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ALICE DANTAS BRITES

**POR QUE OS POVOS DA FLORESTA SE ENVOLVEM NO
MONITORAMENTO PARTICIPATIVO DA COLETA E DO COMÉRCIO
DE RECURSOS NATURAIS? AVALIANDO MÚLTIPLOS
DETERMINANTES DA PARTICIPAÇÃO**

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Orientadora: Profa. Dra. Carla Morsello.

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FOLHA DE APROVAÇÃO

Por que os povos da floresta se envolvem no monitoramento participativo da coleta e do comércio de recursos naturais? Avaliando múltiplos determinantes da participação

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RESUMO

BRITES, Alice Dantas. **Por que os povos da floresta se envolvem no monitoramento participativo da coleta e do comércio de recursos naturais? Avaliando múltiplos determinantes da participação**, 2015, 167f. Tese (Doutorado) – Programa de Pós-graduação em Ciência Ambiental (PROCAM) Universidade de São Paulo, São Paulo, 2015.

O monitoramento participativo dos efeitos ecológicos e socioeconômicos da coleta e do comércio de recursos naturais é uma estratégia considerada promotora tanto da conservação ambiental, quanto do empoderamento das comunidades locais. O sucesso da estratégia, todavia, depende, sobretudo, da disponibilidade e disposição dos indivíduos em participarem. Apesar disso, sabe-se pouco sobre os fatores que determinam a participação voluntária no monitoramento, especialmente em comunidades de pequena escala habitantes de áreas remotas. Sendo assim, esta tese teve por objetivo investigar o efeito de determinantes da participação no monitoramento. Para tal, foi estudada uma comunidade da Amazônia brasileira que coleta e comercializa *Carapa guianensis* (andiroba), um produto florestal não madeireiro (PFNM). Dois métodos de coleta de dados foram utilizados: (i) *survey* por meio de entrevistas a 166 adultos (≥ 18 anos; 51 unidades domésticas) para estimar a intenção de participar e os determinantes da participação, e (ii) implementação de monitoramento experimental dos efeitos da coleta e do comércio de *C. guianensis* para quantificar a participação real no monitoramento. Os resultados são apresentados em três capítulos. No Capítulo 1, avaliamos se os benefícios econômicos obtidos com o comércio de PFNM ou, alternativamente, o comportamento cooperativo são determinantes mais importantes da participação. Os resultados indicaram que as duas variáveis aumentam a intenção e a participação real no monitoramento. Porém, o comportamento cooperativo foi um indicador mais forte da participação entre as diferentes atividades de monitoramento avaliadas. No Capítulo 2, investigamos os fatores psicológicos que afetam a participação, utilizando como base a Teoria do comportamento planejado (TCP) e avaliando o efeito das variáveis deste modelo sobre a probabilidade da participação voluntária no monitoramento. Os resultados indicaram que, em geral, o modelo da TCP é adequado para prever a intenção de participar em diferentes etapas do monitoramento avaliadas. Em particular, um dos indicadores de atitude (prazer) é capaz de explicar a participação nas quatro etapas de monitoramento. Normas subjetivas também foram importantes preditores da intenção de participar da coleta de dados da população de andiroba e entrevistar outros moradores da comunidade. Já o controle comportamental percebido previu a intenção de participar da coleta de dados sobre a população do recurso natural e a entrada e armazenamento de dados. No Capítulo 3, partimos da hipótese de que a percepção dos impactos ecológicos e socioeconômicos da coleta e do comércio de PFNM pode explicar a participação no monitoramento. Os resultados indicaram que a percepção dos dois tipos de impactos é importante, sobretudo para a participação real. Porém, outros fatores como gênero, idade e escolaridade são determinantes mais fortes da participação em algumas atividades. Ademais, encontramos evidências de que aliar o monitoramento de impactos ecológicos e socioeconômicos aumenta o sucesso da prática. As conclusões do estudo contribuem com lições práticas para aumentar a participação no monitoramento. Destacamos, dentre elas, a importância de estratégias para aumentar a cooperação entre os comunitários, a disseminação de informações sobre os possíveis impactos

negativos da coleta e do comércio de recursos naturais, e o fornecimento de compensações financeiras equivalentes ao custo de oportunidade de participação.

Palavras-chave: monitoramento e avaliação, manejo comunitário, produtos florestais não madeireiros, comportamento pró-ambiental, Reserva Extrativista, Amazônia brasileira.

ABSTRACT

BRITES, Alice Dantas. **Why do people participate in monitoring the effects of natural resource harvest and trade? Assessing multiple drivers of participation**, 2015, 167f. Tese (Doutorado) – Programa de Pós-graduação em Ciência Ambiental (PROCAM) Universidade de São Paulo, São Paulo, 2015.

Participatory monitoring of ecological and socioeconomic effects of harvesting and trading natural resources is advocated as a promoter of natural resource conservation and local community empowerment. Nevertheless, the strategy's success depends upon people's willingness and availability to participate. Yet little is known about the factors that drive local communities to volunteer in participatory monitoring, particularly in relation to small-scale communities living in remote locations. This thesis investigated whether a number of candidate factors were able to predict people's participation in monitoring. To do so, we conducted a study in a forest community of the Brazilian Amazon that harvested and traded *Carapa guianensis* (andiroba), a non-timber forest product (NTFP). Two methods of data gathering were employed: (i) an interview-based survey of 166 adults (≥ 18 y.o.; 51 households) to estimate people's self-stated intention to participate and the drivers of their participation, and (ii) experimentally-implemented monitoring tasks of the effects of harvesting and trading *C. guianensis* to measure people's actual participation. Results are presented in three chapters. In Chapter 1, we evaluated whether economic benefits received from the NTFP trade or, alternatively people's cooperativeness, were more important in predicting people's participation. Results indicated that both variables raised people's intention and actual levels of participation in monitoring, but cooperativeness was a stronger and better predictor across monitoring tasks. In Chapter 2, we investigated the psychology of engaging in monitoring, departing from the theoretical framework of the Theory of Planned Behavior (TPB) for understanding whether the variables in the model were appropriate to predict the willingness to volunteer in monitoring tasks. We found that the TPB model, in general, was able to predict people's intention to volunteer in monitoring tasks. Specifically, one of the attitude indicators (attitude – pleasure) explained the intention to engage in all monitoring tasks assessed. Subjective norms were also important to predict the intention to collect data on natural resource populations and to interview community inhabitants, whereas perceived behavioral control predicted the intention to collect data on natural resources and to deal with data management and storage. Finally, in Chapter 3 we hypothesized that the awareness of ecological and socioeconomic impacts of NTFP harvest and trade should explain people's participation in monitoring. Results indicated that both factors were important, particularly regarding to people's actual participation, although factors such as gender, age and schooling were occasionally stronger predictors. Nevertheless, there is evidence that combining monitoring of ecological and socioeconomic factors will boost the practice's success. The study conclusions contribute to lessons aimed at stimulating participation in monitoring. Among those, we highlight the importance of strategies to increase levels of cooperativeness among people, spreading information about the possible negative effects of natural resource harvest and trade, and granting financial compensations equivalent to the opportunity costs of participation.

Keywords: monitoring and evaluation, community-based management, non-timber forest products, pro-environmental behavior, Extractive Reserve, Brazilian Amazon.

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INTRODUÇÃO GERAL

O posicionamento dos atores locais no debate acadêmico de conservação e de desenvolvimento passou de um papel periférico, como era até o final dos anos 1980, para de centralidade e participação nas estratégias e decisões, como é atualmente (AGRAWAL; REDFORD, 2009; BERKES, 2003). A mudança foi fruto da falta de sinergia entre as práticas conservacionistas e outros objetivos sociais como de justiça social, redução da pobreza e das desigualdades (AGRAWAL; REDFORD, 2009; BRECHIN; WILSHUSEN; FORTWANGLER et al., 2002), que despontavam com frequência como efeito de estratégias protecionistas de criação de áreas protegidas em países em desenvolvimento (MORSELLO, 2001). Apontada inicialmente em críticas de antropólogos e ativistas sociais, a falha consistia na enorme desigualdade na distribuição dos custos e benefícios da conservação (BRECHIN; WILSHUSEN; FORTWANGLER et al., 2003; WELLS, 1992) que impactava – e impacta – negativamente, sobretudo populações de baixa renda, com pouco poder e marginalizadas politicamente (AGRAWAL; REDFORD, 2009).

O debate, associado à expansão da luta por direitos e democracia em países em desenvolvimento, ocasionou a devolução de terras e do controle dos recursos naturais para populações rurais ao redor do mundo (BERKES, 2003; ROS-TONEN; ZALL, 2005), assim como mudanças nas estratégias de conservação. Áreas designadas para a conservação da biodiversidade, originalmente estabelecidas com o propósito único de conservação da vida selvagem e mantidas inabitadas (conservação em “fortaleza”), passaram a incorporar propósitos sociais e a serem encaradas como provedoras de bens e serviços, assim como motores de mudanças sociais e econômicas (BRANDON; REDFORD; SANDERSON, 1998; BROCKINGTON; DUFFY; IGOE, 2008). Da mesma forma, estratégias de conservação protecionistas foram em grande parte substituídas por estratégias de conservação com a participação das comunidades locais.

Parte importante das estratégias que servem como veículo para essas mudanças são mecanismos econômicos diretos, como os pagamentos por serviços ambientais, e indiretos, como os projetos integrados de conservação e desenvolvimento local (PICD) (FERRARO; KISS, 2002).

Ambas as estratégias fundamentam-se no objetivo de garantir o desenvolvimento socioeconômico das comunidades através de atividades que resultem em baixos impactos ambientais (BERKES, 2003), incluindo iniciativas como os pagamentos por serviços ambientais (FERRARO; KISS, 2002), o ecoturismo comunitário (KISS, 2004), a redução de emissões por desmatamento e degradação florestal (DUCHELLE; CROMBERG; GEBARA et al., 2014) e o comércio de produtos florestais não madeireiros (SHACKLETON; SHACKLETON; SHANLEY, 2011).

Dentre as estratégias de conservação e desenvolvimento propostas, uma das mais difundidas para regiões florestadas é a comercialização de produtos florestais não madeireiros (PFNM), ou seja, de recursos florestais que não são madeira como é o caso de frutos, folhas, fibras e resinas (HIREMATH, 2004; ROS-TONEN; WIERSUM, 2005). A popularização do comércio de PFNM parte da hipótese que a prática valoriza a manutenção da floresta em pé, pois aumenta a dependência de recursos florestais como fonte de renda para os habitantes (SILLS; PATTANAYAK; FERRARO et al., 2006) e, ao mesmo tempo, é menos danosa ao ambiente do que outras atividades como a agricultura, criação de gado e exploração madeireira (PETERS, 1994; SHANLEY; LAIRD; PIERCE et al., 2002). Baseando-se neste pressuposto, desde o final dos anos 1980, expandiram-se iniciativas ao redor do mundo voltadas a promover o comércio dos PFNM (SHACKLETON; SHACKLETON; SHANLEY, 2011). Na Amazônia brasileira, por exemplo, ao menos desde os anos 1990, instituições governamentais e não governamentais incentivam a exploração e comercialização de PFNM como forma de conciliar a geração de renda monetária à conservação da floresta (MORSELLO; BRITES; TSUBOUCHI et al., 2010). Iniciativas nesse sentido incluem, por exemplo, o estabelecimento de parcerias ou acordos diretos de venda com empresas (MORSELLO, 2006); incentivos à construção de mini fábricas para processamento de múltiplos PFNM, como forma de diversificar a produção e agregar valor aos produtos (CANDIDO, 2010); a divulgação de preços de mercado dos PFNM para permitir melhor negociação de preços por parte dos extrativistas (PINTO, 2012), dentre outros.

Porém, após quase três décadas do início da implementação desses projetos, o conhecimento acumulado tem demonstrado que nem sempre o duplo objetivo de conservação e desenvolvimento é atingido (e.g. KUSTERS, 2009; SHONE; CAVIGLIA, 2006). De fato, desde 1994 Kremen et al (1994), ao avaliarem os resultados de 36 projetos de conservação e desenvolvimento voltados a diversos tipos de atividades (e.g. ecoturismo, pagamento por serviços ambientais), observaram que apenas cinco haviam alcançado o duplo sucesso nos objetivos de conservação e desenvolvimento. Desde então, estudos têm identificado limitações e

dificuldades da abordagem (ADAMS; AVELING; BROCKINGTON et al., 2004; SALAFSKY, 2011), assim como constatado uma tendência a observar melhores resultados de conservação em contextos em que os resultados de qualidade de vida são piores e vice versa, alimentando a ideia que existem *trade-offs* entre os objetivos (KUSTERS; ACHDIAWAN; BELCHER et al., 2006; SUNDERLIN; ANGELSEN; BELCHER et al., 2005), ou mesmo um crescente ceticismo com a proposta (FERRARO; KISS, 2002).

Devido aos resultados ambíguos e nem sempre desejáveis, vários autores passaram a defender a necessidade e importância de avaliar os resultados dessas abordagens de conservação e desenvolvimento (e.g. GARCIA; LESCUYER, 2008; KREMEN; MERENLENDER, 1994). Para isso, seria necessário estabelecer planos de monitoramento e, portanto, a coleta periódica de dados sobre um conjunto específico de variáveis (indicadores) pertinentes aos objetivos ou atividades de determinada iniciativa, que permitissem avaliar as consequências dos projetos de conservação e desenvolvimento (SALZER; SALAFSKY, 2006). Dada à natureza desses projetos, o monitoramento deveria abranger os impactos ecológicos e socioeconômicos, além de ter sua implementação viabilizada em termos financeiros e pragmáticos, consideradas como as principais limitações do contexto remoto onde os projetos são implementados (SHANLEY; PIERCE, 2006). Com as informações disponibilizadas pelo monitoramento, seria possível aprender com as iniciativas, bem como adaptar as formas de manejo rumo a resultados melhores (WILLIAMS, 2011).

Dentre as estratégias possíveis de monitoramento dos efeitos da exploração e do comércio de recursos naturais por comunidades locais, como é o caso dos PFM, o monitoramento participativo, ou seja, aquele realizado pela própria comunidade com ou sem apoio de atores externos (e.g. órgãos governamentais, ONGs e pesquisadores), tem sido sugerido como a forma mais indicada por razões pragmáticas, assim como capaz de gerar os melhores resultados (e.g., DANIELSEN; BURGESS; BALMFORD et al., 2009; HOLCK, 2008; LAWRENCE; PAUDEL, 2006). O monitoramento participativo é considerado vantajoso tanto em termos de conservação ambiental, quanto de empoderamento das comunidades, além de mais viável de implementar. Em relação à conservação, o monitoramento participativo pode levar a uma detecção precoce de possíveis ameaças aos recursos naturais, permitindo adaptação das estratégias de manejo e evitando danos irreversíveis. Especificamente, a vantagem da participação dos atores locais consiste, por um lado, no contato frequente destes com os recursos e, sendo assim, a detecção precoce de impactos negativos (FRÖDE; MASARA, 2007). Por outro, viabiliza a coleta de dados em escalas variadas e com frequência maior que o possível no monitoramento

profissional. Mais importante, incrementa também as chances de mudanças de comportamento e a adoção de regras de manejo restritivas, pelo aumento da confiança dos moradores no processo que gerou as possíveis limitações de uso (DANIELSEN; BURGESS; JENSEN et al., 2010). Quanto ao empoderamento das comunidades, o monitoramento participativo traz atores frequentemente marginalizados para uma posição central na tomada de decisões sobre o uso e manejo dos recursos naturais (SETTY; BAWA; TICKTIN et al., 2008). Por fim, o monitoramento participativo também é considerado vantajoso em termos pragmáticos, especialmente para países em desenvolvimento onde recursos financeiros são limitados, por ser considerado menos custoso de implementar e mais fácil de ser mantido do que o monitoramento realizado por atores externos, como pesquisadores ou consultores contratados (HOLCK, 2008).

Apesar da ênfase dada aos benefícios de implementar o monitoramento de forma participativa, restam dúvidas sobre a viabilidade desta abordagem, em especial, quanto à motivação das comunidades em participar do monitoramento (e.g., SMITH; CHHETRI; REGMI, 2003; VAN RIJSOORT; JINFENG, 2005). Ou seja, apesar da alardeada conveniência da abordagem, seu principal pressuposto, i.e. que os indivíduos de determinada comunidade estarão dispostos a participar voluntariamente do monitoramento, não foi suficientemente avaliado (EVANS; GUARIGUATA, 2008; VAN RIJSOORT; JINFENG, 2005). Apesar disso, entender quais fatores determinam a participação no monitoramento é importante, pois este conhecimento permitirá conceber estratégias para incentivar a participação, aumentando a probabilidade de sucesso desta abordagem de monitoramento no curto e longo prazo. Por sua vez, o sucesso na implementação pode levar ao manejo mais eficiente em termos de conservação dos recursos naturais, assim como dos resultados relativo ao desenvolvimento local.

Este é o tema da presente tese, a qual tem como objetivo central identificar determinantes da participação de atores locais no monitoramento dos efeitos da coleta e comercialização de recursos naturais. Esses determinantes incluem fatores econômicos, comportamentais e psicológicos, como atitudes e percepção de impactos da exploração de recursos naturais.

Para atender ao objetivo central, utiliza-se como exemplo o monitoramento da exploração de PFNM, a partir de um estudo realizado em uma comunidade, comunidade do Roque, situada na Reserva Extrativista do Médio Juruá, Amazonas, Brasil (5°33'54"S; 67°42'47"W). Desde 2000, a comunidade possui uma parceria com empresa de cosméticos nacional para a comercialização de óleos vegetais.

O principal produto comercializado é o óleo de andiroba (*Carapa guianensis*, Aubl.), que

é processado a partir das sementes em uma usina situada na comunidade. *C. guianensis*, conhecida popularmente no Brasil como andiroba, pertence à família Meliaceae e apresenta ampla distribuição nas regiões Neotropicais da América Central e do Sul e na África Tropical (BOUFLEUER, 2004). Na Amazônia brasileira a espécie ocorre em maior densidade em áreas alagadiças, mas, ocasionalmente, pode ser encontrada em terra-firme (PINTO; AMARAL; GAIA et al., 2010). Os indivíduos adultos atingem cerca de 30 metros de altura e 1,2 metros de diâmetro (BOUFLEUER, 2004), frutificando entre janeiro e abril (PINTO; AMARAL; GAIA et al., 2010). O total de sementes produzidas por indivíduo adulto apresenta grande variação, podendo chegar a 200 kg por ano (SHANLEY; MEDINA, 2005). No entanto, a taxa de predação pela fauna local também é muito alta, variando entre 50-96% do total de sementes produzidas (MACHARGUE; HARTSHORN, 1983).

Dois métodos principais de coleta de dados foram empregados para estimar a participação em quatro tarefas de monitoramento, quais sejam: a coleta de dados das populações de andiroba, entrevistar a outros membros da comunidade, entrada e armazenamento de dados e reuniões de planejamento e discussão. O primeiro método consistiu em um *survey* por meio de entrevistas com todos os indivíduos adultos (≥ 18 anos; 51 unidades domésticas), para avaliar a intenção auto-declarada de se envolver no monitoramento, bem como os fatores que afetam a participação (e.g., fatores econômicos, comportamentais e psicológicos) (ver apêndices A e B). As entrevistas foram realizadas em dois blocos diferentes, o primeiro realizado entre março e abril de 2013 e o segundo entre outubro e dezembro do mesmo ano. Os moradores foram entrevistados individualmente pela pesquisadora e, cada entrevista, durou entre 30 e 60 minutos.

O segundo método consistiu na implementação de um monitoramento experimental dos efeitos da coleta e comércio de *C. guianensis* para estimar a participação real no monitoramento. Além de permitir estimar a correlação entre a participação auto-declarada e a participação real, a implementação do monitoramento experimental contribuiu para ampliar o número de estudos experimentais acerca do uso de recursos naturais por comunidades locais que ainda é escasso (CAVALCANTI; SCHLÄPFER; SCHMID, 2010).

Os resultados acerca da percepção dos impactos ecológicos e socioeconômicos da coleta e comércio de *C. guianensis* pela comunidade, obtidos durante o primeiro bloco de entrevistas (março e abril de 2013), foram utilizados para selecionar os indicadores a serem avaliados durante o monitoramento experimental. Foi escolhido apenas um indicador para os efeitos ecológicos e um para os efeitos socioeconômicos, pois se recomenda iniciar um plano de monitoramento de maneira simplificada, com poucos indicadores, para não sobrecarregar os

participantes. Ao longo do tempo, e conforme o interesse e treinamento dos comunitários é possível introduzir novos indicadores que sejam relevantes ao contexto (GUIJT, 1999). Para os efeitos ecológicos foi escolhido monitorar alterações na densidade e na estrutura da população de andiroba. Para os efeitos socioeconômicos, a distribuição da renda monetária proveniente de atividades ligadas à coleta e venda de andiroba foi escolhida para o monitoramento experimental.

O monitoramento experimental foi implementado entre outubro e dezembro de 2013 e consistiu em quatro etapas: (i) reunião inicial; (ii) coleta de dados socioeconômicos dos moradores; (iii) coleta de dados ecológicos sobre a população de *C. guianensis* e (iv) reunião final.

A primeira etapa do monitoramento experimental consistiu em uma reunião inicial com a comunidade para: discutir a importância do monitoramento; apresentar os impactos ecológicos e socioeconômicos percebidos como mais relevantes pelos moradores e planejar as próximas atividades. Todos os adultos (≥ 18 anos) da comunidade foram convidados a participar da reunião inicial. O nome dos indivíduos presentes no início da reunião foi anotado, bem como o tempo de permanência de cada um deles.

Na segunda etapa do monitoramento experimental, a pesquisadora treinou um grupo de comunitários voluntários para monitorar o efeito socioeconômico (i.e. distribuição da renda monetária proveniente de atividades ligadas à coleta e venda de andiroba). Estes comunitários realizaram então entrevistas com todos os adultos da comunidade.

Na terceira etapa, a pesquisadora treinou um grupo de comunitários voluntários para levantar dados sobre a população de *C. guianensis* da qual eles coletam os frutos. Durante esta etapa foram levantados número de adultos e jovens na área.

Por fim, foi realizada uma reunião de fechamento para apresentar os dados coletados, discutir a importância de manter o monitoramento ao longo do tempo e levantar estratégias para contornar os obstáculos da manutenção do monitoramento. Novamente, todos os adultos (≥ 18 anos) da comunidade foram convidados a participar da reunião inicial. O nome dos indivíduos presentes no início da reunião foi anotado, bem como o tempo de permanência de cada um deles.

O conteúdo da tese está dividido em três capítulos, cada qual destinado a investigar diferentes fatores, ou conjunto de fatores, que podem determinar a participação no monitoramento. O primeiro capítulo testa a hipótese de que pessoas usualmente cooperativas e aquelas mais beneficiadas pelo comércio de PFNM seriam mais propensas a participar do

monitoramento de forma voluntária. No segundo capítulo foi testado se a Teoria do Comportamento Planejado (TCP) (AJZEN, 1991) é um modelo adequado para prever a propensão à participação no monitoramento da coleta e comercialização de recursos naturais. O terceiro capítulo parte da hipótese de que a maior percepção dos impactos ecológicos e socioeconômicos negativos provocados pela coleta e pelo comércio de PFNM aumenta a probabilidade de participação dos indivíduos em diferentes atividades de monitoramento. Por fim, a tese encerra com uma seção de conclusões finais, na qual os principais resultados e conclusões de cada capítulo são sintetizados, assim como sugestões para estudos futuros são apresentadas. É importante ressaltar que os capítulos estão estruturados no formato de capítulos autocontidos, ou seja, com introdução, métodos, discussão e conclusões próprias. Embora esta estrutura possa tornar algumas partes repetitivas ao leitor de toda a tese, ela foi escolhida para facilitar a publicação futura no formato de artigos científicos.

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CAPÍTULO 1

Why people engage in participatory monitoring of natural resources harvest and trade effects? The role of resource dependence and cooperative behavior

Abstract

Participatory monitoring of natural resources harvest and trade effects is advocated as a strategy that promotes resource conservation and local communities' empowerment. However, the strategy success depends utmost on people's willingness to participate, so understanding what drives people's participation is of vital importance. While some studies present evidence that increased income benefits from natural resources promotes participation in monitoring, others argue that people participate regardless of benefits. In this study we addressed this question and hypothesized that greater cooperativeness and higher benefits obtained from non-timber forest products (NTFP) predict a higher probability of participation in monitoring. To do so we conducted a study in a forest community of the Brazilian Amazon that harvested and traded *Carapa guianensis*, a NTFP. Two techniques of data gathering were employed to estimate participation in four monitoring tasks (planning, data collection, data management and outcomes discussion): (i) an interview-based survey of 166 adults (51 households) to evaluate the self-stated intention to engage in monitoring, and (ii) experimentally-implemented monitoring tasks to evaluate who actually participated. The results showed that both higher income dependence on NTFPs and levels of cooperativeness were associated with greater intention and actual participation in monitoring, but cooperativeness was a stronger and better predictor across monitoring tasks. Despite being sufficient for a start, the levels of participation in experimental monitoring were low, thus challenging the practice's sustainability. Strategies to increase participation may include avoiding income inequalities, providing information about monitoring benefits and granting financial compensation equivalent to opportunity costs.

Keywords: monitoring and evaluation, community-based management, volunteering, non-timber forest product, cooperation, Brazilian Amazon.

1. Introduction

The commercial trade of non-timber forest products (NTFPs) from natural environments has been proposed since the late eighties as a win-win strategy because it is believed to promote the conservation of natural environments while improving local inhabitants' development (SHACKLETON; SHACKLETON; SHANLEY, 2011). The proposal rationale rests on the fact that harvesting NTFPs is already a fundamental activity for forest-based people worldwide, who use NTFPs for subsistence and as a source of cash income through trading them *in natura* or processed (TICKTIN; SHACKLETON, 2011). Moreover, NTFP harvesting values the maintenance of natural ecosystems whose resources people rely on (SILLS; PATTANAYAK; FERRARO et al., 2006), and is less harmful to the environment than other activities based on forest conversion, such as agriculture and cattle breeding (PETERS, 1994; SHANLEY; LAIRD; PIERCE et al., 2002).

Despite the strategy popularity as a conservation and development tool, accumulated evidence shows NTFP harvest and trade can produce undesired ecological and socioeconomic effects. Potential ecological impacts include a decrease in the size of NTFP populations or even their local extinction (e.g. KUSTERS, 2009; RAIMONDO; DONALDSON, 2003); a decline in the resources' quality or size, such as smaller leaves (ENDRESS; GORCHOV; PETERSON et al., 2004) or fruits (SINHA; BAWA, 2002); changes in the species diversity at the harvested area (MOEGENBURG; LEVEY, 2003) and changes at the landscape due to the opening of trails and roads for resource transportation (KUSTERS, 2009). Trading NTFPs may also produce negative socioeconomic consequences, such as increase social conflicts, as the generated income is often unequally distributed among community members (e.g., ARNOLD; RUIZ-PÉREZ, 2001), weaken cooperativeness among households, threatening their well-being (RIZEK; MORSELLO, 2012) and decrease the practice of subsistence activities (FISHER; DECHANEUX, 1998).

Results are therefore mixed, leading many authors to claim that the effects of NTFP harvest and trade should be monitored (e.g., HALL; BAWA, 1993; SETTY; BAWA; TICKTIN et al., 2008; TICKTIN, 2004). Monitoring can be implemented with different degrees of communities' involvement. At one extreme, monitoring can be externally-driven and executed only by external stakeholders, such as professional researchers and government employees (DANIELSEN; BURGESS; BALMFORD et al., 2009). At another extreme monitoring can be locally-driven and executed by community inhabitants either by themselves, or with the assistance of external stakeholders, who can take part in certain monitoring steps, such as

planning, data collection, data management and decision making (DANIELSEN; BURGESS; BALMFORD et al., 2009). Also called participatory monitoring, locally-driven monitoring or community-monitoring, the approach has been advocated by several authors as advantageous over externally-driven practices for several reasons (e.g., BOISSIÈRE; BASTIDE; BASUKI et al., 2014; HOLCK, M.H., 2008). First, by transferring the control of information about natural resource conditions to local communities, participatory monitoring may increase inhabitants' control over decisions about resources management and strength local institutions (SETTY; BAWA; TICKTIN et al., 2008) (HOLTE-MCKENZIE; FORDE; THEOBALD, 2006). Second, participation raises people's confidence in a project or conservation strategy, facilitating agreements between local and external stakeholders and increasing the adoption of management rules within the community (DANIELSEN; BURGESS; JENSEN et al., 2010). By promoting residents' periodical visits to the natural environments where resources are exploited, participatory monitoring also allows the early detection of conservation threats such as a decrease in resources' populations (FRÖDE; MASARA, 2007). Furthermore, some proponents advocate that, when compared with monitoring executed by external stakeholders, involving local people lowers implementation costs at least for external institutions such as governments or NGOs, because it decreases the need to hire external labor (HOLCK, M.H., 2008).

Despite the much vaunted desirability of participatory monitoring, there are still doubts about its feasibility, because participatory strategies depend on local people's motivation and willingness to engage (EVANS; GUARIGUATA, 2008; VAN RIJSOORT; JINFENG, 2005). If community members, or at least a good part of them, are unwilling to volunteer, monitoring will certainly fail. Thus, understanding which factors drive people's participation is important, because this knowledge may help to devise strategies that encourage people's involvement in monitoring in the short and long terms.

Engaging in participatory monitoring of common pool resources, such as frequently is the case with NTFPs, has high opportunity costs because it takes people's time and effort away from other productive activities, and does not necessarily result in personal and immediate benefits (EVANS; GUARIGUATA, 2008). Thus, according to some authors (DANIELSEN; BURGESS; BALMFORD, 2005), participation will only occur if the benefits of monitoring are clear and exceed the costs incurred by the person. Presumably, those benefitting more from NTFP harvest and trade should have higher incentives to monitor and participation should incur lower opportunity costs. Also, it is possible that when income derives mainly from the natural resource

harvested, people are more likely to participate because decreases in resource populations could impair their future flux of income.

We are unaware of studies that specifically evaluated the association between benefits earned from NTFPs and participation in monitoring the effects of these resources harvest and trade. However, previous studies about local stakeholders' participation in natural resource management found a positive association between forest dependence and participation (JUMBE; ANGELSEN, 2007; LISE, 2000; MASKEY; GEBREMEDHIN; DALTON, 2006).

For instance, Maskey et al. (2006), studying community-based forest management in Nepal, noted that those earning the highest levels of income from harvested natural resources (e.g., timber and fodder) were more likely to actively participate in meetings to decide forest management issues. The authors highlight the danger of a cycle of exclusion since the disadvantage groups have a small role in decision-making and, consequently, glean fewer benefits from the forest resources. A similar trend was observed by Lise (2000) in a study about people's participation in forest management in India. The author observed that the benefits obtained from forest resources were an important driver of participation in different management activities, e.g. village council meetings, and also affected people's attitudes about forest management.

In contrast, Gichuki and Macharia (2003), studying community-based management of wetlands in Kenya found that, occasionally, those poorer or who did not benefit from the exploited resource were the ones participating most in monitoring. Jumbe and Angelsen (2007) also observed conflicting evidence in a study about local stakeholders participation in forest co-management in two reserves in Africa. For one of the reserves (Liwonde) the authors found that greater forest dependence was associated with lower levels of participation.

This conflicting evidence therefore suggests there are factors other than the benefits received from the exploited resource which may affect people's participation. Indeed, several factors were shown to influence people's participation in natural resource management and monitoring, as well as human cooperative behavior in general (KÜMMERLI; COLLIARD; FIECHTER et al., 2007; MOLINA; GIMÉNEZ-NADAL; CUESTA et al., 2013). For instance, personal characteristics such as gender (GICHUKI; MACHARIA, 2003) and age (GICHUKI; MACHARIA, 2003; MASKEY; GEBREMEDHIN; DALTON, 2006) can influence people's likelihood of participating in natural resource management and monitoring. Since women and older individuals tend to be more cooperative (MASKEY; GEBREMEDHIN; DALTON, 2006;

MOLINA; GIMÉNEZ-NADAL; CUESTA et al., 2013), we can expect that people with these characteristics would be more prone to engage in monitoring.

Since engaging in volunteer-based monitoring (i.e. without payments) brings about potential benefits to community's well-being but entails personal costs without the guarantee of individual gains, people's participation is an example of cooperative behavior. Thus, it is possible that besides other personal factors, more cooperative individuals have a higher propensity to participate in monitoring, independently of the benefits they earn from exploiting the resource. Despite that, we are unaware of studies comparing the relative influence of how much people benefit from resource exploitation, in one side, and their intrinsic cooperative behavior, on the other, to explain their likelihood of participating in monitoring.

Knowing better which are the factors that explain most people's likelihood of participating in monitoring may help us to devise better strategies that guarantee monitoring establishment and maintenance in the long term. For instance, if participation is mainly affected by the benefits obtained from the resource exploitation, increasing economic returns such as paying premium prices, and guaranteeing that those less likely to participate benefit financially, can help to boost participation levels. On the other hand, if a person's intrinsic cooperative behavior is a better predictor of participation, strategies aimed at increasing cooperation at the community level will probably have better outcomes.

In this study we therefore assessed which were the factors that better explained people's voluntary participation in monitoring the ecological and socioeconomic effects of NTFP harvest and trade. We hypothesized that higher cooperativeness and higher benefits obtained from NTFP predict a higher probability of participation in monitoring the effects of natural resource harvest and trade. To test our hypothesis we conducted a study in a community from the Médio Juruá Extractive Reserve in the Brazilian Amazon, where people harvest NTFPs and trade them with a cosmetics company. In that community, we compared the relative role of the economic benefits a person received from harvesting and trading NTFPs and his/her intrinsic cooperative behavior on the likelihood of participating in monitoring, controlling for other personal characteristics. We evaluated participation through two estimation strategies: (i) people's self-stated willingness to participate assessed through a survey, and (ii) people's actual participation in four tasks associated with monitoring which we experimentally implemented during the study. We chose this approach because, in that way we could investigate both: people's self-stated intention to monitor and their actual participation, therefore enabling us to understand whether the two measures were correlated.

2. Methods

The study was based on a cross-sectional design (NEWING; EAGLE; PURI et al., 2011) in which we compared the intention to participate and the actual participation in monitoring the effects of NTFP harvest and trade of individuals who differed in the economic benefits they received from NTFP and their cooperative behavior, controlling for background characteristics (e.g., gender, age, education). 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). Therefore, to evaluate people's participation in monitoring, we adopted two estimation strategies: (i) their self-stated willingness to participate assessed through a survey, and (ii) their actual participation in four tasks associated with monitoring activities, which we experimentally implemented during the study. We chose this approach because, in that way, the robustness of our findings could be improved in two ways. First, the approach enabled us to investigate both: people's self-stated intention to monitor and their actual participation, therefore enabling us to understand whether the two measures were correlated. If so, self-reports could be used as reliable measures of people's actual participation, therefore allowing those interested to predict the likely levels of participation before implementing monitoring. Moreover, our estimate of people's participation is not influenced by previous occurrences that might have altered people's intention to engage besides the factors we were interested in (i.e., benefits received and levels of cooperation).

2.1. Study site overview

The study was carried out at Roque, a community in the Médio Juruá Extractive Reserve, located in the Carauari town, Amazonas state of Brazil (5°33'54"S; 67°42'47"W). The Reserve has 253,226 ha and approximately 1900 inhabitants distributed among 13 communities (ICMBIO, 2011). Local inhabitants are "Caboclos", who are descendants from mixed indigenous, African and European ancestors, and have lived in the Amazonian forested regions for many generations (NUGENT, 1993). With 495 inhabitants distributed among 51 households, Roque is the most populous community of the Reserve.

Since 2000, the community has a commercial agreement for the provision of NTFP-based vegetable oils to a cosmetics company. Andiroba seeds (*Carapa guianensis* Aubl., Meliaceae) is the main forest product traded, which are harvested and then locally-processed into vegetable oil. After being transferred to town, the oil is refined by a chemical industry operating in Manaus, Brazil, and resold to the cosmetics company (RIZEK; MORSELLO, 2012).

Community members earn cash income from the following tasks associated with NTFP harvest and trade: seed gathering; participation in trips to purchase seeds from other communities; transportation of seeds or processed oil within the community; temporary employment in the processing plant and permanent employment in the cooperative. While employees of the processing plant receive regular and higher payments, the tasks of gathering and transportation are sporadic and associated with lower payments.

Two factors accounted for our choice of case study community. First, the research group had previously investigated the community, which allowed us to build community trust, as well as a more comprehensive and in-depth understanding of the local operation of NTFP harvesting and trade. Additionally, there was a manifest interest of both the community and the environmental government agency to establish monitoring of the effects of NTFP trade to the resource and to local inhabitants, so understanding what drives participatory monitoring was important to them.

2.2. *The sample*

The unit of analysis adopted was the individual and his/her propensity to participate in monitoring (i.e., self-stated intention or actual participation). The sample comprised the entire adult population of Roque (≥ 18 years) (N=170), but since not all inhabitants were present during fieldwork and a few were unwilling to take part in the study, our response rate equaled 97% of the adult population (n=166). In contrast to other studies with rural communities, which frequently consider children and teenagers because in these contexts they often participate in productive activities (RIZEK; MORSELLO, 2012), we adopted the cut-age of 18 y.o. (legal adulthood in Brazil) following a community request based on their fear of being legally-accused of child labor exploitation.

Three variables were estimated at the household level, defined in this study as the group of people who shared production tasks (e.g., agriculture) and consumption (NETTING, 1993).

These variables – i.e., household size, age dependence ratio and household cash income - were included in the analyses because they could affect individual's propensity to participate in monitoring (see: GICHUKI; MACHARIA, 2003).

2.3. Data gathering

Two techniques of data gathering were employed to estimate the variables of interest: (i) an interview-based survey, and (ii) the implementation of an experimental monitoring of NTFP harvest and trade effects over conservation and community well-being.

The interview-based survey was composed of multiple choice questions (structured questionnaire) carried out through face-to-face interviews by ADB between March/April and October/December, 2013. We surveyed a total of 166 adult individuals from 51 households. Through the interview-based survey we gathered: (i) people's self-stated intention to monitor (dependent variable); (ii) two proxies of cooperative behavior (explanatory variables); (iii) NTFP dependence (explanatory variable); and (iii) control variables.

We also implemented an experimental monitoring of NTFP harvest and trade effects at the community. The experimental monitoring was adapted from the methodologies proposed by Byers (2000), Machado (2008) and Fröde & Masara (2007) for the implementation of participatory management in extractive communities. We conduct a total of four monitoring tasks: (i) data gathering on the natural resource population (*C. guianensis* Aubl., in our case), such as the density of seedlings, samplings and adults; (ii) interviewing other community inhabitants to gather data such as the amount of natural resource harvested and the income earned with selling the resource and employment in the processing steps; (iii) an initial meeting to discuss the importance of monitoring and plan the monitoring tasks; and (iv) a final meeting to discuss the results, the benefits and the obstacles for monitoring implementation at the community. We invited all the adults to take part in these tasks and, through direct observation; we computed who participated in each one. Through the experimental monitoring implementation we gathered people's actual participation at monitoring NTFP harvest and trade effects (dependent variable).

2.4. The models and variables

We assessed the correlation between participation in NTFP monitoring activities (dependent variables) and individual's levels of (i) cooperative behavior, measured through two proxies and (ii) NTFP dependence (explanatory variables). Two groups of models were adopted, which correlated the same set of explanatory variables with two alternative definitions of participation. The first was the self-stated intention to participate in NTFP monitoring tasks estimated through the individual-based survey, while the second was the actual participation in certain tasks of NTFP monitoring which we experimentally implemented during the study. The variables included in each model are described next.

2.4.1. Dependent variables: self-stated intention to participate and actual participation in NTFP monitoring

We assessed both an individual's self-stated intention to participate and the actual participation in monitoring the ecological and socioeconomic impacts of NTFP harvest and trade.

Self-stated intention to participate indicated an individual's reported willingness to participate in NTFP monitoring activities. Because natural resources monitoring can include a multitude of tasks and each one requires different types of effort and skills, we assessed the self-stated intention to participate in four tasks that are often included in monitoring the effects of natural resource harvesting (BOISSIÈRE; BASTIDE; BASUKI et al., 2014; DANIELSEN; BURGESS; BALMFORD, 2005): (i) to collect data on the natural resource population (*C. guianensis* Aubl., in our case), such as the density of seedlings, samplings and adults; (ii) to interview other community inhabitants to gather data such as the amount of natural resource harvested and the income earned with selling the resource and employment in the processing steps; (iii) to take part in communal meetings to plan monitoring activities or to discuss its outcomes and (iv) to manage and store the data obtained throughout monitoring in the computer. Respondents were asked about their intention to participate in each of these tasks according to 5-points ordinal scales (from 1 = I certainly would not participate through 5 = I certainly would participate). We collected this information through the interview-based survey carried out with the adult population.

The *Actual participation* was represented by a dummy variable (0 = did not participate; 1 = participated). The tasks of collecting data on the natural resource population and interviewing other community inhabitants were the same we assessed for the self-stated participation. The task of taking part in communal meetings was divided in two different tasks. Taking part in an initial meeting to discuss the importance of monitoring and plan the monitoring activities and taking part in a final meeting to discuss the outcomes, benefits and obstacles for monitoring establishment at the community. Due to infrastructural difficulties, we did not include the task of data management and storage in the experimental monitoring.

2.4.2. *Explanatory variables*: NTFP dependence and cooperative behavior

We assessed individuals' levels of benefits received from NTFP harvest and trade (*NTFP dependence*) and their intrinsic cooperative behavior. This second variable was measured through two different proxies (*Self-stated cooperativeness* and *Past volunteer activities*)

For estimating the benefits received from NTFP harvest and trade, we equaled it with the income dependence on NTFPs. *NTFP dependence* was defined as the income ratio between the cash income derived from NTFPs and from other sources (e.g., wages, agriculture) which can vary vastly amongst forest community inhabitants (ZENTENO; ZUIDEMA; DE JONG et al., 2013). Data to estimate the variable comes from the interview-based survey, in which we asked for all sources of cash income in the previous 90-days. Due to fluctuations in income levels, we repeated the income survey to improve our estimates in two distinct periods: flooding season (between March and April, 2013) and low-water season (between October and December, 2013). Thus, the values used to estimate the NTFP dependence was the individual's mean cash income for a month. All the values were converted from Reais to USD dollars using the exchange rate of September 2014 (R\$ 1.00 = USD 0.44).

In order to increase the accurateness of our measures, two variables accounted for individuals' cooperative behavior in the models: *Self-stated cooperativeness*, or individuals' willingness to cooperate, and *Past volunteer activities* accounting for individuals' actual behavior in the past.

To construct the variable *Self-stated cooperativeness*, we built an index through assessing individuals' self-stated intention to help in three hypothetical voluntary situations, which were familiar for the local people and that any inhabitant was able to participate. For instance, we

asked whether the person would help to fix another family's house in case it was damaged by a storm. Respondents were asked about their intention to help in each of the three situations according to a 5-points ordinal scale (from 1 = would certainly not help throughout 5 = would certainly help). The reliability between the statements was checked using the Cronbach's Alpha (CORTINA, 1993) adopting $\alpha = 0.7$ as minimum value for reliability (KLINE, 2011). We then used the Principal Component Analysis (PCA) to aggregate the statements and generate an unique factor, representing the variable of interest (GADERMANN, A.M.; GUHN, M.; ZUMBO, B.D., 2012), i.e. the *Self-stated cooperativeness*.

The second indicator of cooperative behavior – *Past volunteer activities* - indicates a person's actual cooperation with voluntary activities at the community in the previous year. We included this variable to assess differences between individuals' actual cooperativeness, i.e. to assess how many times the individuals engaged in activities they were not obligated to and without receiving payments. The variable was estimated by calculating the percentage of seven volunteer activities that the individual took part in the previous year at the community. The activities were: chelonian monitoring (*Podocnemis* sp), pirarucu fish monitoring (*Arapaima gigas*), building a communal house to process manioc flour, taking care of children from other households, helping to clear or plant another household agricultural plot, and helping to build or repairing community infrastructures (e.g., bridges and electric power line).

2.4.3. Control variables

A total of seven variables were included in the regression models in order to control for confounding factors. Four variables were assessed at individual level (gender, age, education, residence) and three at household level (household size, age dependence, household total income).

2.5. Data analysis

In both groups of regressions, we adopted two-level mixed-effects models, an approach that takes into account the hierarchical nature of the sampling design (GELMAN; HILL, 2007) , i.e., the fact that individuals were nested within households. The procedure therefore corrects for

non-independence between individuals from the same households, and produce unbiased and often more conservative standard errors, confidence intervals and significance tests (GOLDSTEIN, 2011).

The three explanatory variables were included in the regression models in their standardized form to enable direct comparison of effect magnitudes from variables estimated in different scales (ZUUR; LENO; WALKER et al., 2009). The variables were standardized by subtracting their mean and dividing by two times their standard deviation. Variables thus have a mean of zero and take ± 0.5 standard deviation values, allowing a direct comparison between regression coefficients (GELMAN, 2008).

To assess the correlation between NTFP dependence or individuals' cooperative behavior (explanatory variables) on their self-stated intention to participate in NTFP monitoring, we used multilevel mixed-effects ordered logistic regressions (MEOLOGIT) due to the ordinal nature of the dependent variables, controlling for confounding factors. In total, we performed four MEOLOGIT models, one for each monitoring tasks considered (i.e., intention to: collect data about the natural resource population, interview community inhabitants, attend to meetings to plan monitoring and discuss its outcomes and work on data management and storage).

To assess the association between the NTFP dependence or the individuals' cooperative behavior (explanatory variables) on people's actual participation in the experimental monitoring tasks, we used multilevel mixed-effects logistic regressions (MELOGIT) due to the binary nature of the dependent variables, controlling for confounding factors. In total, we performed four MELOGIT, one for each of the monitoring activities considered (i.e., to: collect data about the natural resource population, interview community inhabitants; participate in an initial communal meeting to plan the monitoring and participate in a final meeting to discuss monitoring outcomes)

3. Results

Results are divided into three parts, beginning by (1) descriptive statistics characterizing the study sample, then the two sets of regressions: (2) the effects of NTFP dependence and cooperative behavior over the self-stated intention to participate in each monitoring task and (3) the same analyses for the actual participation in each monitoring tasks.

3.1. Descriptive statistics

Among 166 respondents (18 to 74 y.o.) living in households with an average of five people and five years of schooling, 51% were women and 49% men (Table 1). Households' total cash income varied greatly from USD 71.0 to USD 7,344.4 per year, while individuals earned on average USD 97.64 per year from NTFP trade activities (SD = 214.16; range: USD 0.00 to USD 1,452.00). Women (Mean = 105.60 USD) benefited slightly more than men (Mean = 89.05 USD) from NTFP income ($t = 2.13$; $p = 0.03$), whereas men (Mean = 838.22 USD) earned more from other income sources than women (Mean = 573.90 USD; $t = -2.31$; $p = 0.02$).

The self-stated intention to participate in monitoring comprised involvement in four tasks. Among them, attending to meetings for planning and discussing monitoring outcomes was the task in which people were more willing to participate (Mean = 3.3, SD = 1.5) (Table 1), followed by collecting data on natural resource populations (Mean = 2.4; SD = 1.5), managing and storing data (Mean = 2.0; SD = 1.5) and interviewing community inhabitants (Mean = 1.7; SD = 1.1; Figure 1).

Table 1. Descriptive statistics of the variables included in the models.

Variables	Definition/Values	N	Central Tendency	SD	Min	Max
Dependent variables						
<i>Self-stated intention to participate</i>						
Collect data on natural resource population	Ordinal scale from 1=certainly would not participate to 5= certainly would participate	166	^a Me=2.4	1.5	1.0	5.0
Interview community inhabitants	Ordinal scale from 1=certainly would not participate to 5= certainly would participate	166	^b Me=1.7	1.1	1.0	5.0
Meeting to plan and discuss monitoring outcomes	Ordinal scale from 1=certainly would not participate to 5= certainly would participate	166	Me=3.3	1.5	1.0	5.0
Data management and storage	Ordinal scale from 1=certainly would not participate to 5= certainly would participate	166	Me=2.0	1.5	1.0	5.0
<i>Actual participation in experimental monitoring</i>						
Collect data on natural resource population	Binary variable: 0=did not participate; 1=participated	166	^c Mo=0 (96%)	0.1	0.0	1.0
Interview community inhabitants	Binary variable: 0=did not participate; 1=participated	166	Mo=0 (98%)	0.1	0.0	1.0
Meeting to plan monitoring activities	Binary variable: 0=did not participate; 1=participated	166	Mo=0 (85%)	0.3	0.0	1.0
Meeting to discuss monitoring outcomes	Binary variable: 0=did not participate; 1=participated	166	Mo=0 (88%)	0.3	0.0	1.0
Explanatory variables						
NTPF dependence	Percentage of the total income that comes from NTFP	166	Me=0.3	0.4	0.0	1.0
Past volunteer activities	Percentage of volunteer activities made in the previous year	166	Me=0.2	0.1	0.0	0.7
Self-stated cooperativeness	Index of willingness to help in three hypothetical voluntary situations	166	Me=10	1.7	3.0	12.0
Control variables						
Gender	Man=1; Woman=0	166	Mo=0 (52%)	^d n.a	n.a	n.a
Age	Age in years	166	Me=32.4	13.2	18.0	74.0
Education	Number of years of formal education	166	Me=4.8	3.7	0.0	11.0
Residence	Percentage of life lived in the community	166	Me=0.7	0.3	0.0	1.0
Household size	Number of individuals at the respondent household	166	Me=4.6	3.2	1.0	14.0
Age dependence ratio	Percentage of working age over non-working age individuals at respondent household	166	Me=0.7	0.5	0.0	5.0
Household total income	Total cash income of respondents' household (USD/year)	166	Me=1,774.3	152.6	71.0	7,344.4

Notes: ^aMe= mean; ^bMd = median; ^cMo = mode and percentage in parentheses; ^dn.a = not applicable.

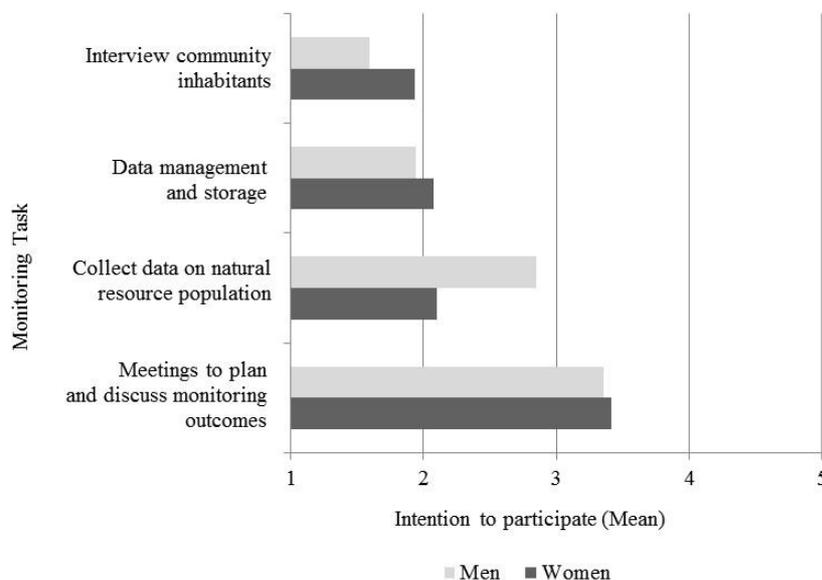


Figure 1. Distribution of the self-stated intention to participate in different monitoring tasks. The intention to participate (X-axis) was measured following the ordinal scale: 1 = I certainly would not participate; 2 = I probably would not participate; 3 = maybe I would participate; 4 = I probably would participate and 5 = I certainly would participate.

Considering all community adults (N=170), actual participation was low for the four assessed tasks (Figure 2). However, results for actual participation were proportional to those obtained with the self-stated intention, i.e. those tasks with higher levels of actual participation were the same with the highest levels of self-stated intention. A total 51 individuals participated at least in one of the implemented tasks, 32 of whom were women (37% of total adult women) and 19 men (23% of total adult men). Meetings were the monitoring task achieving the highest levels of actual participation (14% and 11% of the total adult population for the initial and final meetings, respectively), followed by collecting data on natural resources (3%) and, interviewing community inhabitants (2%). Collecting data on natural resources was the only activity in which women participated less than men.

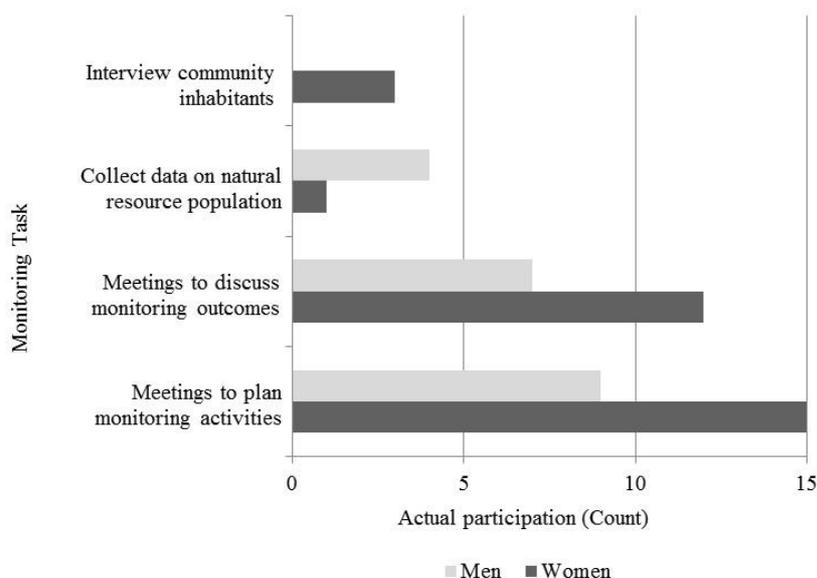


Figure 2. Number of participants in each experimental monitoring activity. The X-axis represents the number of participants by gender in each task.

Individual dependence on NTFP income ranged widely, going from 0 to 100% (Mean = 0.38; SD = 0.41) (Table 1). The average level of NTFP dependence among people who actually participated in some of the four experimental monitoring tasks (Mean = 0.495; SD = 0.064) was higher than among those individuals who did not participate (Mean = 0.359; SD = 0.250) ($t = 6.79$; $p = 0.00$) (Table 2).

Table 2. Comparison between NTFP dependence values of participants and non-participants in the experimental monitoring tasks.

NTFP Dependence ^a	Experimental monitoring task				Total Mean
	Collect data on natural resource population	Interview community inhabitants	Meeting to plan monitoring activities	Meeting to discuss monitoring outcomes	
People who actually participated	0.553 ^b (0.404) ^c	0.356 (0.409)	0.495 (0.417)	0.403 (0.405)	0.495 (0.064)
People who did not participate	0.372 (0.411)	0.379 (0.412)	0.359 (0.408)	0.369 (0.420)	0.359 (0.250)

Notes: a = NTFP dependence varies from 0 to 1; b = mean; c = standard deviation.

Individual self-stated cooperativeness mean was high (Mean = 10.00; SD = 1.73) and did not differ between women (Mean = 10.29; SD = 1.77) and men (Mean = 10.73; SD = 1.37) ($t = 2.53$; $p = 0.11$). Conversely, individuals' actual cooperation with voluntary activities at the community in the previous year (*Past volunteer activities*) was low (Mean = 0.20; SD = 0.18) with men (Mean = 0.23; SD = 0.19) cooperating slightly more than women (Mean = 0.16; SD = 0.18) ($t = 3.44$; $p = 0.00$).

3.2. Factors associated with the intention to participate in NTFP monitoring

The following results of the multilevel regressions regard the association between the self-stated intention to participate in monitoring (dependent variable) and both NTFP dependence and an individual's intrinsic cooperative behavior (explanatory variables) (Table 3).

Reported intention to collect data on natural resources positively correlated with the two indicators of individual's level of cooperativeness, i.e. *Past volunteer activities* ($\beta = 36.084$; $p < 0.01$) and *Self-stated cooperativeness* ($\beta = 0.423$; $p < 0.10$). *NTFP dependence* was also positively associated with intention to participate ($\beta = 3.029$; $p < 0.10$). Thus, those volunteering more frequently in the past, reporting to be more cooperative and depending more on NTFP income were also more likely to report they would collect data on natural resources. Moreover, *Gender* was an important predictor, with men being more prone to participate than women.

In contrast, the reported intention to interview community inhabitants was associated with lower levels of volunteering in the past ($\beta = -18.707$; $p < 0.10$) and was not predicted by *Self-stated cooperativeness* and *NTFP dependence*. Moreover, those with higher education levels reported higher willingness to interview, whereas those older and living in households with higher levels of *Age dependence ratio* were less prone to participate.

The intention to attend to meetings was more likely among those who volunteered more frequently in the past ($\beta = 28.143$; $p < 0.01$), reported higher levels of cooperativeness ($\beta = 0.585$; $p < 0.01$) and were more dependent on NTFP income ($\beta =$

4.190; $p < 0.05$). Additionally, older people were more prone to participate in meetings, contrasting with the findings for interviews.

Reported intention to participate in data management and storage negatively correlated with *Past volunteer activities* ($\beta = - 20.000$; $p < 0.10$), indicating that those volunteering more frequently in the past were less likely to engage in this task. Neither *Self-stated cooperativeness* nor *NTFP dependence* predicted the intention to engage in data analysis tasks. Younger and more educated people reported higher levels of intention to participate in data analysis, whereas higher levels of household *Age dependence ratio* reduced the likelihood of participating in this task.

Table 3. Results from multilevel regressions of the association between self-stated intention to participate and NTFP dependence and indicators of cooperative behavior

Variable	Monitoring task			
	Collect data on natural resource population a β (S.E)	Interview community inhabitants β (S.E)	Meetings to plan or discuss monitoring outcomes β (S.E)	Data management and storage β (S.E)
NTFP dependence	3.029* (1.499) ^a	-0.793 (1.643)	4.190** (1.357)	-1.646 (1.735)
Past volunteer activities	36.084*** (8.298)	-18.707* (7.922)	28.143*** (7.398)	-20.000* (8.445)
Self-stated cooperativeness	0.423* (0.222)	0.304 (0.309)	0.585*** (0.182)	0.291 (0.349)
Gender	0.729** (0.256)	-0.441 (0.306)	-0.352 (0.231)	0.178 (0.321)
Age	0.004 (0.010)	-0.038** (0.016)	0.039*** (0.010)	-0.102*** (0.017)
Residence	-0.196 (0.353)	-0.843 (0.444)	-0.206 (0.350)	-0.565 (0.430)
Education	0.020 (0.034)	0.232*** (0.039)	0.010 (0.039)	0.233*** (0.043)
Household size	0.000 (0.047)	0.035 (0.044)	-0.062 (0.047)	0.081 (0.061)
Age dependence ratio	-0.007 (0.023)	-0.072* (0.028)	0.006 (0.021)	-0.078* (0.031)
Household total income	0.165 (0.175)	-0.008 (0.183)	0.111 (0.150)	0.104 (0.240)
Wald chi ² (11)	60.94	98.53	64.78	135.53
Prop>chi ²	0.000	0.000	0.000	0.000
N	166	166	166	166
Model specification	Ordered logit	Ordered logit	Ordered logit	Ordered logit

Notes: a = Robust standard errors; * p < 0.10; ** p < 0.05; *** p < 0.01

3.3. Factors associated with the actual participation on experimental NTFP monitoring

In this section, we present the results from the multilevel regressions between the actual participation (experimental monitoring) and both an individual's level of cooperative behavior and their NTFP dependence (Table 4). We assessed the actual participation in four monitoring activities: (i) collecting data about the natural resource population; (ii) interviewing the community inhabitants; (iii) taking part in an initial communal meeting to discuss and plan monitoring activities and (iv) taking part in a final communal meeting to discuss monitoring results, as well as benefits and obstacles envisaged.

The likelihood of participating in actual data gathering of natural resources was significantly predicted by the two indicators of cooperativeness, i.e. an individuals' level of *Past volunteer activities* ($\beta = 70.875$; $p < 0.01$) and their *Self-stated cooperativeness* ($\beta = 6.866$; $p < 0.01$). However, *NTFP dependence* did not predict the likelihood of participating in the natural resources monitoring. The actual participation in interviewing community inhabitants, was not consistently driven by any of the explanatory variables (i.e., *Past volunteer activities*, *Self-stated cooperativeness* and NTFP dependence).

In the case of the actual participation in the initial and final meetings, *Self-stated cooperativeness* ($\beta = 2.369$; $p < 0.05$ and $\beta = 3.352$; $p < 0.05$) was the only significant predictor of engagement, whereas neither *Past volunteer activities* nor *NTFP dependence* were significantly associated with this task. People who took part in both meetings were significantly older, more educated and had higher levels of *Household total income*.

Table 4. Results from multilevel regressions of the association between actual participation in experimental monitoring and NTFP dependence and indicators of cooperative behavior

Variable	Experimental monitoring task			
	Collect data on natural resource population β (S.E)	Interview community inhabitants β (S.E)	Meeting to plan monitoring activities 0.495 (0.417)	Meeting to discuss monitoring outcomes β (S.E)
NTFP dependence	7.325 (5.325) ^a	9.971 (13.649)	4.155 (2.263)	2.353 (2.760)
Past volunteer activities	70.875 ^{***} (19.78)	-49.144 (35.902)	-1.709 (11.434)	-2.454 (11.956)
Self-stated cooperativeness	6.866 ^{***} (1.905)	0.155 (0.866)	2.369 ^{**} (0.837)	3.352 ^{**} (1.020)
Gender	0.418 (0.552)	. ^b	-0.658 (0.384)	-0.554 (0.460)
Age	0.004 (0.025)	-0.035 (0.053)	0.043 [*] (0.017)	0.082 ^{***} (0.020)
Residence	0.848 (1.543)	-7.317 (4.065)	-0.132 (0.668)	-0.397 (0.854)
Education	-0.181 (0.187)	0.607 (0.348)	0.121 [*] (0.058)	0.220 ^{**} (0.075)
Household size	-0.157 (0.148)	-0.319 [*] (0.140)	-0.015 (0.064)	-0.075 (0.071)
Age dependence ratio	-0.001 (0.049)	-0.353 (0.289)	0.048 (0.034)	0.029 (0.043)
Household total income	0.757 (0.807)	2.105 (1.648)	0.431 (0.301)	0.763 [*] (0.372)
Wald chi ² (11)	34.56	14.56	32.34	32.44
Prop>chi ²	0.000	0.001	0.000	0.000
N	166	166	166	166
Model specification	Logit	Logit	Logit	Logit

Notes: a = Robust standard errors; * p < 0.10; ** p < 0.05; *** p < 0.01; b = omitted from the results because only women participated.

4. Discussion

We present the discussion in five parts, beginning by exploring how much self-stated intention to participate approximates actual participation. Secondly, we discuss how much people participated and who did so in the experimental monitoring tasks. Then we explore which are the monitoring tasks people were more likely to engage. We finish by discussing the effects of NTFP dependence and cooperative behavior over people's participation in monitoring.

4.1. *How much self-stated intention approximates actual participation?*

In this study, we adopted both people's self-stated intention to participate and actual participation in monitoring, because using both indicators allowed us to evaluate whether the first could predict the latter. Understanding this issue is important because self-stated intentions can be quickly researched, therefore providing a means to effectively plan monitoring tasks before implementation. Previous scholars, however, argued that stated intentions to perform a specific behavior and the actual behavior, whether related to conservation or not, are not invariably equivalent (BAGOZZI; BAUMGARTNER; YI, 1989; MANSKI, 1990). Instead, informants often report what they believe researchers would prefer as an answer (BLEEK, 1987), or what is considered as more socially or culturally acceptable (SALAMONE, 1977).

Agreeing with this line of thought, the results showed that self-stated participation cannot predict the actual levels of participation (i.e. the number of volunteers in each task), because, as expected, people reported higher levels of intention to participate than they actually volunteered in real situations. Even so, results were proportional, i.e. those tasks with higher levels of intention to participate were the same with the highest levels of actual participation. Hence, the results suggest that assessing self-stated intentions can help devise which activities are more likely to be voluntarily performed and those in need of extra incentives, as well as the characteristics of the people more likely to engage in each task.

4.2. How much people actually participated?

In all monitoring tasks conducted experimentally, participation was low, going from 2% of the adult population in the interviews to 14% in the initial meeting. These low levels both agree and disagree with previous studies, because participation rates in community-based management and monitoring of natural resources vary greatly. For instance, Trimble et al. (2014) studying co-management agreements between small-scale fishermen communities and government in Brazil, observed that the number of fishermen who participate in meetings related to the participatory management was often low. On the other hand, studying a small-scale indigenous community in India, Setty et al. (2008) observed high levels of participation in monitoring the harvest of NTFPs.

In our study there are at least three possible reasons for the low levels of participation. Two of them are outcomes of NTFP trade implementation and considered as common results of market integration among small-scale and largely autarchic groups (RIZEK; MORSELLO, 2012). The third reason may be a consequence of the strictly commercial use of *Carapa* by the community.

First, the NTFP market weakened cooperation networks within the community, as observed in a previous study (RIZEK; MORSELLO, 2012). During the interviews, respondents often reported that, presently, cooperation among residents is less evident than in the past, such as exemplified by rarer acts of food sharing among households. Respondents also reported a lack of trust in other residents' propensity to help in activities for the common good, but levels of trust in peers increase group cooperation (BARR, 2003; CARDENAS; STRANLUND; WILLIS, 2000). Moreover, previous evidence shows that, in general, individuals' cooperativeness is positively conditioned by their perception of cooperation of the rest of the group (FISCHBACHER; GÄCHTER; FEHR, 2001).

The second possibly reason for low participation is an outcome of the processing plant construction in 2000, since when there was a substantial influx of new inhabitants to the village. Population growth is a known factor that can imperil group cooperation and reduces pro-social behavior, because it changes the dynamics of interactions (BOWLES; GINTIS, 2011) and increases the frequency of conflicts (POLLNAC; CRAWFORD; GOROSPE, 2001). In the village, current conflicts between new and old residents were evident and reflected even in the spatial configuration of the houses.

Third, the fact that the exploited resource is not used for subsistence can lead to a lack of incentive to ensure its sustainability and thus to participate in monitoring. *Carapa* is exploited only for trade and not for subsistence (e.g. as food). Hence, a reduction in *Carapa* populations would not severely threaten the community subsistence. Although cash income could be affected, other income sources exist, such as agriculture (especially manioc flour trade) or even substituting *Carapa* harvesting for other NTFPs (e.g. *Astrocaryum murumuru* and *Euterpe oleracea*). In contrast, higher rates of participation are frequently found in contexts where managed natural resources are used for subsistence (e.g. COULIBALY-LINGANI; SAVADOGO; TIGABU et al., 2011; POLLNAC; CRAWFORD; GOROSPE, 2001). When negative effects, such as decreases in the stocks or quality of natural resources, may imperil the community's livelihoods, the incentives to conserve natural resources and monitor their populations are higher. However, when resources are harvested only for commercial use, as in this case study, incentives are limited and perhaps lower than the opportunity cost involved in voluntarily engaging in monitoring tasks. When this happens, probably extra incentives are needed in order to successfully implement and maintain monitoring tasks.

Nevertheless, it should be mentioned that although the rate of participation was low when considering the adult population, the number of people engaging was sufficient for satisfactorily beginning and accomplishing each of the experimental monitoring tasks. Yet, low levels of initial participation can threaten the maintenance of participatory monitoring if replacing volunteers is impossible. In the long run, having the same residents involved in voluntary monitoring may be unfeasible because of the trade-offs with productive activities. In fact, those studies reporting long term successful volunteer-based management and monitoring (e.g. BOISSIÈRE; BASTIDE; BASUKI et al., 2014; SETTY; BAWA; TICKTIN et al., 2008) are often associated with external funding from NGOs or government bodies at least at the program's beginning (e.g. ANDRIANANANDRASANA, 2005; VAN RIJSOORT; JINFENG, 2005).

4.3. Who are the people participating the most?

Between the participants of experimental monitoring activities, women and older individuals were more frequent, which reflects the findings of previous research (MASKEY; GEBREMEDHIN; DALTON, 2006; MOLINA; GIMÉNEZ-NADAL; CUESTA et al., 2013). In the absence of social norms preventing or restricting women's activities within the community (AGRAWAL, 2001; SETTY; BAWA; TICKTIN et al., 2008), this trend of being more cooperative can lead women to participate more than men in community-based management (MASKEY; GEBREMEDHIN; DALTON, 2006; WESTERMANN; ASHBY; PRETTY, 2005). In our study, even though some activities are traditionally done by men (e.g. hunting), women were not prohibited from performing any activity, including those related to NTFP harvest and trade (e.g. working at the processing plant) and even hold important political roles, such as the community leadership and the board of the processing plant. The lack of restrictive norms and the trend of being more cooperative are factors that could explain the higher level of women's participation at the experimental monitoring activities.

Evidence from other studies supports the finding that older individuals have a higher propensity to cooperate and to engage in some steps of natural resource management and monitoring, particularly in planning steps (like meetings) (GICHUKI; MACHARIA, 2003; MASKEY; GEBREMEDHIN; DALTON, 2006). Reyes-García et al. (2006), when studying cooperativeness between indigenous communities, went further by finding that cooperation increases with age until a certain age (approximately 46 years), and then starts to decrease. Likewise, studies about human cooperation based on economic games also highlight that older people are often more cooperative (ASWANI; GURNEY; MULVILLE et al., 2013; MCELREATH, 2004), possibly because they are more concerned about the future of resource stocks (ASWANI; GURNEY; MULVILLE et al., 2013). Last, it is possible that older people have a greater motivation to discuss the possible problems of the NTFP harvest, since they are usually found to be more concerned with the environment (LIU; VEDLITZ; SHI, 2014).

Although our results showed that women and elders tend to participate more in the experimental monitoring activities, we found two exceptions. First, for the natural resource population monitoring, women participated less than men. For this specific activity, it is possible that social norms play a role, since local women reported they dislike visiting forested area without accompanying men, because they are afraid of wild animals, particularly jaguars. As often only men are culturally accepted as shotgun owners, women prefer to trek

forested areas only in their presence. Second, participants in the interview were younger than in the other activities. Even if evidence shows that older people are more cooperative, in this case, participation could be more associated with higher education levels of the younger individuals. Presumably, higher literacy suits the younger to accomplish the task of interviewing community inhabitants.

While at first the greater participation of elders and women does not pose a problem for the monitoring of natural resources implementation, we must ensure that their participation does not become a burden of extra workload, as it represents additional activities to those already existing, such as domestic work for women.

4.4. Which are the monitoring tasks in which people are more likely to participate?

Levels of intention and actual participation fluctuated among monitoring tasks. Meetings to plan monitoring and discuss outcomes experienced the highest levels of intention and actual participation, probably because the task does not demand specific skills, such as literacy; involve risk exposure, such as visiting forested locations, and compete with subsistence activities, such as agriculture and household duties, because meetings occurred in the evenings. Despite the higher rate in comparison with other tasks actual participation in meetings was low considering the number of community adults (14% of the adults for the initial and 11% for the final meeting), but higher than observed in other local meetings unrelated to this study. For instance, in two meetings occurring during fieldwork (e.g., meeting with health officials and with other researchers) the number of participants was even lower (9% and 5% of the adult population, respectively). According to key informants, residents attend in large numbers only when meetings discuss NTFP trade payments, while other topics congregate few people.

The three remaining activities (i.e. monitoring natural resources, interviewing and data management) showed even lower levels of intention and actual participation.

Few people demonstrated an intention (most answers were “I probably would not participate”) or actually participated in natural resource monitoring due to two main reasons. First, surveying plant populations is little enjoyed because it involves visiting forested locations, and to some, particularly women, represents a risky business. Second, natural resource monitoring took a considerable amount of people’s time out of other productive

duties, since reaching *Carapa* trees involved walking about 40 minutes in the forest and crossing the river by canoe or boat, an asset not all inhabitants hold. Although it seems expected that people would be less prone to participate in more time consuming tasks, we are unaware of studies which investigated this association.

Interestingly, people participating in the monitoring of *Carapa* population were older than those showing up in other monitoring tasks. Besides, previous evidence which suggest that older people generally have higher propensity to be cooperative (ASWANI; GURNEY; MULVILLE et al., 2013), another plausible explanation is that local elders had stronger bonds with the forest than those younger because of in their past reliance on extractive activities, such as rubber extraction (DERICKX, 1992).

Interviewing other community members to assess information on the amount of NTFP harvested and the income earned with it, was also associated with low levels of intention (most answers were “I certainly would not participate” or “I probably would not participate”) and of actual participation (three individuals). Low rate of engagement in this monitoring task can be explained by the reliance on reading and writing skills, which are uncommon among community members. Indeed those participating in interviews had an average of nine years of formal education, therefore almost twice the community’s average of 4.8 years. Moreover, several people reported that despite being able to read and write, they did not enjoy interviewing, or considered it difficult and tedious.

Reported rate of intention to participate in data management and storage was also low (most answers equal to “I probably would not participate”); recall also that for this activity we estimated only the intention to participate. As with interviewing, leading with data requires skills uncommon in community inhabitants, explaining the low intention to participate. Accordingly, higher levels of intention are associated with younger and more schooled people, presumably because they are able to write, read and use computers. Other studies also presented evidence that the longest the time needed to learn a certain skill needed to manage an activity, the smallest the people’s willingness to cooperate with it (PANNELL; MARSHALL; BARR et al., 2006).

4.5. Effects of cooperative behavior and NTFP benefits on the participation in natural resource monitoring

The results demonstrated that both an individual's cooperativeness and his/her income dependence on NTFPs predicted participation in monitoring the effects of natural resource harvest and trade. However, cooperative behavior, particularly when estimated by the actual cooperation in the past, was a stronger and more general predictor. While cooperation in the past significantly correlated with participation in all monitoring tasks, NTFP dependence was associated only with certain monitoring activities.

As expected, more cooperative individuals were more likely to report an intention to participate and higher levels of actual participation in the monitoring tasks implemented. Exceptions to this were the intentions to interview community inhabitants and deal with data management and storage, both of which associated with lower rates of cooperation in the past. One possible explanation is that people who participated in the past volunteer activities that we assessed have different skills than the ones required to interview and work with data management and storage. The activities assessed by "*Past volunteer activities*" variable did not require literacy or computer skills. Thus, even if we included the education level as a control in our analysis, it is possible that people perceived activities that required literacy and computer skills as drudgery and were not willing to perform them. Another possible explanation is that all the activities assessed by "*Past volunteer activities*" variable were activities that community inhabitants were used to do. Thus, it is possible that this variable was inadequate to measure the intention to participate in activities that the community were not used to perform and for which they lacked the required.

Against our expectation, NTFP dependence does not always affect participation; instead it seems to be related to specific monitoring activities. Specifically, we found that a higher NTFP dependence increased the intention to participate in natural resource monitoring and to attend meetings. Although regression analysis results were not significant for the effect of NTFP dependence over actual participation, the averages of NTFP dependence of those who actually participated in some experimental monitoring activity were higher than the averages of people who did not participate (0.50 and 0.36 respectively). Moreover, these averages were also higher for who engaged in natural resource population monitoring and attended to meetings, as the observed for the association between the intention to participate and NTFP dependence.

We are unaware of studies that specifically evaluated participation in different stages of monitoring the effects of NTFP harvest and trade. However, previous studies, that had also found a positive association between forest dependence and participation of local stakeholders from rural communities in natural resource management (JUMBE; ANGELSEN, 2007; LISE, 2000; MASKEY; GEBREMEDHIN; DALTON, 2006) can shed some light in our findings.

For instance, Maskey et al. (2006) studying community forestry in rural Nepal also had linked participation in forest management with higher benefits derived from common forest resources (e.g. timber, fodder). However, the authors did not discriminate participation in different management tasks, instead, they discriminated different levels of participation in meetings to discuss forest management issues. They found that those who received more benefits were more likely to actively participate in meetings; i.e. they used to make suggestions and take part in decision making. On the other hand, the ones who received fewer benefits, generally, did not actively participated in the meetings. Presumably, these outcomes can be compared with our findings about the association between higher dependence on NTFP income and higher intention to attend to meetings, since meetings were related to planning and decision making.

However, our finding that higher NTFP dependence increased the intention to participate in the natural resource monitoring seems to be counterintuitive since it was not a monitoring step related to decision making, as for the case of meetings. A plausible explanation for this finding; comprises lower opportunity costs for those involved in harvesting NTFP, consequently with higher NTFP dependence. While visiting the area where the NTFP occurs, harvesters can, at the same time, monitor its populations (e.g. counting the number of adult trees, seedlings and samplings). In contrast, people who rely more on other income sources (lower NTFP dependence), such as agriculture, cannot ally both activities, thus their opportunity cost to monitor the natural resource population are higher and they are less prone to perform it.

It is also noteworthy the contrast between our findings and one of the findings of a study about local stakeholders participation in forest co-management in Africa (JUMBE; ANGELSEN, 2007). Jumbe and Angelsen (2007) argued that the relationship between forest dependence and participation in forest co-management seems to be linked to the use of the natural resources. Studying two reserves in Malawi, the authors observed that when resources are used primarily for household subsistence, greater forest dependence leads to higher levels of participation. On the other hand, when resources are used primarily for commercial trade,

greater forest dependence leads to lower levels of participation. In our study, although *Carapa* is used strictly for trade, the resource dependence and the participation were positively correlated, at least for two of the four monitoring tasks assessed. These contrasting results might be explained by local stakeholders' distinct perceptions about monitoring. In the referred study, the authors argued that market integration increase the value of forest resource, hence, it could decrease the probability of people's participation in co-management since they may fear restrictions on the use of forest resources (JUMBE; ANGELSEN, 2007). In our case study, the community did not have prior experiences with monitoring the use of NTFP. Thus, it is possible that even if they use the resource for commercial trade, they did not have a negative perception about resource's monitoring.

5. Conclusions

We began the study by hypothesizing that higher cooperativeness and higher benefits obtained from NTFP predict a higher probability of participation in monitoring the effects of natural resource harvest and trade. Our results demonstrated that both an individual's cooperativeness and his/her income dependence on NTFPs predicted participation. However, cooperative behavior, particularly when estimated by the actual cooperation in the past, was a stronger and more general predictor. While cooperation with volunteer activities in the past significantly correlated with participation in all monitoring tasks, NTFP dependence was associated only with certain monitoring activities.

We also observed low levels of intention to participate and of actual participation in the experimental monitoring activities performed. Although low when compared to the total number of adults in the community, the number of participants in each experimental monitoring activity was sufficient to begin the process of participatory monitoring. However, the low levels of intention to participate can pose a problem to maintain the monitoring activities over the long term. That is because, probably, there would not be possible to replace those inhabitants who had already participated in any of the activities. Monitoring a natural resource is an investment of time and effort, often representing a high opportunity cost, especially for communities in developing countries (EVANS; GUARIGUATA, 2008). Thus, keeping the same inhabitants doing the monitoring activities in a voluntary way is not feasible at our context as it also should not be for others with similar characteristics.

In order to evaluate whether people's self-stated intention to participate could predict actual participation in monitoring we adopted both indicators. The results showed that, as expected, people reported higher levels of intention to participate than they actually volunteered in real situations. Even so, results were proportional, i.e. those tasks with higher levels of intention to participate were the same with the highest levels of actual participation. Hence, the results suggest that assessing self-stated intentions can help devise which activities are more likely to be voluntarily performed and those in need of extra incentives, as well as the characteristics of the people more likely to engage in each task.

Finally, knowing that maintaining participatory monitoring in the long term is a challenge (GARCIA; LESCUYER, 2008) and that cooperative behavior is a stronger driver of

participation, we can think in some strategies to foster people participation and increase the chances of successful monitoring establishment and maintenance.

First it is necessary to develop strategies to increase cooperativeness between community members. Evidence shows that increasing the available information among people can increase cooperation within the group (CAMERER; FEHR, 2004; MOON; MARSHALL; COCKLIN, 2012). Thus, by increasing the information available about the importance of monitoring for forest conservation and for community livelihoods, it may be possible to increase the rate of participation.

Second, it is necessary to create strategies for the benefits of monitoring to outweigh the its costs (DANIELSEN; BURGESS; BALMFORD, 2005). For this, participants could be paid - in cash or in kind - an amount at least equal to the opportunity cost of their participation. This payment could be done by governmental institutions or companies engaged at the NTFP harvest, and at least for that activities that community consider as more difficult to perform (e.g. interviews and data management) or more time consuming (e.g. monitor the resource population).

At last, some considerations about monitoring design can help to improve the probability of a successful implementation. First, it is necessary to keep monitoring as simple as possible to increase the chances of participation and future maintenance (BOISSIÈRE; BASTIDE; BASUKI et al., 2014; GHATE; NAGENDRA, 2005). In our case, maybe it would be better to start just by collecting data about the natural resource populations, postponing data gathered through interviews and data management. Second, it would be also necessary to establish clear rules of who would be responsible for each activity and when, to avoid the burden of extra work just for some individuals, mainly women and elders, since our results showed that these are the people who are more likely to participate. And finally, if it is not possible to simplify complex monitoring steps (e.g. data management); it is worthwhile to consider using the help of external actors (e.g. researchers); with the commitment that the monitoring outcomes would return to the community so they can use the generated information to take their own management decisions (STUART-HILL; DIGGLE; MUNALI et al., 2005).

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CAPÍTULO 2

Predicting the intention to participate in natural resource monitoring: An application of the Theory of planned behavior

Abstract

Success in participatory monitoring of the effects of natural resource harvest and trade depends on people's willingness and availability to participate. Yet little is known about the factors driving people to volunteer in participatory monitoring. Testing the suitability of theoretical social psychology frameworks for explaining people's participation thus provides a powerful analytical tool. In this study, we evaluated the effects of factors associated with the Theory of Planned Behavior (TPB) (attitude, subjective norm and perceived behavioral control) over individuals' intention to participate in four tasks of natural resource monitoring: collecting data on natural resource populations; interviewing other community inhabitants; participating in communal meetings, and dealing with data management and storage. Moreover, we investigated whether adding descriptive norms increased the TPB predictive power. To do so, we surveyed 149 individuals (51 households) in a community of the Brazilian Amazon where inhabitants harvested and traded non-timber forest products (NTFPs). Results showed that only one attitude variable (pleasure of performing the task) affected the four monitoring tasks. Subjective norm (whether significant others approve participation) positively affected the intention to collect data on natural resource populations and to interview other community inhabitants, whereas *Perceived behavioral control* (participating is under individuals own control) affected the intention to collect data on natural resource populations and to deal with data management and storage. Adding *Descriptive norm* (perceptions about the behavior of others) did not increase the predictive power of the TPB model. Strategies to boost participation should deal mainly with approaches to: engage significant people (e.g. leaderships) in order to incentive people's participation and reinforce monitoring as a social norm; and to overcome potential barriers for participation (e.g. lack of literacy or assets).

Keywords: monitoring and evaluating, community-based management, volunteering, Theory of planned behavior, attitudes, Brazilian Amazon.

1. Introduction

Monitoring and evaluation, or the process of gathering information about a system or process to detect changes and evaluate impacts over time and space (HOLCK, M.H., 2008), is a widely recognized component of any project, program or intervention to ensure that money is well spent and objectives are met (GUIJT, 1999). Likewise, in the area of natural resource management in tropical developing countries, there is a frequent claim that monitoring should be expanded if natural ecosystems are to be preserved for future generations (HOLCK, M.H., 2008). Monitoring in these contexts would help to track changes in biodiversity, an obligation for the Convention of Biodiversity signing parties (HOLCK, M.H., 2008), but also to provide essential information for evaluating interventions aimed at either conserving natural ecosystems or improving local livelihoods (BOISSIÈRE; BASTIDE; BASUKI et al., 2014). For instance, monitoring could contribute to assessing the impacts of strategies usually adopted to promote forest conservation while increasing local well-being, such as trading forest resources and payments for ecosystem services.

However, many developing countries face lack of financial and human resources (HOLCK, M.H., 2008), one of the reasons why monitoring by external stakeholders such as professional researchers has been increasingly replaced in the last twenty years (NICHOLS, 2002). Instead, participatory monitoring in natural resource management, which is pursued by or at least with the involvement of local stakeholders (EVANS; GUARIGUATA, 2008; NICHOLS, 2002), has gained popularity due to its low cost in face of growing scarcity of conservation and development funds (HOLCK, M.H., 2008), but also because of the increased demand for performance-based accountability in management and funding circles (ESTRELLA; GAVENTA, 1998). More importantly, participatory monitoring gained recognition in community-based forest management because it is deemed able to promote both local communities' empowerment and forest conservation. By transferring the control of information about natural resource conditions to local communities, participatory monitoring builds local analytical capacity, increasing inhabitants' power of management decisions and strengthening local institutions (HOLTE-MCKENZIE; FORDE; THEOBALD, 2006; SETTY; BAWA; TICKTIN et al., 2008). Furthermore, by promoting inhabitants' periodical contact with natural resources and their surrounding environments, as well as incorporating both traditional local knowledge and scientific knowledge, participatory monitoring may

allow the early detection of threats to natural resources, such as population declines (FRÖDE; MASARA, 2007). Participating in volunteer monitoring also provides opportunities for increasing people's connection with nature, and, ultimately, their respect and care for the environment (HIGGS; EGAN; HJERPE et al., 2011).

Monitoring may involve different degrees of local people's engagement. At one extreme there is an externally driven monitoring which does not involve local people and all the processes, i.e. from design, data collection, data analysis to information use, is undertaken by external stakeholders (e.g. professional researchers). At the other end there is monitoring where all steps are carried out by local stakeholders (DANIELSEN; BURGESS; BALMFORD et al., 2009). Yet, local inhabitants' volunteering in monitoring tasks demands time and effort, incurring personal opportunity costs, which are not immediately compensated (EVANS; GUARIGUATA, 2008). Moreover, when people differ in their values and perceptions about monitoring or the different tasks involved, they may diverge in their motivation to engage even if they experience equivalent opportunity costs. In theory, when individuals consider a certain behavior such monitoring as positive (attitude), and if they believe their significant others want them to perform the behavior (subjective norm), this results in a higher intention (motivation) and they are more likely to do so (AJZEN, 1991). For instance, some local inhabitants may have negative attitudes towards monitoring because they fear the knowledge derived from it could translate in imposed restrictions on their use of natural resources (VAN RIJSOORT; JINFENG, 2005); whereas others may believe monitoring produces positive outcomes. Thus, we could plausibly expect the former group to be less likely to participate in monitoring.

Since several motives, benefits, barriers, and constraints need to be kept in mind for understanding and motivating humans to adopt behaviors such as volunteer monitoring, there is a growing recognition that studying the human dimensions of natural resource management and conservation (ST. JOHN; KEANE; JONES et al., 2014; VERÍSSIMO, 2013), and particularly the psychology of engagement in those actions is important (MOON; MARSHALL; COCKLIN, 2012; SPONARSKI; VASKE; BATH et al., 2014; ZUBAIR; GARFORTH, 2006). In this regard, departing from a theoretical framework for understanding and predicting the willingness to volunteer in monitoring tasks would provide a powerful analytical tool (HIGGS; EGAN; HJERPE et al., 2011). The Theory of Planned Behavior (TPB) proposed by Ajzen (1991) may fulfill that function, because it offers an approach to better understand the psychology of human behavior. The TPB is part of a group of models

based on the role of cognitive self-regulation, as compared to other approaches dealing with aspects such as social institutions or personality traits in explaining human disposition to adopt behaviors (AJZEN, 1991). Specifically, the theory is a variant of the Theory of Reasoned Action, one of the most influential approaches to study the validity of the attitude–behavior relationship, i.e. how much attitudes are proximate causes of behavior (FISHBEIN; AJZEN, 1975). The TPB appropriateness is also reflected in its adoption in several studies aimed at predicting behavior towards resource management and environmental conservation (e.g. BEEDELL; REHMAN, 2000; MARCHINI; MACDONALD, 2012; WILLIAMS; JONES; CLUBBE et al., 2012)

The TPB framework is based on two main assumptions. First, the intention to perform a behavior is the most proximal indicator of the actual behavior (AJZEN, 1991), although the relation between intention and behavior cannot be taken for granted and must be submitted to systematic empirical investigation (FISHBEIN; AJZEN, 1975). Additionally, behavioral intention is influenced by three factors specific to that behavior: attitude, subjective norm and perceived behavioral control (AJZEN, 1991) (Figure 1). An attitude is a positive or negative judgment of both the act of performing a certain behavior, or the implications of such behavior. For instance, the statement “I believe monitoring is important for natural resource conservation” reveals a positive attitude towards the behavior of monitoring natural resources. Subjective norms refer to the impact of important individuals and groups (e.g., family, friends, and leaders) on a person’s behavioral intentions; thus whether believing that significant others approve a behavior such as monitoring increases the intention to participate in the activity. The third factor, perceived behavioral control is the notion added by the TPB to the Theory of Reasoned Action and reflects the idea that perceptions about constraints, or how much the behavior is perceived to be under a person’s control, will affect behavioral intention (MANFREDO, 2008). Hence, if a person believes to have the skills and tools necessary to perform monitoring, the intention to do it will increase. Perceived behavioral control is also considered a proxy of actual control over the behavior, and being so, it can also directly affect the actual performance of the behavior and not just the intention (AJZEN, 1991).

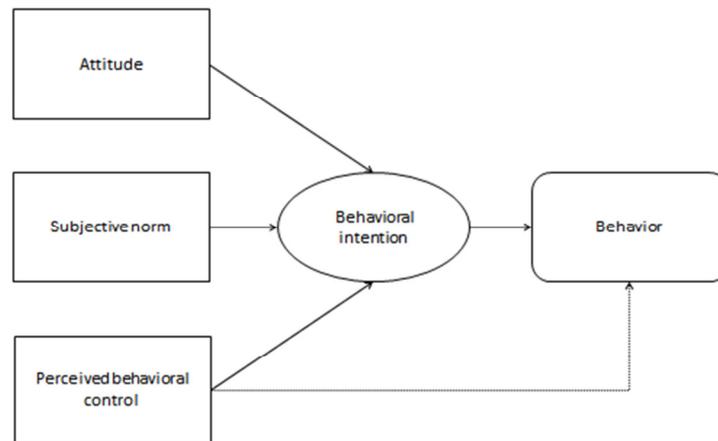


Figure 1. - The theory of planned behavior (Adapted from Ajzen, 2011). The more positive individuals' attitude, subjective norm and perceived behavioral control, the higher their behavioral intention and the probability of actually performing the behavior. The perceived behavioral control can also directly affect the behavior.

Although the predictive power of the TPB model and variables has been demonstrated in several areas (AJZEN, 2011), after more than two decades since its initial proposition accumulated evidence shows that the addition of other factors to the framework (e.g., emotions and personality traits) may improve its predictive power in some contexts (e.g. ARVOLA; VASSALLO; DEAN et al., 2008; LAM, 1999; MARCHINI; MACDONALD, 2012).

In a study about how to craft better pro- environmental messages, Cialdini (2003) argues that human behavior is motivated by two types of social norms: injunctive norm and descriptive norm. Injunctive norm is similar to the subjective norm from the TPB, i.e. it refers to individuals' perceptions about whether significant others approve a certain behavior. Whereas the descriptive norm reflects individuals' perception about which behaviors are typically performed by their group. Together, both types of norms motivate different human behaviors, such as littering (CIALDINI; RENO; KALLGREN, 1990); recycling (CIALDINI, 2003) and stealing natural resources from national parks (CIALDINI, 2003). In a similar way, studies from the field of experimental economics have shown that human behavior is influenced by perceptions about other people's behavior (BARR, 2003; CARDENAS; STRANLUND; WILLIS, 2000). This body of evidence showed that people's cooperativeness

is positively conditioned by the perception of cooperation from the rest of the group (FISCHBACHER; GÄCHTER; FEHR, 2001).

This evidence suggests that it is important to consider the descriptive norm in addition to the subjective norm from the original TPB model. Some studies from different fields of knowledge had showed that the addition of the descriptive norm can increase the TPB power of prediction (COOKE; SNIEHOTTA; SCHÜZ, 2007; MARCHINI; MACDONALD, 2012; SIEVERDING; MATTERNE; CICCARELLO, 2010). In the area of environmental conservation, Marchini and Macdonald (2012), in a study aimed at predicting ranchers' intentions to kill jaguars, observed that the addition of rancher's perceptions about whether other ranchers would kill a jaguar (descriptive norm) to the original TPB model improved the prediction of behavioral intentions in two different Brazilian regions (Pantanal and Amazon).

In the context of our study it is therefore plausible to suppose that those who believe other community inhabitants will cooperate with monitoring tasks (i.e. would volunteer to participate in it) will show a higher intention to take part in monitoring themselves. Therefore, adding the descriptive norm to the TPB model is likely to increase its predictive power.

Although there are several studies adopting the TPB framework with or without added components to predict human behavior towards resource management and environmental conservation (e.g., MARCHINI; MACDONALD, 2012; SEELAND; MOSER; SCHEUTHLE et al., 2002; ZUBAIR; GARFORTH, 2006), we are unaware of similar studies aimed at understanding people's intentions to engage in participatory monitoring. Adopting the TPB framework allows us to systematically test which factors foster people's participation in volunteer activities such as monitoring in several contexts, improving the theoretical advances in this area of knowledge. Additionally, more systematic evaluations of drivers affecting people's participation can contribute to devise strategies to encourage local participation in monitoring, increasing the likelihood of long-term success of the practice and thus of resource management.

In this study, we therefore adopted the TPB framework and evaluated the effects of its factors (i.e. attitudes, subjective norms, and perceived behavioral control) over individuals' intention to participate in natural resource monitoring. We also investigated whether adding a descriptive norm variable increased the TPB predictive power. We expected that those demonstrating greater intention to engage in natural resource monitoring were those who: had positive attitudes towards monitoring; believed that significant others would approve and support monitoring; believed to have the skills and tools needed to perform monitoring tasks,

and believed that other community's inhabitants would also participate (Figure 2). The study was conducted in a forest community of the Brazilian Amazon, where non-timber forest products (NTFPs) were harvested and traded with a cosmetics company.

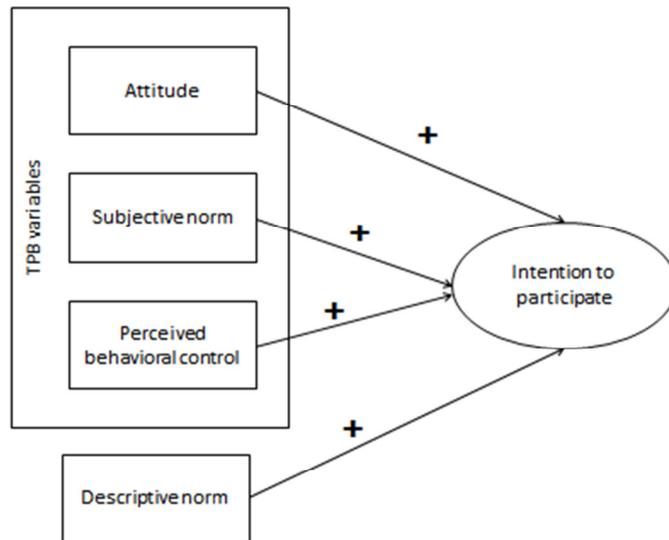


Figure 2. Expected relationships of TPB factors and descriptive norm over intention to participate in monitoring the effects of natural resource harvest and trade.

2. Methods

To evaluate whether TBP factors and descriptive norm predicted participation in monitoring, we investigated as a case study the inhabitants of a community who regularly harvested and traded a non-timber forest product (NTFP), but did not monitor the effects of these activities. This allowed us to assess individuals' intention to participate without the influence of previous occurrences, which might have altered their propensity to engage in monitoring.

In the following sections, we present the community studied, the sample and techniques of data gathering, and the variables and procedures for data analysis.

2.1. The study area

The study was carried out at Roque, a community in the Médio Juruá Extractive Reserve, located in the Carauari town, Amazonas State, Brazil (5°33'54"S; 67°42'47"W). The Reserve has 253,226 ha and approximately 1,900 inhabitants distributed among 13 communities (ICMBIO, 2011). Local inhabitants are "Caboclos", that is descendants from mixed indigenous, African and European ancestors who have lived in the Amazonian forested regions for many generations (NUGENT, 1993). With 495 inhabitants distributed among 51 households, Roque is the most populous community of the Reserve.

Since 2000, the community, through a local cooperative, has a commercial agreement with a cosmetics company for the provision of NTFP-based vegetable oils. Seeds from the andiroba tree (*Carapa guianensis* Aubl., Meliaceae) are the main product traded. The seeds are harvested and then locally-processed into vegetable oil. After being exported to town, the oil is refined by a chemical industry operating in Manaus, Brazil, and resold to the cosmetics company (RIZEK; MORSELLO, 2012).

Three factors accounted for our choice of case study community. The research group had previous research experience in the location, a factor important because it increased the community trust in the research group. Moreover, previous experience provided background data and an in-depth understanding of the local operation of NTFP harvesting and trade. Also,

there was a manifest interest of both the community and the environmental government agency to establish a monitoring plan for evaluating the effects of NTFP harvest and trade.

2.2. The sample and data gathering

At Roque, we set up to sample the intention to participate in monitoring for all adult population (≥ 18 years; $N=170$) of the community. However, a few members were absent during fieldwork or were unwilling to participate in the study, thus our final response rate equaled 87% of the adult population ($n=149$), representing all 51 households. Note also that, in contrast to other studies in rural communities which often sample younger ages because children and teenagers may participate in productive activities (e.g. RIZEK; MORSELLO, 2012), we adopted the cut-age of 18 y.o. (legal adulthood in Brazil). We did so following a community request based on their reported fear from being accused of child labor exploitation by legal authorities.

We conducted an interview-based survey with this sample to gather our variables of interest, i.e. people's self-stated intention to monitor; TBP variables; and descriptive norm variable. The interview-based survey was composed of multiple choice questions (structured questionnaire) carried out through face-to-face interviews by ADB between March/April and October/December, 2013.

2.3. Assessed variables

Our behavior of interest was the intention to participate in monitoring natural resources, but monitoring of this type involves multiple tasks, each one requiring different sorts of effort and skills. We therefore choose to estimate the intention to participate in four different tasks often included in monitoring the ecological and socioeconomic effects of trading natural resources (BOISSIÈRE; BASTIDE; BASUKI et al., 2014; DANIELSEN; BURGESS; BALMFORD, 2005): (i) to collect data on the natural resource population, specifically *C. guianensis* Aubl., such as the density of seedlings, samplings and adults; (ii) to interview other community inhabitants to obtain information on the amount of natural resources harvested and the income earned; (iii) to participate in communal meetings to plan monitoring

duties or to discuss its outcomes, and (iv) to manage and store data obtained throughout monitoring. Respondents were asked about their intention to participate in each of these tasks according to 5-points ordinal scales (Table 1).

Table 1. Statements used to assess individuals' intention to participate in the four monitoring tasks. The presented statements are a translation from the original in Portuguese.

Statement	Scale values
1. Would you participate in a monitoring task in which you need to go to the <i>andirobeiras</i> area to collect data about the trees, such as counting the number of adults and young trees?	Ordinal scale from 1= I certainly would not participate to 5 = I certainly would participate
2. Would you participate in a monitoring task in which you need to interview other Roque inhabitants to collect data, such as the amount of <i>andiroba</i> harvested and income earned with <i>andiroba</i> ?	Ordinal scale from 1= I certainly would not participate to 5 = I certainly would participate
3. Would you participate in communal meetings to plan the monitoring or discuss its outcomes and plan how to manage the <i>andirobeiras</i> ?	Ordinal scale from 1= I certainly would not participate to 5 = I certainly would participate
4. Would you participate in the management and storage of the data obtained through monitoring?	Ordinal scale from 1= I certainly would not participate to 5 = I certainly would participate

People's attitudes, i.e. their positive or negative perceptions (MANFREDO, 2008) towards monitoring, were assessed by two statements for each of the four monitoring tasks, totalizing eight statements (Table 2). The first set of statements assessed individual's perceptions about the pleasure of performing each of the four monitoring tasks (*Attitude – Pleasure*) on a 5-point scale. The second set of statements reflected people's perception about the importance of each monitoring task for forest conservation or community development (*Attitude – Importance*).

Table 2. Statements used to assess individuals' attitudes towards the four monitoring tasks. The presented statements are a translation from the original in Portuguese.

Statement	Scale values
Attitude – Pleasure	
1. For you, going to the <i>andirobeiras</i> area to collect data about the trees, such as counting the number of adults and young trees, would be a _____ task to do.	Ordinal scale from 1 = very unpleasant to 5 = very pleasant
2. For you, to interview other Roque inhabitants to collect data, such as the amount of <i>andiroba</i> harvested and income earned with <i>andiroba</i> , would be a _____ task to do.	Ordinal scale from 1 = very unpleasant to 5 = very pleasant
3. For you, to participate in communal meetings to plan the monitoring or discuss its outcomes and plan how to manage the <i>andirobeiras</i> would be a _____ task to do.	Ordinal scale from 1 = very unpleasant to 5 = very pleasant
4. For you, to participate in the management and storage of the data obtained through monitoring, would be a _____ task to do.	Ordinal scale from 1 = very unpleasant to 5 = very pleasant
Attitude - Importance	
1. For you, going to the <i>andirobeiras</i> area to collect data about the trees, such as counting the number of adults and young trees, is a _____ task to do.	Ordinal scale from 1 = not important to 5 = very important
2. For you, interviewing other Roque inhabitants to collect data, such as the amount of <i>andiroba</i> harvested and income earned with <i>andiroba</i> , is a _____ task to do.	Ordinal scale from 1 = not important to 5 = very important
3. For you, meetings to plan the monitoring or discuss its outcomes and plan how to manage the <i>andirobeiras</i> are _____ tasks to do.	Ordinal scale from 1 = not important to 5 = very important
4. For you, the management and storage of the data obtained through monitoring, is a _____ task to do.	Ordinal scale from 1 = not important to 5 = very important

Subjective norms, or individuals' beliefs regarding whether people important to them, such as relatives or leaders, would approve their engagement in a certain behavior (AJZEN, 2011), were assessed by three different statements for each of the four monitoring tasks (Table 3), totalizing 12 statements. In the first set of statements, respondents rated their agreement with the sentence that their families would approve their engagement in monitoring tasks (*Subjective norm – Family*), while the second set regarded the approval of friends (*Subjective norm – Friends*) and the third set the approval of community leaders (*Subjective norm – Community leaders*).

Table 3. Statements used to assess individuals' subjective norms regarding the four monitoring tasks. The presented statements are a translation from the original in Portuguese.

Statement	Scale values
Subjective norm - Family	
1. My family would approve if I went to the <i>andirobeiras</i> area to collect data about the trees, such as counting the number of adults and young trees.	Ordinal scale from 1 = totally disagree to 5 = totally agree
2. My family would approve if I went to interview other Roque inhabitants to collect data, such as the amount of <i>andiroba</i> harvested and income earned with <i>andiroba</i> .	Ordinal scale from 1 = totally disagree to 5 = totally agree
3. My family would approve if I participate in communal meetings to plan the monitoring or discuss its outcomes and plan how to manage the <i>andirobeiras</i> .	Ordinal scale from 1 = totally disagree to 5 = totally agree
4. My family would approve if I participate in the management and storage of the data obtained through monitoring.	Ordinal scale from 1 = totally disagree to 5 = totally agree
Subjective norm - Friends	
1. My friends would approve if I went to the <i>andirobeiras</i> area to collect data about the trees, such as counting the number of adults and young trees.	Ordinal scale from 1 = totally disagree to 5 = totally agree
2. My friends would approve if I went to interview other Roque inhabitants to collect data, such as the amount of <i>andiroba</i> harvested and income earned with <i>andiroba</i> .	Ordinal scale from 1 = totally disagree to 5 = totally agree
3. My friends would approve if I participate in communal meetings to plan the monitoring or discuss its outcomes and plan how to manage the <i>andirobeiras</i> .	Ordinal scale from 1 = totally disagree to 5 = totally agree
4. My friends would approve if I participate in the management and storage of the data obtained through monitoring.	Ordinal scale from 1 = totally disagree to 5 = totally agree
Subjective norm – Community leaders	
1. The community leaders would approve if I went to the <i>andirobeiras</i> area to collect data about the trees, such as counting the number of adults and young trees.	Ordinal scale from 1 = totally disagree to 5 = totally agree
2. Community leaders would approve if I went to interview other Roque inhabitants to collect data, such as the amount of <i>andiroba</i> harvested and income earned with <i>andiroba</i> .	Ordinal scale from 1 = totally disagree to 5 = totally agree
3. Community leaders would approve if I took part in communal meetings to plan the monitoring or discuss its outcomes and plan how to manage the <i>andirobeiras</i> .	Ordinal scale from 1 = totally disagree to 5 = totally agree
4. Community leaders would approve if I participate in the management and storage of the data obtained through monitoring	Ordinal scale from 1 = totally disagree to 5 = totally agree

Perceived behavioral control was assessed through two different statements for each of the four monitoring tasks (Table 4), totaling 8 statements. As explained earlier, perceived behavioral control regards the perceived degree of control in performing a certain behavior, i.e. how much an individual believe to possess skills and tools necessary to do so (AJZEN,

2011). Thus, in the first set of statements, we asked respondents about the difficulty of performing each of the four monitoring tasks (*Perceived behavioral control – Difficulty*). In the second set of statements, we evaluated whether respondents agreed that performing the monitoring tasks was a decision under their control or not (*Perceived behavioral control – Decision*).

Table 4. Statements used to assess individuals’ perceived behavior control regarding the four monitoring tasks. The presented statements are a translation from the original in Portuguese.

Statements	Scale values
Perceived behavior control – Difficulty	
1. For you, going to the <i>andirobeiras</i> area to collect data about the trees, such as counting the number of adults and young trees, would be a _____ task to do.	Ordinal scale from 1 = very difficult to 5 = very easy
2. For you, interview other Roque inhabitants to collect data, such as the amount of <i>andiroba</i> harvested and income earned with <i>andiroba</i> , would be a _____ task to do.	Ordinal scale from 1 = very difficult to 5 = very easy
3. For you, to participate in communal meetings to plan the monitoring or discuss its outcomes and plan how to manage the <i>andirobeiras</i> would be a _____ task to do.	Ordinal scale from 1 = very difficult to 5 = very easy
4. For you, to participate in the management and storage of the data obtained through monitoring, would be a _____ task to do.	Ordinal scale from 1 = very difficult to 5 = very easy
Perceived behavior control – Decision	
1. Going or not to the <i>andirobeiras</i> area to collect data about the trees, such as counting the number of adults and young trees is a decision that depends only on me.	Ordinal scale from 1 = totally disagree to 5 = totally agree
2. Interviewing or not other Roque inhabitants to collect data, such as the amount of <i>andiroba</i> harvested and income earned with <i>andiroba</i> is a decision that depends only on me.	Ordinal scale from 1 = totally disagree to 5 = totally agree
3. Participating or not in communal meetings to plan the monitoring or discuss its outcomes and plan how to manage the <i>andirobeiras</i> is a decision that depends only on me?	Ordinal scale from 1 = totally disagree to 5 = totally agree
4. Participating or not in the management and storage of the data obtained through monitoring is a decision that depends only on me?	Ordinal scale from 1 = totally disagree to 5 = totally agree

In addition to the four TPB components, we also assessed individuals' descriptive norm, i.e. perceptions regarding the participation of other inhabitants in the four monitoring tasks. To do so, respondents chose how many inhabitants they believed would engage in each one of the monitoring task (*Descriptive norm*), according to a 5-point scale (Table 5)

Table 5. Statements used to assess individuals' descriptive norm regarding the four monitoring tasks. The presented statements are a translation from the original in Portuguese.

Statement	Scale values
1. How many Roque inhabitants do you think would go to the <i>andirobeiras</i> area to collect data about the trees, such as counting the number of adults and young trees?	Ordinal scale from 1 = no one to 5 = all of them
2. How many Roque inhabitants do you think would interview other Roque inhabitants to collect data, such as the amount of <i>andiroba</i> harvested and income earned with <i>andiroba</i> ?	Ordinal scale from 1 = no one to 5 = all of them
3. How many Roque inhabitants do you think would participate in communal meetings to plan the monitoring or discuss its outcomes and plan how to manage the <i>andirobeiras</i> ?	Ordinal scale from 1 = no one to 5 = all of them
4. How many Roque inhabitants do you think would participate in the management and storage of the data obtained through monitoring?	Ordinal scale from 1 = no one to 5 = all of them

2.4. Data analysis

Data analysis was based on Structural Equation Modeling (SEM), a procedure often adopted to: (i) validate pre-existing models; (ii) evaluate concurrent models; and (iii) develop new models (HAIR JR.; BLACK; BABIN et al., 2009). In this study, we used SEM to assess the validity of the TPB pre-existing model in predicting the intention to participate in four monitoring tasks, and to compare two concurrent models: the original TPB model with another version including *Descriptive norm*.

Before proceeding with the SEM analysis, two data preparation procedures are required: data screening and score reliability test (KLINE, 2011). Data screening is a necessary step to identify potential problems in the raw data. To comply with this, we followed Kline's (2011)

recommendations, and checked for missing values, outliers and collinearity between variables. In the next step, we proceeded with the score reliability test using the Cronbach's alpha (CORTINA, 1993) and adopting $\alpha = 0.7$ as a minimum value for reliability (KLINE, 2011). Cronbach's alpha was estimated for each set of statements regarding *Attitude*, *Subjective norm* and *Perceived behavioral control* for the four monitoring tasks (Table 6). Statements with $\alpha < 0.7$ were kept in the models as independent observed variables, whereas those with $\alpha \geq 0.7$ were aggregated in the models as one unique latent variable. In contrast to an observed variable, a latent variable is a hypothetical construct or factor (KLINE, 2011).

After data screening and reliability tests, we proceeded to the SEM analysis. Four different sets of SEM were prepared, one for each monitoring task: (i) to collect data on the natural resource population; (ii) to interview other community inhabitants; (iii) to participate in communal meetings and (iv) to manage and store data. For each set we first assessed models only with the TPB variables; then we included the additional variable *Descriptive norm*. We did so to compare the predictive power of the original and transformed TPB models. Due to the non-parametric nature of our data, we estimated the models using the Quasi-maximum likelihood (QML) estimation method. The QML is similar to the maximum likelihood estimation method but it relaxes the assumptions of normality and adjusts the standard errors (KLEIN; MUTHÉN, 2007). In order to obtain the correlation between the variables, we used the standardized coefficients option (KLINE, 2011).

Following each model estimation, we performed two post-estimation tests to compare the goodness of fit of the alternative models (TPB and TPB plus *Descriptive norm*): Akaike's information criterion (AIC) (AKAIKE, 1987) and Baysen information criterion (BIC) (SCHWARZ, 1978). Lower values of AIC and BIC indicate a better fitted model. All analyses were conducted in Stata® v. 13.0.

Table 6. - TPB statements score reliability tests. Tests were performed using Cronbach's alpha and adopting $\alpha = 0.7$ as minimum value for reliability. Statements with α score < 0.7 were kept in the models as independent observed variables. Statements with α score ≥ 0.7 were aggregated in the models as one unique latent variable.

Statement	Cronbach's alpha	Decision
Monitoring task: to collect data about the natural resource population		
Attitude		
Pleasure and Importance	0.32	Kept in the models as two independent observed variables
Subjective norm		
Family, Friends and Community leaders	0.85	Aggregated in the models as one unique latent variable
Perceived behavioral control		
Difficulty and Decision	0.21	Kept in the models as two independent observed variables
Monitoring task: to interview other community inhabitants		
Attitude		
Pleasure and Importance	0.31	Kept in the models as two independent observed variables
Subjective norm		
Family, Friends and Community leaders	0.93	Aggregated in the models as one unique latent variable
Perceived behavioral control		
Difficulty and Decision	0.83	Aggregated in the models as one unique latent variable
Monitoring task: to take part in communal meetings		
Attitude		
Pleasure and Importance	0.50	Kept in the models as two independent observed variables
Subjective norm		
Family, Friends and Community leaders	0.80	Aggregated in the models as one unique latent variable
Perceived behavioral control		
Difficulty and Decision	0.18	Kept in the models as two independent observed variables
Monitoring task: to work in data management and storage		
Attitude		
Pleasure and Importance	0.38	Kept in the models as two independent observed variables
Subjective norm		
Family, Friends and Community leaders	0.80	Aggregated in the models as one unique latent variable
Perceived behavioral control		
Difficulty and Decision	0.97	Aggregated in the models as one unique latent variable

3. Results

We present the results of the TPB models in four parts, according to people's intention to participate in the four monitoring tasks assessed: (i) collecting data on the natural resource population, (ii) interviewing other community inhabitants, (iii) taking part in communal meetings to discuss monitoring-related issues, and (iv) dealing with data management and storage.

Note also that, contrary to our expectations, the addition of the variable “*Descriptive norm*” - i.e. individuals beliefs regarding the participation of other inhabitants - did not improve the prediction power of any of the TPB models and consistently led to a decrease in the goodness of fit (Table 7). Thus, we dropped the variable from the final models and adopted the original TPB model.

Table 7. - Goodness of fit of the performed models. Models [1]; [3]; [5] and [7]: models only with TPB variables. Models [2]; [4]; [6] and [8]: models with TPB variables and Descriptive norm.

	Task							
	To collect data about the natural resource population		To interview other community inhabitants		To participate in communal meetings related to monitoring		To participate in data management and storage	
Goodness of fit	Model [1]	Model [2]	Model [3]	Model [4]	Model [5]	Model [6]	Model [7]	Model [8]
P>Chi ²	0.0002	0.0000	0.000	0.0000	0.0000	0.000	0.000	0.000
AIC	3875.30	4182.47	4229.72	4960.62	3778.96	4540.51	3447.67	4853.48
BIC	3923.36	4233.54	4295.81	5038.72	3827.02	4609.61	3810.75	4925.57

Notes: AIC = Akaike's information criterion and BIC = Bayesian information criterion.

3.1. Intention to collect data on the natural resource population

People's intention to participate in the task of collecting data about the natural resource population (*C. guianensis*) was, on average, low (Table 8). They also tended to consider the task important for monitoring the resource and believed that people important to them (i.e. family, friends and community leaders) would approve if they performed the task. They tended to consider the task as neither pleasant nor unpleasant to perform. However, on average, they considered the task as difficult to do and that the decision of doing it or not was not a decision that depended only on their own will. Finally, they believed that only a few people at the community would participate in the monitoring task of collecting data on the natural resource population.

As expected, individuals who perceived the task of collecting data about the natural resource as more pleasant (*Attitude –Pleasure*) had greater intention to participate in this task ($\beta = 0.35$; $p = 0.005$) (Figure 3) (Supporting information 1). Also, a higher perception that the decision of collect data about the resource population depended only on their own will (*Perceived behavioral control – Decision*), the higher their intention to participate ($\beta = 0.34$; $p = 0.002$). Finally, the perception of approval from significant people (*Subjective norm*) also led to a greater intention to participate ($\beta = 0.2$; $p = 0.051$).

However, contrary to our expectation, the importance that individuals gave to the task of collecting data on the natural resource (*Attitude – Importance*) and the perception of the difficulty of performing the task (*Perceived behavioral control – Difficulty*) were not significantly associated with the intention to participate in collecting data about the natural resource population.

Table 8. - Descriptive statistics of the variables included in the models of the intention to participate in the monitoring task of collecting data about the natural resource population. Higher values of median and mean indicate more positive answers (n=149)

Statements	Values of the 5-point scales	Q1 Lower Quartile	Q2 Median	Q3 Upper Quartile	Mean (SD) ^a
Intention to participate Respondents intention to participate in the task	1 = certainly would not participate; 2 = probably would not participate; 3 = maybe would participate; 4 = probably would participate; 5 = certainly would participate	1	2	3	2.19 (1.38)
Attitude – Pleasure Respondents perceived pleasure of performing the task	1 = very unpleasant; 2 = unpleasant; 3 = neither pleasant nor unpleasant; 4 = pleasant; 5 = very pleasant	3	3	4	3.11 (1.14)
Attitude – Importance Respondents perceived importance of performing the task	1 = not important; 2 = little important; 3 = neither important nor unimportant; 4 = important; 5 = very important	4	4	5	4.09 (1.09)
Subjective norm - Family Respondents perceived approval of their family	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	3	4	5	2.73 (1.48)
Subjective norm – Friends Respondents perceived approval of their friends	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	3	4	5	3.78 (1.52)
Subjective norm – Community leaders Respondents perceived approval of community leaders	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	4	5	5	4.00 (1.62)
Perceived behavioral control – Difficulty Respondents perceived difficulty of performing the task	1 = very difficult; 2 = difficulty; 3 = neither difficult nor easy; 4 = easy; 5 = very easy	2	3	4	2.97 (1.07)
Perceived behavioral control – Decision Respondents perceived decision of performing the task	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	1	3	4	2.33 (1.80)
Descriptive norm Respondents perceived participation of other community inhabitants in the task	1 = no one; 2 = less than a half; 3 = a half; 4 = more than a half; 5 = all of them	2	2	2	1.87 (0.70)

^a Standard deviation

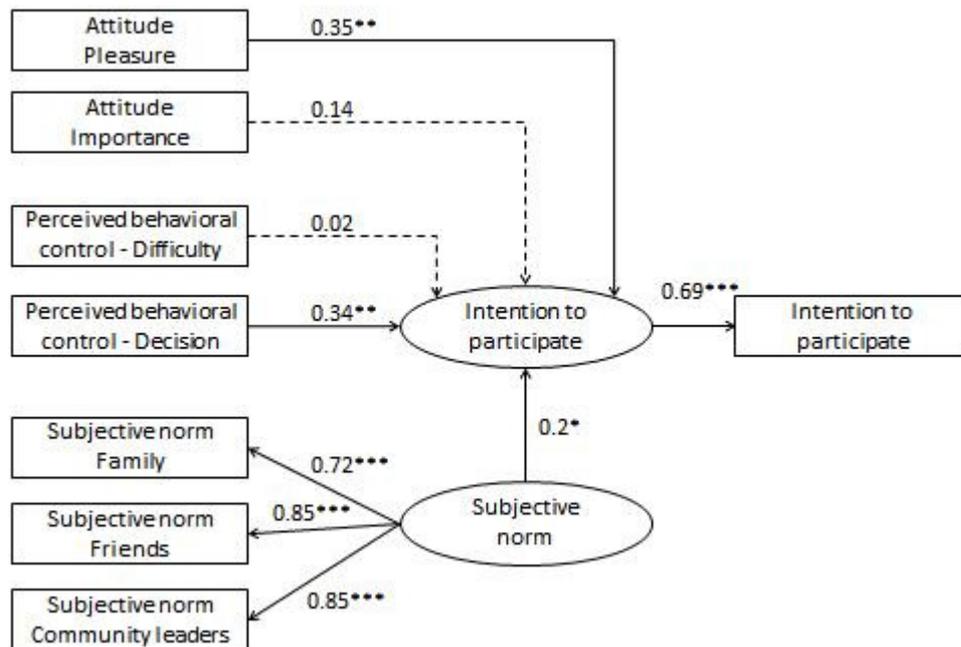


Figure 3. - Final model for the intention to participate in the monitoring task of collecting data about the natural resource population. Values of standardized β coefficients; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Solid lines represent significant associations; dotted lines represent non-significant associations. Rectangles represent observed variables. Circles represent latent variables.

3.2. Intention to interview other community inhabitants

Similar to the previous task, individuals showed, on average, a low level of intention to interview other community inhabitants to collect information on the amount of natural resources harvested and income earned on these products (Table 9). They tended to consider the task of interviewing as neither pleasant nor unpleasant to perform. They also tended to consider the task important for monitoring the effects of natural resource harvest and trade and believed that people important to them (i.e. family, friends and community leaders) would approve if they performed the task. On average, they tended to consider interviewing as a task neither difficult nor easy to do. Similar to perceptions on collecting data about the natural resource populations, they also believed that only a few people at the community would participate in interviewing task.

As expected, the more enjoyable individuals perceived that is to interview other community inhabitants (*Attitude – Pleasure*), the higher was their intention to participate in this task ($\beta = 0.86$; $p = 0.000$) (Figure 4) (Supporting information 1). Also, the perception of approval from people who they considered important (*Subjective norm*) led to a higher intention to interview other community members ($\beta = 0.50$; $p = 0.040$).

Contrary to our expectations, the importance that individuals gave to the task of interviewing other community inhabitants in order to collect data about the amount of natural resource harvested and the income earned (*Attitude – Importance*) and the *Perceived behavioral control* (*Difficulty* and *Decision*) were not significantly associated with the intention to participate.

Table 9. - Descriptive statistics of the variables included in the models of the intention to participate in the monitoring task of interviewing other community inhabitants. Higher values of median and mean indicate more positive answers (n=149)

Statements	Values of the 5-point scales	Q1 Lower Quartile	Q2 Median	Q3 Upper Quartile	Mean (SD) ^a
Intention to participate Respondents intention to participate in the task	1 = certainly would not participate; 2 = probably would not participate; 3 = maybe would participate; 4 = probably would participate; 5 = certainly would participate	2	3	4	2.90 (1.43)
Attitude – Pleasure Respondents perceived pleasure of performing the task	1 = very unpleasant; 2 = unpleasant; 3 = neither pleasant nor unpleasant; 4 = pleasant; 5 = very pleasant	3	3	4	3.43 (0.84)
Attitude – Importance Respondents perceived importance of performing the task	1 = not important; 2 = little important; 3 = neither important nor unimportant; 4 = important; 5 = very important	4	4	5	3.91 (1.57)
Subjective norm - Family Respondents perceived approval of their family	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	4	5	5	4.43 (1.12)
Subjective norm – Friends Respondents perceived approval of their friends	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	4	5	5	4.00 (1.56)
Subjective norm – Community leaders Respondents perceived approval of community leaders	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	5	5	5	4.20 (1.57)
Perceived behavioral control – Difficulty Respondents perceived difficulty of performing the task	1 = very difficult; 2 = difficulty; 3 = neither difficult nor easy; 4 = easy; 5 = very easy	3	3	4	3.15 (0.87)
Perceived behavioral control – Decision Respondents perceived decision of performing the task	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	2	4	4	3.21 (1.30)
Descriptive norm Respondents perceived participation of other community inhabitants in the task	1 = no one; 2 = less than a half; 3 = a half; 4 = more than a half; 5 = all of them	2	2	2	1.83 (0.62)

^a Standard deviation

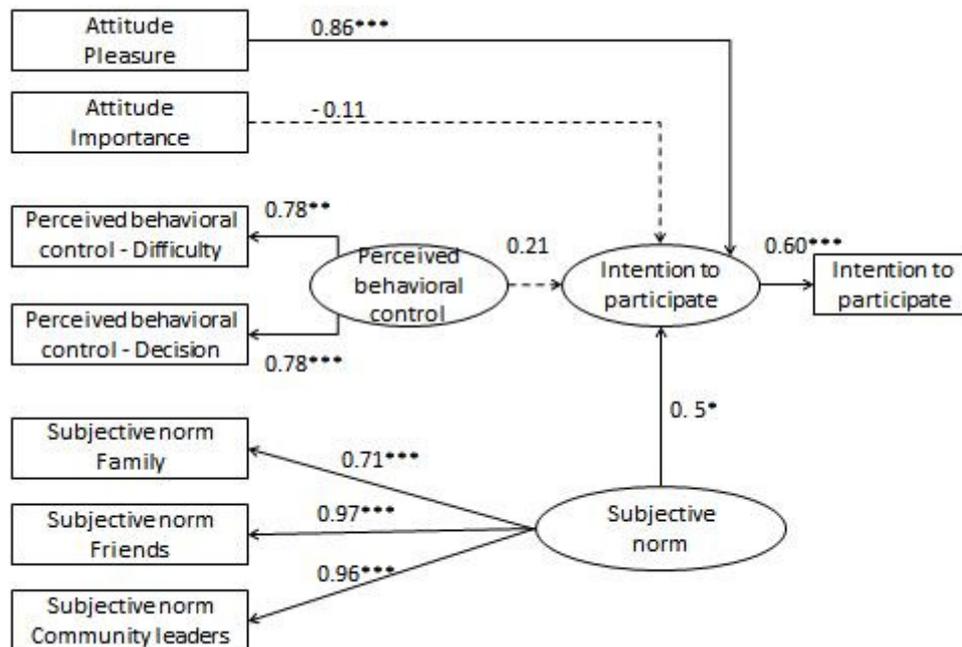


Figure 4. - Final model for the intention to participate in the monitoring task of interviewing other community inhabitants. Values of standardized β coefficients; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Solid lines represent significant associations; dotted lines represent non-significant associations. Rectangles represent observed variables. Circles represent latent variables.

3.3. Intention to participate in monitoring-related meetings

On average, individuals showed an intermediate - i.e. most answers located at “*Maybe I would participate*” option - intention to participate in meetings related to monitoring (Table 10). They showed a neutral perception of pleasure and importance of performing the task. I.e., they found that participating in meetings related to monitoring was neither pleasant nor unpleasant and neither important nor unimportant to plan the monitoring and discuss its outcomes. They tended to believe that people important to them would approve if they participated in monitoring meetings. They also showed a neutral perception of its difficulty (neither difficult nor easy) and a neutral agreement (neither agreed nor disagreed) with the statement that participating in the meeting is a decision that depends only on their own will. Similar to the previous monitoring tasks, they also believed that only a few people at the community would participate in the monitoring related meetings.

For this task, only the variable *Attitude – Pleasure* showed a positive and significant effect ($\beta = 0.28$; $p = 0.021$), indicating that individuals who believed that participating in meetings related to monitoring was a pleasant task were more prone to participate (Figure 5) (Supporting information 1). The effects of the other TPB variables over participation in meetings related to monitoring were not statistically significant.

Table 10. - Descriptive statistics of the variables included in the models of the intention to participate in communal meetings to plan the monitoring or discuss its outcomes. Higher values of median and mean indicate more positive answers (n=149)

Statements	Values of the 5-point scales	Q1 Lower Quartile	Q2 Median	Q3 Upper Quartile	Mean (SD) ^a
Intention to participate Respondents intention to participate in the task	1 = certainly would not participate; 2 = probably would not participate; 3 = maybe would participate; 4 = probably would participate; 5 = certainly would participate	2	3	5	3.04 (1.45)
Attitude – Pleasure Respondents perceived pleasure of performing the task	1 = very unpleasant; 2 = unpleasant; 3 = neither pleasant nor unpleasant; 4 = pleasant; 5 = very pleasant	3	3	4	3.22 (0,83)
Attitude – Importance Respondents perceived importance of performing the task	1 = not important; 2 = little important; 3 = neither important nor unimportant; 4 = important; 5 = very important	4	3	5	3.88 (1.04)
Subjective norm - Family Respondents perceived approval of their family	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	4	4	5	4.40 (1.31)
Subjective norm – Friends Respondents perceived approval of their friends	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	3	5	5	3.88 (1.68)
Subjective norm – Community leaders Respondents perceived approval of community leaders	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	4	5	5	4.27 (1.45)
Perceived behavioral control – Difficulty Respondents perceived difficulty of performing the task	1 = very difficult; 2 = difficulty; 3 = neither difficult nor easy; 4 = easy; 5 = very easy	3	3	4	3.22 (1.04)
Perceived behavioral control – Decision Respondents perceived decision of performing the task	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	4	4	5	3.48 (1.60)
Descriptive norm Respondents perceived participation of other community inhabitants in the task	1 = no one; 2 = less than a half; 3 = a half; 4 = more than a half; 5 = all of them	2	2	3	2.32 (0.64)

^a Standard deviation

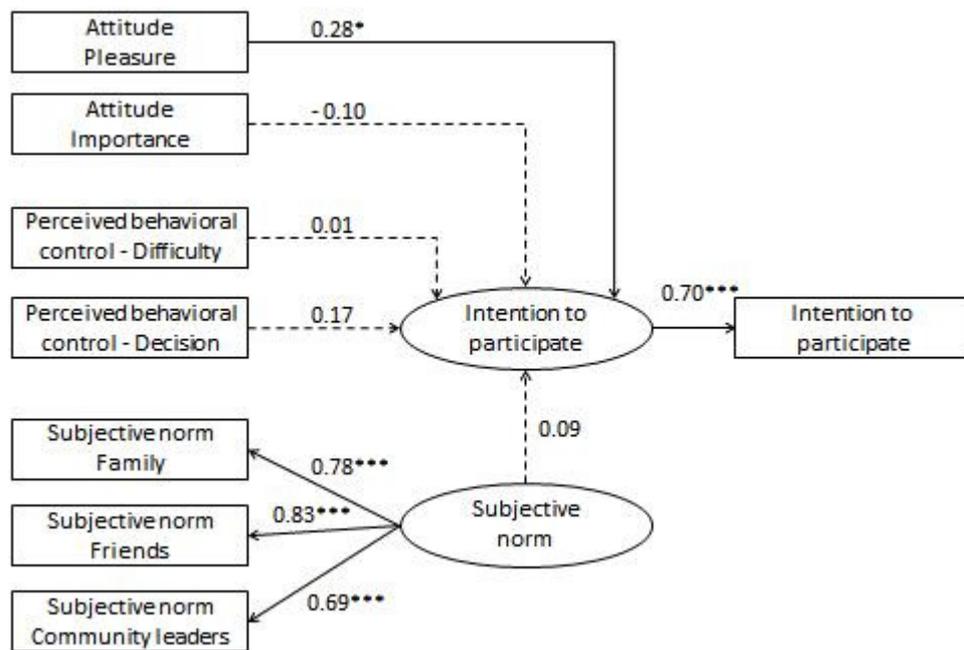


Figure 5. - Final model for the intention to participate in meetings related to the monitoring. Values of standardized β coefficients; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Solid lines represent significant associations; dotted lines represent non-significant associations. Rectangles represent observed variables. Circles represent latent variables.

3.4. Intention to participate in data management and storage

On average, individuals showed a low intention to participate in data management and storage (Table 11). They tended to perceive the task as unpleasant but important for the monitoring the effects of harvest and trade of natural resources. On average, they did not agree that people important to them would approve if they participate in data management and storage. They also perceived the task as difficult to perform and did not agree that the decision of performing the task or not depends only on their own will. Finally, as for the other three monitoring tasks, they believed that only a few people at the community would participate in data management and storage.

The *Attitude – Pleasure* ($\beta = 0.57$; $p = 0.027$) and the *Perceived behavioral control* ($\beta = 0.01$; $p = 0.000$) positively affects the intention to participate in data management and storage

(Figure 6) (Supporting information 1). I.e. individuals who believed that participating in this task was pleasant, who believed that the task was easy and that performing it or not only depends on their own will, were more prone to participate in data management and storage. The effects of the other TPB variables over participation were not statistically significant.

Table 11. - Descriptive statistics of the variables included in the models of the intention to participate in data management and storage. Higher values of median and mean indicate more positive answers (n=149)

Statements	Values of the 5-point scales	Q1 Lower Quartile	Q2 Median	Q3 Upper Quartile	Mean (SD) ^a
Intention to participate Respondents intention to participate in the task	1 = certainly would not participate; 2 = probably would not participate; 3 = maybe would participate; 4 = probably would participate; 5 = certainly would participate	1	1	4	2.19 (1.65)
Attitude – Pleasure Respondents perceived pleasure of performing the task	1 = very unpleasant; 2 = unpleasant; 3 = neither pleasant nor unpleasant; 4 = pleasant; 5 = very pleasant	1	1	4	2.18 (1.50)
Attitude – Importance Respondents perceived importance of performing the task	1 = not important; 2 = little important; 3 = neither important nor unimportant; 4 = important; 5 = very important	4	4	5	3.99 (1.06)
Subjective norm - Family Respondents perceived approval of their family	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	1	1	5	2.46 (1.83)
Subjective norm – Friends Respondents perceived approval of their friends	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	1	1	4	2.32 (1.78)
Subjective norm – Community leaders Respondents perceived approval of community leaders	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	1	1	5	2.40 (1.87)
Perceived behavioral control – Difficulty Respondents perceived difficulty of performing the task	1 = very difficult; 2 = difficulty; 3 = neither difficult nor easy; 4 = easy; 5 = very easy	1	1	3	1.91 (1.28)
Perceived behavioral control – Decision Respondents perceived decision of performing the task	1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree	1	1	2	1.80 (1.33)
Descriptive norm Respondents perceived participation of other community inhabitants in the task	1 = no one; 2 = less than a half; 3 = a half; 4 = more than a half; 5 = all of them	3	2	4	2.08 (0.67)

^a Standard deviation

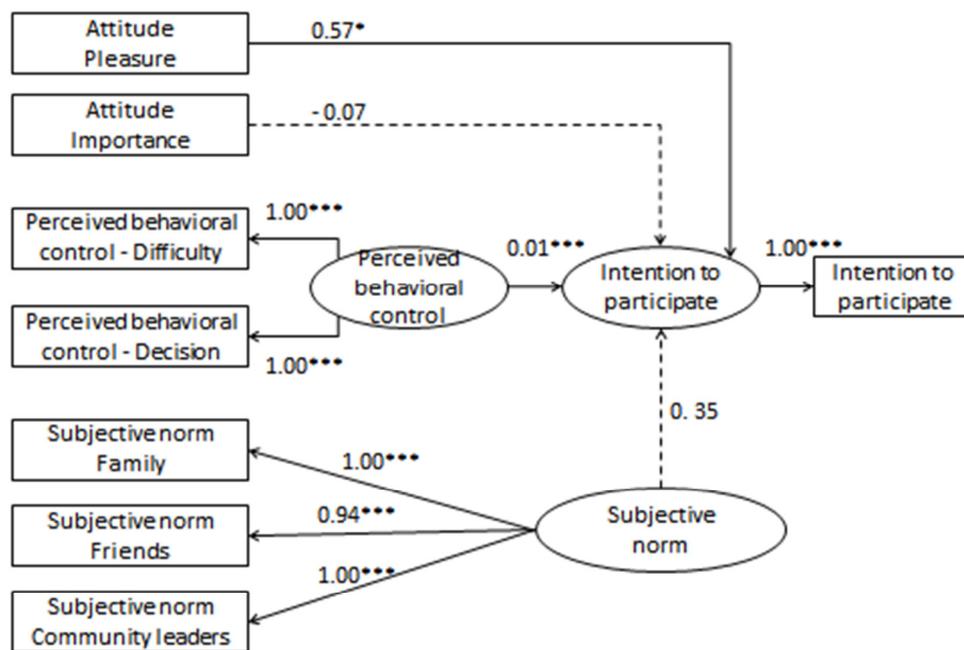


Figure 6. - Final model for the intention to participate in data management and storage. Values of standardized β coefficients; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. Solid lines represent significant associations; dotted lines represent non-significant associations. Rectangles represent observed variables. Circles represent latent variables.

4. Discussion

This study aimed to determine the effects of TPB factors over individuals' intention to participate in natural resource monitoring and whether the addition of the *Descriptive norm* variable strengthened the TPB predictive power. In the following paragraphs, we discuss the main findings for these two issues and their importance for designing better suited monitoring programs.

4.1. Effects of TPB factors over individuals' intention to participate in natural resource monitoring

As expected, the results indicated that TPB factors – i.e. attitude, subjective norm and perceived behavioral control – positively affected individuals' intention to participate in natural resource monitoring (Figure 2, introduction). Despite that, the factors predicting individuals' intention to participate differed across the four monitoring tasks evaluated, except for one of the attitude variables – Attitude-pleasure – which consistently increased the likelihood of participation.

We discuss next these findings organized according to TPB factors over the intention to participate in each assessed monitoring task and end up discussing the addition of descriptive norm to the TPB model.

4.1.1. Attitude

Two attitude variables were investigated: *Attitude-pleasure*, or how much people agreed the monitoring task was pleasurable to perform, and *Attitude-importance*, in regard of the perceived importance of each task to forest conservation or community development. Yet only the former was significantly and positively associated with individuals' intention to participate in all the four monitoring tasks evaluated, whereas the importance attributed did not predict participation in any of the tasks. As expected, the more one felt the monitoring

task as pleasurable to perform, the greater was the reported intention to participate. Because the importance of pleasure as a predictor was consistent across the four monitoring tasks assessed, there are reasons to believe this attitude is a strong driver of voluntary participation in monitoring the effects of natural resource harvest and trade.

Consistent with our results, prior studies also found attitudes to be important drivers of pro-environmental behaviors (e.g. GREAVES; ZIBARRAS; STRIDE, 2013; KARPPINEN, 2005; MARCHINI; MACDONALD, 2012; ZUBAIR; GARFORTH, 2006). Nevertheless, these studies evaluated the effect of attitude as a unique construct composed by different scales (e.g. good-bad; important-unimportant; healthy-unhealthy), which makes it difficult to directly compare their results with ours since we adopted two separate constructs. Recalling that we choose to keep our two attitude statements (i.e. *Attitude-pleasure* and *Attitude-importance*) as independent variables in the models, since the Cronbach's alpha was lower than 0.7 (Table 6). We were not totally surprised by this result since attitudes can encompass multiple factors that are not necessarily correlated (MANFREDO, 2008). In their study, Hinds and Sparks (2008) discern two main attitude dimensions, cognitive and affective, which measure discrete aspects of the same attitude and are not correlated (AJZEN; TIMKO, 1986). The cognitive dimension relates to individuals' perception of whether the behavior achieves something. The affective dimension relates to individuals' feelings about performing the behavior. Possibly, our variable *Attitude-pleasure* represents the affective dimension, while the *Attitude-importance* represents the cognitive dimension. Thus, they actually measured distinct dimensions, what can explain the low Cronbach's alpha between both. Moreover, Ajzen and Timko (1986) argue that the affective dimension can predict behavior independently of the cognitive attitude dimension. This is a possible explanation why we only obtained a significant effect of our variable *Attitude-Pleasure* over the intention to perform the monitoring tasks.

Although not assessing specifically, or not exclusively, the pleasure of performing a behavior, some studies found that the affective dimension of attitude is an important driver of human behaviors. For instance, for exercising (AJZEN; TIMKO, 1986) and for blood donation (BRECKLER; WIGGINS, 1989), the affective dimension seems to be a more relevant behavior predictor than the cognitive dimension. In the specific case of predicting behaviors associated with natural environments, such as spending free time in natural environments (HINDS; SPARKS, 2008), logging in native forests (POOLEY; O'CONNOR, 2000) and engaging in conservation organizations (KALS; MONTADA; SCHUMACHER,

1999), previous evidence also pointed to a strong influence of the affective dimensions. Our findings support these previous studies and gives strength to the importance of including the affective dimension when studying human behaviors, including those related to environmental conservation.

4.1.2. Subjective norm

Subjective norm, or an individual's perception of how much significant others would approve a certain behavior (AJZEN, 1991) affected two monitoring tasks in this study, both of which entailed some sort of data gathering: collecting data on natural resource populations and interviewing other community inhabitants to gather information on the amount of resources exploited and income earned. As expected, a higher agreement that those important to the interviewee approved his/her engagement in a monitoring task led to a higher intention to participate at least in these two monitoring tasks. Several studies report similar results stressing the influence of significant others' approval on people's intention to perform environmental conservation behaviors such as planting trees (ZUBAIR; GARFORTH, 2006), recycling (GREAVES; ZIBARRAS; STRIDE, 2013), conserving water (LAM, 1999) and preserving jaguars (MARCHINI; MACDONALD, 2012). This empirical evidence supports the theory that human behavior is partly defined by extrinsic motivation, such as social norms from their group (CLAYTON; MYERS, 2009).

These findings can help design strategies to promote participation in volunteer monitoring. For instance, because people tend to participate more when community leaders or family members approve their participation, involving and convincing particularly the former may help boost engagement. However, trying to create or change people's perception of a social norm such as that participation in monitoring is approved and expected, is a difficult process because social norms are intrinsic to the individual, whereas information is something extrinsic (HARLAND; STAATS; WILKE, 1999). Even so, using significant people to communicate and inform about the importance of monitoring can at least launch the process of internalization of a new social norm and behavior change (HARLAND; STAATS; WILKE, 1999).

4.1.3. *Perceived behavioral control*

Perceived behavioral control regards individual perceptions about how much a certain behavior is under their own control, i.e. how much they believe to have the skills and tools necessary to perform the behavior (AJZEN, 2011). *Perceived behavioral control* positively affected the intention to participate in two monitoring tasks: collect data on natural resource populations and deal with data management and storage. These effects were expected since both tasks required special skills, access to assets and greater effort in terms of time spent, which therefore implies that the activity is not fully under the respondent control.

Recalling that in the model for the monitoring task of collecting data on natural resource populations *Perceived behavioral control* was assessed by two independent observed variables: *Difficulty* and *Decision*. However, only *Decision* had a significant effect on people's intention to participate, i.e. people who agreed with the statement "*Going or not to the andirobeiras area to collect data about the trees, such as counting the number of adults and young trees is a decision that depends only on me*" were more likely to plan to participate. Some characteristics of this task can explain this association. Gathering data on natural resources involves time to reach locations where the resource exploited occurs, as well as a boat to cross a river, an asset that not all inhabitants possess. Moreover, walking through the forest was associated with some risk, perceived particularly by women who reported that they preferred not entering the forest alone (see Chapter 1). Thus, the lack of assets or of a companion to enter the forest can make people dependent on other inhabitants to perform the task, decreasing their *Perceived behavioral control*.

In turn, in the model for the monitoring task of dealing with data management and storage, it was possible to create a unique latent variable for the *Perceived behavioral control*. Dealing with data management and storage requires some level of literacy, as well as certain computer skills, factors which are again at least partially out of people's control. Thus, it was expected that people who believe to have these skills would be more likely to participate.

Other studies reported the influence of perceived behavioral control over the intention to perform pro-environmental behaviors. For instance, studying farm forestry in Pakistan, Zubair and Garforth (2006) found that the perceived behavioral control positively affected farmers' intention to plant trees in their properties. From this fact, the authors identified which were the main barriers for farmers to plant trees (e.g. lack of a seed nursery) and proposed strategies to

overcome these barriers. A similar result was observed by Lam (1999) when studying people's intention to conserve water in Twain. The author observed that one of the barriers for people to conserve water was the lack of information about how to use more efficient equipment. Thus, the authors argued that instructing people on how to install and use such equipment might be a strategy to boost water conservation. Last, in a study about cultivation of a wild-harvested palm species in a small-scale community in Belize, Williams and colleagues (2012) found that training people on how to cultivate the species could have a positive impact on perceived behavioral control and, thus, increase people's intention to cultivate.

Building on these results, we can devise strategies to increase people's Perceived behavioral control and hence, increase participation in monitoring the effects of natural resource harvest and trade. For instance, it is important to identify possible barriers for participation, as the lack of assets and skills, and to find ways to overcome these obstacles. Training people on the techniques needed to monitor and providing the assets needed are possible strategies to increase perceived behavioral control over and participation in monitoring.

4.2. The extended TPB model: Descriptive norm addition

Contrary to what was expected, the addition of the variable "*Descriptive norm*" did not improve the predictive power of the TPB; instead it led to a decrease in the goodness of fit for all assessed models. These results did not agree with other studies that had found significant effects of descriptive norm over individual's intentions to perform different behaviors, such as drinking (COOKE; SNIEHOTTA; SCHÜZ, 2007), doing preventive health exams (SIEVERDING; MATTERNE; CICCARELLO, 2010) and persecuting jaguars (MARCHINI; MACDONALD, 2012).

However, respondents' perception of the participation of other community members was low for the four tasks we assessed. This can pose a problem for the establishment and maintenance of participatory monitoring at the community. Often, people's behavior is

influenced by what they perceive as the predominant behavior in their group (CIALDINI, 2003; CIALDINI; RENO; KALLGREN, 1990). Thus, it is possible that the negative perception about others' participation would keep some individuals from participating themselves, impairing successful participatory monitoring in the community.

5. Conclusions

The aim of this study was to identify whether and how the TPB factors, i.e. attitude, subjective norm and perceived behavioral control, affect individuals' intention to participate in natural resource monitoring, particularly in four tasks often pursued when evaluating the effects of natural resource harvest and trade: to collect data on natural resource populations; to interview other community inhabitants; to participate in communal meetings to plan the monitoring or discuss its outcomes and to deal with data management and storage. We also aimed to assess whether the addition of the *Descriptive norm* variable strengthened the TPB power for predicting individuals' intention to participate at monitoring.

The four monitoring tasks we assessed required different efforts and skills, thus it was expected that the best predictors would differ among them. Even so, one of the attitude variables, the *Attitude-Pleasure*, consistently and positively affected the four monitoring tasks. Subjective norm and Perceived behavioral control affected two different tasks each; while the former predicted the reported intention to collect data on natural resource populations and to interview other community inhabitants, Perceived behavioral control predicted the intention to collect data on the natural resource populations and to deal with data management and storage.

Our results supported the importance of including the affective dimension of attitudes, such as the pleasure attributed to performing an activity, when studying human behaviors as proposed by other authors (AJZEN; TIMKO, 1986), including those related to environmental conservation (HINDS; SPARKS, 2008).

In contrast, the results showed that the addition of the *Descriptive norm* variable to the TPB model did not contribute to improve the model strength at predicting individual's intention to participate in monitoring. However the low levels of respondents' perception about others inhabitants' participation can impair a successful monitoring establishment in the community, since people's behavior is influenced by what they perceive as the predominant behavior in their group (CIALDINI, 2003; CIALDINI; RENO; KALLGREN, 1990)

The results highlight the need to use a combination of distinct strategies in order to promote behavioral changes as earlier proposed (MONROE, 2003; STERN, 2000), and therefore to increase the likelihood of people's participation in monitoring. In our case, three

main strategies could help in this regard: for instance, influential people (e.g. leaderships) could be used in campaigns to incentive participation and reinforce monitoring as a social norm; more information disseminated about the importance of monitoring for forest conservation and community livelihoods; and strategies attempted to overcome the barriers for participation (e.g. lack of literacy or assets).

Finally, two limitations of the study should be acknowledged. First, we did not include a measure of actual participation in our models. I.e. we did not compare people self-reported intention to participate in different monitoring tasks with their actual participation. Including a measure of actual participation could be important to check if both are correlated. However, in a previous study (see Chapter 1) we observed that, although actual participation is often lower than self-reported intention to participate, both measures are consistently correlated among the different monitoring tasks. Second, studies using face-to-face interview-based questionnaires face the risk of obtaining a social desirability bias in the answers (GREAVES; ZIBARRAS; STRIDE, 2013). I.e. people can lie and answer what they think will be better accepted by their group or by the interviewer. However, this bias is more frequent when dealing with sensitive questions (NEWING; EAGLE; PURI et al., 2011), for instance performing illegal activities, which was not the case in our study. Notwithstanding, we adopted some procedures to minimize a possible bias. We guaranteed the anonymity of the respondent (NEWING; EAGLE; PURI et al., 2011) and, whenever possible, we conducted the interview with the respondent alone with the interviewer (BERNARD, 2006).

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Supporting information 1

Detailed results from the structural equation models. Standardized β coefficients values (Std β Coef); robust standard errors (SE); * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Variable	Path	Variable	Std β Coef	SE	<i>p</i>
Intention to collect data about the natural resource population					
Attitude – Pleasure	→	Intention to participate/latent	0.35**	0.13	0.005
Attitude – Importance	→	Intention to participate/latent	0.14	0.08	0.106
Perceived behavioral control – Difficulty	→	Intention to participate/latent	0.02	0.12	0.849
Perceived behavioral control – Decision	→	Intention to participate/latent	0.34**	0.11	0.002
Subjective norm - Family	→	Intention to participate/latent	0.72***	0.07	0.000
Subjective norm – Community friends	→	Intention to participate/latent	0.85***	0.05	0.000
Subjective norm – Community leaders	→	Intention to participate/latent	0.85***	0.04	0.000
Subjective norm/latent	→	Intention to participate/latent	0.20*	0.15	0.051
Intention to participate/latent	→	Intention to participate	0.69***	0.04	0.000
Intention to interview other community inhabitants					
Attitude – Pleasure	→	Intention to participate/latent	0.86***	0.20	0.000
Attitude – Importance	→	Intention to participate/latent	-0.11	0.07	0.141
Perceived behavioral control/latent	→	Intention to participate/latent	0.21	0.23	0.930
Perceived behavioral control – Difficulty	→	Perceived behavioral control/latent	0.78**	1.01	0.000
Perceived behavioral control – Decision	→	Perceived behavioral control/latent	0.78***	0.36	0.000
Subjective norm - Family	→	Subjective norm/latent	0.71***	0.01	0.000
Subjective norm – Community friends	→	Subjective norm/latent	0.96***	0.06	0.000
Subjective norm – Community leaders	→	Subjective norm/latent	0.97***	0.05	0.000
Subjective norm/latent	→	Intention to participate/latent	0.50*	0.34	0.040
Intention to participate/latent	→	Intention to participate	0.60***	0.05	0.000
Intention to participate in communal meetings related to monitoring					
Attitude – Pleasure	→	Intention to participate/latent	0.28*	0.12	0.021
Attitude – Importance	→	Intention to participate/latent	-0.10	0.12	0.412
Perceived behavioral control – Difficulty	→	Intention to participate/latent	0.01	0.12	0.928
Perceived behavioral control – Decision	→	Intention to participate/latent	0.17	0.11	0.138
Subjective norm - Family	→	Subjective norm/latent	0.78***	0.08	0.000
Subjective norm – Community friends	→	Subjective norm/latent	0.83***	0.05	0.000
Subjective norm – Community leaders	→	Subjective norm/latent	0.69***	0.09	0.000
Subjective norm/latent	→	Intention to participate/latent	0.09	0.15	0.529
Intention to participate/latent	→	Intention to participate	0.70***	0.06	0.000
Intention to participate in data management and storage					
Attitude – Pleasure	→	Intention to participate/latent	0.57*	0.25	0.027
Attitude – Importance	→	Intention to participate/latent	-0.07	0.11	0.559
Perceived behavioral control/latent	→	Intention to participate/latent	0.00***	0.00	0.000
Perceived behavioral control – Difficulty	→	Perceived behavioral control/latent	1.00***	0.11	0.000
Perceived behavioral control – Decision	→	Perceived behavioral control/latent	1.00***	0.12	0.000
Subjective norm - Family	→	Subjective norm/latent	1.00***	0.00	0.000
Subjective norm – Friends	→	Subjective norm/latent	0.94***	0.06	0.000
Subjective norm – Community leaders	→	Subjective norm/latent	1.00***	0.06	0.000
Subjective norm/latent	→	Intention to participate/latent	0.35	0.23	0.136
Intention to participate/latent	→	Intention to participate	1.00***	0.09	0.000

CAPÍTULO 3

Awareness of the ecological and socioeconomic impacts of resource harvest and trade: Does it raise the likelihood of engagement in participatory monitoring?

Abstract

Harvesting and trading non-timber forest products (NTFPs) is advocated as a win-win strategy for conservation and development, yet it can produce negative ecological and socioeconomic impacts. Hence, monitoring its outcomes is essential with participatory monitoring, i.e. with involvement of local inhabitants, suggested as the most suitable approach. Among other reasons, participatory monitoring is preferred, because it is likely to increase people's awareness of impacts and thus might induce behavioral changes, although there is contradictory evidence in this regard. In this study, we therefore asked if people's awareness about the ecological and socioeconomic impacts of NTFP harvest and trade increased their likelihood of engaging in participatory monitoring. To test our hypothesis, we conducted a study in a community of the Brazilian Amazon that harvested and traded a commercially-important NTFP species. Two methods of data gathering were employed: (i) a survey of 166 adults (51 households) to evaluate people's awareness and their self-stated intention to engage in four monitoring tasks (planning, data collection, data management and outcomes discussion), and (ii) experimentally-implemented monitoring tasks to evaluate who actually participated. The results indicated that awareness of both types of impacts could predict participation in certain tasks, although other factors such as gender, age and schooling were occasionally stronger predictors. On average, people were more aware of socioeconomic impacts than of ecological impacts, with the former predicting participation in ecological data gathering. This finding reinforces the importance of monitoring both ecological and socioeconomic impacts to help achieve the win-win outcomes originally proposed by NTFP trade initiatives.

Keywords: community-based management, pro-environmental behavior, non-timber forest product, knowledge, beliefs, Extractive Reserve.

1. Introduction

Monitoring the condition of natural resources and the outcomes of conservation practices is considered vital to raise knowledge for implementing adaptive management, which consists of simultaneously managing resources and learning about the practices involved in order to adapt them (WILLIAMS, 2011). Thus, gathering repeated data about a natural or social system and the processes that affect them is important because it allows us to detect changes and evaluate the impacts over time of those practices aimed at integrating the conservation of natural environments while improving local inhabitants' well-being (BROWN, 2002; HOLCK, MIKKEL HOOGE, 2008). Although these strategies are founded on the idea of attaining win-win outcomes regarding environmental conservation and local development (BERKES, 2003), nowadays it is acknowledged that there are unforeseen negative outcomes and trade-offs between goals (KREMEN; MERENLENDER; MURPHY, 1994). This is the case with initiatives such as community-based ecotourism (SALAFSKY; WOLLENBERG, 2000), payments for environmental services (PAGIOLA; ARCENAS; PLATAIS, 2005) and trading non timber forest products (NTFPs) (SHACKLETON; SHACKLETON; SHANLEY, 2011).

For instance, with regard to NTFP trade, the win-win rationale rests on the argument that the practice values the maintenance of natural ecosystems whose resources people rely on (SILLS; PATTANAYAK; FERRARO et al., 2006), and is less harmful to the environment than alternative income earning activities (PETERS, 1994; SHANLEY; LAIRD; PIERCE et al., 2002). Despite that, NTFP harvest and trade can produce a plethora of negative ecological (TICKTIN, 2004) and socioeconomic impacts (MORSELLO; ADGER, 2007). Common ecological impacts include population size reductions or even local extinction of the species harvested (e.g. KUSTERS, 2009; RAIMONDO; DONALDSON, 2003); a decline in the resources' quality or size (ENDRESS; GORCHOV; PETERSON et al., 2004; SINHA; BAWA, 2002); species loss (MOEGENBURG; LEVEY, 2003), and landscape consequences caused mainly by new trails and roads for resource transportation (KUSTERS, 2009). Socioeconomic impacts comprise social conflicts arising from unequally distributed benefits (e.g., ARNOLD; RUIZ-PÉREZ, 2001); weakened cooperativeness among households (RIZEK; MORSELLO,

2012); trade-offs with subsistence activities, such as hunting and fishing (FISHER; DECHANEUX, 1998), and a burden of extra workload affecting most often women (CHANDRAMOHAN; HANDRAMOHAN; VILLALAN et al., 2008).

Because certain negative impacts of an ecological and socioeconomic nature are likely to happen, monitoring the outcomes of NTFP harvest and trade is often suggested (e.g., FRÖDE; MASARA, 2007; SETTY; BAWA; TICKTIN et al., 2008), in order to learn about the results and adapt the practice (EVERETT, 2001). Monitoring, however, can be implemented with different goals (HUTTO; BELOTE, 2013) and in different forms, such as regards the level of communities' involvement (DANIELSEN; BURGESS; BALMFORD et al., 2009). Even so, there are several reasons why participatory forms of monitoring, or those that count on at least partial involvement of local inhabitants (DANIELSEN; BURGESS; JENSEN et al., 2010) should be conducted, according to certain authors. One of them is the fact that implementing and maintaining monitoring over the long term is a financial challenge (HOLCK, MIKKEL HOOGE, 2008), so voluntary forms of participatory monitoring are cheaper and more viable (HOLCK, MIKKEL HOOGE, 2008). Moreover, NTFPs are often common pool resources (EVANS; GUARIGUATA, 2008), so participatory monitoring of their harvest and trade may raise community's knowledge and awareness about the conditions of natural resources and thus the chances of behavioral changes.

The rationale behind the adoption of participatory monitoring is therefore based on the premise that not only increased knowledge about a certain aspect, but also people's awareness and beliefs, influences a person's behavior. Yet, there is contradictory evidence in this regard based on accumulated scientific knowledge.

Voluntary engagement in participatory monitoring may be considered a pro-environmental behavior, in the sense of a behavior adopted when consciously seeking to minimize the negative impact of one's actions on the natural environment (KOLLMUSS; AGYEMAN, 2002). Since volunteering also involves costs, in terms of time and foregone activities (ASAH; BLAHNA, 2012), it may be seen as a pro-social behavior as well, i.e. a behavior aimed at helping other people or a group without expecting immediate reward or compensation (TWENGE; BAUMEISTER; DEWALL et al., 2007). Some evidence shows that knowledge and beliefs about the environment are often related to increased propensity to adopt pro-environmental behaviors

(HINES; HUNGERFORD; TOMERA, 1987; SCHULTZ, 2011). For instance, people with more accurate information about recycling, such as which materials are recyclable, are more likely to adopt the practice (CHEUNG; CHAN; WONG, 1999). Similarly, more knowledge about the diversity of species within their farms made British farmers more cooperative towards governmental land conservation programs (BATTERSHILL; GILG, 1996). Moreover, when people are aware or believe that the environment is under threat and certain conservation actions may revert it, they are more likely to engage in such action (KNOWLER; BRADSHAW, 2007; MONROE, 2003).

Despite this evidence, as far back as the early 1970s, the premise that providing knowledge will lead to more enlightened behavior has proved to be at least partially wrong, even if environmental education strategies still rely on this simplistic assumption (KOLLMUSS; AGYEMAN, 2002). Several studies have shown that knowledge and awareness *per se* may not exclusively or nor directly influence behavior, but can act as an indirect modifier of attitudes and values which, in turn, affect actions (BAMBERG; MÖSER, 2007; JENSEN, 2002). The existence of what has been known as an information-action gap is true even regarding behaviors that affect people's own well-being, for instance when information about life-threatening illnesses does not translate into preventive behaviors (FISHER; FISHER; AMICO et al., 2006; SCHLUETER, 1982). For pro-environmental behaviors, this incongruence between awareness and practice also applies for several reasons, according to a review by Kollmuss and Agyman (2002). Above all, the reason rests on the existence of several factors that drive pro-environmental behaviors, some of which may be more important predictors than knowledge depending on the context. For instance, theoretical knowledge, or learning about a problem, has proven to be less important than direct experience and familiarity with the environmental problem (RAJECKI, 1982), such as observing resource population declines. Additionally, personal characteristics, such as gender, age as well sense of responsibility and the personal levels of altruism and satisfaction of own needs, and external factors such as practical difficulties, social norms, external institutional and economic factors have been shown to influence behavior (KOLLMUSS; AGYEMAN, 2002).

In sum, accumulated evidence provides contradictory support for the idea that awareness about the negative impacts of an action to the environment, as would be the case with the negative impacts of NTFP harvesting and trade, increases the likelihood of volunteering in

practices such as monitoring. Yet the information is important because it might suggest whether disseminating the potential impacts of the activity through outreach programs could increase people's engagement in participatory monitoring and, consequently, raise its probability of success.

In this study, we therefore asked whether people's awareness about the ecological and socioeconomic impacts of NTFP harvest and trade increases their likelihood to voluntarily participate in monitoring the effects of the practice. We departed from the hypothesis that greater awareness about the negative ecological and socioeconomic impacts of NTFP harvest and trade should be associated with a higher probability of reporting an intention to participate in monitoring and the actual participation in it.

To test our hypothesis, we conducted a study in a community from the Médio Juruá Extractive Reserve in the Brazilian Amazon, where inhabitants harvest NTFPs and trade them with a cosmetics company. We used two methods of data gathering: an interview-based survey with 163 individuals (51 households), and the experimental implementation of monitoring tasks aimed at evaluating the effects of NTFP harvest and trade effects over conservation and community well-being.

The main contributions of this study are twofold. First, although participatory monitoring is more than one hundred years old, as reflected in Citizen Science initiatives (SILVERTOWN, 2009) and there is a recent boost on participatory practices of ecological data gathering (TULLOCH; POSSINGHAM; JOSEPH et al., 2013), most studies evaluating the motivations for people's engagement focus on contexts where of scientific literacy and schooling are higher (BEIRNE; LAMBIN, 2013). Also, only a few focus on the drivers of engagement in participatory community-based management (e.g., CAVALCANTI; ENGEL; LEIBBRANDT, 2013; CAVALCANTI; SCHLÄPFER; SCHMID, 2010) or monitoring specifically (e.g. ANDRIANANDRASANA; RANDRIAMAHEFASOA; DURBIN et al., 2005; OLDEKOP; TRUELOVE; VILLAMARIN et al., 2012), and even fewer on monitoring aspects of Integrated Conservation and Development Projects (ICDPs) in general (e.g., LARSON; SVENDSEN, 1996), or NTFP harvesting and trade, in particular (e.g., SETTY; BAWA; TICKTIN et al., 2008). We should that small-scale communities, such as those living in forested environments, face different motivations and barriers to voluntary participation. Second, we advance from earlier

studies because we focus not solely on people's awareness of ecological impacts, but also those of socioeconomic nature, to evaluate the likelihood of participation in different monitoring tasks.

2. Methods

The study was based on a cross-sectional design (NEWING; EAGLE; PURI et al., 2011), in which we compared the intention to monitor the effects of NTFP harvest and trade of individuals who differed in their awareness about the ecological and socioeconomic impacts of the activity. 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 impacts of resource harvest and trade (CIFOR, 2007).

In order to assess people's participation in monitoring, we adopted two estimation strategies: (i) their self-stated intention to participate, and (ii) their actual participation in monitoring tasks. We chose this approach because, in that way, the robustness of our findings could be improved in two ways. First, the strategy allowed us to investigate both people's self-stated intention to monitor and their actual participation, therefore enabling us to understand whether adopting the two indicators produced the same results. Moreover, our estimate of people's participation was less influenced by previous occurrences that might have altered people's intention to engage (e.g., individuals' previous experiences with monitoring NTFP harvest and trade), avoiding the confounding effects of other factors aside from those we were interested in.

2.1. Study site overview

The study was carried out at Roque, a community in the Médio Juruá Extractive Reserve, located in Carauari town, Amazonas state of Brazil (5°33'54"S; 67°42'47"W). The Reserve has 253.226 ha and approximately 1,900 inhabitants distributed among 13 communities (ICMBIO, 2011). With 495 inhabitants distributed among 51 households, Roque is the most populous community of the Reserve. Local inhabitants are "Caboclos", traditional inhabitants descending from mixed indigenous, African and European ancestors, who have been living in the Amazonian forested regions for several generations (NUGENT, 1993).

Since 2000, the community has a commercial agreement for the provision of NTFP-based vegetable oils to a cosmetics company. Andiroba seeds (*Carapa guianensis* Aubl., Meliaceae) are the main forest product traded, which is harvested and then locally-processed into vegetable oil. After being transferred to town, the oil is refined by a chemical industry operating in Manaus, Brazil, and then resold to the cosmetics company (RIZEK; MORSELLO, 2012).

Community members earn cash income from the following tasks associated with NTFP harvest and trade: seed gathering; participation in trips to purchase seeds from other communities; transportation of seeds or processed oil within the community; temporary employment in the processing plant, and permanent employment in the cooperative. While employees of the processing plant receive regular and higher payments, the tasks of gathering and transportation are sporadic and entail lower returns.

Two factors accounted for our choice of case study community. First, the research group had previously investigated the community, which allowed us to build community trust as well as a more comprehensive and in-depth understanding of the local operation of NTFP harvesting and trade. Additionally, there was a manifest interest of both the community and the environmental government agency to establish a monitoring plan for the effects of NTFP trade, so understanding what drives volunteering in participatory monitoring was important to them.

2.2. *The sample*

The main unit of analysis adopted was the individual and his/her propensity to participate in monitoring (i.e. alternatively the self-stated intention and actual participation). The sample comprised the entire adult population of Roque (≥ 18 y.o.) (N=170), but because not all inhabitants were present during fieldwork and a few were unwilling to take part in the study, our response rate equaled 97% of the adult population (n=166). In contrast to other studies with rural communities, which often also sample children and teenagers because they usually participate in productive activities in these contexts (e.g., RIZEK; MORSELLO, 2012), we adopted the cut-age of 18 y.o. (legal adulthood in Brazil) following a community request based on their fear of being legally-accused of child labor exploitation. However, two variables were estimated at the household level, defined in this study as the group of people who shared production tasks (e.g.,

agriculture) and consumption (NETTING, 1993). These variables – i.e. household size and age dependence ratio - were included in the models because they could affect individual's propensity to participate in monitoring (see: GICHUKI; MACHARIA, 2003).

2.3. Data gathering

Two techniques of data gathering were employed to estimate people's participation in monitoring: (i) an interview-based survey, and (ii) the experimental implementation of voluntary and participatory monitoring of the effects of NTFP harvest and trade over conservation and community socioeconomic indicators.

The interview-based survey was composed of multiple choice questions (structured questionnaire) carried out through face-to-face interviews by ADB between March/April and October/December, 2013. We surveyed a total of 163 adult individuals from 51 households. Through the interview-based survey, we gathered: (i) people's self-stated intention to monitor (dependent variable); (ii) people's awareness of ecological and socioeconomic impacts of NTFP harvest and trade (explanatory variable), and (iii) control variables.

We also experimentally implemented a monitoring scheme of the effects of NTFP harvest and trade at the community level. To do so, we combined and adapted the methodologies proposed by Byers (2000), Machado (2008) and Fröde & Masara (2007) for the implementation of participatory management in extractive communities. Because monitoring involves multiple tasks with different characteristics and therefore participation could vary across them, we executed a total of four monitoring tasks: (i) data gathering on the natural resource population (*C. guianensis* Aubl., in our case), such as the density of seedlings, samplings and adults; (ii) interviewing other community inhabitants to gather information on issues such as the amount of *Carapa* harvested, as well as the income earned with selling the resource and employment in each of the processing steps; (iii) an initial meeting to discuss the importance of monitoring and to plan the successive monitoring tasks; and (iv) a final meeting to discuss the results, the benefits and the obstacles for the implementation of monitoring at the community. We began the activity by inviting all the community adults to take part in these tasks and, through direct observation;

we computed who participated in each one of them. This computation equals people's actual participation at each of the monitoring tasks (dependent variables).

2.4. The models and variables

We investigated the association between participation in four NTFP monitoring tasks (dependent variables) and an individual's awareness of (i) ecological impacts and (ii) socioeconomic impacts of NTFP harvest and trade (explanatory variables). "Awareness" is defined here as a person's beliefs or his/her subjective understanding of an impact which, unlike knowledge, may or may not be accurate, and yet still predicts human behavior (SCHULTZ, 2002). We built four main groups of models which correlated the two explanatory variables (ecological awareness and socioeconomic awareness) with two alternative definitions of participation (self-stated intention to participate and actual participation in each of the four monitoring tasks). The variables included in the models are detailed in the next section.

2.4.1. Dependent variables

We assessed both an individual's self-stated intention to participate and their actual participation in monitoring the ecological and socioeconomic effects of NTFP harvest and trade.

Self-stated intention to participate indicated an individual's stated willingness to participate in NTFP monitoring tasks. Because monitoring can entail a multitude of tasks and each one requires different types of effort and skills, we assessed, through the interview-based survey, the self-stated intention to participate in four tasks that are often included in monitoring the effects of natural resource harvesting and trade (BOISSIÈRE; BASTIDE; BASUKI et al., 2014; DANIELSEN; BURGESS; BALMFORD, 2005): (i) to collect data on the natural resource population (*C. guianensis* Aubl., in our case), such as the density of seedlings, samplings and adults; (ii) to interview other community inhabitants to gather data such as the amount of natural resource harvested and the income earned with selling the resource and employment in the processing steps; (iii) to take part in communal meetings to plan monitoring activities or to

discuss its outcomes and (iv) to manage and store the data obtained throughout monitoring in the computer. Respondents were asked about their intention to participate in each of these tasks according to 5-points ordinal scales (from 1 = I certainly would not participate through 5 = I certainly would participate).

The *Actual participation* indicated a person's actual participation in four experimental monitoring tasks implemented (i.e. to collect data on the natural resource population; to interview other community inhabitants; to take part in an initial meeting and to take part in a final meeting). Due to infrastructural difficulties, we did not include the task of data management and storage in the experimental monitoring as we did for *Self-stated intention to participate*. The *Actual participation* was represented as a dummy variable (0 = did not participate; 1 = participated).

2.4.2. Explanatory variables

We assessed people's awareness of two impacts types associated with NTFP harvest and trade: ecological impacts and socioeconomic impacts. For ecological impacts, we considered the negative effects that NTFP trade could have over: the population of the harvested natural resource, the biological communities at the harvested site, and the landscape (KUSTERS; ACHDIAWAN; BELCHER et al., 2006). We considered as socioeconomic impacts the negative effects that NTFP trade could have over community well-being, such as an increase in internal conflicts (MORSELLO, 2006) and a decrease in the group cooperativeness (RIZEK; MORSELLO, 2012) (see supporting information 1 for details).

For each type of impact, we constructed a Likert-type scale (LIKERT, 1932) composed of seven statements, through which we assessed respondent's awareness of ecological and socioeconomic impacts of NTFP harvest and trade (Supporting information 1). The response to each statement was in the format "I strongly disagree", "I disagree", "Neutral or did not answer", "I agree" and "I strongly agree". To each of the referred answer, points were assigned in a scale from 1 to 5, with higher values representing a stronger concordance with the negative impacts of NTFP harvest and trade. For each respondent and each type of belief (ecological and socioeconomic), the Likert-scale was the sum of the points attributed to the seven statements,

therefore ranging from 7 to 35 points with higher values representing higher awareness belief about negative impacts.

Before including the variables in the models, we evaluated the Likert-scales for their unidimensionality and internal consistency. Unidimensionality indicates whether each of the Likert-scales embodies only one concept or construct (OPPENHEIM, 1992), and to assess it we performed a principal component analysis (PCA). The PCA results showed that the first component of each scale explained more than 50% of data variance, while the eigenvalue of the second components were close to 1 (Supporting information 2), confirming the unidimensionality of each Likert-scale (TABACHNICK; FIDELL, 2001).

Internal consistency is a measure of scale reliability and describes whether the scale statements measure the same underlying concept or construct (KLINE, 2011). To assess the internal consistency of each Likert-scale, we used the ordinal alpha (GADERMANN, A.M.; GUHN, M.; ZUMBO, B., 2012), which is an alternative to traditional Cronbach's alpha considered more appropriated for ordinal variables (GADERMANN, A.M.; GUHN, M.; ZUMBO, B., 2012). The ordinal alpha estimation indicates whether the statements for each type of belief (ecological and socioeconomic) are correlated and, therefore, can be added up to form the two Likert-scales. The values obtained for the two scales were above 0.6 (ecological beliefs ordinal alpha = 0.65; socioeconomic beliefs ordinal alpha = 0.79), thus indicating an acceptable degree of correlation (CORTINA, 1993) between the seven statements of each Likert-scale and the appropriateness to add them up.

2.4.3. Control variables

To control for confounding factors that could also explain participation, nine additional variables were included in the models (Table 1). From these, seven variables were assessed at the individual level (*Gender, Age, Schooling, Residence, Total income, NTFP dependence* and *Subsistence workload*), while two at the household level (*Age dependence ratio* and *Household size*).

Table 1. Definition of control variables included in the regressions.

Variable	Definition
<i>Individual level</i>	
Man	Gender: man=1; woman=0
Age	Age in years
Schooling	Number of years of formal education
Residence duration	Percentage of lifetime spent at Roque community
Cash income	Mean cash income of the person (USD/month)
NTFP dependence	Percentage of the individual cash income originating from NTFPs
Subsistence workload	Number of hours per week spent in subsistence activities
<i>Household level</i>	
Age dependence ratio	Percentage of working age over non-working age individuals at respondent household
Household size	Number of individuals at the respondent household

2.5. Data analysis

To investigate the association between participation in each of the four monitoring tasks and a person's awareness about ecological and socioeconomic impacts of NTFP harvest and trade, we performed four sets of regressions. Two of these sets assessed the association between the self-stated participation in monitoring tasks and people's awareness in each of the two categories of impact (i.e. ecological and socioeconomic), whereas the two other sets correlated the actual participation with the same variables.

For all regressions, we adopted two-level mixed-effects models, an approach that takes into account the hierarchical nature of the sampling design (GELMAN; HILL, 2007), in our case the fact that individuals were nested within households. The procedure therefore corrects for non-independence between individuals from the same households, and produces unbiased and often more conservative standard errors, confidence intervals and significance tests (GOLDSTEIN, 2011). Before running the regressions, we checked for Pearson's pairwise correlations ($p_{wcorr} > 0.60$, $p < 0.05$) between explanatory variables with Sidák-adjusted significance levels for multiple correlations (HAMILTON, 2012). Since none of those tested were highly correlated we kept all in the final models.

For the association between individuals' awareness of ecological or socioeconomic impacts of NTFP harvest and trade (explanatory variables) and their self-stated intention to participate in NTFP monitoring tasks (dependent variables), we adopted multilevel mixed-effects ordered logistic regressions (MEOLOGIT) due to the ordinal nature of the dependent variables. In total, we performed eight MEOLOGIT models, one for each category of impact (i.e. ecological and socioeconomic) and one for each monitoring tasks considered, controlling for confounding factors (see Tables 2 and 4). For the same regressions with actual participation in the experimental monitoring tasks as dependent variables, we adopted multilevel mixed-effects logistic regressions (MELOGIT) due to the binary nature of the dependent variables, controlling for confounding factors. Again, we run eight MELOGIT models, one for each combination of impact category (ecological and socioeconomic) and monitoring tasks considered (see Tables 3 and 5).

Explanatory and control variables were included in the final sets of regressions in two forms: original estimates and standardized values. We included the standardized variables to enable the direct comparison of magnitude of the effects between variables estimated with different scales (ZUUR; LENO; WALKER et al., 2009). The variables were standardized by subtracting their mean and dividing by two times their standard deviation to set them on the same scale as binary variables; variables thus have a mean of zero and take ± 0.5 standard deviation values (GELMAN, 2008)

All statistical analyses well performed with Stata® v. 13.1.

3. Results

We present the results in four sections, beginning with a description of people's awareness of the ecological and socioeconomic impacts of NTFP harvest and trade. In the second part, we begin with the results of the association between individuals' awareness of the ecological impacts of NTFP harvest and trade with, successively, their self-stated intention to participate and their actual participation in each of the four monitoring tasks. We continue in the third section with the results of the regressions with the awareness of the socioeconomic impacts as an explanatory variable, considering the same outcomes. The last section is dedicated to explore other factors which consistently influenced people's participation in monitoring.

3.1. People's awareness of ecological and socioeconomic impacts of NTFP harvest and trade and their participation in monitoring

On average, respondents displayed intermediate levels of ecological (Mean = 21.11, SD = 5.58) and socioeconomic awareness (Mean = 27.83, SD = 3.91) of the negative impacts associated with NTFP harvest and trade. These intermediate levels indicate that most answers to each of the 14 statements regarding people's beliefs about ecological and socioeconomic impacts were located between "agree" and "disagree" options, with few people demonstrating strong agreement with the existence of impacts. Despite that, there was a large variation among participants in their levels of awareness, more pronounced in the perception of ecological impacts than of those socioeconomic (ecological: range 9 to 33; socioeconomic: range 15 to 35), meaning that interviewees varied more on their perceptions of the former (Figure 1). When we compare responses about socioeconomic and ecological impacts, on average, participants were more aware of socioeconomic than ecological impacts (t-test = 10.36; $p < 0.00$).

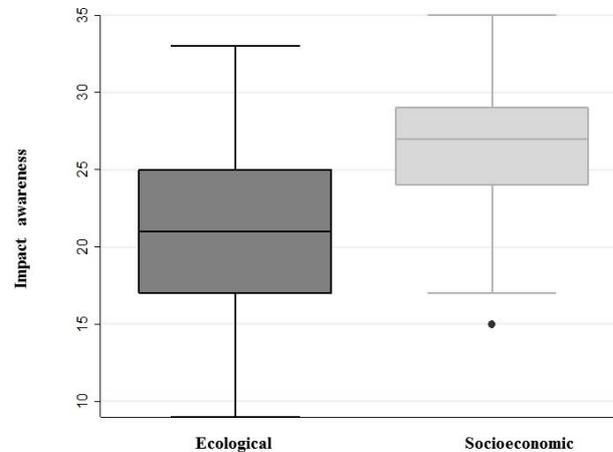


Figure 1. Distribution of people's awareness of ecological and socioeconomic impacts of NTFP harvest and trade. People's awareness of ecological and socioeconomic impacts index. Higher values correspond to higher perception of negative impacts. Boxplot showing the data median (horizontal line), 1 st quartile (lower whisker), 2nd quartile (lower box), 3rd quartile (upper box) and 4th quartile (upper whisker).

With regards to the awareness of ecological impacts, women (Mean = 20.96; SD = 5.65) and men (Mean = 21.27; SD = 5.54) had similar levels of perceptions (t-test = 0.50; $p = 0.61$). The same occurred with socioeconomic impacts, perceived equivalently by both genders (Woman = 27.14, SD = 3.70; Men = 26.50, SD = 4.12; t-test = 1.47, $p = 0.14$). Awareness of ecological impacts was also similar between different categories of age (f-test = 1.19; $p = 0.31$) and schooling (f-test = 0.45, $p = 0.77$). In contrast, awareness of socioeconomic impacts was slightly higher for people between 33 and 45 years old (f-test = 3.60; $p = 0.00$) and between 3 and 5 years of formal education (f-test = 2.73; $p = 0.03$).

A person's self-stated intention to participate in monitoring comprised involvement in four tasks, from which attending to meetings for planning and discussing monitoring outcomes was the one they were more likely to report an intention to participate (Mean = 3.3, SD = 1.5), followed by collecting data on natural resource populations (Mean = 2.4; SD = 1.5), managing and storing data (Mean = 2.0; SD = 1.5) and interviewing community inhabitants (Mean = 1.7;

SD = 1.1). Both men and women showed similar willingness to engage in each monitoring task expect for collecting data on natural resource populations where men's willingness (Mean = 2.45; SD = 1.42) was slightly higher than women's (Mean = 2.03; SD = 1.28) (t-test = 2.83; $p = 0.00$).

For the actual participation in monitoring, the engagement of community adults (N=170) was low for the four assessed tasks and lower than their reported intention to participate. A total 51 individuals, 19 men and 32 women, participated at least in one of the experimentally-implemented tasks. Meetings were the monitoring task that achieved the highest levels of actual participation (14% and 11% of the total adult population for the initial and final meetings, respectively), followed by collecting data on natural resources (3%) and, interviewing community inhabitants (2%). Only women took part in interviewing other inhabitants, while collecting data on natural resources was the only activity in which women participated less than men, yet differing by only one individual.

3.2. Association between awareness of ecological impacts and participation in monitoring the effects of NTFP harvest and trade

In this section, we present the results of the mixed-effects regressions regarding the association between people's awareness of ecological impacts of NTFP harvest and trade and, successively, their self-stated intention (Table 2) to participate and their actual participation (Table 3) in experimentally-implemented monitoring tasks. In both tables, regressions in columns [1], [3], [5] and [7] present coefficients for variables estimated in their original scale, whereas columns [2], [4], [6] and [8] show coefficients obtained from standardized variables' values.

The regression results showed that awareness of the ecological impacts was able to predict people's likelihood of reporting an intention to volunteer and their actual participation in certain monitoring tasks. Higher awareness of negative ecological impacts associated with NTFP harvest and trade positively correlated with an individual's likelihood of self-stating an intention to engage in collecting data on natural resources, more specifically information on *Carapa* populations (Table 2 columns [1, 2], line [a]). Even so, awareness of ecological impacts was a weaker predictor when compared to other assessed variables. In this regard, the most important driver was a person's sex, with men more likely to report an intention to volunteer in data

gathering than women. Likewise, a person's level of schooling increased a person's likelihood to volunteer in data gathering, although this effect was only slightly stronger than the perception of ecological impacts.

In contrast and unexpectedly, increased awareness of the same ecological impacts negatively correlated with the self-stated intention to deal with data management and storage (Table 2 columns [7, 8], line [a]). Thus, those who perceived higher levels of negative ecological impacts of NTFP harvest and trade were also less prone to report that they would engage in the monitoring task of data management and storage. Despite that, level of schooling, age, and being part of a household with a high number of consumers over producers (age dependence ratio) were stronger predictors in comparison with awareness. While higher levels of schooling increased the likelihood of self-stated intention to participate in data management and storage, age and dependence ratio decreased it.

With regards to people's reported intention to participate in interviewing community inhabitants and participating in communal meetings, awareness of ecological impacts was not an important driver. For interviewing, the most important and significant predictors were, in order, a person's NTFP dependence (i.e. the ratio between the individual's cash income derived from NTFPs and from other sources), age, level of schooling and being part of a household with a high age dependence ratio. Therefore, although a person's NTFP dependence, age in years and the age dependence ratio of the person's household reduced his/her likelihood of participating in interviews, higher levels of schooling increased this probability.

In the case of meetings, age was again important, but contrary to the interviews it increased the likelihood of a person's reporting an intention to volunteer. Despite that, the coefficient is nearly 18 times smaller than that associated with the most important driver, which was NTFP dependence.

As for individuals self-stated, awareness of negative ecological impacts also positively correlated with an individual's actual intention to volunteer in collecting data on natural resources (Table 3 columns [1,2], line [a]). However, awareness of ecological impacts was a weaker predictor when compared to a person's age. In this regard, older people were more likely to engage in collecting data on natural resources. Although weaker, a person's workload in subsistence practices was also significantly associated, increasing the likelihood of participation.

Awareness of ecological impacts did not predict actual participation in interviewing other inhabitants (Table 3 columns [3, 4]). However, gender fully predicts participation, since no men participated in this task.

The likelihood of attending the communal meeting to plan monitoring activities also increased with an individual's level of awareness of ecological impacts (Table 3 columns [5,6], line [a]). In both meetings, age increased the likelihood of participation, being a stronger predictor than awareness of ecological impacts for the first meeting, while a person's workload in subsistence practices decreased the likelihood of participation.

Table 2. Results of mixed-effects regressions of the association between awareness of ecological effects and self-stated intention to participate in monitoring.

Variable	Monitoring task							
	Collect data on natural resource population		Interview community inhabitants		Meetings to plan or discuss monitoring outcomes		Data management and storage	
	Original ^a [1] β Coef.	Std ^b [2] β Coef.	Original [3] β Coef.	Std [4] β Coef.	Original [5] β Coef.	Std [6] β Coef.	Original [7] β Coef.	Std [8] β Coef.
[a] Awareness - Ecological	0.06** (0.02) ^c	0.02** (0.00)	-0.03 (0.03)	-0.01 (0.01)	0.02 (0.03)	0.00 (0.01)	-0.07** (0.03)	-0.02** (0.01)
[b] Man	0.66** (0.30)	2.66** (1.22)	-0.34 (0.40)	-1.36 (1.62)	-0.17 (0.25)	-0.68 (1.02)	-0.03 (0.45)	-0.14 1.80
[c] Age	0.02 (0.01)	0.30 (0.19)	-0.07*** (0.02)	-1.05*** (0.35)	0.04*** (0.01)	0.64*** (0.20)	-0.08*** (0.02)	-1.08*** 0.36
[d] Schooling	0.10** (0.04)	0.05** (0.02)	0.28*** (0.05)	0.15*** (0.03)	0.06 (0.05)	0.03 (0.03)	0.23*** (0.05)	0.12*** 0.02
[e] Residence	-0.61 (0.48)	-3.78 (3.01)	-0.70 (0.84)	-4.35 (5.22)	-0.30 (0.50)	-1.87 (3.08)	-0.33 (0.64)	-2.08 (3.96)
[f] NTFP dependence	0.20 (0.48)	1.45 (3.46)	-1.01* (0.59)	-7.26* (4.29)	1.30*** (0.48)	9.39*** (3.46)	-0.65 (0.66)	-4.72 (4.78)
[g] Subsistence workload	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)
[h] Age dependence ratio	0.00 (0.02)	0.00 (0.00)	-0.13*** (0.03)	-0.03*** (0.01)	-0.01 (0.02)	-0.00 (0.00)	-0.10*** (0.03)	-0.03*** (0.01)
[i] Household size	0.02 (0.03)	0.01 (0.01)	-0.02 (0.04)	-0.01 (0.03)	-0.04 (0.03)	-0.02 (0.02)	-0.02 (0.04)	-0.01 (0.02)
N	163	163	163	163	163	163	163	163
Wald chi ² (9)	21.84	21.84	75.59	75.59	29.11	29.11	69.07	69.07
Prop>chi ²	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Model	Meologit ^d	Meologit	Meologit	Meologit	Meologit	Meologit	Meologit	Meologit

Notes: a = original variables; b = standardized variables; c = robust standard errors; d = multilevel mixed-effects ordered logistic regression; * p < 0.10; ** p < 0.05; *** p < 0.01

Table 3. Results of mixed-effects regressions of the association between awareness of ecological effects and actual participation in monitoring.

Variable	Monitoring task							
	Collect data on natural resource population		Interview community inhabitants		Meeting to plan monitoring activities		Meeting to discuss monitoring outcomes	
	Original ^a [1] β Coef.	Std ^b [2] β Coef.	Original [3] β Coef.	Std [4] β Coef.	Original [5] β Coef.	Std [6] β Coef.	Original [7] β Coef.	Std [8] β Coef.
[a] Awareness - Ecological	2.15*** (0.73) ^c	0.77*** (0.26)	-0.02 (0.15)	-0.00 (0.05)	0.12* (0.07)	0.04* (0.02)	0.08 (0.06)	0.02 (0.02)
[b] Man	1.53 (2.71)	6.07 (10.81)	-- ^d --	-- --	-0.21 (0.62)	-0.87 (2.43)	-0.17 (0.74)	-0.68 (2.97)
[c] Age	0.10** (0.04)	1.35** (0.62)	-0.02 (0.08)	-0.82 (0.05)	0.06* (0.03)	0.88* (0.45)	0.09*** (0.03)	1.18*** (0.40)
[d] Schooling	0.031 (0.33)	0.01 (0.18)	0.29* (0.17)	0.15* (0.09)	0.15 (0.09)	0.08 (0.05)	0.20** (0.08)	0.11* (0.04)
[e] Residence	-3.48 (3.48)	-21.50 (21.51)	-4.35 (2.88)	-26.85 (17.81)	0.21 (1.26)	1.304 (7.78)	-0.17 (1.34)	-1.08 (8.27)
[f] NTFP dependence	-4.01 (2.66)	-28.87 (19.16)	-3.28 (4.64)	-23.60 (33.44)	0.15 (0.91)	1.08 (6.61)	0.33 (0.90)	2.41 (6.50)
[g] Subsistence workload	0.01* (0.01)	0.00* (0.00)	-0.01 (0.01)	-0.00 (0.00)	-0.01*** (0.00)	-0.00*** (0.00)	-0.02* (0.01)	-0.00* (0.00)
[h] Age dependence ratio	-0.33 (0.31)	-0.11 (0.10)	-0.20 (0.13)	-0.06 (0.04)	0.01 (0.08)	0.00 (0.02)	-0.04 (0.06)	-0.01 (0.02)
[i] Household size	0.19 (0.21)	0.11 (0.13)	-0.14 (0.20)	-0.09 (0.12)	0.16 (0.12)	0.10 (0.07)	0.08 (0.07)	0.05 (0.04)
N	163	163	83 ^e	83	163	163	163	163
Wald chi ² (9)	19.69	19.69	24.15	24.15	45.23	45.23	21.41	21.41
Prop>chi ²	0.0199	0.0199	0.0021	0.0021	0.000	0.000	0.0110	0.0110
Model	Melogit ^f	Melogit	Melogit	Melogit	Melogit	Melogit	Melogit	Melogit

Notes: a = original variables; b = standardized variables; c = robust standard errors; d = omitted from the results because being a man predicted failure perfectly; e = man dropped from the sample; f = multilevel mixed-effects logistic regression; * p < 0.10; ** p < 0.05; *** p < 0.01

3.3. Association between awareness of socioeconomic impacts and participation in monitoring the effects of NTFP trade

Equivalent to the former section, in this part we present the results of the mixed-effects regressions regarding the association between people's awareness of socioeconomic impacts from NTFP trade and, successively, their self-stated intention to participate (Table 4) and their actual participation in monitoring tasks (Table 5). As earlier, we also repeated the set of regressions with the original variables and then with the standardized values.

The results showed that, contrary to what has been found for ecological impacts, awareness of socioeconomic impacts is able to preview the self-stated intention to participate only in regard to one of the monitoring tasks (i.e. meetings), yet it is a better predictor of the person's actual participation, in which it significantly correlated with three out of the four assessed tasks (i.e. collect data about *Carapa* populations and two types of meetings).

A person's awareness of the socioeconomic impacts of NTFP trade positively correlated only with their self-stated intention to take part in communal meetings (Table 4 columns [5, 6], line [a]). Therefore, those perceiving higher levels of negative socioeconomic impacts of NTFP trade were more likely to report they would participate in communal meetings addressing monitoring issues. Much more important, however, were two other factors, namely a person's dependence on NTFPs and, less strongly, a person's age, both of which increased the intention to participate in meetings.

The self-stated intention to participate in three other tasks, i.e. collecting data on natural resources, interviewing community inhabitants and dealing with data management and storage, were not affected by a person's awareness of the socioeconomic impacts of NTFP trade but only by other independent variables assessed. For data gathering, being a man with higher levels of schooling consistently raised the intention to participate (Table 4 columns [1, 2]). As regards interviewing (Columns [3, 4]) and data management (Columns [7, 8]), in both cases the level of schooling again increased the intention to participate, whereas the person's age and his/her household age dependence ratio decreased the intention to participate. Note, however, that the level of NTFP dependence was the strongest driver of the intention to participate in interviewing

community inhabitants about the impacts of NTFP harvesting and trade. Nevertheless, contrary to expected, higher dependence lead to a lower intention to participate.

When considering a person's actual participation in experimentally-implemented tasks, awareness of the socioeconomic impacts of NTFP trade was a good predictor of participation in collecting data on natural resources (Table 5 columns [1,2], line [a]) and in both meetings conducted (Table 5 columns [5, 6, 7, 8], line [a]). Again, however, a person's age was a more important predictor of attending the two meetings, with age increasing the likelihood of participation. Although less strongly, a person's workload in subsistence practices was also significantly associated, but in this case it reduced the likelihood of people attending the monitoring meetings. Note, however that gender fully predicts participation in interviewing other inhabitants, since no men participated in this task (Table 5 columns [3, 4]).

Table 4. Results of mixed-effects regressions of the association between awareness of socioeconomic effects and self-stated intention to participate in monitoring.

Variable	Monitoring task							
	Collect data on natural resource population		Interview community inhabitants		Meetings to plan or discuss monitoring outcomes		Data management and storage	
	Original ^a [1] β Coef.	Std ^b [2] β Coef.	Original [3] β Coef.	Std [4] β Coef.	Original [5] β Coef.	Std [6] β Coef.	Original [7] β Coef.	Std [8] β Coef.
[a] Awareness - Socioeconomic	0.04 ^c (0.03)	0.02 (0.01)	0.04 (0.05)	0.02 (0.02)	0.10*** (0.03)	0.05*** (0.01)	-0.01 (0.05)	-0.00 (0.02)
[b] Man	0.70** (0.30)	2.82** (1.20)	-0.33 (0.40)	-1.34 (1.62)	-0.14 (0.28)	-0.58 (1.11)	-0.04 (0.43)	-0.16 (1.73)
[c] Age	0.02 (0.01)	0.30 (0.20)	-0.08*** (0.02)	-1.13*** (0.36)	0.043*** (0.01)	0.57*** (0.19)	-0.08*** (0.02)	-1.12*** (0.36)
[d] Schooling	0.09** (0.04)	0.05** (0.02)	0.27*** (0.06)	0.14*** (0.03)	0.047 (0.05)	0.02 (0.02)	0.24*** (0.05)	0.13*** (0.02)
[e] Residence	-0.64 (0.49)	-3.97 (3.02)	-0.73 (0.82)	-4.51 (5.10)	-0.30 (0.47)	-1.90 (2.95)	-0.37 (0.68)	-2.29 (4.20)
[f] NTFP dependence	0.02 (0.03)	1.79 (3.57)	-1.11* (0.61)	-8.02* (4.44)	1.25** (0.53)	9.03** (3.83)	-0.67 (0.66)	-4.85 (4.74)
[g] Subsistence workload	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.00 (0.00)	-0.001 (0.00)	-0.00 (0.00)
[h] Age dependence ratio	0.00 (0.02)	0.00 (0.00)	-0.10*** (0.03)	-0.03*** (0.01)	-0.02 (0.02)	-0.00 (0.00)	-0.11*** (0.033)	-0.03*** (0.01)
[i] Household size	0.02 (0.03)	0.01 (0.01)	-0.02 (0.04)	-0.01 (0.02)	-0.04 (0.03)	-0.02 (0.01)	-0.02 (0.04)	-0.01 (0.02)
N	163	163	163	163	163	163	163	163
Wald chi ² (9)	17.34	17.34	73.88	73.88	41.66	41.66	73.08	73.08
Prop>chi ²	0.0437	0.0437	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Model	Meologit ^d	Meologit	Meologit	Meologit	Meologit	Meologit	Meologit	Meologit

Notes: a = original variables; b = standardized variables; c = robust standard errors; d = multilevel mixed-effects ordered logistic regression; * p < 0.10; ** p < 0.05; *** p < 0.01

Table 5. Results of mixed-effects regressions of the association between awareness of socioeconomic effects and actual participation in monitoring.

Variable	Monitoring task							
	Collect data on natural resource population		Interview community inhabitants		Meeting to plan monitoring activities		Meeting to discuss monitoring outcomes	
	Original ^a	Std ^b	Original	Std	Original	Std	Original	Std
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	β Coef.	β Coef.	β Coef.	β Coef.	β Coef.	β Coef.	β Coef.	β Coef.
[a] Awareness - Socioeconomic	0.31** (0.14) ^c	0.31** (0.14)	-0.17 (0.28)	-0.17 (0.28)	0.33*** (0.11)	0.33*** (0.11)	0.33*** (0.11)	0.31*** (0.11)
[b] Man	0.74 (0.78)	2.96 (3.13)	-- ^d --	-- --	-0.07 (0.62)	-0.30 (2.49)	0.09 (0.72)	0.35 (2.90)
[c] Age	0.03 (0.09)	0.51 (1.21)	-0.04 (0.10)	-0.66 (1.39)	0.08* (0.04)	1.12* (0.58)	0.11** (0.04)	1.51** (0.61)
[d] Schooling	-0.03 (0.24)	-0.01 (0.12)	0.36 (0.40)	0.19 (0.22)	0.15 (0.11)	0.08 (0.06)	0.24* (0.12)	0.13* (0.06)
[e] Residence	0.75 (1.86)	4.65 (11.52)	-5.63 (3.78)	-34.76 (23.31)	0.76 (1.42)	4.70 (8.80)	0.43 (1.73)	2.68 (10.70)
[f] NTFP dependence	0.74 (1.52)	5.36 (10.94)	-5.55 (8.20)	-39.95 (59.02)	0.61 (0.93)	4.43 (6.68)	0.62 (0.90)	4.47 (6.53)
[g] Subsistence workload	0.00 (0.01)	0.00 (0.00)	-0.02 (0.02)	-0.00 (0.00)	-0.01*** (0.00)	-0.00*** (0.00)	-0.02** (0.01)	-0.00** (0.00)
[h] Age dependence ratio	-0.06 (0.08)	-0.02 (0.03)	-0.26 (0.16)	-0.09 (0.05)	0.04 (0.09)	0.01 (0.03)	-0.03 (0.08)	-0.01 (0.02)
[i] Household size	0.05 (0.12)	0.03 (0.07)	-0.21 (0.31)	-0.13 (0.19)	0.21 (0.16)	0.13 (0.09)	0.14 (0.11)	0.08 (0.06)
N	163	163	83 ^e	83	163	163	163	163
Wald chi ² (9)	53.22	53.22	27.16	27.16	53.22	35.07	53.22	23.15
Prop>chi ²	0.0000	0.0000	0.0007	0.0007	0.0000	0.0029	0.0000	0.0059
Model	Melogit ^f	Melogit	Melogit	Melogit	Melogit	Melogit	Melogit	Melogit

Notes: a = original variables; b = standardized variables; c = robust standard errors; d = omitted from the results because being a man predicted failure perfectly; e = man dropped from the sample; f = multilevel mixed-effects logistic regression; * p < 0.10; ** p < 0.05; *** p < 0.01

3.4. Other factors affecting people's intended and actual participation in monitoring

The results indicated that, frequently, other independent variables were better predictors of self-stated and actual participation in monitoring than the awareness of ecological and socioeconomic impacts. Among these, a person's age and level of schooling were those more frequently associated with the likelihood of reporting an intention to participate in monitoring, as well as the actual participation in certain tasks.

With regards to age, the effect was either positive or negative depending on the monitoring task at stake. While younger individuals displayed a higher propensity to report they would take part in interviewing other community inhabitants and in data management and storage (Tables 2 and 4), those older were more prone to report they would attend communal meetings related to monitoring (Tables 2 and 4), and indeed participated in those meetings that actually took place (Tables 3 and 5).

With regards to schooling, increased levels consistently raised people's proneness to report they would volunteer to collect data on natural resources, interview other community inhabitants and assist in data management and storage (Tables 2 and 4). For the actual participation in experimental monitoring activities, this association was also positive and significant for interviewing other community inhabitants and participating in communal meetings related to monitoring (Tables 3 and 5).

Although less frequently, gender, NTFP dependence, household age dependence and subsistence workload also influenced people's participation in certain cases. Among these, it was remarkable that gender totally predicted participation in interviewing other community inhabitants, a task performed only by women (Tables 3 and 5). In turn, NTFP dependence had a strong effect in people's reported intention to interview other community inhabitants and to attend communal meetings. However, while it increased the likelihood of reporting participation in meetings, it decreased the likelihood of reporting participation in interviewing. The age dependence ratio decreased the likelihood of people's intention to participate in interviewing and data management, showing perhaps that people are aware that these tasks are time demanding and may be a burden to those households with fewer producers than consumers. This effect, however, unexpectedly disappeared in the actual monitoring tasks implemented. In contrast, subsistence workload, which measures the level of

an individual's occupied time, was more important to predict people's actual participation in monitoring tasks than their reported intention.

4. Discussion

We began this article by hypothesizing that participation in monitoring the effects of NTFP harvest and trade should be associated with people's awareness of the impacts of this activity. We therefore expected that people perceiving more negative ecological and socioeconomic impacts caused by NTFP harvest and trade should also be those more likely to voluntarily engage in monitoring. Indeed, our results showed that awareness of both types of negative impacts (ecological and socioeconomic) can predict people's reported intention to participate, but more strongly their actual participation, although not across all monitoring tasks. In the following paragraphs we discuss three main findings of this study: (i) people were more aware of socioeconomic than ecological impacts; (ii) the effect of awareness in explaining people's reported intention and actual participation differed across the monitoring tasks assessed and the type of awareness, and (iii) age, schooling and gender were stronger predictors of people's participation than awareness of impacts in relation to certain tasks. After that, we explore some practical implications of the findings for initiatives aimed at implementing participatory monitoring.

4.1. Awareness of NTFP ecological and socioeconomic impacts.

Our findings showed that people were, on average, more aware of socioeconomic than ecological impacts of NTFP harvest and trade, as demonstrated by the comparison of the mean values of impact awareness. Moreover, awareness of socioeconomic impacts even predicted actual participation in collecting data on natural resources population, a task which is associated solely with evaluating ecological impacts, and has no implications for understanding socioeconomic impacts.

Two possible reasons could explain why people were more aware of socioeconomic impacts. First, and perhaps more important, is the fact that when people experience something directly, this fact has a stronger effect over their attitudes than when they experience it through other means, such as when they are told about it, read or watch something about it (FRIEDRICH; JEFFERSON; GLEGG, 2014; MILLER, 2005; RAJECKI, 1982). Direct experience regards the actual physical contact with natural settings and nonhuman species in an unregulated manner, whereas indirect experience involves also some sort of physical

contact but in far more restricted, programmed, and managed context, as would be the case in a zoo. In turn, vicarious or symbolic experiences occur in the absence of actual physical contact with the natural world, but involve representations or depictions of a certain phenomena (KELLERT, 2002). The accumulated evidence shows that indirect and vicarious experiences are no substitutes for direct contact (MILLER, 2005) and, perhaps, the nature of people's experience about the two types of impacts we have studied may explain the observed difference. On the one hand, socioeconomic impacts, such as the consequences of income inequalities or conflicts among community members, can be experienced directly by any community inhabitant because these problems are observable at the village setting and during daily life. On the other hand, to directly perceive the ecological impacts people need to be in direct and repeated contact with the forest and the area where the natural resource population occurs. Although the community studied live in a forested environment, visiting forested locations does not occur on a daily basis. Hence, the observed difference between the experiences' nature might explain higher average levels of awareness of socioeconomic impacts than of those ecological.

Second, the natural resource studied, i.e. *Carapa*, was not traditionally used by the community, and its commercial harvest and trade is rather new (since 2000). Ecological impacts of NTFP harvest, and specifically of fruits and seeds, can happen in a very slow and gradual pace and thus, be observable only after many years of harvest (TICKTIN; NANTEL, 2004; TICKTIN; SHACKLETON, 2011). It is therefore possible that local people were less aware of ecological impacts because the impacts were small at the research site, or even inexistent, being more difficult to perceive than the socioeconomic ones. Despite the fact that impacts may still be minimal, and there is evidence that significant levels of impact drives more participation (POLLNAC; CRAWFORD; GOROSPE, 2001), understanding what drives people to volunteer in monitoring is important to establish monitoring at early stages. Only early implementation will guarantee impacts can be dealt with and management practices can be adapted to avoid irreversible damages to the species, as well as the biological community (STEM; MARGOLUIS; SALAFSKY et al., 2005).

Another important finding regards the observation that increased awareness of socioeconomic impacts was significantly correlated with people's propensity to participate in data gathering on the *Carapa* population, which is essentially an ecological variable. Thus, it seems that a more integrated monitoring of the socioeconomic and ecological impacts of NTFP harvest and trade could boost a positive cycle. Monitoring is a strategy that raises

information and knowledge about the variables of interest (WILLIAMS, 2011), thus if increased awareness of socioeconomic impacts raises people's willingness to participate in data gathering relative to ecological impacts, this may help to achieve the win-win outcomes originally proposed by NTFP initiatives (SHACKLETON; SHACKLETON; SHANLEY, 2011).

4.2. Differences between awareness effects over participation in different monitoring tasks

The association between impact awareness and self-stated and actual participation in monitoring varied across the different monitoring tasks assessed. In general, however, these results were expected, such as when we observed that higher levels of awareness of ecological impacts correlated with the self-stated intention to engage in tasks related to resource conservation. In contrast, two unexpected results were observed and are discussed below, because this evidence may help to detect monitoring tasks for which disseminating the impacts of NTFP harvest and trade is not sufficient to motivate people's participation and, therefore, other strategies might work better.

First, socioeconomic and ecological awareness never predicted the intention to interview other inhabitants nor the actual participation in interviewing, which deviates from the results found with other tasks. Although we can only speculate about the reasons, there are at least two intertwined possibilities. Community inhabitants may have perceived interviews as time-consuming, as they actually are, and were therefore unwilling to engage in this task despite increasing levels of impact awareness. This perception may, in part, be a consequence of several research projects, including this one, that included conducting interviews in the community, which raised local inhabitants' knowledge about the peculiarities of the activity. Moreover, combining interviewing with other subsistence duties is impossible, which contrasts with other time-consuming monitoring tasks such as gathering data on natural resource populations. In the latter case, people can engage in other activities while gathering data on NTFP populations, such as hunting or harvesting other types of NTFPs. As combining activities is considered beneficial to raise economic gains and to reduce risks (BABULO; MUYS; NEGA et al., 2008; MORSELLO; DELGADO; FONSECA-MORELLO et al., 2014), opportunity costs involved with interviewing are perhaps higher. Therefore, no matter the level of awareness of impacts local inhabitants have, they may be refractory to the activity.

Note, however, that we cannot exclude at least another plausible idiosyncratic explanation, such as a negative cultural perception of interviewing by local people. For instance, it might be considered unethical by local standards that a local member investigates people's information on income and other factors, which are essential to monitor the effects of NTFP trade.

The second puzzling result is in regards to the negative association between ecological impact awareness and the self-stated intention to participate in data management and storage. Those believing more strongly that NTFP harvest and trade entailed negative ecological impacts were also less likely to be motivated to participate in data management and storage. Recall that in this case we refer to their self-stated intention to participate, as we did not implement data gathering experimentally. Although several prior studies reported a gap between either knowledge or awareness and people's behavior towards the environment (e.g. BAMBERG; MÖSER, 2007; JENSEN, 2002), we are unaware of studies observing that raised awareness may in fact decrease people's motivation. Although we cannot rule out other options, this counterintuitive result could possibly be explained by, on the one side, a difference in background characteristics of those people perceiving higher levels of ecological impacts and, on the other side, the skills needed to work with data management and storage. As people vary in their personal preferences and the perceived pleasure of performing a certain activity is a driver of its accomplishment (AJZEN; TIMKO, 1986), it is likely that those more aware of ecological impacts are also spending more time in forest-based activities, such as hunting and harvesting NTFP. This would result partially from their personal preferences for these field based activities, thus people with this profile would be more likely to participate in field-based tasks, but would refrain from taking part in office-based ones because of preferences, as well as due to the lack of skills.

4.3. Effects of age, schooling and gender over participation

Alongside impact awareness, other three independent variables consistently affected people's self-reported and actual participation in certain monitoring tasks: age, schooling and gender.

Age was the most consistent driver, but in some instances it motivated participation, whereas in others it lowered the likelihood of engagement in monitoring tasks. Interviewing

and data management were preferred by younger people, while meetings were preferred by older people. Although there is evidence that, in general, elders may be more cooperative (ASWANI; GURNEY; MULVILLE et al., 2013), younger inhabitants from the studied community have better levels of schooling, since the community school was implemented recently. This is important, since literacy was necessary for performing at least two monitoring tasks, i.e. conducting interviews and data management and storage. There is evidence that elders are sometimes more concerned with environmental issues (LIU; VEDLITZ; SHI, 2014), thus it is likely that they are more motivated to discuss the effects of NTFP harvesting and trade during communal meetings, as we have found. Previous studies on natural resource management and monitoring also support this finding, because they present empirical evidence that elders are more prone to cooperate and engage in planning and decision-making steps, such as meetings (GICHUKI; MACHARIA, 2003; MASKEY; GEBREMEDHIN; DALTON, 2006).

Another noteworthy finding related to age is how it determines variations in people's awareness of the two types of impacts assessed. Although average levels of awareness of ecological impacts were not significantly affected by age, a peak of awareness of socioeconomic impacts was observed among the middle aged (33 to 45 years). We were unable to find information about how activity patterns change with age in regard to NTFP gathering or trading, but for other forest-based activities, such as hunting, this is approximately the age productivity peaks (GURVEN; KAPLAN; GUTIERREZ, 2006). Thus, the result seems to imply that the higher levels of awareness of socioeconomic impacts derive from a greater engagement of this age group in productive activities, such as NTFP harvesting and trade.

The second important variable was schooling, which was an important predictor of participation, although not for all tasks. Controlling for other factors (including awareness of socioeconomic and ecological impacts), schooling tended to increase both self-stated and actual participation in monitoring. As expected, schooling was important for the two tasks which demand literacy (interviewing and data management), but it additionally raised people's motivation to participate in data gathering and their actual participation in meetings, both of which were not based on formal education skills. This latter result can plausibly be explained by previous evidence showing that more years of schooling tend to increase people's awareness of environmental issues (KOLLMUSS; AGYEMAN, 2002) and, hence, perhaps increases motivation to engage in monitoring the effects of NTFP harvest and trade.

In contrast, for negative socioeconomic impacts of NTFP harvest and trade, those people with lower levels of schooling (i.e. 3 to 5 years) had higher levels of awareness. As we did not find previous studies evaluating whether people's awareness of socioeconomic impacts is also associated with schooling levels, we can only suggest tentative explanations. Perhaps, those with lower levels of schooling were also those benefiting less from NTFP trade, which is why they were more aware of its negative socioeconomic impacts.

Finally, gender was also an important determinant of participation, as earlier shown by previous studies (COLEMAN; MWANGI, 2013; GICHUKI; MACHARIA, 2003). However, the effect of gender on people's participation in monitoring was unclear, in some instances increasing the likelihood of participation, and in other decreasing it. Noteworthy was the fact that only women took part in actually interviewing other inhabitants. The reason for this finding is perhaps embedded in the local culture and social relations, which were formed by almost a hundred years (i.e., from 1879 to at least the early 1970s) dedicated to rubber tapping as an economic activity (ALLEGRETTI, 2002). As noted long ago by Murphy and Steward (MURPHY; STEWARD, 1956 p. 343), the exploitation of wild rubber is a solitary, individual occupation in that the tapping of the tree, the subsequent collection of the latex, and the final coagulation process are one-man jobs. This solitary nature of rubber tapping, as well as the original dispersion of households in the forested environments, is considered an inherent part of the social formation of extractive societies (ALLEGRETTI, 2002). In this context, men are accustomed to be more solitaire, whereas women are more used to group activities and to socialize with other inhabitants. As interviewing requires visiting other people's houses and to talk with many people, there are chances that women are more willing to perform it for cultural reasons. Another alternative explanation is the fact that women in the village had, in average, more years of schooling (Mean = 5.6 years) than men (Mean = 4.11 years; test-t = 3.72; $p < 0.00$) and, consequently, they were more likely to had the literacy skills needed for interviewing.

4.4. Implications for the establishment of participatory monitoring of NTFP harvest and trade

Knowledge and awareness about an issue, such as an environmental problem, may not exclusively nor directly affect people's behavior (AJZEN; JOYCE; SHEIKH et al., 2011). Nevertheless, both can act as indirect modifiers of attitudes which, in turn, affect behavior

(BAMBERG; MÖSER, 2007). Hence, increasing people's awareness of the negative impacts associated with NTFP harvest and trade can be a starting point for promoting behavioral changes and thus engaging local inhabitants with monitoring such impacts. Moreover, the positive relationship between awareness and behavioral changes is usually stronger when information about a certain issue is spread by someone people trust and know personally (DIETZ, 2002). For community-based projects, this could be done, for instance, by community leaders. Yet, considering that awareness is a necessary but not sufficient factor to promote behavioral changes (KOLLMUSS; AGYEMAN, 2002), other strategies beyond spreading information about the impacts of NTFP harvest and trade are needed to motivate people to engage in monitoring its effects.

One way to promote more efficient and permanent behavioral changes is to develop new social norms (DIETZ, 2002), i.e. patterns and rules that govern behavior in groups and societies (JACKSON, 1965). Communicating and making information available can provide a starting point for promoting the internalization of new social norms by the group (HARLAND; STAATS; WILKE, 1999). There are, however, several alternative strategies to support this process, which may include: getting people to commit to perform the behavior and making this commitment public (RANDALL, 2002) therefore creating a peer's source of pressure for change (ALEXANDER; PIAZZA; MEKOS et al., 2001); providing incentives (e.g., financial or prestige-based) for those performing the behavior (WINTER; PROZESKY; ESLER, 2007); giving feedback about the behavior and its consequences (DIETZ, 2002), and removing barriers to behavioral adoption (ANDREWS; STEVENS; WISE, 2002). Transporting these lessons to the context of monitoring the effects of NTFP harvest and trade, a few strategies could be adopted to promote people's participation. For instance, create together with the community a schedule and clear rules for people's responsibilities with each of the monitoring tasks and make these commitments public. Additionally, find ways to provide financial compensation for those participating in activities which take too much time, as well as publicize people's commitments to increase their prestige. Equally important could be to provide information about monitoring outcomes and to remove barriers that may prevent participatory monitoring to happen.

5. Conclusions

We departed from the hypothesis that people's awareness of ecological and socioeconomic impacts should increase their likelihood of participation in monitoring the effects of NTFP harvest and trade. Our findings corroborated this hypothesis, because we observed that awareness of ecological and socioeconomic impacts of NTFP harvest and trade predicted people's reported intentions to participate and, more strongly, their actual participation, although not across all monitoring tasks. Three important findings must be highlighted.

First, people were more aware of socioeconomic than ecological impacts, and the former could predict even people's participation in collecting data on natural resources populations, a task for evaluating ecological impacts. This finding highlights the importance of conjoint monitoring the socioeconomic and ecological impacts to boost people's participation, and thus help to achieve the win-win outcomes originally proposed by NTFP trade initiatives (SHACKLETON; SHACKLETON; SHANLEY, 2011).

Second, two unexpected results should be highlighted. People's awareness of socioeconomic and ecological impacts neither predicted the intention to interview other inhabitants, nor the actual participation in interviewing. Additionally, people believing that NTFP harvest and trade entailed negative ecological impacts were less likely to participate in data management and storage. Although we had advanced some possible reasons for these puzzling findings, more studies are needed to empirically check our assumptions.

Third, we found that age, schooling and gender may also be important predictors of people's participation, as they consistently affected people's self-reported and actual participation in different monitoring tasks. Thus, these variables must be considered when studying people's motivation to volunteer in monitoring.

Despite impact awareness was able to predict people's participation in several cases, we also found also it failed to predict participation in certain tasks; for instance, the actual participation in interviewing community inhabitants. These findings are in line with previous evidence that knowledge and awareness *per se* may not directly influence human pro-environmental behaviors (BAMBERG; MÖSER, 2007; JENSEN, 2002). Thus, to ensure people's engagement in monitoring the effects of NTFP harvest and trade, or other natural

resources for that matter, disseminating the negative impacts of the activity is a necessary but not sufficient step. Multiple strategies, such as providing incentives for participation, removing barriers for participation and advancing social norms that make monitoring a commonplace accepted activity are necessary.

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Supporting information 1

Statements regarding people's beliefs about ecological and socioeconomic impacts of NTFP harvest and trade. For all the statements, the values of the ordinal scales correspond to: 1 = totally disagree; 2 = disagree; 3 = do not agree or disagree; 4 = agree 5 = totally agree. The presented statements are a translation from the original in Portuguese.

Statements	Values of ordinal scales
Ecological beliefs	
1. It is more difficult to find andiroba to harvest here at Roque today than it was five years ago.	From 1 = I strongly disagree to 5 = I strongly agree
2. The andiroba harvest decreases the amount of food available for some animals of the forest.	From 1 = I strongly disagree to 5 = I strongly agree
3. The agricultural plots increased in size after we started to harvest and trade andiroba.	From 1 = I strongly disagree to 5 = I strongly agree
4. The andiroba harvest causes less andirobeiras trees to born in the forest.	From 1 = I strongly disagree to 5 = I strongly agree
5. The amount of andiroba we harvest here at Roque will make our forest to have less andirobeiras trees in the future.	From 1 = I strongly disagree to 5 = I strongly agree
6. When I walk through the forest I see less andiroba seedlings than I did before.	From 1 = I strongly disagree to 5 = I strongly agree
7. When I walk through the forest I see fewer large andirobeira trees than I did before.	From 1 = I strongly disagree to 5 = I strongly agree
Socioeconomic beliefs	
1. The trade of andiroba oil generates some fights between people at Roque.	From 1 = I strongly disagree to 5 = I strongly agree
2. After men began working on the trade of andiroba oil women were left with an increased workload.	From 1 = I strongly disagree to 5 = I strongly agree
3. Not all families at the community improved their quality of life after we started to trade andiroba oil.	From 1 = I strongly disagree to 5 = I strongly agree
4. Once we start to trade andiroba oil the sharing of goods between households decreased.	From 1 = I strongly disagree to 5 = I strongly agree
5. The work at andiroba oil trade activities decreased the time we have to fish, hunt and work in the agricultural plots.	From 1 = I strongly disagree to 5 = I strongly agree
6. The quality of life at Roque worsened after we started to trade andiroba oil.	From 1 = I strongly disagree to 5 = I strongly agree
7. The activities of harvesting and trading andiroba oils give money only for some families here at Roque.	From 1 = I strongly disagree to 5 = I strongly agree

Supporting information 2

Results for the principal component analysis (PCA) of the two Likert-scales for people's awareness of NTFP harvest and trade impacts.

People's awareness of:	Factor	Eigenvalue	Difference	Proportion explained
Ecological impacts	1	2.27	0.81	0.28
	2	1.35	0.23	0.18
	3	1.22	0.23	0.15
	4	0.99	0.30	0.12
	5	0.68	0.07	0.08
	6	0.61	0.08	0.07
	7	0.52	0.28	0.06
Socioeconomic impacts	1	1.82	0.54	0.22
	2	1.28	0.20	0.16
	3	1.07	0.07	0.13
	4	1.00	0.12	0.12
	5	0.88	0.13	0.11
	6	0.75	0.09	0.09
	7	0.65	0.13	0.08

CONCLUSÕES FINAIS

Esta tese teve por objetivo contribuir para a lacuna na literatura científica acerca dos fatores que determinam a participação voluntária de indivíduos no monitoramento dos efeitos ecológicos e socioeconômicos da exploração e do comércio de recursos naturais por comunidades locais. A partir dos resultados, foi evidenciado que fatores econômicos, comportamentais e psicológicos, como atitudes e percepção de impactos da exploração, atuam em conjunto para determinar a motivação dos indivíduos a participarem do monitoramento, assim como o seu envolvimento real na atividade. Em termos práticos, o estudo contribuiu para levantar algumas estratégias que podem aumentar a probabilidade de participação dos indivíduos e, conseqüentemente, aumentar o sucesso de iniciativas de monitoramento participativo. A seguir, apresentamos uma síntese das principais conclusões do estudo.

O primeiro capítulo partiu da hipótese de que pessoas usualmente cooperativas e aquelas mais beneficiadas pelo comércio de PFNM estariam mais propensas a participar do monitoramento de forma voluntária. Os resultados corroboraram a hipótese e trouxeram evidências de que as duas variáveis avaliadas – i.e. dependência de produtos florestais não madeireiros (PFNM) e comportamento cooperativo – são indicadores tanto da intenção de participar do monitoramento, quanto da participação real em diferentes atividades de monitoramento. No entanto, o comportamento cooperativo demonstrou ser um indicador de participação mais forte e mais frequente quando analisadas as diferentes atividades de monitoramento. De maneira geral, estes resultados concordam com estudos prévios que apontam outros fatores, além dos benefícios econômicos, como determinantes da participação (e.g. GICHUKI; MACHARIA, 2003; SETTY; BAWA; TICKTIN et al., 2008). Além disso, os resultados indicam que, apesar de suficiente para inicializar o monitoramento, o número esperado de voluntários é baixo, dada a baixa participação em todas as atividades do monitoramento experimental realizado na comunidade, o que pode comprometer a manutenção do monitoramento no longo prazo. A principal razão é que dado ao baixo número, especialmente em tarefas como coleta de dados ecológicos e socioeconômicos, seria difícil substituir os indivíduos que já realizaram alguma das tarefas do monitoramento, como forma de reduzir o ônus da carga de trabalho. Monitorar a coleta e o comércio de um recurso natural consome tempo e esforço dos participantes, representando um alto custo de

oportunidade para aqueles que participam (EVANS; GUARIGUATA, 2008), os quais precisam deixar de lado atividades geradoras de renda monetária. Portanto, manter sempre os mesmos indivíduos realizando o monitoramento de maneira voluntária não é uma estratégia viável no contexto estudado, bem como em outras comunidades de pequena escala similares àquela estudada.

Os resultados do segundo capítulo mostraram que, dentre as variáveis da Teoria do comportamento planejado (TCP) (AJZEN, 1991), i.e. atitudes, normas subjetivas e controle comportamental percebido, o melhor preditor da intenção dos indivíduos participarem do monitoramento da coleta e do comércio de recursos naturais foi um dos indicadores de atitude adotado. Esse indicador atitudinal correspondeu ao prazer de realizar determinada atividade de monitoramento. Por exemplo, controlando para outros fatores, o indivíduo que considera prazeroso visitar zonas de floresta para coletar dados sobre a população do recurso natural tem probabilidade muito maior de participar como voluntário na atividade. Dessa forma, os resultados reafirmam a importância de avaliar as dimensões afetivas (e.g. prazer e sentimentos associados a um comportamento) e não apenas cognitivas quando se estuda a motivação de comportamentos humanos (AJZEN; TIMKO, 1986), incluindo aqueles relacionados à conservação ambiental (HINDS; SPARKS, 2008). Porém, mesmo que em menor escala, as normas subjetivas (i.e. se pessoas próximas aprovam a participação) e o controle comportamental percebido (i.e. a percepção de que participar depende apenas da própria vontade) também afetaram positivamente a intenção de participar do monitoramento. Embora a adição da norma descritiva (i.e. percepções sobre o comportamento dos outros) não tenha aumentado o poder de predição dos modelos analisados, isso ocorreu provavelmente porque os entrevistados, em sua maioria, demonstraram não acreditar que outros moradores da comunidade participariam voluntariamente do monitoramento. Como o comportamento de um indivíduo é, em parte, influenciado pelo comportamento predominante em seu grupo, ou seja, pela norma descritiva (CIALDINI, 2003; CIALDINI; RENO; KALLGREN, 1990), a percepção negativa da provável participação dos outros moradores pode afetar negativamente o envolvimento voluntário de membros do grupo.

Por fim, o terceiro capítulo testou a hipótese de que a percepção de impactos negativos, tanto ecológicos como socioeconômicos, provocados pela coleta e comercialização de recursos naturais aumenta a intenção de participar e a participação real, em algumas atividades de monitoramento. Os resultados indicaram que a percepção dos dois tipos de impactos é importante, em especial para a participação real. Porém, outros fatores como

gênero, idade e educação são determinantes mais fortes da participação em algumas atividades. Além disso, encontramos evidências de que aliar o monitoramento de impactos ecológicos e socioeconômicos aumenta o sucesso da prática.

Implicações para planos de monitoramento

Em termos práticos, os resultados deste estudo realçam a importância de utilizar uma combinação de diferentes estratégias para aumentar a probabilidade de participação no monitoramento da coleta e do comércio de recursos naturais. A seguir destacamos três principais estratégias com tal objetivo.

Em primeiro lugar, sabendo que o comportamento cooperativo do indivíduo é um fator determinante e muito importante para que estes sejam voluntários no monitoramento participativo, desenvolver estratégias que promovam o nível de cooperação entre os membros da comunidade pode aumentar o engajamento e, conseqüentemente, o sucesso do monitoramento participativo. Evidências de estudos prévios mostram que aumentar a informação compartilhada entre as pessoas pode aumentar a cooperação entre as mesmas (CAMERER; FEHR, 2004; MOON; MARSHALL; COCKLIN, 2012). Com efeito, nossos resultados demonstraram que o aumento na percepção sobre os impactos negativos da coleta e comercialização de recursos naturais leva a uma maior motivação e, mais importante, incrementa a participação real, ao menos em algumas etapas do monitoramento. Sendo assim, estabelecer formas de divulgar informações sobre os possíveis impactos ecológicos e socioeconômicos da atividade, assim como o papel do monitoramento no entendimento do processo e para a identificação de formas de adaptação, embora um tanto quanto óbvio, pode ser mesmo assim um mecanismo eficaz para aumentar a probabilidade de participação. Além disso, os efeitos dessas informações sobre a participação podem ser ampliados se as mesmas forem transmitidas por pessoas importantes para os membros das comunidades, como por exemplo, os líderes comunitários. Outra possibilidade para promover a cooperação dentre os indivíduos de um grupo é criar compromissos públicos entre os membros (RANDALL, 2002). No contexto da participação no monitoramento, esses compromissos poderiam ser firmados a partir de regras claras sobre quem será responsável por cada uma das atividades e quando, por

meio de compromissos assumidos publicamente, por exemplo, durante as reuniões de planejamento e discussão do monitoramento, mas também por outros meios locais para atingir aqueles que não comparecem a esses eventos.

Em segundo lugar, ao menos para algumas etapas necessárias ao monitoramento, como, por exemplo, realizar entrevistas, seria importante criar estratégias para reduzir o custo de oportunidade da participação. Dado que a participação voluntária é improvável em algumas atividades e pode causar acarretar ônus aos envolvidos, os participantes poderiam ser pagos, em dinheiro ou bens de consumo, em quantia equivalente ao custo de oportunidade de sua participação. No caso específico do comércio de PFM, os recursos financeiros para tal poderiam vir como parte dos valores conseguidos com o comércio com as empresas envolvidas na coleta e comércio dos recursos naturais. O pagamento poderia ser realizado ao menos para as atividades que consomem mais tempo como coletar dados da população do recurso natural e entrevistar membros da comunidade. Recorde, contudo, que o conhecimento prático e não somente teórico é mais importante para determinar o comportamento pró-ambiental (KOLLMUSS; AGYEMAN, 2002). Sendo assim, é provavelmente melhor que o pagamento não implique no envolvimento de um número pequeno de pessoas, mas seja efetivado para boa parcela da comunidade, por exemplo, estabelecendo formas rotativas de responsabilidade com as tarefas.

Por fim, os estudos mostraram que, projetos pilotos, como, por exemplo, “monitorar o monitoramento”, no sentido de implementá-lo como feito neste estudo de maneira experimental e coletar informações sobre os determinantes (ou correlatos) da participação pode ajudar de várias formas. Por exemplo, a identificar barreiras que impedem que certos indivíduos ou o grupo como um todo participem e, com isso, criar maneiras de superá-las (ANDREWS; STEVENS; WISE, 2002). No caso aqui estudado, por exemplo, para alcançar a área de ocorrência de *C. guianensis* é preciso percorrer um percurso de barco, mas nem todos os moradores possuem barco e o combustível necessário para ir até a área. Portanto, o fornecimento de um barco comunitário e de combustível para realização do monitoramento da população de *C. guianenses* é necessário, fazendo novamente uso de recursos financeiros colocados à parte do comércio com a empresa.

Sugestões para pesquisas futuras

Longe de esgotar o entendimento dos fatores que motivam a participação no monitoramento da coleta e do comércio de recursos naturais, os resultados encontrados no decorrer deste estudo levantam diversas questões interessantes para futuras pesquisas. A seguir, destacamos quatro sugestões de pesquisas que, entre outras, merecem, a nosso ver, serem investigadas.

Em primeiro lugar, há fatores que podem afetar a participação dos indivíduos no monitoramento tratados na literatura para outros temas correlatos que não foram objeto da presente tese. Dentre outros, existem indícios de que a participação também possa ser afetada por valores morais dos indivíduos (MOON; MARSHALL; COCKLIN, 2012); o tamanho e a homogeneidade do grupo do qual eles fazem parte (POLLNAC; CRAWFORD; GOROSPE, 2001), e suas percepções quanto aos impactos causados pelo homem sobre a natureza de maneira geral (MILLAR; CURTIS, 1999).

Outra questão interessante seria entender até que ponto o nível de dependência de diferentes recursos naturais afeta a intenção das pessoas participarem do monitoramento. Por exemplo, realizar um estudo comparativo entre a propensão à participação no monitoramento de recursos naturais usados somente para o comércio e, portanto, como fonte de renda monetária, como foi o caso da *C. guianensis* neste estudo, e outro utilizado para a subsistência, por exemplo, um alimento essencial como é o caso da caça ou pesca para os habitantes de regiões florestadas remotas. É possível que a participação no monitoramento de um recurso do qual os indivíduos dependem fortemente para a subsistência seja maior, porque ameaças a estes recursos podem afetar mais drasticamente o modo de vida da comunidade.

Outra linha de estudos de importância fortemente prática refere-se à eficácia de diferentes tipos de estratégias para aumentar a participação no monitoramento. Por exemplo, avaliar os efeitos de estratégias sugeridas neste estudo como: promover a cooperação entre os indivíduos da comunidade; fornecer incentivos econômicos para atividades com baixa participação dado o alto custo de oportunidade, ou divulgar informações sobre os possíveis impactos negativos da coleta e comercialização de recursos naturais.

Por fim, dado que o presente estudo avaliou apenas a propensão em uma comunidade, seria importante repetir a análise dos mesmos fatores avaliados nesta tese em outras

comunidades que coletam e comercializam recursos naturais com características similares ou diversas. Com isso, seria possível avaliar se os resultados são consistentes e até que ponto generalizáveis a contextos diversos.

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2. ATITUDE EM RELAÇÃO À CONSERVAÇÃO NEP

Nesta parte da entrevista, vou falar algumas frases sobre a relação do homem com a natureza. Queria que, para cada uma das frases o(a) sr(a) me dissesse, por favor, se concorda muito, concorda um pouco, tanto faz, discorda um pouco ou discorda muito. Não existe uma resposta certa ou errada o que vale é a opinião do(a) sr(a).

NV	O(a) sr(a) concorda ou discorda com esta frase:	Concorda muito	Concorda um pouco	Tanto faz	Discorda um pouco	Discorda muito	Não sei
2.1	O homem tem o direito de modificar a natureza como ele quiser	1	2	3	4	5	0
2.2	O homem está abusando muito da natureza	5	4	3	2	1	0
2.3	Se as coisas continuarem do jeito que estão logo vamos ter uma grande crise ambiental	5	4	3	2	1	0
2.4	O impacto do homem sobre a natureza não é tão grande quanto às pessoas falam	1	2	3	4	5	0

3. ATIVIDADES VOLUNTÁRIAS

Agora eu vou perguntar sobre alguns trabalhos voluntários, ou seja, sem ganhar dinheiro ou qualquer outra coisa em troca, que talvez o(a) sr(a) já tenha feito no último ano, ou seja de _____ de 2012 até hoje.

3.1 No último ano o(a) sr(a) ajudou a consertar alguma parte (por ex. telhado, porta, janela) da casa de alguém aqui do Roque, sem ganhar nada em troca? Sim Não

3.2 No último ano o(a) sr(a) ajudou na roça de alguém que não seja da sua família sem ganhar nada em troca? Sim Não

3.3 No último ano o(a) sr(a) ajudou alguém que não é da sua família a fazer farinha, sem ganhar nada em troca? Sim Não

3.4 No último ano o(a) sr(a) tomou conta de crianças de outras famílias sem ganhar nada em troca? Sim Não

4. CONFIANÇA

Nesta parte da entrevista eu vou falar algumas frases sobre o que o(a) sr(a) acha sobre pessoas da sua família, amigos ou estranhos. Para cada uma das frases eu vou querer saber se o(a) sr(a) concorda muito, concorda um pouco, tanto, faz, discorda um pouco ou discorda muito com o que eu falei. Não existe uma resposta certa ou errada o que vale é a opinião do(a) sr(a).

NV	O(a) sr(a) concorda ou discorda com esta frase:	Concorda muito	Concorda um pouco	Tanto faz	Discorda um pouco	Discorda muito	Não sei
4.1	Hoje em dia, você não pode contar com ninguém	1	2	3	4	5	0
4.2	Eu confio nas pessoas da minha casa	5	4	3	2	1	0
4.3	Sempre que puderem as pessoas vão tentar te enganar	1	2	3	4	5	0
4.4	Sempre que eu precisar os meus amigos vão me ajudar	5	4	3	2	1	0

5. EMPRESTAR

Agora eu vou falar algumas frases sobre com qual frequência o(a) sr(a) empresta algumas coisas, por exemplo, enxadas, roupas e eletrodomésticos. Para cada uma das coisas queria que, por favor, o(a) sr(a) me dissesse se nunca empresta, empresta poucas vezes, depende, empresta quase sempre que te pedem ou sempre empresta.

NV	Com qual frequência o(a) sr(a) empresta:	Sempre	depende	Nunca	Não sei
5.1	Dinheiro para os seus amigos?	1	2	3	0
5.2	Ferramentas de trabalho (por ex. enxada, facão, pá) para seus amigos?	1	2	3	0
5.3	Comidas compradas como café, sal, açúcar, para seus amigos?	1	2	3	0
5.4	Eletrodomésticos, por ex, rádio, tv, seus ou da sua casa, para seus amigos?	1	2	3	0

6. VALORES

Nesta parte da entrevista eu vou falar algumas frases para o(a) sr(a). Para cada uma eu vou querer saber se o(a) sr(a) concorda muito, concorda um pouco, tanto faz, discorda um pouco ou discorda muito de cada uma delas. Não existe uma resposta certa ou errada o que vale é a opinião do(a) sr(a).

NV	O(a) sr(a) concorda ou discorda com esta frase:	Concorda muito	Concorda um pouco	Tanto faz	Discorda um pouco	Discorda muito	Não sei
6.1	Eu acho que só aquelas pessoas que tiram coisas da mata tem a obrigação de cuidar e preservar a mata aqui do Roque	1	2	3	4	5	0
6.2	Eu tenho a obrigação de proteger a mata que existem em volta do Roque	5	4	3	2	1	0
6.3	Eu não acho que eu teria culpa se a mata aqui do Roque começasse a diminuir	1	2	3	4	5	0
6.4	Eu acho que a gente que mora aqui no Roque tem a obrigação de tentar fazer com que todas as atividades relacionadas à venda dos óleos (por ex. coletar, carregar sementes, escolher) sejam pagas de maneira justa	5	4	3	2	1	0
6.5	Eu acho que se a venda de óleos trouxer problemas para o Roque a culpa é da empresa compradora e não da comunidade	1	2	3	4	5	0
6.6	Eu pessoalmente me sentiria culpado(a) se eu soubesse que a venda dos óleos traz problemas para algumas famílias aqui do Roque	5	4	3	2	1	0

7. PERCEPÇÃO DA COOPERAÇÃO DOS OUTROS

7.1 Agora eu vou ler algumas histórias que eu inventei, mas que poderiam acontecer aqui no Roque. Depois vou dizer algumas alternativas sobre o que poderia acontecer em cada situação. Para cada uma das histórias que eu ler vou pedir para o(a) sr(a), por favor, imaginar o que acha que aconteceria. Imagine que um pesquisador veio aqui no Roque fazer uma pesquisa. Esse pesquisador quer fazer uma reunião para discutir com os moradores se a coleta de andiroba causa algum problema na mata. O(a) sr(a) acha que:

Todo mundo do Roque iria na reunião	3
A maioria das pessoas iria na reunião	2
Poucas pessoas iriam na reunião	1
Ninguém iria na reunião	0

7.2 Imagine que depois de uma chuva muito forte o telhado da igreja ficou cheio de buracos. É preciso consertar o telhado. Mas ninguém vai pagar pelo trabalho. Alguns moradores do Roque resolvem juntar pessoas para ajudar a arrumar o telhado. O(a) sr(a) acha que:

Todo mundo do Roque iria ajudar a consertar o telhado	3
A maioria das pessoas iria ajudar a consertar o telhado	2
Poucas pessoas iriam ajudar a consertar o telhado	1
Ninguém ia ajudar a consertar o telhado	0

7.3 Imagine que aconteceu uma enchente aqui no Roque e que a casa de uma das famílias foi totalmente destruída. Essa família não tem condições de construir uma casa nova sozinha. Eles pedem ajuda para as pessoas do Roque para reconstruir a casa, mas não tem dinheiro para pagar pelo trabalho. O(a) sr(a) acha que:

Todo mundo do Roque iria aceitar ajudar a construir uma casa nova para a família	3
A maioria das pessoas iria aceitar ajudar a construir uma casa nova para a família	2
Poucas pessoas iriam aceitar ajudar a construir uma casa nova para a família	1
Ninguém iria aceitar ajudar a construir uma casa nova para a família	0

8. PERCEPÇÃO SOCIAL COMERCIALIZAÇÃO

Agora vou falar algumas frases sobre a venda de óleos aqui do Roque. Queria que, para cada uma o(a) sr(a) me dissesse, por favor, se concorda muito, concorda um pouco, tanto faz, discorda um pouco ou discorda muito. Não existe uma resposta certa ou errada o que vale é a opinião do(a) sr(a).

NV	O(a) sr(a) concorda ou discorda da frase:	Concorda muito	Concorda um pouco	Tanto faz	Discorda um pouco	Discorda muito	Não sei
8.1	A venda de óleo aqui no Roque dá dinheiro só para algumas famílias	5	4	3	2	1	0
8.2	A venda de óleos provoca algumas brigas entre as pessoas da comunidade	5	4	3	2	1	0
8.3	A vida no Roque piorou depois que começamos a vender óleo	5	4	3	2	1	0
8.4	O trabalho na venda dos óleos faz termos menos tempo para pescar, caçar e trabalhar no roçado	5	4	3	2	1	0
8.5	Depois que começamos a vender os óleos as pessoas passaram a vizinhar menos	5	4	3	2	1	0
8.6	Nem todas as famílias da comunidade melhoraram de vida depois que começamos a vender óleo	5	4	3	2	1	0
8.7	Depois que os homens começaram a trabalhar na venda dos óleos sobrou mais trabalho do dia a dia para as mulheres fazerem	5	4	3	2	1	0

9. ATITUDE DE COOPERAÇÃO DO ENTREVISTADO

Nesta parte eu vou ler algumas histórias que eu inventei, mas que poderiam acontecer aqui no Roque. Depois vou ler algumas alternativas sobre o que o(a) sr(a) faria nessa situação. Para cada uma das histórias vou pedir para o(a) sr(a), por favor, me dizer o que faria. Não existe uma resposta certa ou errada o que vale é a opinião do(a) sr(a).

9.1 Imagine que um pesquisador veio fazer uma pesquisa aqui no Roque. Esse pesquisador quer fazer uma reunião para discutir com os moradores se a coleta de andiroba e murumuru causa algum problema na mata. O que o(a) sr(a) faria:	
Eu iria na reunião com certeza	5
Eu iria na reunião	4
Talvez eu fosse na reunião/não sei	3
Eu acho que não iria na reunião	2
Eu não poderia ir na reunião de jeito nenhum porque isso ia atrapalhar as outras coisas que eu tenho que fazer no meu dia a dia.	1

9.2 Imagine que depois de uma chuva muito forte o telhado da igreja ficou cheio de buracos. É preciso consertar o telhado. Mas ninguém vai pagar pelo trabalho. Alguns moradores do Roque resolvem juntar pessoas para ajudar a arrumar o telhado. O que o(a) sr(a) faria:	
Eu ajudaria a consertar o telhado com certeza	5
Eu ajudaria a consertar o telhado	4
Talvez eu ajudasse/não sei	3
Eu acho que não ajudaria a consertar o telhado	2
Eu não poderia ajudar a consertar o telhado de jeito nenhum porque isso ia atrapalhar as outras coisas que eu tenho que fazer no meu dia a dia	1

9.4 Imagine que aconteceu uma enchente aqui no Roque e que a casa de uma das famílias foi totalmente destruída. Essa família não tem condições de construir uma casa nova sozinha. Eles pedem ajuda para as pessoas do Roque para reconstruir a casa, mas não tem dinheiro para pagar pelo trabalho. O que O(a) sr(a) faria:	
Eu ajudaria com certeza	5
Eu ajudaria	4
Talvez eu ajudasse/não sei	3
Eu acho que não ajudaria	2
Eu não iria poder ajudar de jeito nenhum porque isso ia atrapalhar as outras coisas que eu tenho que fazer no meu dia a dia.	1

10. PERCEPÇÃO ECOLÓGICA DA COLETA

Nesta parte da entrevista, vou falar algumas frases sobre a coleta de andiroba e murumuru aqui no Roque. Queria que, para cada frase que vou ler, que o(a) sr(a) me dissesse, por favor, se concorda muito, concorda um pouco, tanto faz, discorda um pouco ou discorda muito. Não existe uma resposta certa ou errada o que vale é a opinião do(a) sr(a).

NV	O(a) sr(a) concorda ou discorda com esta frase:	Concorda muito	Concorda um pouco	Tanto faz	Discorda um pouco	Discorda muito	Não sei
10.1	É mais difícil encontrar andiroba para coletar aqui no Roque hoje em dia do que era há cinco anos atrás	5	4	3	2	1	0
10.2	Coletar andiroba diminui a quantidade de comida para vários bichos da mata	5	4	3	2	1	0
10.3	As áreas de roçado augmentaram de tamanho depois que começamos a coletar e vender andiroba	5	4	3	2	1	0
10.4	Pegar andiroba faz com que nasçam menos plantinhas de andiroba na mata	5	4	3	2	1	0
10.5	A quantidade de andiroba que a gente coleta aqui no Roque vai fazer com que no futuro a nossa mata tenha menos andirobeiras do que ela tem hoje	5	4	3	2	1	0

12. PERCEPÇÃO DO VALOR DA FLORESTA

Agora eu vou falar algumas frases sobre a mata aqui do Roque. Para cada uma eu vou pedir pra que o(a) sr(a) me diga, por favor, se concorda muito, concorda um pouco, tanto faz, discorda um pouco ou discorda muito com o que eu falei. Não existe uma resposta certa ou errada o que vale é a opinião do(a) sr(a).

NV	O(a) sr(a) concorda ou discorda com esta frase:	Concorda muito	Concorda um pouco	Tanto faz	Discorda um pouco	Discorda muito	Não sei
12.1	A mata é importante, pois me dá alimento	5	4	3	2	1	0
12.2	A mata é importante, pois me dá dinheiro	5	4	3	2	1	0
12.3	Quero que meus filhos cresçam em um lugar onde ainda existe mata	5	4	3	2	1	0
12.4	Quanto mais mata tiver, melhor será a qualidade de vida da comunidade	5	4	3	2	1	0

11. RENDA

Nesta parte da entrevista, eu vou perguntar sobre as formas que as pessoas ganham dinheiro aqui no Roque, como salário, coleta de andiroba, aposentadoria, bolsa verde, bolsa família, bicos. Para responder, por favor, pense só naquilo que o(a) sr(a) mesmo(a) ganhou e não uma outra pessoa da sua casa ou família ganhou.

Primeiro vou perguntar para o(a) sr(a) sobre o dinheiro recebido de trabalhos relacionados à venda dos óleos de andiroba e murumuru, como coleta de frutos e sementes, trabalhos na usina, etc.

R01	O(a) sr(a) coletou andiroba ou murumuru para vender nos últimos 3 meses, ou seja, de janeiro até hoje?	sim <input type="checkbox"/> não <input type="checkbox"/>
R02	Quanto no total o(a) sr(a) ganhou com a coleta de andiroba de murumuru nos últimos 3 meses?	\$
R03	O(a) sr(a) fez alguma viagem para comprar andiroba ou murumuru de outras comunidades nos últimos 3 meses, ou seja, de janeiro hoje?	sim <input type="checkbox"/> não <input type="checkbox"/>
R04	Quanto no total o(a) sr(a) ganhou com todas as viagens de compra de andiroba ou murumuru de outras comunidades nos últimos 3 meses?	\$
R05	O(a) sr(a) carregou sacas de andiroba ou murumuru dos barcos para a usina ou galões de óleo da usina para os barcos nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R06	Quanto no total o(a) sr(a) ganhou para carregar sacas de andiroba ou murumuru dos barcos para a usina ou galões de óleo da usina para os barcos nos últimos 3 meses?	\$
R07	O(a) sr(a) ajudou a separar ou quebrar as melhores sementes ou frutos nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R08	Quanto no total o(a) sr(a) ganhou para por quebrar ou separar as sementes ou frutos nos últimos 3 meses?	\$
R09	O(a) sr(a) teve algum trabalho temporário na usina (operar as máquinas, limpeza) nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R10	Quanto no total o(a) sr(a) ganhou por este(s) trabalho(s) temporário(s) na usina nos últimos 3 meses?	\$
R11	O(a) sr(a) participou da gestão financeira da cooperativa nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R12	Quanto no total o(a) sr(a) ganhou por trabalhar na gestão financeira da cooperativa nos últimos 3 meses?	\$
R13	O(a) sr(a) trabalhou na administração da cooperativa nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R14	Quanto no total o(a) sr(a) ganhou pelo trabalho na administração da cooperativa nos últimos 3 meses?	\$
R15	O(a) sr(a) trabalhou na manutenção das máquinas da usina nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R16	Quanto no total o(a) sr(a) ganhou por trabalhar na manutenção das máquinas da usina nos últimos 3 meses?	\$

Agora eu vou perguntar para o(a) sr(a) sobre o dinheiro recebido de trabalhos com salários regulares (que são recebidos todo mês) ou com auxílios do governo. Para responder, por favor, pense só naquilo que o(a) sr(a) mesmo(a) ganhou e não uma outra pessoa da sua casa ou família ganhou.

R17	O(a) sr(a) recebeu algum salário por trabalhos regulares (todo mês) nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R18	Quanto por mês o(a) sr(a) ganhou por este(s) trabalho(s) regular?	\$
R19	O(a) sr(a) recebeu alguma aposentadoria como, por exemplo, por velhice, invalidez, morte de pais nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R20	Quanto por mês o(a) sr(a) ganhou desta aposentadoria?	\$
R21	O(a) sr(a) recebeu algum pagamento de programas de renda do governo como bolsa escola, bolsa família, bolsa trabalho, bolsa reaprendendo, vale leite nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R22	Quanto por mês o(a) sr(a) ganhou destes programas?	\$
R23	O(a) sr(a) recebeu algum pagamento de programas de serviços ambientais, como o bolsa verde, nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R24	Quanto por mês o(a) sr(a) ganhou destes programas?	\$
R25	O(a) sr(a) recebeu algum outro tipo de auxílio em dinheiro do governo ou algum tipo de pensão nos últimos 3 meses que eu não tenha falado?	sim <input type="checkbox"/> não <input type="checkbox"/>
R26	Quanto por mês o(a) sr(a) ganhou destes auxílios?	\$

Agora eu vou perguntar para o(a) sr(a) sobre o dinheiro recebido de trabalhos temporários ou bicos

R27	O(a) sr(a) recebeu dinheiro por algum trabalho eventual ou bico, como ajudar na construção de alguma coisa, para o governo nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R28	Quanto no total o(a) sr(a) ganhou por esse(s) trabalho(s) eventual para o governo nesses 3 meses?	\$
R29	O(a) sr(a) recebeu dinheiro por algum trabalho temporário ou bico para pesquisadores nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R30	Quanto no total o(a) sr(a) ganhou por esse(s) trabalho(s) eventual ou bico para os pesquisadores nesses 3 meses?	\$
R31	O(a) sr(a) recebeu dinheiro por algum outro tipo de trabalho temporário ou bico nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R32	Quanto no total o(a) sr(a) ganhou por esse(s) trabalho(s) eventual nesses 3 meses?	\$

Agora eu vou perguntar para o(a) sr(a) sobre o dinheiro recebido da venda de produtos. Para responder, por favor, pense só naquilo que o(a) sr(a) mesmo(a) vendeu e não uma outra pessoa da sua casa ou família vendeu.

R33	O(a) sr(a) vendeu produtos da mata, por ex. açaí, carne de caça, peixe, nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R34	Quanto no total o(a) sr(a) ganhou por esta venda nesses 3 meses?	\$
R35	O(a) sr(a) vendeu produtos da roça (mandioca, farinha, bananas etc) nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R36	Quanto no total o(a) sr(a) ganhou por esta venda nesses 3 meses?	\$
R37	O(a) sr(a) vendeu animais criados em casa (como galinhas, porcos) ou ovos nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R38	Quanto no total o(a) sr(a) ganhou pela venda destes animais nesses 3 meses?	\$
R39	O(a) sr(a) recebeu dinheiro por vender outros produtos como pão, canoas, objetos próprios, ou outros que eu não tenha falado nos últimos 3 meses?	sim <input type="checkbox"/> não <input type="checkbox"/>
R40	Quanto no total o(a) sr(a) ganhou pela venda destes produtos nesses 3 meses?	\$

O(a) sr(a) recebeu algum presente nos últimos 3 meses? Esse presente pode ser dinheiro, alguma coisa da mata, da roça ou algo comprado como um rádio, roupas, etc. Para responder, por favor, pense só naquilo que o(a) sr(a) mesmo(a) ganhou e não uma outra pessoa da sua casa ou família ganhou.

ID GIFT	O que o(a) sr(a) ganhou nesses últimos 3 meses?	Quanto o(a) sr(a) ganhou? (indicar a unidade de medida)	Quanto custa a unidade de ____ se o(a) sr(a) fosse comprar?
1			
2			

O(a) sr(a) recebeu algum dinheiro emprestado nos últimos 3 meses? Para responder, por favor, pense só naquilo que o(a) sr(a) mesmo(a) recebeu emprestado e não uma outra pessoa da sua casa ou família recebeu

ID LOAN	Quanto dinheiro o(a) sr(a) recebeu emprestado nesses últimos 3 meses?	De quem (banco, governo, amigo) o(a) sr(a) recebeu esse dinheiro emprestado?
1		
2		

Anotações:

Muito obrigada pelas suas respostas!
A sua participação é muito importante para o sucesso do estudo!

APÊNDICE B

Questionário utilizado nas entrevistas realizadas durante o segundo período de campo (Outubro/Dezembro, 2013) por ADB.

DATA: 2013	CASA:	HSHD:	SUBJID:	Pg1
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Nesta entrevista eu vou falar sobre algumas atividades que podem ser feitas para saber quais são as vantagens e os problemas que catar andiroba e vender óleos podem trazer, tanto para os moradores aqui do Roque quanto para a floresta. Eu vou começar explicando cada uma dessas atividades. Depois disso, eu vou pedir para o sr, por favor, me dizer a sua opinião. Queria lembrar que não existem respostas certas ou erradas, o que interessa é saber a sua opinião sobre esses assuntos.

13 IR NA MATA

Uma atividade que pode ser feita para saber se a quantidade de andirobeiras da mata aqui do Roque está mudando é ir na mata onde elas estão e contar a cada ano o número de plantas filhotes e adultas. Sabendo disso, eu gostaria que o sr, por favor, imaginasse algumas situações e respondesse algumas perguntas sobre essa atividade de ir na mata contar as andirobeiras. Faz de conta que o sr teria que ir na mata do Roque onde vocês costumam catar andiroba. Nesse lugar, o sr teria que marcar com barbante um quadrado de 30 por 30 metros. Dentro deste quadrado o sr teria que contar e medir a largura de todas as andirobeiras adultas ou pequenininhas anotando tudo em um papel. O sr teria que repetir isso em um total de 10 quadrados em lugares diferentes da mata.

1301 O sr iria na mata contar as andirobeiras?									
com certeza [5]	provavelmente sim [4]	Talvez [3]	provavelmente não [2]	não [1]	não sei [0]				
1302 Se o sr fosse convidado para a contar as andirobeiras da mata aqui do Roque mas sem ganhar dinheiro para fazer isso, o sr iria?									
com certeza [5]	provavelmente sim [4]	Talvez [3]	provavelmente não [2]	não [1]	não sei [0]				
1303 Faz de conta que existe alguém que pode pagar por esse trabalho de ir na mata contar as andirobeiras. Que valor o sr acharia justo cobrar por dia?							Valor:		
1304 Para o sr, ir na mata contar as andirobeiras seria uma atividade _____ de fazer:									
muito legal [5]	legal [4]	mais ou menos [3]	chata [2]	muito chata [1]	não sei [0]				
1305 Para o sr, ir na mata contar as andirobeiras seria uma atividade _____ de fazer:									
muito fácil [5]	fácil [4]	mais ou menos [3]	difícil [2]	muito difícil [1]	não sei [0]				
1306 Agora eu vou ler para o sr uma lista de atividades do dia a dia de vocês e eu gostaria de saber, para cada uma delas, primeiro se o sr fez a atividade no último mês e, depois, se o sr deixaria de fazer a atividade por um dia para ir na mata do Roque contar as andirobeiras.									
Atividade	Fez?	N deixaria	Difícilmente deixaria	tlv	Deixaria facilmente	Deixaria c/certeza	ns		
1306a Pescar	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0		
1306b Caçar	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0		
1306c Trabalhar no roçado	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0		
1306d Trabalhar na casa de farinha	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0		
1306e Ir ao culto ou missa	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0		
1306f Ver televisão	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0		
1306g Jogar bola	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0		
1306h Se reunir com amigos para conversar	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0		
1306i Trabalhos de casa (cozinhar, limpar)	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0		
1307 A decisão de trabalhar indo na mata contar as andirobeiras seria uma decisão:									
Só sua					1				
Que dependeria da opinião de outras pessoas, por exemplo, esposo(a), pais, amigos, família					2				
Não sei					0				
Agora vou perguntar se o sr concorda ou discorda dessa frase:					CM	CP	IND	DP	DM
1308 Trabalhar indo na mata contar as andirobeiras é uma decisão que depende só de mim					5	4	3	2	1
<i>Nesta parte da entrevista eu vou querer saber a opinião do sr sobre a importância de ir na mata contar as andirobeiras. O senhor acha que:</i>					MI	I	IND	PI	NéI
1309 Para saber se o número de andirobeiras está mudando, contar as andirobeiras que existem na mata do Roque é					5	4	3	2	1
<i>Agora vou pedir para o sr imaginar se pessoas importantes para o sr, como a sua família ou amigos, aprovariam que o sr trabalhasse indo na mata contar as andirobeiras e dizer se concorda ou discorda das frases que eu vou ler.</i>					CM	CP	IND	DP	DM
13010 A minha família aprovaria que eu trabalhasse indo na mata contar as andirobeiras					5	4	3	2	1
13011 Os meus amigos aprovariam que eu trabalhasse indo na mata contar as andirobeiras					5	4	3	2	1
13012 Os líderes da comunidade aprovariam que eu trabalhasse indo na mata contar as andirobeiras					5	4	3	2	1

Uma das atividades que pode ser feita é entrevistar os moradores para ouvir deles o que eles acham que está sendo bom ou ruim.

<i>Nesta parte da entrevista eu vou pedir para o sr imaginar quantas pessoas aqui do Roque trabalhariam indo na mata contar as andirobeiras.</i>	NEN	POU	MET	MTO	TOD
13013 Quantos moradores do Roque você acha que trabalhariam indo na mata contar as andirobeiras sem ganhar nada em troca?	1	2	3	4	5
13014 Quantos moradores do Roque você acha que trabalhariam indo na mata contar as andirobeiras se fossem pagos para isso?	1	2	3	4	5

14 ENTREVISTAR sabe ler e escrever? [0] Não [1] Sim

Conhecendo essas informações, a gente pode tentar inventar formas de melhorar os resultados da venda de óleos tanto para os moradores quanto para a floresta. Sabendo disso, eu gostaria que o sr, por favor, imaginasse algumas situações e respondesse algumas perguntas sobre a atividade de entrevistar. Faz de conta que, assim como eu estou fazendo com o sr, o sr precisaria ir sozinho de casa em casa aqui no Roque e entrevistar todos os adultos. Para entrevistar, o sr precisaria **ler** exatamente o que está escrito em uma lista de perguntas para cada um dos adultos anotando as respostas em um papel. Cada entrevista duraria mais ou menos uma hora.

1401 O sr entrevistaria os moradores aqui do Roque?								
com certeza [5]	provavelmente sim [4]	talvez [3]	provavelmente não [2]	não [1]	não sei [0]			
1402 Se o sr fosse convidado para a entrevistar as pessoas aqui do Roque mas sem ganhar dinheiro para fazer isso, o sr faria?								
com certeza [5]	provavelmente sim [4]	talvez [3]	provavelmente não [2]	não [1]	não sei [0]			
1403 Faz de conta que existe alguém que pode pagar por esse trabalho de entrevistar. Que valor o sr acharia justo cobrar por um dia de trabalho para entrevistar? Valor:								
1404 Em qual época do ano o sr acharia melhor entrevistar os moradores aqui do Roque pois é uma época que o sr tem mais tempo livre?								
cheia [1]	seca [2]	tanto faz [0]						
1405 Para o sr, entrevistar as pessoas seria uma atividade de fazer:								
mto legal [5]	legal [4]	mais ou menos [3]	chata [2]	mto chata [1]	não sei [0]			
1406 Para o sr, entrevistar as pessoas seria uma atividade de fazer:								
mto fácil [5]	fácil [4]	mais ou menos [3]	difícil [2]	mto difícil [1]	não sei [0]			
1407 Agora eu vou ler para o sr uma lista de atividades do dia a dia de vocês e eu gostaria de saber, para cada uma delas, primeiro se o sr fez a atividade no último mês e, depois, se o sr deixaria de fazer a atividade por um dia para entrevistar os moradores do Roque.								
Atividade	Fez?	N deixaria	Difícilmente deixaria	tlv	Deixaria facilmente	Deixaria c/certeza	ns	
1407a Pescar	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0	
1407b Caçar	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0	
1407c Trabalhar no roçado	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0	
1407d Trabalhar na casa de farinha	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0	
1407e Ir ao culto ou missa	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0	
1407f Ver televisão	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0	
1407g Jogar bola	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0	
1407h Se reunir com amigos para conversar	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0	
1407i Trabalhos de casa (cozinhar, limpar)	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0	
1408 A decisão de trabalhar entrevistando as pessoas aqui do Roque seria uma decisão:								
Só sua	1							
Que dependeria da opinião de outras pessoas, por exemplo, esposo(a), pais, amigos, família	2							
Não sei	0							
Agora vou perguntar se o sr concorda ou discorda dessa frase:				CM	CP	IND	DP	DM
1409 Trabalhar entrevistando as pessoas aqui do Roque é uma decisão que depende só de mim				5	4	3	2	1
<i>Nesta parte da entrevista eu vou querer saber a opinião do sr sobre a importância de entrevistar. O sr acha que:</i>				MI	I	IND	PI	NéI
1410 Para entender quais são os benefícios e os problemas da venda de óleos para a comunidade, entrevistar os moradores do Roque seria _____				5	4	3	2	1
1411 Para entender quais são os efeitos que catar andiroba causam na floresta, entrevistar os moradores do Roque seria _____				5	4	3	2	1
<i>Agora eu vou querer saber a opinião do sr sobre a utilidade de entrevistar. O senhor acha que:</i>				MU	U	IND	PU	NéU
<i>Agora vou pedir para o sr imaginar se pessoas importantes para o sr, como a sua família ou amigos, aprovariam que o sr trabalhasse entrevistando e dizer se concorda ou discorda das frases que eu vou ler.</i>				CM	CP	IND	DP	DM
1412 A minha família aprovaria que eu trabalhasse entrevistando				5	4	3	2	1
1413 Os meus amigos aprovariam que eu trabalhasse entrevistando				5	4	3	2	1
1414 Os líderes da comunidade aprovariam que eu trabalhasse entrevistando				5	4	3	2	1
<i>Agora eu vou pedir para o sr imaginar quantas pessoas aqui do Roque trabalhariam entrevistando.</i>				NEN	POU	MET	MTO	TOD
1415 Quantos moradores do Roque você acha que trabalhariam entrevistando sem ganhar nada em troca?				1	2	3	4	5
1416 Quantos moradores do Roque você acha que trabalhariam entrevistando se fosse pagos para isso?				1	2	3	4	5

15. REUNIÃO

Agora eu vou querer saber sobre outra atividade: participar de reuniões. Eu gostaria que o senhor imaginasse que fossem organizadas reuniões dos moradores do Roque. Nessas reuniões os moradores conversariam sobre quais são os benefícios e também os problemas que a venda dos óleos está trazendo para a comunidade e também para a floresta. E, depois disso, os moradores teriam que planejar de que forma seria possível melhorar os resultados da venda de óleos.

1501 O sr iria numa reunião para discutir os problemas e benefícios da venda de óleos para a comunidade e para a floresta?										
com certeza [5]	provavelmente sim [4]	talvez [3]	provavelmente não [2]	não [1]	não sei [0]					
1502 Se o sr fosse convidado para ir na reunião, mas sem ganhar dinheiro para fazer isso, o sr iria?										
com certeza [5]	provavelmente sim [4]	talvez [3]	provavelmente não [2]	não [1]	não sei [0]					
1503 Faz de conta que existe alguém que pode pagar para que você fosse à reunião. Que valor o sr acharia justo cobrar por reunião?							Valor:			
1504 Em qual época do ano o sr acharia melhor fazer essa reunião por ser uma época que o sr tem mais tempo livre?										
cheia [1]		seca [2]		tanto faz [0]						
1505 Para o sr, ir na reunião seria uma atividade de fazer:										
muito legal [5]	legal [4]	mais ou menos [3]	chata [2]	muito chata [1]	não sei [0]					
1506 Para o sr, ir na reunião seria uma atividade de fazer:										
muito fácil [5]	fácil [4]	mais ou menos [3]	difícil [2]	muito difícil [1]	não sei [0]					
1507 Agora eu vou ler para o sr uma lista de atividades do dia a dia de vocês e eu gostaria de saber, para cada uma delas, primeiro se o sr fez a atividade no último mês e, depois, se o sr deixaria de fazer a atividade por um dia para ir na reunião.										
Atividade	Fez?	N deixaria	Difícil deixaria	tlv	Deixaria facilmente	Deixaria c/certeza	ns			
Pescar	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0			
1507a Caçar	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0			
1507b Trabalhar no roçado	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0			
1507c Trabalhar na casa de farinha	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0			
1507d Ir ao culto ou missa	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0			
1507e Ver televisão	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0			
1507f Jogar bola	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0			
1507g Se reunir com amigos para conversar	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0			
1507h Trabalhos de casa (cozinhar, limpar)	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0			
1508 A decisão de ir a essa reunião seria uma decisão:										
Só sua					1					
Que dependeria da opinião de outras pessoas, por exemplo, esposo(a), pais, amigos, família					2					
Não sei					0					
<i>Agora vou perguntar se o sr concorda ou discorda dessa frase:</i>					CM	CP	IND	DP	DM	NS
1509 Ir nessa reunião é uma decisão que depende só de mim					5	4	3	2	1	0
<i>Agora vou pedir para o sr imaginar se pessoas importantes para o sr, como a sua família ou amigos, aprovariam que o sr fosse à reunião e dizer se concorda ou discorda das frases que eu vou ler.</i>					CM	CP	IND	DP	DM	NS
15010 A minha família aprovaria que eu fosse à reunião					5	4	3	2	1	0
15011 Os meus amigos aprovariam que eu fosse à reunião					5	4	3	2	1	0
15012 Os líderes da comunidade aprovariam que eu fosse à reunião					5	4	3	2	1	0
<i>Nesta parte da entrevista eu vou pedir para o sr imaginar quantas pessoas aqui do Roque iriam</i>					NEN	POU	MET	MTO	TOD	NS
15013 Quantos moradores do Roque você acha que iriam na reunião sem ganhar nada em troca?					1	2	3	4	5	0
15014 Quantos moradores do Roque você acha que iriam na reunião se fossem pagos para isso?					1	2	3	4	5	0
<i>Nesta parte da entrevista eu vou querer saber a opinião do sr sobre a importância de fazer esta reunião para discutir os benefícios e problemas da venda de óleos aqui no Roque. O senhor acha que:</i>					MI	I	IND	PI	Nét	NS
15015 para entender quais são os benefícios e os problemas da venda de óleos para a comunidade, organizar uma reunião com os moradores do Roque seria _____					5	4	3	2	1	0
15016 para entender quais são os efeitos que catar andiroba causam na floresta organizar uma reunião com os moradores do Roque seria _____					5	4	3	2	1	0

16 COMPUTADOR: sabe ler e escrever? [0] Não [1] Sim

Nessa parte da entrevista eu vou falar sobre uma atividade no computador. Imagine que os moradores do Roque fizeram as entrevistas, observaram o que os outros moradores fazem ao longo do dia e foram na mata contar as andirobeiras. Agora eles possuem muitas informações sobre a comunidade e sobre a floresta, mas está tudo anotado em papel. Para poder guardar essas informações de maneira mais organizada e também para no futuro poder comparar com novas informações, é preciso pegar esses papéis e copiar as informações no computador. Sabendo disso, eu gostaria que o sr, por favor, imaginasse algumas situações e respondesse algumas perguntas sobre essa atividade no computador.

1601 Faz de conta que uma pessoa veio aqui no Roque para ensinar os moradores a copiarem essas informações no computador. Para isso, a pessoa vai dar aulas que duram uma hora por dia durante uma semana inteira. Pensando nisso, o sr estaria disposto a passar uma hora por dia por uma semana para aprender a fazer esse trabalho no computador? (se responder não pular para questão 1801)

com certeza [5] | provavelmente sim [4] | talvez [3] | provavelmente não [2] | não [1] | não sei [0]

1602 Se o sr tivesse feito o curso para aprender a usar o computador sr faria esse trabalho de copiar as informações do papel para o computador?

com certeza [5]	provavelmente sim [4]	talvez [3]	provavelmente não [2]	não [1]	não sei [0]		
1603 Se o sr fosse convidado para ajudar a fazer esse trabalho no computador mas sem ganhar dinheiro para fazer isso, o sr faria?							
com certeza [5]	provavelmente sim [4]	talvez [3]	provavelmente não [2]	não [1]	não sei [0]		
1604 Faz de conta que existe alguém que pode pagar por esse trabalho no computador. Que valor o sr acharia justo cobrar por dia para trabalhar no computador?					Valor:		
1605 Em qual época do ano o sr acharia melhor fazer essa atividade no computador por ser uma época que o sr tem mais tempo livre?							
cheia [1]		seca [2]		tanto faz [0]			
1606 Para o sr, fazer esse trabalho no computador seria uma atividade _____ de fazer:							
muito legal [1]		legal [2]	mais ou menos [3]	Chata [4]	muito chata [5]	não sei [0]	
1607 Para o sr, fazer esse trabalho no computador seria uma atividade _____ de fazer:							
muito fácil [1]		fácil [2]	mais ou menos [3]	Difícil [4]	muito difícil [5]	não sei [0]	
1608 Agora eu vou ler para o sr uma lista de atividades do dia a dia de vocês e eu gostaria de saber, para cada uma delas, primeiro se o sr fez a atividade no último mês e, depois, se o sr deixaria de fazer a atividade por um dia para trabalhar no computador.							
Atividade	Fez?	N deixaria	Difícilmente deixaria	tlv	Deixaria facilmente	Deixaria c/certeza	ns
1608a Pescar	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0
1607b Caçar	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0
1607c Trabalhar no roçado	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0
1607d Trabalhar na casa de farinha	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0
1607e Ir ao culto ou missa	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0
1607f Ver televisão	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0
1607g Jogar bola	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0
1607h Se reunir com amigos para conversar	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0
1607i Trabalhos de casa (cozinhar, limpar)	<input type="checkbox"/> S <input type="checkbox"/> N	1	2	3	4	5	0
1609 A decisão de fazer esse trabalho no computador seria uma decisão:							
Só sua						1	
Que dependeria da opinião de outras pessoas, por exemplo, esposo(a), pais, amigos, família						2	
Não sei						0	
<i>Agora vou perguntar se o sr concorda ou discorda dessa frase:</i>							
	CM	CP	IND	DP	DM	NS	
16010 Fazer esse trabalho no computador é uma decisão que depende só de mim	5	4	3	2	1	0	
<i>Agora vou pedir para o sr imaginar se pessoas importantes para o sr, como a sua família ou amigos, aprovariam que o sr fizesse esse trabalho no computador e dizer se concorda ou discorda das frases que eu vou ler.</i>							
	CM	CP	IND	DP	DM	NS	
16011 A minha família aprovaria que eu fizesse esse trabalho no computador	5	4	3	2	1	0	
16012 Os meus amigos aprovariam que eu fizesse esse trabalho no computador	5	4	3	2	1	0	
16013 Os líderes da comunidade aprovariam que eu fizesse esse trabalho no computador	5	4	3	2	1	0	
	NEN	POU	ME T	MT O	TO D	NS	
16014 Quantos moradores do Roque você acha que trabalhariam no computador sem ganhar nada em troca?	5	4	3	2	1	0	
16015 Quantos moradores do Roque você acha que trabalhariam no computador se fossem pagos para isso?	5	4	3	2	1	0	
<i>Nesta parte da entrevista eu vou querer saber a opinião do sr sobre a importância de fazer este trabalho de passar as informações coletadas com entrevistas, observando os moradores e indo na mata contar as andirobeiras para o computador. O senhor acha que:</i>							
	MI	I	IND	PI	NéI	NS	
1601 Passar as informações do papel para o computador seria _____ para no futuro compararmos com novas informações	5	4	3	2	1	0	

17 ORDENAR

Agora, eu vou querer saber a sua opinião sobre qual dessas atividades que a gente conversou, o sr acharia as mais legais ou mais chatas de fazer.

1801 Para isso eu vou pedir para o sr ordenar as atividades daquela que o sr acharia a mais legal para aquela que o sr acharia a mais chata de fazer (mostrar figuras com atividades) (1 é a mais legal; 6 a mais chata).

1802 Agora eu gostaria que o sr, por favor, ordenasse essas atividades daquela que o sr acharia a mais fácil de fazer para aquela que acharia a mais difícil de fazer (mostrar figuras com atividades) (1 é a mais fácil; 6 a mais difícil)

Atividade	1801 legal/chata	1802 fácil/difícil
Entrevistar os moradores do Roque		
Contar as andirobeiras na mata		
Ir à reunião		
Trabalhar no computador		

18 LÍDER

Agora vou pedir para o sr fazer de conta que os líderes da comunidade disseram que seria importante que cada morador do Roque ajude a fazer pelo menos uma dessas atividades.

<i>Nesse caso o sr faria alguma delas sem receber dinheiro em troca?</i>	com certeza	provavelmente sim	talvez	provavelmente não	não	ns
1801 Entrevistaria os moradores do Roque sem ganhar dinheiro para fazer isso?	5	4	3	2	1	0
1803 Iria na mata contar as andirobeiras sem ganhar dinheiro para fazer isso?	5	4	3	2	1	0
1804 Participaria da reunião sem ganhar dinheiro para ir?	5	4	3	2	1	0
1805 Trabalharia no computador sem ganhar dinheiro para fazer isso?	5	4	3	2	1	0

19 ATIVIDADES VOLUNTÁRIAS (II)

Agora eu vou perguntar sobre alguns trabalhos voluntários, ou seja, sem ganhar dinheiro ou qualquer outra coisa em troca, que talvez o(a) sr(a) já tenha feito no último ano, ou seja de _____ de 2012 até hoje.	S	N
1901 No último ano o(a) sr(a) ajudou a arrumar a rede elétrica aqui do Roque?		
1902 No último ano o(a) sr(a) ajudou no manejo do Pirarucu aqui no Roque?		
1903 No último ano o(a) sr(a) ajudou na construção da casa de farinha comunitária do Roque?		
1904 No último ano o(a) sr(a) ajudou na vigilância da desova dos bichos de casco?		

21 AÇAÍ/PERCEPÃO ECOLÓGICA DA COLETA DE ANDIROBA (II)

Agora, vou falar algumas frases sobre as palmeiras de açaí aqui no Roque. Queria que, para cada frase, que o sr me dissesse, por favor, se concorda muito, concorda um pouco, tanto faz, discorda um pouco ou discorda muito. Não existe uma resposta certa o que vale é a opinião do sr.

O sr concorda ou discorda com esta frase:	CM	CP	IN D	DP	DM	NS
1901 É mais difícil encontrar açaí para tirar aqui no Roque hoje em dia do que era há cinco anos atrás	5	4	3	2	1	0
1902 Tirar açaí diminui a quantidade de comida para alguns bichos da mata	5	4	3	2	1	0
1903 Tirar açaí faz com que nasçam menos palmeiras de açaí na mata	5	4	3	2	1	0
1904 Quando ando pela mata eu vejo menos palmeiras grandes de açaí do que eu via antes	5	4	3	2	1	0
1906 A gente tem que ir cada vez mais longe para encontrar açaí bom de tirar	5	4	3	2	1	0
1907 Quando vou na mata vejo menos palmeiras filhotes de açaí do que eu via antes	5	4	3	2	1	0
Agora eu vou perguntar da andiroba. O sr concorda ou discorda com esta frase:	CM	CP	IN D	DP	DM	NS
1908 Quando vou na mata vejo menos plantinhas de andiroba filhotes do que eu via antes	5	4	3	2	1	0
1909 Quando ando pela mata eu vejo menos árvores grandes de andiroba do que eu via antes	5	4	3	2	1	0

RENDA

Nesta parte da entrevista, eu vou perguntar sobre as formas que as pessoas ganham dinheiro aqui no Roque, como salário, catar andiroba, aposentadoria, bolsa família. Para responder, por favor, pense só naquilo que o sr mesmo ganhou e não uma outra pessoa da sua casa ou família ganhou. Primeiro vou perguntar para o sr sobre o dinheiro recebido de trabalhos relacionados à venda dos óleos, como catar sementes, trabalhos na usina, etc e depois sobre outras formas de ganhar dinheiro.

R012	O sr coletou andiroba ou murumuru para vender nos últimos 3 meses, ou seja, de agosto até hoje?	s[_]n[_]
R022	Quanto no total o sr ganhou?	\$
R032	O sr fez alguma viagem para comprar andiroba ou murumuru de outras comunidades nos últimos 3 meses, ou seja, de agosto hoje?	s[_]n[_]
R042	Quanto no total o sr ganhou?	\$
R052	O sr carregou sacas de andiroba ou murumuru dos barcos para a usina ou galões de óleo da usina para os barcos nos últimos 3 meses?	s[_]n[_]
R062	Quanto no total o sr ganhou?	\$
R072	O sr ajudou a separar ou quebrar as melhores sementes ou frutos nos últimos 3 meses?	s[_]n[_]
R082	Quanto no total o sr?	\$
R092	O sr teve algum trabalho temporário na usina (operar as máquinas, limpeza) nos últimos 3 meses?	s[_]n[_]
R102	Quanto no total o sr ganhou?	\$
R112	O sr participou da gestão financeira da cooperativa nos últimos 3 meses?	s[_]n[_]
R122	Quanto no total o sr ganhou?	\$
R132	O sr trabalhou na administração da cooperativa nos últimos 3 meses?	s[_]n[_]
R142	Quanto no total o sr?	\$
R152	O sr trabalhou na manutenção das máquinas da usina nos últimos 3 meses?	s[_]n[_]
R162	Quanto no total o sr?	\$
R172	O sr recebeu algum salário por trabalhos regulares (todo mês) nos últimos 3 meses?	s[_]n[_]
R182	Quanto por mês o sr ganhou?	\$
R192	O sr recebeu alguma aposentadoria como, por exemplo, por velhice, invalidez, morte de pais nos últimos 3 meses?	s[_]n[_]

R202	Quanto por mês o(a) sr(a) ganhou?	\$
R212	O sr recebeu algum pagamento de programas do governo como bolsa escola, bolsa família, bolsa trabalho, nos últimos 3 meses?	s[_]n[_]
R222	Quanto por mês o sr ganhou?	\$
R232	O sr recebeu algum pagamento de programas de serviços ambientais, como o bolsa verde, nos últimos 3 meses?	s[_]n[_]
R242	Quanto por mês o sr ganhou?	\$
R252	O sr recebeu algum outro tipo de auxílio do governo ou algum tipo de pensão nos últimos 3 meses que eu não tenha falado?	s[_]n[_]
R262	Quanto por mês o sr ganhou?	\$
R272	O sr recebeu dinheiro por algum bico, como ajudar na construção de alguma coisa, para o governo nos últimos 3 meses?	s[_]n[_]
R282	Quanto no total o sr ganhou?	\$
R292	O sr recebeu dinheiro por algum trabalho temporário ou bico para pesquisadores nos últimos 3 meses?	s[_]n[_]
R302	Quanto no total o sr ganhou?	\$
R312	O sr recebeu dinheiro por algum outro tipo de trabalho temporário ou bico nos últimos 3 meses?	s[_]n[_]
R322	Quanto no total o sr ganhou?	\$
R332	O sr vendeu produtos da mata, por ex. açaí, carne de caça, peixe, nos últimos 3 meses?	s[_]n[_]
R342	Quanto no total o sr ganhou s?	\$
R352	O sr vendeu produtos da roça (mandioca, farinha, bananas etc) nos últimos 3 meses?	s[_]n[_]
R362	Quanto no total o sr ganhou?	\$
R372	O sr vendeu animais criados em casa (como galinhas, porcos) ou ovos nos últimos 3 meses?	s[_]n[_]
R382	Quanto no total o sr ganhou?	\$
R392	O sr recebeu dinheiro por vender outros produtos canoas, objetos próprios, ou outros que eu não tenha falado nos últimos 3 meses?	s[_]n[_]
R402	Quanto no total o sr ganhou?	\$

O sr recebeu algum presente nos últimos 3 meses? Pode ser dinheiro, alguma coisa da mata, da roça ou algo comprado como um rádio, roupas, etc. Para responder, por favor, pense só naquilo que o sr mesmo ganhou e não uma outra pessoa da sua casa ou família ganhou.

ID	O que?	Quantos ?	Quanto custa?
1			
2			

O sr recebeu algum dinheiro emprestado nos últimos 3 meses? Para responder, por favor, pense só naquilo que o sr mesmo recebeu emprestado e não uma outra pessoa da sua casa ou família recebeu.

ID	Quanto?	De quem?
1		
2		

Anotações:

Muito obrigada pelas suas respostas!
A sua participação é muito importante para o sucesso do estudo!