AMBIENTE & SOCIEDADE 25 anos 25 años 25 years

SciELO

Willingness to adopt voluntary and compulsory forest restoration practices by rural landowners in the central Rio Doce basin – MG

Caroline de Souza Cruz Salomão [I]
Letícia Santos de Lima [II]
Raoni Guerra Lucas Rajão [III]

Abstract: The maintenance of hydrological conditions in rural watersheds depends on the behavior of rural landowners regarding land use and vegetation cover protection. We analyzed the willingness of farmers from the Rio Doce basin to adopt voluntary forest restoration strategies and to bring their lands into compliance with Federal Law 12.651/2012. We applied a questionnaire to 30 landowners in the municipality of Governador Valadares and the surrounding region. The results indicate that 86% of the farmers acknowledge maintaining vegetation cover as highly important, highlighting benefits such as reduced erosion (86%) and increased discharge in springs (73%). Technical assistance for productivity (29.6%), donation of materials (22.2%) and economic incentives (22.2%) were identified as factors that increase the motivation of farmers to implement such practices. Agroforestry Systems were the most preferred modality (50%). The long-term presence of rural assistance organizations and the trust between them and landowners explain the dissemination of environmental notions and pro-conservation attitudes.

Keywords: Permanent preservation areas, forest code, watershed conservation, payment for environmental services, environmental law

[I] *Laboratório de Gestão de Serviços Ambientais. Universidade Federal de Minas Gerais, MG - Brasil.*

[II] *Departamento de Eng. Hidráulica e Recursos Hídricos, Escola de Engenharia, Universidade Federal de Minas Gerais, MG - Brasil.*

[III] *Departamento de Engenharia de Produção. Escola de Engenharia, Universidade Federal de Minas Gerais, MG - Brazil.*

São Paulo. Vol. 25, 2022

Original Article

DOI: http://dx.doi.org/10.1590/1809-4422asoc20200085r3vu2022L1AO

Introduction

The effectiveness of forest conservation and restoration strategies in rural settings is a recurring theme in academic and non-academic literature (CHAVES et al., 2004; KWAYU et al., 2014; COSTEDOAT et al., 2015). One of the main factors that can lead restoration strategies to success or failure is the socioeconomic and cultural context in which they are developed (BOELENS et al., 2014; OLIVEIRA et al., 2017). The educational, economic, and social profile of individuals and groups, as well as the culture in which they are inserted, determine highly relevant behavioral aspects that will be fundamental in the pre-disposition of individuals and groups to engage in forest conservation and restoration projects (EZZINE-DE-BLAS et al., 2015; HOWLEY et al., 2015; MONROY-SAIS et al., 2018). Through its behavioral effects, culture exerts great influence on the socio-environmental interaction of individuals, perceptions and judgments about the meaning given to "nature," the "environment," and how this translates into awareness and action regarding the conservation of natural resources (KOSOY et al., 2008). This topic becomes especially relevant when focused on the environmental regularization of rural properties and willingness to voluntary participate in forest restoration projects. These aspects may condition the behavioral response of individuals or groups to attempts to establish conservation agreements at the property level, which, in the long run, will result in the success or failure of many of these initiatives. However, with the exception of Pacheco et al. (2017, 2020), the current literature provides little information on the preferences of producers in the context of environmental regularization.

Given this, it is necessary to understand the profiles of rural landowners and understand their perceptions towards the environment in which they live, as well as their attitudes, motivations, and reluctance to comply with the environmental law and to engage in voluntary projects that encourage them to adopt different conservation practices at the rural property level. In this context, we present a pilot study, which has an exploratory and self-reporting basis, focused on the socioeconomic characteristics and behavioral aspects regarding voluntary forest restoration in different modalities and compliance with the requirements of the Forest Code (Federal Law 12.651/2012) among rural landowners in the municipality of Governador Valadares (Minas Gerais) and surrounding municipalities, located in the central region of the Rio Doce Basin. This study was developed based on a questionnaire applied to 30 rural landowners.

The Rio Doce Basin was chosen for this study given the challenge posed after the Samarco disaster in 2015 and the availability of resources to support environmental regularization of rural properties in the region. The collapse of the Fundão mining tailings dam in Mariana/MG in 2015 is today considered the biggest environmental disaster to have occurred in Brazil. Under pressure from the public authorities, the mining companies responsible (Samarco S.A., under a partnership between Vale S.A. and BHB Billiton) signed a Transaction and Conduct Adjustment Agreement (TTAC) to mitigate the impacts and compensate for the major environmental and social damages caused (MPMG, 2020). Among the various objects of the agreement, an obligation was established to restore 40,000 ha of permanent preservation areas (APPs) in the basin.

Faced with the prospect of implementing this major project, there is an opportunity to study firsthand the behavioral aspects of landowners that may determine the degree of success of such initiatives.

With the exception of the limited sample size of a typical exploratory study, this study presents a series of relevant considerations for the development of conservation and/or forest restoration projects that seek long-term effectiveness and sustainability.

Literature Review

In recent years, a growing number of academic publications have addressed behavioral aspects associated with "pro-environmental" attitudes and actions among landowners (VAN HERZELE et al., 2013; VAN DIJK et al., 2016; SCHINAIDER et al., 2019). These studies have mainly focused on voluntary conservation agreements arising from projects using different approaches, such as: integrated conservation development projects (ICDPs) (BAUCH et al, 2014); payments for environmental services (PESs) (MÉNDEZ-LOPEZ et al., 2015); impact mitigation projects around protected areas (OLIVEIRA et al., 2020); agri-environmental schemes, such as in the context of the European Union (BROWN et al., 2020), among others. Many of these studies emphasize that intrinsic motivations play a key role in landowners' willingness to adopt conservation practices on their farms. We present some of the many references on this topic in Table 1, summarizing the main findings, and among these, we briefly address a few selected studies below.

Zanella et al. (2014) studied three water PES projects in Brazil. The researchers observed two relevant explanatory variables for voluntary participation in conservation projects: access to information and a general pre-existing environmental concern among participating individuals. Howley et al. (2015) studied the predisposition of farmers to adopt environmental practices on the farm, such as forest restoration. The results obtained by the authors indicate that, even with higher economic returns, some farmers may be resistant to these practices because forest restoration does not conform to their production-oriented attitudes. Therefore, ceasing to produce on part of the property was something understood by farmers as a contradiction in relation to their identity as a producer.

Méndez-Lopez et al. (2015) investigated the motivations behind local communities' participation in three different conservation project modalities in Southern Mexico: protected areas, areas voluntarily designated for conservation, and PES projects. Protected areas in Mexico are designated by law and the local community can participate through co-responsibilities in management; voluntarily designated areas are private properties in which the owners decide to devote them to conservation, elevating their status to that of a protected area; PES, in turn, are established voluntarily, according to the rules of Mexico's ProÁrbol program (MÉNDEZ-LOPEZ et al., 2015). All three modalities require the establishment of agreements between stakeholders. The motivations for participation observed by the authors were similar in all three modalities. The predominant ones were the obligation to comply with established agreements (even if voluntary) and a desire to "care for the land." Also in Mexico, Costedoat et al. (2015), when interviewing 82

landowners participating in biodiversity conservation PES, found that community leaders played a strategic role in moderating individual preferences in the community and that they induced greater individual participation in project working groups. This fact brings to light the importance of considering governance structures at the community level, whether formal or informal.

Van Vijk et al. (2016) conducted a survey among 314 dairy farmers in the Netherlands about their willingness to voluntarily adopt agri-environmental measures without economic incentive. Since there was no economic compensation, the study provided clear insight into the intrinsic motivations of the participants. The results obtained showed that the main driver of willingness to participate was related to a notion of personal identity of the producer, i.e., that adopting such practices was something typical for him/her, something like "part of who I am". Furthermore, attitude towards conservation practices was also strongly linked to willingness to adopt them, in this case referring to the idea that such practices would be useful or not. Subjective norms were also identified as inducers of the willingness to adopt, being evaluated through the perception of support coming from people considered important to the interviewed individual. Box 1 highlights some additional studies, their location and context, as well as the main conclusions regarding the motivations of landowners to adopt environmental practices.

One aspect that remains underexplored in these studies is the relationship between the profile of the producer and the modality of environmental regularization preferred by the producer. Exceptions are the articles by Pacheco et al. (2017 and 2020), in a survey of 77 producers in 17 municipalities in Pará and Mato Grosso, which indicate that farmers tend to prefer environmental regularization through off-site compensation, while cattle ranchers also point to forest restoration within the property as a viable activity. However, these studies do not detail the restoration modality, suggesting that the preferred one is the option of lowest cost and where native vegetation would not have an economic function. This indicates the importance of exploring in a more detailed way the preferences of producers in relation to restoration modalities that involve economic use of restored areas, such as agroforestry within legal reserves.

Box 1 – Selection of some studies that explore the motivations of landowners to adopt voluntary environmental measures.

Reference	Site and context	Main conclusions
Kosoy et al. (2008)	Mexico, 4 communities in carbon sequestration projects	Positive perceptions about environmental conservation encourage participation in conservation projects, as does a concern for the living conditions of future generations.

Van Hecken & Bastiaensen (2010)	Nicaragua, 123 participants in silvopastoral conservation projects	Participation in the project analyzed was motivated not only by financial incentives, but also by a collective social learning process. Rural technical assistance motivated the adoption of silvopastoral conservation practices.
Bremer et al. (2014)	Ecuador, participants in a hydric PES project	Pre-existing human and social capitals are important factors for rural landowner participation. Pro-environmental attitudes and perceptions in favor of conservation are important motivators for participation in PES schemes.

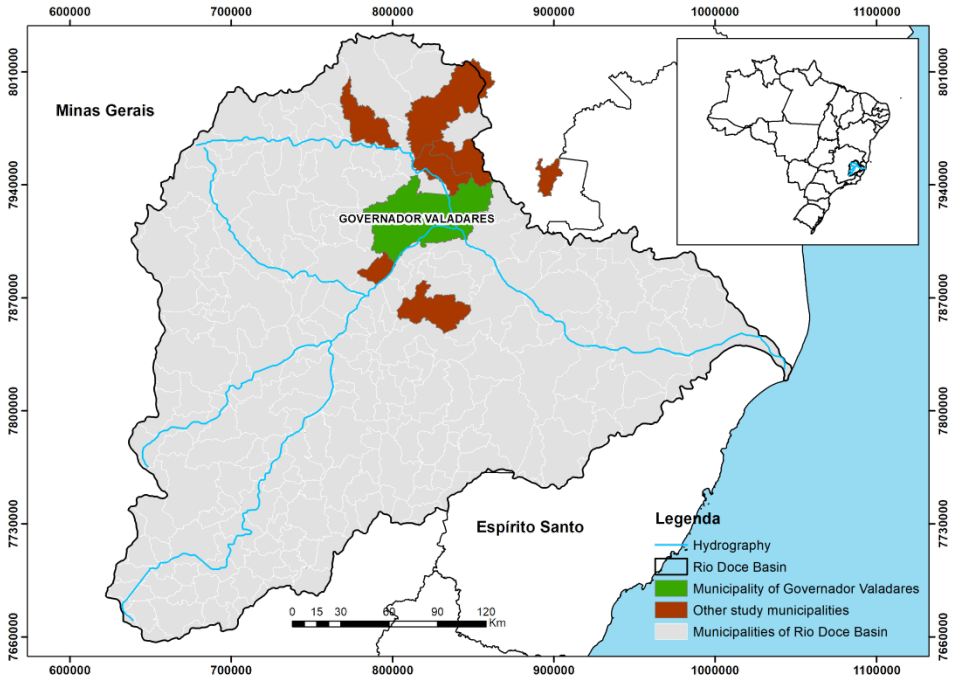
Source: developed by the authors, 2021.

Methodology

Study Area

This exploratory study was developed in the central Rio Doce region, particularly in the rural area of Governador Valadares municipality (MG) and in the following neighboring municipalities: Frei Inocêncio, Itabirinha, Itambacuri, Jampruca, Periquito, Santa Maria do Suassuí, Tarumirim (Figure 1). With approximately 87 thousand km^2 of drainage area, the Rio Doce Basin is located in the states of Minas Gerais (86% of the basin area) and Espírito Santo (14% of the basin area) and is almost totally inserted in the Atlantic Forest biome (RIBEIRO et al., 2020). According to the latest available data (from 2010), the basin has a population of approximately 3.5 million inhabitants and an urbanization rate of 69%, with 35% of its municipalities having a greater rural than urban population (IBGE, 2010; REIS, SILVEIRA & COSTA, 2010). In 2015, the basin was hit by one of the biggest environmental disasters in Brazil, the collapse of the Fundão tailings basin of the Samarco S.A. mining company, located in the district of Bento Rodrigues, in Mariana (MG), which generated incalculable environmental damage to the fauna, flora, waterways and, consequently, socioeconomic damage.

Figure 1 - Location of the Rio Doce basin (in gray, black outline) and municipalities of the individuals participating in the study (Governador Valadares in green and surrounding municipalities in orange: Frei Inocêncio, Itabirinha, Itambacuri, Jampruca, Periquito, Santa Maria do Suassuí, Tarumirim). Boundaries of the Rio Doce basin and hydrography data obtained from the National Water Agency (ANA); political boundaries obtained through IBGE.



Source: developed by the authors, 2021.

Questionnaire design and sampling

The design of the questionnaire for field application was based on the literature review regarding the willingness of landowners to participate in environmental conservation projects and forest restoration measures on their properties, both on a voluntary and regulatory basis. The questionnaire was developed during meetings held in the Environmental Services Management Laboratory (LAGESA/UFMG), through debates with researchers and students involved in the project "Definition of criteria for prioritization of areas for environmental restoration in the Rio Doce Basin", coordinated by professors from UFMG and UFV (RIBEIRO et al., 2020).

The questionnaire was structured in sections that sought to trace the social and economic profile of the producer, conditions of the rural property and economic activities, attitudes, and motivations regarding compliance with the Forest Code and willingness to participate in voluntary projects. In short, the questionnaire contained: (a) 20 questions

referring to the identification of the interviewee, their socioeconomic context and family situation; (b) 7 questions about rural technical assistance, source of information in the field, support from local entities and voluntary associations; (c) 16 questions regarding the characterization of the rural property and its market value; (d) 20 questions characterizing family income, rural production and infrastructure in the field; (e) 31 questions about compliance with the Forest Code, environmental perception and motivations for conservation. For socioeconomic characterization of the individual and their family situation, we used the 2017 IBGE Census questionnaire as a reference, making any necessary adaptations (IBGE, 2017).

Regarding the questions in group (e), different formats were combined to seek to characterize the respondents' positioning: selection lists, option ranking, degree of agreement with statements via Likert scale and open questions, among others. The complete questionnaire can be found in the Supplementary Material section of this article.

The sampling (30 individuals) was based on a "snowball" strategy (BIERNACKI; WALDORF, 1981), which consists of a study based on the respondents' contact networks, starting, initially, with entities with high local adhesion, such as the Rural Workers Union and the Governador Valadares Rural Union. In addition to entities with class representation, local non-governmental organizations, such as the Tamanduá Agro-ecology Center (CAT) and the Instituto Terra, were points of contact for application of the questionnaire. Data collection was done using the Kobo Toolbox application (https://www.kobotoolbox.org/).

Results

Socioeconomic profile of landowners

The average age of the responding landowners in the questionnaire was 56.6 years (n = 29). 21 respondents (70%) live on the rural property, while the rest do not, or live only part of the year on the property (Table 1). In terms of family status, the respondents were mostly married individuals with descendants (average of 2.5 children). Most of the descendants work (although there are a small number of students) and do not live on the farm. All 30 respondents can read and write. Among 29 respondents, 11 have an education corresponding to elementary school (37.9%), 9 have completed college (31%), 7 have completed high school (24.1%), 1 attained a master's degree (3.5%), with only 1 never having attended school (3.5%) (Table 1).

Table 1 - Socioeconomic characteristics of the interviewees by absolute frequency (n), relative frequency (%) and average. Sample: 30 rural landowners living and working in the municipality of Governador Valadares and surrounding municipalities.

Socioeconomic characteristic	N	%	Average
Gender			
Men	22	73	
Women	8	27	
Age	29	97	56.6 years
Residence			
On the property	21	70	
Outside of the property	5	17	
Partially on the property	4	13	
Marital status			
Married	25	83	
Single	3	10	
Divorced	2	7	
Number of children	30	100	2.5
Education			
Did not attend	1	3	
Elementary	11	37	
High school	7	23	
College	9	30	
Graduate school	1	3	
Not declared	1	3	
Property size			
Up to 1 MF	13	43	
Between 1 and 4 MF	8	27	
Between 4 and 15 MF	7	23	
Over 15 MF	2	7	
PRONAF aptitude declaration (DAP)			
Yes	18	60	
No	12	40	
Stated value of land	29	97	R$ 1.6 Million
Not declared	1	3	
Monthly revenue	**30**	**100**	R$ 2,391.3
Additional monthly revenue	**29**	**97**	R$ 2,549.8

Socioeconomic characteristic	N	%	Average
Revenue origin			
Retirement	14	47	
Outside of the property	11	37	
Both	3	10	
Not declared	2	7	
Rural Environmental Registry (CAR)			
Yes	23	77	
No	7	23	

Source: developed by the authors, 2021.

* R$ = Brazilian Reais (national currency).

The average size of the farms sampled was 127 hectares. The first quartile of the sample is composed of values equal to or less than 14.5 ha, while the third quartile of the sample is composed of values equal to or greater than 159.7 ha. In the region of Governador Valadares and the surrounding municipalities, the fiscal module (FM) corresponds to 30 ha (a fiscal module is a unit of measurement calculated for each municipality in accordance with Brazilian Act No. 6.746/79). Considering the size of the properties reported by the respondents, it can be observed that the sample is composed of 13 smaller properties, i.e., up to 1 MF (43.3%); 8 small properties, between 1 and 4 MF (26.7%); 7 medium-sized properties between 4 and 15 MF (23.3%); and 2 large properties, over 15 MF (6.7%).

Regarding agricultural activity, 60% of the respondents possessed the PRONAF (National Family Agriculture Strengthening Program) declaration of aptitude (DAP), showing that more than half the sample was composed of small family farmers. The average declared value of the properties was 1.6 million Reais. In most cases, the degree of technological sophistication of the properties is low to medium, and there is a tendency towards stability or production improvement.

Almost all respondents raise some kind of animal and most also produce fruit. Milk, eggs, cattle feed, and vegetables are also produced by at least 2/3 of our sample of producers. Annual crops are grown by 19 of the 30 landowners. Only 10 respondents (33.3%) claimed to have some kind of combined cultivation such as an agroforestry system (SAF), or integrated crop-livestock-forestry production, or an agroecological yard. The average income obtained from rural production is R$2,391.3/month (average deviation of R$191.51). Only 4 respondents do not receive additional income unrelated to the farm. On average, the additional income was R$2,549.8/month, with an average deviation of R$2,020.5/month and is derived from retirements or pensions and off-farm activities, or both sources. Most respondents (76.7%) already had their properties registered in the Rural Environmental Registry (CAR). Among these, the reasons selected for doing so were the following (multiple answers possible): to stay in compliance with the law (n = 20); to have access to bank credit (n = 7); to avoid fines (n = 4) and for environmental

awareness (n = 3).

As for the frequency with which producers receive training for rural production, 18 respondents said they receive training with very low or low frequency (60%), 4 reported moderate frequency (13.3%), and 8 reported receiving training with high or very high frequency (26.7%). Likewise, only 3 respondents (10%) stated that they receive technical assistance on the farm very frequently, and more than half stated that they receive it very infrequently or very infrequently. When asked about the origin of the technical assistance, the respondents identified various entities, in a list of non-exclusive options, such as unions and associations; the S System (National Rural Learning Service); and non-governmental organizations.

Respondents were asked about the entities by which they felt supported in the region, from a list of 11 non-exclusive options. Among the 26 answers to this question, rural producer associations, as well as church-related entities, were each selected 11 times (42.3%). The Technical Assistance and Rural Extension Company of the State of Minas Gerais (EMATER) was selected 10 times (38.5%), and NGOs were selected 9 times (34.6%). Other options appeared less frequently among the responses. When the respondents selected "other" as an answer, they mentioned the Terra Institute, the Tamanduá Agroecology Center (CAT), Caritas, the Vale do Rio Doce Agricultural Cooperative, and the CENIBRA company, among others.

The Rural Workers Union of Governador Valadares represents a very important source of support for the owners of smallholdings and small rural producers and is also a linking point for a network of associations, cooperatives, and relevant social movements in the region. Among 13 respondents belonging to the small landowner category, 6 mentioned the Rural Workers Union as an entity they feel supported by. This union works actively in partnership with CAT, and also through representation in national movements, such as the Movement of Small Farmers (MPA). The CAT and the Rural Workers Union supported the creation of the Regional Cooperative of Solidarity Economy, Family and Agroecological Agriculture (CRESAFA). Among the entities that are closest to the small producers is EMATER, which helps in the promotion of the Family Farming Market. The Rural Union of Governador Valadares was mentioned as a support point by 6 respondents: 1 large, 3 medium and 2 smallholders. Together with the Ruralist Union, the Rural Workers Union promotes the dissemination of information regarding rural production through local events and training.

Environmental perception and motivation

Half of the respondents were participating in some conservation or restoration project on the rural property promoted by some local entity at the time of the fieldwork, and another 3 had participated previously. Particularly, natural spring protection and restoration projects were frequently mentioned. 24 respondents have natural springs on their farms (80%), and, among these, only 5 declared that they are not protected. Among the entities mentioned as responsible for such projects there are: Terra Institute, CAT,

Renova Foundation, Inter-American Development Bank (Sustainable IDB), Agroecology Center (NAGÔ/UFJF), Rural Workers Union, Rural Union and Banco do Brasil Foundation. Governmental entities, such as EMATER and municipal governments, were also mentioned. The presence of such entities in the region clearly constitutes a source of awareness, environmental education, and assistance for rural living. This was highlighted throughout conversations and informal interviews with respondents and other residents of the region.

Some of the questions regarding environmental perception focused on the respondent's view of the association between measures to protect the remaining vegetation cover on their rural property and possible benefits or harms. In a non-exclusive multiple-choice list, we asked respondents to point out which benefits and/or harms they would associate with forests and woodlands on their rural property. Protection of water sources and soil were the options selected by all 30 respondents, followed by scenic beauty, selected by 24 respondents (80%), and farm enhancement, selected by 23 respondents (76.7%). Nearly half of the respondents (46.7%) pointed out that woodlands would have the benefit of being a "source of timber" and 9 associated the woods and forests on their properties with a "government requirement" (30%). 5 respondents selected "loss of productive area" (16.7%), while 2 selected "economic loss" (6.7%).

Among the questions about perceptions regarding environmental conservation on the property, we asked about a possible increase in vegetation cover of riparian forest and hilltops on the property. The respondents were asked to indicate whether they associated such increments with a certain benefit, which was indicated using a 5-option Likert scale. The results indicated that most respondents believe there is a very high (56.7%) or high (30%) benefit from increasing vegetation cover in riparian forests and, similarly, on hilltops (63.3% - Very high; 23.3% - High).

Next, the respondents were asked about which benefits they had thought of when answering the previous two questions. Several were mentioned, most reflecting the importance attributed to forests for soil quality, erosion control, protection of water sources, and a general improvement of the property. Some respondents mentioned specific processes, such as increased water infiltration, improved grazing in the lowlands, biodiversity, and climate. Among the respondents, 7 of them (23.3%) mentioned aspects that denote a vision of collective benefit for society and the environment by mentioning terms such as "future generations", "nature" and "quality of life".

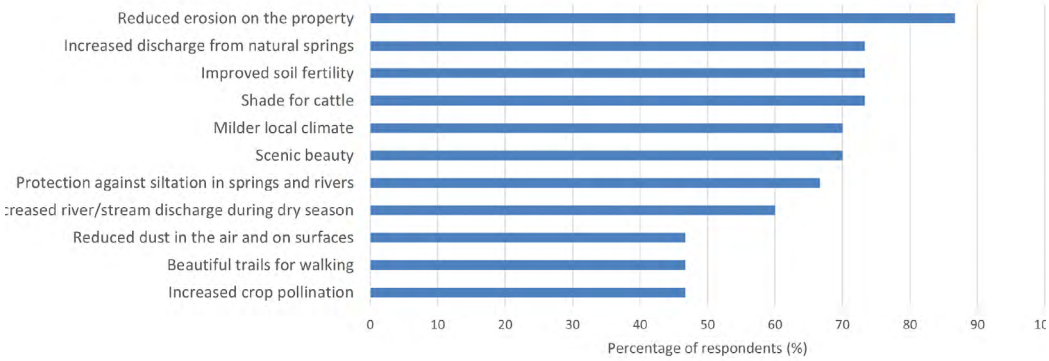
Similar questions were asked regarding the perception of harm from the increase in vegetation cover on the rural property. When it comes to riparian forest cover, 16 respondents believe that there would be very low loss (53.3%), 2 respondents believe there would be low loss (6.7%), while 10 respondents believe they would have moderate to high loss. A similar pattern is repeated for this question when referring to hilltops, with 21 declaring that they would have very low to low losses (70%) and 7 high to moderate losses (23.3%).

Among the 18 respondents who declared a perception of low or very low damage with the increase of vegetation cover in riparian forests, 12 of them currently participate

in conservation projects. These responses do not allow us to infer whether the perception of harm led them to join conservation projects or if, on the contrary, participation or non-participation shaped their perception of the potential harm.

Next, each respondent was asked which benefits from a list (more than one possible answer) they believed would be associated with protecting (non-cultivated) vegetation cover on private property. 26 respondents selected reduced erosion on the property (86.7%), 22 respondents selected increased discharge from natural springs (73.3%), as well as improved soil fertility and shade for cattle. 21 respondents also selected milder local climate (70%) and scenic beauty (Figure 2).

Figure 2: Benefits associated with protecting non-cultivated vegetation on the farm selected by respondents.



Source: developed by the authors, 2021.

Regarding soil and water conservation practices on the farm, the respondents were asked to select from a list those practices that they perform on their properties. More than half of the respondents stated that they practice riparian forest recovery (63.3%), reforestation to protect springs (63.3%), fallowing or resting the soil (60%), and protection and conservation of slopes (56.7%). Many respondents pointed to the drought of 2015 as an aggravating factor for access to water, a fact that prompted these landowners to take measures to conserve natural springs.

Regarding the compliance of rural properties with the requirements of the Forest Code, among the 30 respondents, 20 (66.6%) stated that they had already registered their APPs and legal reserve areas (RL) in the CAR system. The reasons given for this were related to: "being up to date with the law", "environmental awareness", "concern about water". Among the 10 remaining landowners who have not yet registered the property, 7 stated that they intend to do so, and 3 stated that they will not do so. Among those who have not regularized their property, it was stated that lack of knowledge about the process hindered progress or that "it is a farmstead and does not require regularization".

Willingness and strategies for regularization and conservation

From a list of non-exclusive factors, the respondents were asked which of these would increase their willingness to regularize APP or RL conditions, or even to voluntarily increase the vegetation cover on their properties. 27 individuals answered this question. Among the most selected factors were: 1) donation of materials for forest restoration, selected by 21 individuals (77.8%); 2) economic incentive, e.g. tax reduction, selected by 19 individuals (70%); 3) assistance to improve productivity, selected by 19 respondents (70%); and technical assistance to achieve compliance, selected by 18 respondents (66.7%).

The next question sought to develop a ranking of the selected factors. The respondents were asked which one was the most important. Among the 27 responses obtained were: assistance to improve the productivity of the property (29.6%); donation of materials (22.2%); economic incentive (22.2%); and technical assistance to achieve compliance (14.8%). Four of the options listed were not selected as first most important by any respondent: market demand for agricultural products, reduction in the practical cost of complying, compliance by the neighbors, and environmental certification seal of their production. The second most important factor was marked by 26 respondents. The most selected option was the technical assistance to achieve compliance (19.2%), followed by the reduction in the practical cost of compliance (15.4%). The remaining respondents selected other options.

Three alternatives for voluntary restoration of vegetation cover on the property were presented to respondents to explore which would be of most interest if they were asked to voluntarily join: (a) fencing and protection to favor natural regeneration (RN), (b) implementation of an agroforestry system (SAF), agrosilvopastoral system or crop-livestock-forestry integration practices, and (c) full area planting (PT) for reforestation aimed at conservation.

The results show that among the 29 respondents to this question, 15 would adopt an option similar to SAFs (51.7%), indicating an interest in reconciling environmental conservation with productive activity. 7 would adopt RN (24.1%), which could demonstrate that many of the owners, although willing to meet certain conservation demands, prefer options that represent lower costs (in material or labor terms). Finally, 3 respondents indicated a preference for total planting (10.3%) and another 3 for 'any of the options' (10.3%).

Discussion

Our study is composed of a sample of rural landowners in which respondents are predominantly individual producers, male in gender, somewhat older, married, and with children. This profile resembles that which is predominant in Minas Gerais, according to the Agro Census (IBGE, 2017), where the most frequent profile was: male gender (85% of agricultural establishments), individual production (77.6% of cases), and ranging in

age between 55 and 64 years. Regarding schooling, our sample is composed, on average, of rural landowners with greater access to education, in relation to the Agro Census results for Minas Gerais, despite both showing a predominance for respondents with an elementary school level of education. The proportion of respondents with aptitude for PRONAF is close to those obtained by the 2017 Agro Census for the municipalities of Governador Valadares, Periquito, Itambacuri, and Jampruca. Our sample is also similar to the rural property size values obtained for these municipalities through the Agro Census. In our study, most of the rural landowners declared that they seek to follow the forest legislation in effect, which is evidenced by the large number of respondents that already have completed their CAR registration and declared that they are in compliance with the Forest Code regarding the protection of APPs and RLs. However, it is important to stress the self-declaratory nature of the survey, whose limitation is due to the lack of mechanisms to verify the actual protection of APPs and RLs on site.

In general, in our study, rural landowners of all income and educational levels understand the importance of preserving riparian and hilltops vegetation to maintain a balance in the soil-water interaction processes, an ecological function already recommended in Art. 3 of the Forest Code. The protection of vegetation is understood as a form of soil protection, natural spring maintenance and conservation of water quality, since cattle, for example, cannot trample the springs when they are fenced. Many respondents spontaneously mentioned that they understand the importance of vegetation cover on hilltops as a way to increase water infiltration, which, in turn, contributes to the conservation of springs and rivers. Environmental perception about the links between vegetation protection and soil and water conservation has been observed in other studies conducted in Latin America (e.g. KOSOY et al. 2008; LIMA et al. 2019).

The sampled landowners, in general, also understand the importance of conservation as a way to obtain benefits for the property: shade for cattle, increased soil fertility, and milder climate. This is also evidenced by the mention of scenic beauty as a benefit, representing a pleasure associated with life in the countryside and also a property valuation factor. This perception of benefits to the property obtained through environmental conservation has been observed in other empirical studies (e.g., FIGUEIROA et al. 2016; PACHECO et al. 2017). Similarly, in a survey conducted by Lima et al. (2019) on four watershed conservation projects in Colombia, the researchers observed that among the participating landowners, mostly smallholder farmers, there was a predominant notion that participation in the projects was a beneficial investment for themselves, considering the various uses of water on the property, ranging from agricultural production, animal watering, to human consumption. Some of the respondents expressed this by saying that "a farm without water is worthless". In our study, many respondents associated the 2015 drought with water scarcity and that boosted their motivation to join conservation projects, a result which is also similar to that obtained in the work of Lima et al. (2019) in Colombia.

While the perception of collective benefit was not widely observed among respondents in this study, this notion has been evidenced in other studies in the literature,

such as in Méndez-Lopez et al. (2015), in which the "desire to care for the land" was highlighted as a precursor to motivation to participate; in Kosoy et al. (2008) and Mills et al. (2017), in which "concern for future generations" was also mentioned by respondents; and in Ross's (2016) study in which many respondents expressed interest in preserving the "natural beauty of the country."

The respondents' highly detailed mentions of the links between vegetation protection and environmental benefits, albeit with some misconceptions, highlight locally disseminated knowledge. Our results indicate that this occurs through technical meetings, seminars, assistance, and visits to rural properties promoted by local entities. There is a great diversity of organizations that perform Technical Assistance and Rural Extension (ATER) services in the territory, especially after the rupture of the Fundão dam in 2015, extending to both the public (e.g., EMATER) and non-governmental (e.g., Instituto Terra, CAT) spheres. Our results indicate the importance of this work in creating environmental awareness as well as in clarifying regulatory issues. Environmental education, as a collective social learning process (VAN HECKEN; BASTIAENSEN, 2010) therefore appears as a major factor in promoting a more conservation-prone attitude among landowners.

The importance of environmental education in behavioral change is evidenced in the literature (GADOTTI, 2001). According to Hanai et al. (2005), one of the ways to perceive, interpret, and value the environment and its conservation is through the educational and experiential process that provides theoretical and practical subsidies for understanding natural systems. In this context, we identified a great value given by rural landowners to the presence of entities such as those of agricultural extension (ATER) and non-governmental organizations. This value seemingly denotes not only a concern with maintaining rural income, but also the rural producer's need to feel that life in the field is recognized and supported, something linked to rural identity (e.g., VAN VIJK et al., 2016). This seems to be one of the motivators of farmers' involvement with capacity building projects in production and conservation, which is consistent with previous studies (e.g., VAN HECKEN; BASTIAENSEN, 2010; FIGUEIROA et al., 2016). Similarly, Lima et al. (2019) concluded that the construction of a discourse favorable to the protection of water resources originates predominantly from environmental education fostered by proponents of conservation projects, in general, non-governmental organizations and civil associations of local producers.

Our study goes beyond the current literature by showing another underexplored facet: the need expressed by landowners to reconcile environmental conservation with a productive life in the field. This is evident in the preference given to SAF (or integrated crop-livestock-forestry practices) among the three alternatives for promoting forest restoration, to the detriment of the alternatives 'natural regeneration' or 'total planting'. There is already some presence of SAF initiatives in the region, and primarily agroecology initiatives promoted by local entities such as CAT, the Rural Workers Union, and CRESAFA. This also provides evidence of the importance of local entities in behavioral change. Technical assistance for the adoption of forestry-pasture practices was also iden-

tified as important for landowner motivations in Van Hecken & Bastiaensen's (2010) study. In line with Howley et al., (2015), producers indicated a preference to restore on hilltops, where elevations hinder agricultural practices, indicating that most respondents rely on areas that are flatter, accessible, and close to water bodies for rural production.

It is important to mention that, based on the experience obtained in the field, there are still many doubts widespread among our respondents about the meaning of a SAF or other integrated production modalities, associated with concepts such as agroecology and permaculture. In addition, there is still little clarity about the limits of the legislation regarding the presence of SAFs and what are the best species combinations in APPs and RLs from an ecological and economic point of view, for example.

For most of the producers who selected economic incentive as a priority factor for adopting conservation practices, the income obtained from rural production is not high and working conditions are harsh. Thus, financial incentives such as technical assistance, material support for conservation practices (e.g., donation of materials), or cost reduction (e.g. taxes) are considered a priority by our respondents. Once again, we note the desire to continue on their property in a productive way, and that in order to protect the vegetation on their property, more technical support and monitoring is needed, adding to this the reduction of forest restoration costs. These results match with the demotivation observed by Pacheco et al. (2017, 2021) among producers in Mato Grosso and Pará, related to the high cost of compliance procedures in relation to the Forest Code.

Our results also are aligned with those of Zanella et al. (2014), who suggest that only a direct financial incentive for conservation, as often proposed in PES-type projects, is not able to convince some groups and that it is important to consider the different motivations of landowners. It is not enough to conceive the individuals' willingness to engage in environmental restoration as an economic problem involving utility maximization by rational actors. Farmers and ranchers are also social actors whose environmental perceptions shape the way in which they view the world and themselves in the world. Thus, although the financial dimension plays an important role in decision making, other symbolic factors carry considerable weight.

Our study addresses, in particular, an aspect that is not yet common in the literature: the differentiation of farmers' preferences regarding possible modalities of on-farm conservation strategies. Each modality addressed in our study involves different levels of complexity, maintenance effort required, material cost, and return for the rural producer. In our research, the modality that attracts the most interest is that which reconciles conservation with production (SAF) and the second most selected is that which implies low maintenance (natural regeneration). This result has profound implications for forest restoration strategies in the field and requires further studies.

Despite its limitations and exploratory nature, this study allowed for the verification of the questionnaire presented as a tool to characterize the socioeconomic profile of rural landowners, as well as their perceptions, motivations, and attitudes towards environmental conservation, regarding the protection of the vegetation cover on the property. Although limited to a non-significant sample, with no claims of statistical inference, this

study helps to shed light on some directions to be explored in the scaling of future forest restoration actions in the field. This methodology has potential for wider application with an adequate sampling strategy and relevant statistical treatment. Additional strategies would be needed to verify the veracity of the information obtained in order to avoid inconsistencies. To this end, it is important to gain the trust of the respondents so that they feel comfortable receiving interviewers on their properties or providing their CAR registration data for cross-checking of information.

Regarding the limitation of the methodology, it is important to stress that the declaratory nature and voluntary participation of this study do not allow for a validation of the answers, nor an on-site verification of compliance with the rules for APPs and RLs. Therefore, the results are limited to what can be inferred from the interviewee's statement. The biggest consequence of this, when it comes to compliance with the Forest Code, is the possibility of a mistaken perception about what the protection of springs or riparian forest consists of and whether the protection meets the criteria required by law. Given the degree of environmental degradation in the region, it is possible that there are different types of biases regarding the total area protected, among other aspects. As an indication of biased declarations, we find some respondents, for example, who prefer not to inform any data that could identify themselves or their properties, such as the CAR number.

Final considerations

This exploratory study presents several aspects that influence the effectiveness and sustainability of conservation and forest restoration initiatives on rural properties in the long term. We highlight that conservation initiatives need to pay attention to aspects that go beyond an economic incentive, and encompass other spheres of human life, such as environmental perceptions and attitudes, the influence of networks and local entities, the sense of belonging and identification with the rural way of life, and income generation strategies, something that is consistent with other recent studies. This perspective is evidenced by the fact that certain forest restoration modalities, such as SAFs, were more prominent than others since they place the rural producer at the core of the forest restoration process.

Our study indicates that pro-environmental perceptions and attitudes are clearly influenced by local governmental and non-governmental organizations in the development of environmental awareness that is disseminated through conservation projects and agricultural extension. In addition, our study found that for many landowners, technical assistance and input donations are as relevant to making forest restoration feasible as direct economic incentives, and that thus environmental conservation and rural production can move in the same direction. This result suggests that the simple payment for environmental services (PES) model may not be sufficient in a context where smallholders would like to obtain technical training to economically exploit their legal reserves and APPs within the modalities provided by law. This means that studies on favorability that adopt a purely biophysical (i.e., viability of natural regeneration) or economic (i.e. opportunity cost) perspective are insufficient to guide forest restoration strategies. There-

fore, future studies could explore how policy discourses, disseminated both regionally and nationally, as well as changes in legislation, may affect landowners' understanding of and interest in meeting legal requirements or engaging in voluntary environmental initiatives. In addition, it is critical to further understand landowner preferences regarding different modalities of forest restoration strategies.

References

BAUCH, SIMONE & SILLS, ERIN & PATTANAYAK, SUBHRENDU. Have We Managed to Integrate Conservation and Development? ICDP Impacts in the Brazilian Amazon. **World Development**, Elsevier, v. 64. p.135-148, 2014.

BIERNACKI, P. & WALDORF, D. Snowball Sampling: Problems and techniques of Chain Referral Sampling. **Sociological Methods & Research**, v. 2, November, p.141-163, 1981.

BOELENS, R., HOOGESTEGER, J., RODRIGUEZ-DE-FRANCISCO, J.C. Commoditizing Water Territories: The Clash between Andean Water Rights Cultures and Payment for Environmental Services Policies. **Capitalism, Nature, Socialism**, v.3, p.84-102, 2014.

BREMER, L; FARLEY, K.; LOPEZ-CARR, D. What factors influence participation in payment for ecosystem services programs? An evaluation of Ecuador's SocioPáramo program. **Land Use Policy**, v.36, p.122-133, 2014.

BROWN, C et al. Simplistic understandings of farmer motivations could undermine the environmental potential of the common agricultural policy. **Land Use Policy**, 105136, 2020.

CHAVES, H.M.L., et al. Quantificação dos Benefícios Ambientais e Compensações Financeiras do "Programa do Produtor de Água" (ANA): I. Teoria. **Revista Bras. de Recursos Hídricos**, v. 9, n. 3, 5-14, 2004.

COSTEDOAT, S., et al. How Effective Are Biodiversity Conservation Payments in Mexico? **PlosOne**, v.10, p. 1-20, 2015.

EZZINE-DE-BLAS, D., CORBERA, E., LAPEYRE, R. Crowding-in or crowding-out? A conceptual framework to understand motivations in payments for ecosystem services. Resources Politics, Conference Paper, p. 1-18, 2015.

GADOTTI, M. **Pedagogia da Terra: Ecopedagogia e Educação Sustentável.** São Paulo: Peirópolis, 2001.

HANAI, F. Percepção e conscientização ambientais: alternativas para a preservação das cavidades naturais do Parque Estadual Turístico do Alto Ribeira (Petar). Simpósio Nacional sobre Geografia, Percepção e Cognição do Meio Ambiente, Londrina 2005.

HOWLEY, P., et al. Explaining the economic 'irrationality' of farmers' land use behaviour: The role of productivist attitudes and non-pecuniary benefits. **Ecological Economics**, v. 109, p. 186-

193, 2015.

IBGE. Questionário completo Censo Agropecuário 2017. Disponível em https://censos.ibge.gov.br/agro/2017/downloads/censoagro2017/Quest_Censo_Agro_2017_Valores_10042017.pdf> Acesso em: 9 de Dezembro 2018

KWAYU, E.J., SALLU, S., PAAVOLA, J. Farmers participation in the equitable payments for watershed services in Morogoro, Tanzania. **Ecosystem Services**, v. 7, p. 1-9, 2014.

KOSOY, N; CORDEBA, E; BROWN, K. Participation in payments for ecosystem services: Case studies from the Lacandon rainforest, Mexico. **Geoforum**, v. 39, Issue 6, p. 2073-2083, 2008.

LIMA, L. et al. Will PES schemes survive in the long-term without evidence of their effectiveness? Exploring four water-related cases in Colombia. **Ecological Economics**, v. 156, p. 211-223, 2019.

MÉNDEZ-LOPEZ, et al. From Paper to Forest: Local Motives for Participation in Different Conservation Initiatives. Case Studies in Southeastern Mexico. **Environmental Management,** v. 56, p. 695–708, 2015

MONROY-SAIS, S. et al. Exploring How Land Tenure Affects Farmers' Landscape Values: Evidence from a Choice Experiment. **Sustainability**, v. 10, 4321, 2018.

MPMG. Termo de Ajustamento de Conduta Samarco. Disponível em> file:///C:/Users/usuario.pesquisa/Downloads/TAC_Governanca.pdf> Acesso em dezembro de 2020.

OLIVEIRA, R.E.; ENGEL, V.L. A restauração florestal na Mata Atlântica. **Revista Ciência Tecnologia & Ambiente**, v. 5, p. 40-48, 2017.

OLIVEIRA, B.R. et al. Land use dynamics and future scenarios of the Rio Doce State Park buffer zone, Minas Gerais, Brazil. **Environ Monit Assess**, v. 192, n. 39, p. 1-12, 2020.

PACHECO et al. Regularização do passivo de reserva legal: Percepção dos produtores rurais no Pará e Mato Grosso. **Ambiente e Sociedade**. v. XX, n.2, p. 185-206, 2017.

PACHECO et al. Will farmers seek environmental regularization in the Amazon and how? Insights from the Rural Environmental Registry (CAR) questionnaires. **Journal of Environmental Management**. v. 284, p. 112010, 2021.

RIBEIRO et al. A spatially explicit index for mapping Forest Restoration Vocation (FRV) at the landscape scale: Application in the Rio Doce basin, Brazil. **Science of the Total Environment**, v.744, p. 0048-9697, 2020

ROSS, C., T. Sliding-scale environmental service payments and non-financial incentives: Results of a survey of landowner interest in Costa Rica. **Ecological Economics**, v. 130, p. 252-262, 2016.

SCHINAIDER et al, 2019. Consciência ambiental versus atitudes pró-ambientais: Uma avaliação dos proprietários das agroindústrias familiares. **Revista Brasileira de Gestão e Desenvolvi-**

mento Regional. v. 15, N. 3, p. 33-47.Taubaté, 2019.

VAN DIJK, W et al. Collective agri-environment schemes: How can regional environmental cooperatives enhance farmers' intentions for agri-environment schemes? **Land Use Policy,** v.42, p.759-766, 2015

VAN DIJK, W et al. Factors underlying farmers' intentions to perform unsubsidised agri-environmental measures**. Land Use Policy**, v.59,p. 207-216, 2016

VAN HECKEN, G; BASTIAENSEN, J. Payments for Ecosystem Services in Nicaragua: Do Market-based Approaches Work?. **Development and change**. v. 41, p.421-444, 2010

VAN HERZELE, A et al. Effort for money? Farmers' rationale for participation in agri-environment measures with different implementation complexity. **J Environ Manage**, v.20, p.131:110, 2013

ZANELLA, M., A., SCHLEYER, C.,SPEELMAN, S. Why do farmers join Payments for Ecosystem Services (PES) schemes? An Assessment of PES water scheme participation in Brazil. **Ecological Economics**, v. 105, p. 166-176, 2014.

Supplementary Material – Questionnaire

Seção 1: Caracterização do Proprietário Rural e Contexto Familiar

1. Nome do/a entrevistado/a (opcional): _____
2. Telefone para contato (opcional): _____
3. Email: _____
4. Cidade/Distrito de nascimento: _____
5. Cidade/Distrito da propriedade: _____
6. Vive na propriedade rural? [ ] 1. Sim [ ] 2. Não. Se não, em qual cidade/distrito?
7. Gênero: [ ] 1. Fem; [ ] 2. Masc; [ ] 3. Outro.
8. Idade: _____
9. Status familiar: [ ] 1. solteiro/a; [ ] 2. casado/a; [ ] 3. divorciado/a; [ ] 4. separado/a; [ ] 5. viúvo/a; [ ] 6. não desejo informar.
10. Quem cuida das contas da fazenda? [ ] homem; [ ] mulher; [ ] casal.
11. Onde vivem/trabalham/estudam os filhos? _____
12. Escolaridade:

[ ] 1. Não frequentei a escola	[ ] 6. Ensino Técnico
[ ] 2. Primeiro grau incompleto (até a 4 ª série)	[ ] 7. Superior incompleto
[ ] 3. Primeiro grau completo (até a 8 ª série)	[ ] 8. Superior completo
[ ] 4. Segundo grau incompleto	[ ] 9. Pós-graduação incompleta
[ ] 5. Segundo grau completo	[ ] 10. Pós-graduação completa

13. Já recebeu algum tipo de treinamento ou fez algum curso? Se sim, qual/quais? (ex. produção de leite, plantio de mudas em viveiros, etc.)

14. Com qual frequência você recebe algum tipo de assistência técnica na propriedade rural? De qual tipo/quais? Por qual entidade?
15. Por quais entidades existentes na sua região você sente que é apoiado?

[ ] 1. Sindicato rural	[ ] 5. EMATER
[ ] 2. Associação de produtores rurais	[ ] 6. Prefeitura
[ ] 3. Igreja	[ ] 7. ONGs
[ ] 4. Cooperativa de produção	[ ] 8. Outros: ___

Seção 2: Caracterização da propriedade rural e seu uso econômico

16. Tamanho da propriedade_____ha.
17. Área plantada no ano passado:_____ha.
18. Área de pasto:_____ha.
19. Área de vegetação remanescente:_____ha.
20. Como você adquiriu a propriedade? (Selecione uma ou mais opções)
21.

[ ] 1. Comprou terra com título	[ ] 3. Assentamento do INCRA
[ ] 2. Comprou terra sem título	[ ] 7. Ocupação
[ ] 5. Herança com título	[ ] 4. Colonização
[ ] 6. Herança sem título	[ ] 8. Outro_____

22. Qual é o valor atual estimado da sua propriedade? R$ _____
23. Qual é a renda mensal líquida que a sua família obtém da propriedade rural?____ R$/mês
24. Qual a renda mensal líquida obtida por sua família por meio de outras fontes?___ R$/mês
25. Marque tudo o que é produzido na sua propriedade:

[ ] 1. leite; [ ] 2. animais*; [ ] 3. derivados do leite (queijo, requeijão etc.); [ ] 4. hortaliças e verduras de época; [ ] 5. cultivos anuais (como mandioca, milho, feijão); ( ) 6. alimento para o gado (capim, cana); [ ] 7. frutas; [ ] 8. madeira; [ ] 9. Outros:

* indicar qual animal e idade:_____

26. Dessa lista de produtos, descreva o preço, o volume, valor e renda líquida da produção:

Código	Unidade	Preço	Média Produção (Volume ou Peso)	Local de venda do produto*	Comprador

* Mencionar se é na propriedade ou a cidade/distrito onde é vendido.

27. Produção mais importante para a geração de renda: _____

28. Como é a sua produção? Faz uso de maquinário? Quais? _____

29. Marque os tipos de insumos para a produção que você utiliza na sua propriedade:

[ ] 1. fertilizantes industriais; [ ] 2. fertilizantes naturais (ex. esterco); [ ] 3. agrotóxicos; [ ] 4. alimento animal; [ ] 5. suplemento animal; [ ] 6. vacinas; [ ] 7. outros: _____

Descreva: _____

30. Nível técnico da produção (interpretação do entrevistador): [ ] baixo; [ ] médio; [ ] alto.
31. Nos últimos 3 anos foram feitos investimentos para aumento ou melhoria da produção? Que tipo de investimento? _____

32. Nos próximos 3 anos, você irá investir na sua propriedade? De que forma? _____

Tendência do grau de tecnificação da produção (interpretativa): [ ] piora; [ ] estável; [ ] melhora; [ ] abandono/venda da propriedade.

Seção 3: Atitude do proprietário rural em relação à conservação compulsória

33. Marque as opções que refletem o que você sente quando você pensa em *matas e florestas*:

[ ] 1. prejuízo econômico [ ] 2. beleza cênica [ ] 3. terra abandonada [ ] 4. proteção do solo	[ ] 5. perda de área produtiva [ ] 6. proteção das fontes hídricas [ ] 7. exigência do governo [ ] 8. fonte de madeira [ ] 9. Outros: ___

34. Qual é o grau de importância que você dá à proteção/recuperação da vegetação na sua fazenda?

1	2	3	4	5
Baixíssima Importância	Baixa Importância	Moderada Importância	Alta Importância	Altíssima Importância

35. Se você aumentasse a cobertura vegetal de *mata ciliar* (no entorno dos rios, lagos e nascentes), como você entenderia isso para a sua fazenda?

1	2	3	4	5
Muito mais benefício	Mais benefício	Benefício e Prejuízo de igual maneira	Mais prejuízo	Muito mais prejuízo

36. Se você aumentasse a cobertura vegetal de *topos de morro* (montanhas, etc.), como você entenderia isso para a sua fazenda?

1	2	3	4	5

Muito mais benefício	Mais benefício	Benefício e Prejuízo de igual maneira	Mais prejuízo	Muito mais prejuízo

37. Se você aumentasse a cobertura vegetal em outras áreas da propriedade, como você entenderia isso para a sua fazenda?

1	2	3	4	5
Muito mais benefício	Mais benefício	Benefício e Prejuízo de igual maneira	Mais prejuízo	Muito mais prejuízo

38. Qual é a importância da proteção/recuperação da mata na sua propriedade para a água?

1	2	3	4	5
Baixíssima importância	Baixa importância	Moderada importância	Alta importância	Altíssima importância

Seção 4: Status da conservação da propriedade em atendimento à lei

39. O que você sabe sobre as exigências da lei sobre a proteção das matas na sua propriedade? (Interpretativa do entrevistador): [ ] pouco; [ ] razoavelmente; [ ] muito.
40. Você já foi multado por questões ambientais? [ ] 1. Sim; [ ] 2. Não.
41. Se Sim, por qual motivo você foi multado?

[ ] 1. Desmatamento sem autorização	[ ] 4. Transporte irregular de produtos florestais
[ ] 2. Desmatamento em área de preservação permanente	[ ] 5. Queimada sem autorização
[ ] 3. Ausência de cadastro ambiental rural, licença ambiental única/rural	[ ] 6. Outros motivos: _____

42. Você já registrou a sua propriedade no Cadastro Ambiental Rural (CAR)? [ ] 1. Sim; [ ] 2. Não.
43. Se sim, porque você resolveu fazer o CAR?

[ ] 1. Ficar regular perante as leis ambientais	[ ] 4. Por consciência ambiental
[ ] 2. Ter acesso a crédito bancário	[ ] 5. Poder vender o seu produto
[ ] 3. Evitar multas	[ ] 6. Outros motivos: _____

44. Se não, quando você acha que vai fazer o CAR?

[ ] 1. Já estou realizando as medidas necessárias	[ ] 4. Irei cadastrar quando for cobrado pelo governo
[ ] 2. Farei nos próximos meses	[ ] 5. Quando o mercado exigir
[ ] 3. Farei no ano que vem	[ ] 6. Nunca irei fazer o CAR

45. Quantos hectares de reserva você tem a *mais* ou a *menos* do exigido pela lei?____ ha

46. Se você já regularizou a sua propriedade rural de acordo com a legislação florestal (proteção de áreas de preservação permanente e reserva legal), quais foram os motivos que o levaram a regularizar (lembrar que não há implicações legais na resposta)?

47. Se você ainda não regularizou a sua propriedade rural, você pretende regularizar? [ ] Sim [ ] Não. Por quê?

48. Como você percebe o risco de não regularizar a sua propriedade segundo a exigência legal de proteção à vegetação (em relação à possibilidade de multa ou processo judicial)?

1	2	3	4	5
Baixíssimo risco	Baixo risco	Moderado risco	Alto risco	Altíssimo risco

SE TIVER DEFICIT DE RESERVA LEGAL OU ÁREA DE PRESERVAÇÃO PERMANENTE

(Lembrar ao entrevistado de que não há implicação legal em suas respostas e que serão mantidas anônimas)

49. Quando você acha que vai recuperar ou compensar a sua reserva legal?

[ ] 1. Já estou realizando as medidas necessárias	[ ] 4. Irei regularizar quando for cobrado pelo

	governo
[ ] 2. Começarei nos próximos meses	[ ] 5. Quando o mercado exigir
[ ] 3. Começarei no próximo ano	[ ] 6. Nunca irei regularizar RL e/ou APP

Outra resposta: 7. _____

50. Se não for regularizar/compensar, quais as razões?

51. Entre as razões abaixo, quais coincidem com as suas razões/motivações?

[ ] 1. O custo de regularizar/compensar é muito alto	[ ] 7. O risco de multa é baixo
[ ] 2. Discordo das leis ambientais do governo	[ ] 8. Não preciso de acesso a crédito bancário
[ ] 3. Reduzirá minha área produtiva	[ ] 9. Nunca serei cobrado pelo governo
[ ] 4. Dificultará a minha produção	[ ] 10. Nunca serei cobrado pelo mercado
[ ] 5. O benefício de regularizar é pequeno	[ ] 11. Não preciso disso p/ vender minha produção
[ ] 6. Ninguém vai regularizar/compensar	[ ] 12. Outros: ___

52. Quais fatores aumentariam a sua predisposição a regularizar ou manter a regularização ambiental da sua propriedade? Marque nos quadrinhos o *(1) mais relevante, (2) segundo mais relevante, (3) terceiro mais relevante* e (x) fatores adicionais.

[ ] 1. aumento da pressão governamental [ ] 2. Assistência para melhorar a produtividade [ ] 3. assistência técnica para regularizar [ ] 4. exigência de mercado dos produtos agrícolas [ ] 5. redução no custo prático da regularização [ ] 6. Se os meus vizinhos regularizassem	[ ] 7. apoio do sindicato rural ou cooperativa [ ] 8. mobilização dos vizinhos/comunidade [ ] 9. selo de certificação ambiental da produção [ ] 10. incentivo econômico (ex. redução impostos) [ ] 11. doação de materiais para recuperação

Complemento: _____

Caroline de Souza Cruz Salomão

✉ carolinescsalomao@gmail.com

ORCiD: https://orcid.org/ 0000-0002-3794-1950

Letícia Santos de Lima

✉ leticialima@ufmg.br

ORCiD: https://orcid.org/ 0000-0002-0268-2055

Raoni Guerra Lucas Rajão

✉ rajao@ufmg.br

ORCiD: https://orcid.org/ 0000-0002-1133-4837

Submitted on: **04/08/2020**

Accepted on: **26/10/2021**

2022;25:e00853

AMBIENTE & SOCIEDADE 25 anos 25 años 25 years

SciELO

Disposição de proprietários rurais à adoção de práticas voluntárias e compulsórias de restauração florestal na região do médio Rio Doce - MG

Caroline de Souza Cruz Salomão
Letícia Santos de Lima
Raoni Guerra Lucas Rajão

Resumo: A manutenção das condições hidrológicas numa bacia rural depende, em parte, do comportamento dos proprietários rurais em relação aos usos da terra e proteção da cobertura vegetal. Neste estudo, analisamos a disposição dos proprietários rurais à recuperação florestal voluntária e à regularização (Lei Federal 12.651/2012) na região do médio Rio Doce (MG). Aplicamos um questionário a 30 proprietários rurais no município de Governador Valadares e entorno. Os resultados indicam que 86% dos proprietários reconhecem como alta a importância da manutenção da cobertura vegetal, destacando benefícios como redução da erosão (86%) e aumento da vazão de nascentes (73%). Assistência para melhorar a produtividade (29,6%), doação de materiais (22,2%) e incentivo econômico (22,2%) aumentam a motivação dos proprietários. O sistema agroflorestal foi a modalidade de maior preferência (50%). A atuação de longo-prazo de entidades de ATER e vínculos de confiança criados com os proprietários, explicam a disseminação das noções ambientais e atitudes pró-conservação.

Palavras-chave: Áreas de preservação permanente, código florestal, conservação de bacias hidrográficas, pagamento por serviços ambientais, regularização ambiental.

São Paulo. Vol. 25, 2022

Artigo Original

DOI: http://dx.doi.org/10.1590/1809-4422asoc20200085r3vu2022L1AO

AMBIENTE & SOCIEDADE 25 anos 25 años 25 years

SciELO

Disposición de propietarios rurales a la adopción de prácticas voluntarias y compulsorias de restauración forestal en la región media de la cuenca del Rio Doce - MG

Caroline de Souza Cruz Salomão
Letícia Santos de Lima
Raoni Guerra Lucas Rajão

Resumen: El mantenimiento de las condiciones hidrológicas en una cuenca depende, en parte, del comportamiento de los propietarios rurales con respecto a los usos del suelo y la protección de la cobertura vegetal. Analizamos la disposición de los propietarios rurales para la recuperación forestal voluntaria y la regularización ante la Ley Federal 12.651/2012 en la cuenca media del Río Doce (MG). Aplicamos una encuesta a 30 propietarios de la municipalidad de Governador Valadares y entorno. Los resultados indican que el 86% de los propietarios reconocen como alta la importancia de mantener la cobertura vegetal, con beneficios tales como reducción de la erosión (86%) y incremento de caudal de manantiales (73%). Asistencia para mejorar la productividad (29,6%), donación de materiales (22,2%) e incentivo económico (22,2%) incrementan la motivación de los propietarios. Los sistemas agroflorestales fueron la modalidad preferida (50%). La actuación de largo-plazo de las entidades ATER y lazos de confianza creado con propietarios, explican la difusión de nociones ambientales y actitudes pro-conservación.

***Palabras-clave*:** Areas de preservación permanente, código forestal, conservación de cuencas hidrográficas, pago por servicios ambientales, regularización ambiental.

São Paulo. Vol. 25, 2022
Artículo original

DOI: http://dx.doi.org/10.1590/1809-4422asoc20200085r3vu2022L1AO