we are unaware of studies comparing the relative influence of economic benefits earned from resource exploitation on one side and cooperative behavior on the other in explaining the likelihood of people's voluntary participation in natural resources monitoring. Still, this information is scientifically important, because, by comparing two drivers associated with different mindsets, the study contributes to long-term and still current debates on how humans think and what shapes cooperation in general (e.g. Gintis et al., 2003; Hopper and Nielsen, 1991) and pro-environmental behaviors such as participatory management, in particular (Schultz et al., 2005; Stern, 2000). Additionally, the information is relevant for policy making because understanding what drives people to volunteer in monitoring can help devise strategies to boost participation and to improve the chances of success in terms of natural resources conservation and local livelihood development (Margoluis and Salafsky, 1998). The successful implementation of several strategies across the tropics could benefit from this information, as with the case studied here of forest products' trade, but also with the engagement in payments for environmental services (Kosoy et al., 2008), adhesion to certification programs (Molnar et al., 2007) or community-based ecotourism (Kiss, 2004). This is so because participation promotes a greater sense of local control over natural resources (Setty et al., 2008) and, consequently, a more sustainable resource use (Handberg and Angelsen, 2015) and local stakeholders' empowerment (Holte-McKenzie et al., 2006).

In this study, we assessed which factors best explained the propensity of Amazonian inhabitants to voluntarily participate in monitoring the effects of a forest resource exploitation. Specifically, our case study evaluates whether economic dependency or, alternatively, people's cooperative behavior best explains local people's engagement in a set of monitoring tasks aimed at evaluating the outcomes of Carapa (*Carapa guianensis* Aubl., Meliaceae) harvesting and trading in the Médio Juruá protected area (Amazonas, Brazil).

2. Methods

The study was based on a cross-sectional design (Newing, 2011) in which we compared participation and participation intent to volunteer in monitoring by individuals who differed in the economic benefits they received from NTFP trade and their cooperative behavior. To do so, we studied a community of forest inhabitants that regularly harvested and traded NTFPs but did not have a monitoring plan, i.e., they did not follow on a regular basis the ecological and socioeconomic impacts of the activity (CIFOR, 2007).

2.1. Study Area

We conducted the study at the Roque community in the Médio Juruá Extractive Reserve (MJER), a Brazilian National Protected Area (5°33'54"S; 67°42'47"W) that grants legal security to forest land traditionally used by inhabitants who depend mostly on natural resources for their livelihoods. The MJER has 253,226 ha and approximately 1900 inhabitants distributed among 13 communities (ICMBIO, 2011). Local inhabitants are called "caboclos" in Portuguese. They are descendants from indigenous ancestors mixed with Africans or Europeans and they have lived in the Amazonian forested regions for many generations (Nugent, 1993). With 495 inhabitants and 51 households, Roque is the most densely populated community in the protected area (ICMBIO, 2011).

At Roque, the sources of monetary income include the eventual trade of agricultural surpluses, government transfers and government salaries to a few individuals (e.g., health agent). However, the main source of monetary income comes from a commercial agreement for the provision of non-timber forest products (NTFP) based on vegetable oils to a cosmetics company. Carapa seeds are the main traded product; they are harvested and then locally-processed into vegetable oil. After being transferred to town, the oil is refined by a chemical industry and resold to the cosmetics company (Rizek and Morsello, 2012).

Three factors supported our choice for this case study community. Firstly, we previously investigated the site, which allowed us to build the necessary trust to conduct the pilot monitoring and gave us a more in-depth understanding of the NTFP exploitation (Brites and Morsello, 2017). Secondly, there was a manifest interest from the environmental government agency to establish a monitoring plan at Roque. Additionally, this arrangement for NTFP trade can be found in several communities in the Brazilian Amazon region (Morsello, 2006; Wadt et al., 2008). Thus, the outcomes of this study may help to implement monitoring strategies in other sites.

2.2. Data Gathering and Sample

Two techniques were employed for data gathering: a survey through face-to-face interviews and direct observation of people who voluntarily engaged in the pilot monitoring tasks that were implemented. In order to gain community trust and to avoid strategic answers, the researcher responsible for the fieldwork spent one month living at the community before starting to gather the data. During this period, with assistance of the community leader, we conducted meetings and households visits to explain the project objectives, introduce the researcher and explain our political and social neutrality. Also, at the beginning of each interview we explained about anonymity and confidentiality, and conducted the interview with the interviewee alone and preferably at his/her own house (Lund et al., 2011).

The interview-based survey was composed of multiple choice questions carried out between March/April and October/December 2013. We censused the community's adult (≥ 18 y.o.) population ($N = 170$) from all the 51 households but because two inhabitants were absent during fieldwork and two were unwilling to enroll, our response rate was 97%. Through the survey we estimated NTFP dependence, cooperative behavior and participation intent using four monitoring tasks. They were: (i) taking part in communal meetings to plan monitoring activities and to discuss their outcomes; (ii) gathering data on the Carapa population, such as density of seedlings, saplings and adults; (iii) interviewing other community inhabitants to collect information on issues such as the amount of resource harvested, income earned through selling seeds and employment in the oil processing plant; and (iv) storing and analyzing data collected through monitoring by creating a database.

From October to December 2013, we implemented a pilot monitoring scheme of the NTFP exploitation potential impacts in which we adapted the methodologies from Machado (Machado, 2008) and Fröde

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