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Drugs and Protected Areas: Coca Cultivation and Social Acceptance of Bahuaja-Sonene National Park in Peru

Jaqueline Garcia-Yi

Chair Group Agriculture and Food Economics, Technische Universität München, Alte Akademie 12, 85354 Freising, Germany; E-Mail: jaqueline.garcia-yi@tum.de; Tel.: +49-8161-71-2282

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Abstract: Cocaine is extracted from coca: a native bush from the Amazon rainforest. Coca is mostly grown in remote areas to avoid government intervention, and it has been increasingly cultivated inside protected areas (PAs). The effects of coca cultivation on the preservation of PAs are largely unknown. This research uses panel data (2006–2008) from a total of 684 farmers to evaluate the influence of coca growing on the acceptance of PAs, using as case study a farmer community located within the buffer zone of Bahuaja-Sonene National Park (Peru). All farmers are coffee growers and some complement their income with coca production. The area has not been subject of forced coca eradication activities. The data were analyzed using probit models with covariance matrix correction for cluster errors by year, with and without interaction effects. The results suggest that coca growers are more likely to state a positive opinion about the PA than non-coca growers. This may reflect the fact that non-coca growers need extensive areas of land for coffee cultivation in order to approach the economic benefits obtained by farmers who also grow coca. However the likelihood of stating a positive opinion by coca growers decreases the higher the perception that coca cultivation has increased in the region. Coca growers may be afraid that large coca areas would lead to the implementation of forced eradication activities. In such a case, the BSNP would restrict the access to remote land resources, which in turn decreases the support for this PA.

Keywords: protected area; drug; coca; cocaine; social acceptance; Peru

1. Introduction

The tropical Andes is the hotspot of the greatest biodiversity on the planet [1]. The humid forests of the tropical Andes region support the richest flora and fauna collections in the world with remarkable numbers of endemic and rare species. This high degree of endemism is a result of the numerous mountain uplifts which have fragmented habitats and allowed species to evolve with separate identities [2]. Endemic species are particularly vulnerable to habitat loss, and any disturbances could mean extinction. Therefore, conservation of tropical forests should be a top priority [3]; unfortunately, large areas of the tropical Andes are being severely degraded [4]. Part of this damage can be attributed to the continuous movement of farmers into the tropical Andes for the purpose of cultivating crops [2].

Coca, the bush from which cocaine is extracted, is a highly profitable crop. It is native to the tropical Andes and therefore grows easily in its natural environment. Farmers face strong economic incentives to cultivate coca. They tend to do it in remote areas (e.g., beyond the borders of settled land) where governmental influence and law enforcement are typically weak [3]. Moreover, eradication activities are currently pushing coca growers into even more isolated places. As such, farmers are increasingly cultivating coca inside protected areas (PAs) [5]. A PA is defined by the International Union for the Conservation of Nature (IUCN) as: "a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values" [6].

Slash-and-burn practices in the cultivation of cash crops, including coca grown inside PAs, are common in the Amazon rainforest [7]. Agriculture is estimated to be the driving force for 80 percent of deforestation worldwide [8]. In particular, commercial agriculture (e.g., oil palm, cacao, and other large scale crops) is the most important driver force of deforestation in Latin America. Nevertheless, commercial agriculture tends to occur in the proximity of roads and in already inhabited areas in contrast to illegal coca production, which mainly occurs in isolated but highly biodiverse areas. As a consequence, one of the latest threats to biodiversity in the tropical Andes is the result of not only agriculture but of coca cultivation for narcotics traffic [2].

Currently, coca is cultivated almost exclusively in three South American countries: Colombia, Peru, and Bolivia with 38, 41, and 21 percent of total coca-growing area worldwide, respectively [9]. Data from the United Nations indicate an increasing overlap in PA land and land used for coca-growing. In Colombia, coca cultivation occurs within 17 of 58 PAs which represents about 8 percent of total coca-growing area in the country [10]. In Peru, coca cultivation occurs in 6 of 75 PAs, including Bahuaja-Sonene National Park (BSNP) [11,12]. Unfortunately, there is no current information about the percentage of coca cultivated inside PAs. Finally, in Bolivia, coca cultivation occurs in 6 of 22 PAs which represents about 4 percent of total coca cultivation in the country [13].

Previous research by this and other authors has focused on the determinants of coca cultivation (e.g., [14–16]). The identification of relevant socio-economic incentives for coca cultivation can help to design drug-control policies in the Andean region. The results have suggested that several factors account for coca growing decisions, including profit of the alternative crop, risk aversion, education level, agricultural plot size, and social identity. However, this particular research focuses on the effect of coca cultivation on the social acceptance of PAs. Given the difficulty in enforcing restrictions on natural resource use through instrumental compliance mechanisms over large and remote areas,

management agencies must rely heavily on the involvement and support of local communities. Lack of local community support can easily undermine the success of PA management efforts and has been implicated as one source of the failures of top-down approaches [17,18]. As such, improving the social acceptance of PAs is a key challenge facing countries all around the world [19].

An individual's support for PAs can be expressed as active support (direct involvement), supportive behavior (adoption of suggested behaviors) and as psychological support and acceptance [17]. This paper investigates factors that influence "stated PA support", which measures the psychological aspect of PA acceptance. Most studies suggest that stated PA support relates to positive attitudes that lead to compliance and better enforcement [18]. As such, people living closer to PAs may have positive or negative attitudes about them. Understanding the factors that encourage positive attitudes is critical to the long-term sustainability of PAs [20]. Studies have used a number of explanatory variables, including behavioral variables, to evaluate or predict local communities' support towards PAs (e.g., [17,18,20–22]). Nevertheless, none of them have considered coca-related variables in the assessment, even though, as indicated before, coca growing is considered an important driver force of deforestation especially in pristine areas in the Amazon rainforest. Understanding coca growers' motivations may help to preserve the ecosystems and natural resources in the Tropical Andes.

Coca and non-coca growers' attitudes about PAs are expected to differ, as their needs differ; such as their land use requirements. Kaimowitz [23] indicates that, since the production of most available agricultural alternatives are less labor- and more land-intensive than coca production, if farmers no longer have the option of planting coca this may lead to the clearing of large areas of forest. Bradley and Millington [24] found that deforestation rates were very low in Bolivia during the period of time when coca cultivation was widespread and anti-coca policies were weakly enforced. Meanwhile Rincon-Ruiz and Kallis [25] suggest that it is not coca production alone that causes the deforestation but also the eradication activities that are continuously pushing coca production to even more remote areas. Therefore, previous research has suggested that deforestation is low in coca-dominated areas when forced eradication activities have not been conducted.

In general, local populations may value PAs highly and support conservation if their livelihood needs are met first [20,26]. Bahuaja-Sonene National Park (BSNP) is a PA under the jurisdiction of the Peruvian government. The Aymara community located nearby makes very limited use of the forest. The area was practically inhabited before their arrival, mostly during the 1950s, and they have never had any sustained contact with local Amazonian tribes which would have afforded the Aymara a deep understanding about the native plants and the multiple uses of other natural resources [27]. For example, local Aymara peasants exclude practically all wild meat, fish, and Amazonian fruit (e.g., "Brazilian" nuts) from their diet; instead, they focus on exchanging or purchasing and consuming traditional foods obtained from the Altiplano [27]. So the current primary constraint that BSNP may impose on the Aymara community relates to the restriction of land availability for agricultural activities in the Amazon rainforest.

The main objective of this study is to evaluate the factors influencing the acceptance of BSNP by an Aymara community living inside the buffer zone of this PA in San Pedro de Putina Punco district in Puno, Peru. The community is composed of coffee growers, a group of whom cultivates coca as an additional cash crop. To this end, a unique data set was obtained from three independent surveys conducted in 2006, 2007 and 2008. In particular, this study focuses on uncovering the effects of coca cultivation on social acceptance of this protected area. In general, illicit drug production is one of the

least understood threats to biodiversity in the tropical Andes [28], and social acceptance of PAs is still an under-explored research theme [22]. One particular characteristic of the study area is that it has never been subject to forced eradication. Coca growing for narcotics traffic has increased only recently (from 2006 onwards; calculated from UNODC in [29]). To the best of my knowledge, this kind of primary research study has not been conducted before mainly because of the challenge of collecting independent data in coca-growing regions due to logistics and safety issues.

2. Materials and Methods

2.1. Description of the Study Area

BSNP is located in the provinces of Tambopata (Department of Madre de Dios) and Sandia (Department of Puno) in Peru. It was established in 1996 (Supreme Decree No. 012-96-AG) and expanded in 2000 (Supreme Decree No. 048-2000-AG). BSNP currently protects an area of 1,091,416 hectares. It stretches to the Tambopata National Reserve in the north (Peru) and the Madidi National Park in the east (Bolivia). BSNP is strategic because it forms part of a transnational system of protected areas known as the Vilcabamba-Amboro corridor, considered of great international relevance due to a level of endemism that is very high, even for the tropical Andes in general [30–32].

BSNP is categorized as a "national park" with the highest level of protection among all the categories of PAs designated by the Peruvian government. According to the Ministry of Environment [33], national parks are representative samples of the major ecological regions of the country. Within national parks, the ecological integrity of one or more ecosystems; associated wildlife; successional and evolutionary processes; and landscape and cultural features are protected. Any type of exploitation of natural resources, including mining, hunting, keeping livestock, grazing, and logging, is prohibited.

The geographic area that now comprises BSNP has been largely inhabited for at least 4000 years. The earliest inhabitants were the ancestors of the contemporary Ese'eja. The socio-cultural processes of the ancient inhabitants of the area have been poorly documented; however, archaeological evidence suggests the existence of trade networks between Amazonian and Andean indigenous populations. Evidence also indicates a sporadic presence of ancient Andean population settlements in the upper rainforest which were linked to coca production for traditional uses (e.g., coca chewing) and gold mining. During the colonial period, there were frequent incursions of Spaniards in search of gold, coca, and Indians for servile or slave labor. Later, during the republican period, traders entered the valley to extract quinine from Chinchona bark and natural latex from rubber trees until these two products began to be chemically synthetized in Europe [34]. For more information about the history of coca cultivation during the different Peruvian periods (pre-colonial, colonial, and republican periods) see Garcia-Yi [35].

The current colonization within the buffer zone of BSNP in the Tambopata valley began during the 1930s by Aymara farmers. This migration to the difficult terrain of the Tambopata valley was the result of the displacement of farmers during the El Chaco war (1932–1935) in Bolivia. During the 1950s and 1960s, colonization soared, fueled by increases in global coffee prices, population growth, and heavy land erosion in the Peruvian Altiplano [34]. Many of these early Aymara farmers were permanent inhabitants of the Altiplano and produced coffee only seasonally in the tropical Andes. Gradually, the Aymara farmers faced problems of micro-land holdings and land dispersion in their native Altiplano due

to population growth and inheritance. Plot sizes became too small to support farmers' subsistence needs and farmers gradually settled permanently in the Amazon rainforest [27]. Currently in the research area, 94 percent of farmers continue to cultivate coffee as a cash crop [36], which is sometimes complemented with coca cultivation. At the time the survey was conducted, membership in a cooperative was required in order for producers to sell their coffee due to restrictions on coffee intermediaries [14].

The upper parts of the Tambopata valley were the first to be colonized. The topography in this area is rugged, ranging in steepness between 12 and 70 percent gradient [37]. The soils are currently very shallow (*ca*. 5 cm deep) due to deforestation and heavy rainfall. Farmers usually do not use fertilizers, and the fallow time is insufficient to allow the soil to naturally renew its fertility [37]. The lower parts of the valley, where BSNP is located, are still mostly covered with primary forest. As a result, the soils are deeper and have good organic matter content. Currently, most of the soil which has adequate levels of organic matter for agricultural production is located near the PA [38]. In addition, there are cultural behaviors associated with deforestation such as the fairly widespread belief that in addition to inheritance, working an area of land creates informal property rights to that area. As a consequence, farmers expect their children to get additional land in the lower parts of the valley in the future [27]. As indicated before, the presence of the PA currently prevents further expansion of agricultural areas, and therefore it has started to create social unrest in the research area [39].

2.2. Survey Conduction

The data from 2006 and 2007 were collected using a questionnaire focused primarily on coffee production. Most questions were associated with coffee cultivation, and only one question was related to coca growing (whether farmers cultivated coca or not). The data from 2008 were collected using a different questionnaire which focused particularly on coca cultivation and included specific questions related to the number of coca bushes cultivated by individual farmers, traditional uses of coca, and farmers' perceptions of coca cultivation and social capital. Both questionnaires included questions related to general farm production and socio-economics and the same specific question about the protected area: "What is your opinion about BSNP? (a) It is positive/It is good to have it; (b) It is negative/It is bad to have it; (c) It is neutral/I am indifferent; (d) I do not know/I do not want to give my opinion". The total number of valid questionnaires was 684 (128, 125, and 431 in 2006, 2007, and 2008, respectively), excluding farmers who did not give their opinion about BSNP (answer "d" above, about 10 percent of the respondents).

All the surveys (2006–2008) were conducted in the main square of San Pedro de Putina Punco during public events such as el *D de San Pedro* (Patron of the indigenous community) when producers congregated in town. Farmers were randomly selected either on the only road leading to the main square or inside the main square. Coca-growing is a sensitive issue, and it was expected that farmers would have concerns about the possible consequences of giving truthful answers should the information become known to a third party such as governmental authorities. As such, the design of the 2008 questionnaire considered the best practices reported in the literature to reduce potential social desirability bias such as establishing farmer-interviewer trust, matching farmer-interviewer ethnic background characteristics, and training interviewers to ask sensitive questions [40]. Detailed information about this questionnaire and survey process can be found in Garcia-Yi & Grote [29].

2.3. Conceptual Framework and Econometric Method

The theory of pro-environmental behavior (PEB) seeks to understand and predict whether individuals act pro-environmentally. Attitudes are an important component of PEB models. Attitudes do not directly determine behavior, rather they influence behavioral intentions which in turn shape individuals' actions [41]. The questions of what determines PEB is such a complex one that cannot be visualized in a single framework or diagram [42]. Factors underlying an individual's stated support for PAs may include instrumental or pragmatic motivations (e.g., costs and benefits associated with farmer' socio-economic characteristics; agricultural plot characteristics; finance and income variables; environmental and deforestation related variables; coca-related characteristics; and location); and normative motivations, tradition, personal beliefs and ideologies (e.g., farmers' identity; social capital; perception variables; risk aversion; and religion) [17]. However, PEB theory has rarely been directly applied to attitudes towards PAs, and this is thought to be a significant gap in the literature [42].

This study aims to analyze the factors influencing the acceptance of BSNP. Via the survey, farmers could state whether they considered the PA as positive, neutral or negative. Ordered probit models are suitable when the dependent variable is ordinal (as in this case). However, preliminary results indicated that neutral and negative opinions should be joined (estimated cutpoint on the latent variable used to differentiate neutral and negative responses was not significant). Therefore, in this research, a probit model for the statement of a positive opinion was used instead. In addition, as mentioned before, about 10 percent of farmers stated that "they did not know/did not want to give their opinion" about BSNP. However, there was no evidence of a potential sample selection problem because there was no conditional dependence between the responses of the participants who answered the PA question and the participants who did not answer the PA question (the rho from a probit model with sample selection was not significant). Consequently, the responses of the participants who did not answer the PA question were not considered in the regressions.

The full list of explanatory variables (x) which are hypothesized to influence the acceptance of BSNP and their expected sign are indicated below:

(a) Socio-economic characteristics

- *Age.* Young local residents are more likely to have a positive opinion about PAs than older local residents [43]; therefore, it is expected that most local young farmers would state a positive opinion about BSNP.
- *Gender.* Women are more affected by PAs than men because they usually carry on multiple activities associated with diverse uses of PAs' resources [44], such as firewood and water collection; therefore it is expected that women would be less supportive of the PA than men.
- *Education and farmer experience.* Highly-educated and experienced farmers tend to have a positive opinion about PAs [20,43].
- *Household labor availability.* High labor availability increases areas under cultivation [45]. Since the PA constrains agricultural extension, it is expected that the larger the labor availability, the lower the support for the PA.
- *Aymara ethnicity.* Attitudes related to PAs are significantly influenced by ethnicity [46], although the direction of this particular variable is unclear.

(b) Agricultural plot characteristics

- *Total size of the agricultural plot.* Farmers with large plot areas are more likely to have a positive opinion about PAs [20].
- *Size of coffee-growing and primary forest areas inside the agricultural plot, slope, and soil quality.* Dependency on PAs' resources decreases the acceptance of PAs [20]; as such, it is expected that having agricultural plots with small sizes of coffee-growing and forest areas, steep slopes, and low soil quality would decrease support for the PA.

(c) Farmers' finance and income variables

- *Coffee production as main economic activity; relative profit of coffee versus coca; experience of shocks due to coffee pest in the previous year; and having debt.* Household income and associated factors influence perceptions of PAs [47]. Coffee production requires a larger cultivation area if profits equivalent to those from coca cultivation are to be obtained; as such, a high value of the variables indicated above would imply a high expected dependency on the PA's land resources and in turn a low level of support for the PA.
- *Performing other non-agricultural economic activities.* Farmers who have additional sources of income seem to invest in forest conversion to agricultural land, although at a decreasing rate [45]; as such, farmers performing other economic activities would show less support for the PA.

(d) Environmental- and deforestation-related variables

- *Being an organic certified coffee producer or attending environmental education meetings.* Environmental education and consciousness increase support for PAs [48].
- *Expecting to continue cultivating coffee and planning to increase coffee areas in primary forest.* Dependency on PAs' resources for cultivating coffee would decrease the acceptance of PAs [20].

(e) Identity, social capital, and perception variables

- *Being born in the research area.* A high level of attachment felt by local residents to the landscape increases the support for PAs [43].
- *Feeling pride in being a coffee farmer.* This farmer characteristic is associated with low coca cultivation [14] which is expected to translate into a high need of a PA's land resources and therefore a low level of support for the PA.
- *Trust in the authorities.* High levels of trust imply support for PAs [21,48].
- *Holding a public position and feeling safe in the neighborhood.* High levels of social capital in general seem to increase support for PAs [21]; therefore, it is expected that these characteristics would increase the acceptance of the PA.
- *Believing that money; holding large coffee-growing areas; and cultivating good-quality of coffee are prestigious.* Social identity and perceptions influence support for PAs [19]. It is expected that "believing that holding large coffee-growing areas is prestigious" would imply that farmers are motivated to cultivate coffee and would need PAs' land resources, which in turn would translate into decreased support for the PA. For the other two variables, the direction of the effect is unclear.

(f) Risk aversion and religion

- *Degree of farmer's risk aversion.* Evidence of the effect of risk aversion of farmers in conservation support is inconsistent [49]; as such the effect of this variable remains unclear.
- *Being Catholic.* Religion influences attitudes towards PAs [20], although the direction of the effect remains unclear.

(g) Coca-related characteristics

- *Being a coca grower and the size of the area under coca cultivation.* These characteristics would decrease farmers' dependency on land resources compared with other alternative cash crops [23–25]; therefore it is expected that support for the PA would increase.
- *Believing that: coca cultivation has increased in the neighborhood in the last five years; farmers cultivate coca because it is easier than coffee cultivation; farmers cultivate coca because they do not have more primary forest for cultivating coffee; and coca growers cultivate coca only for traditional uses.* Social identity and perceptions influence support for PAs [19], although the direction of these effects are unclear.

(h) Location

- *Time to road in minutes.* Roads favor deforestation [50]; therefore it is expected that support for PAs would decrease for farmers located close to roads (who may have incentives to deforest).
- *Agricultural plot location in the low, medium or high part of the Tambopata valley.* The location of the community has an impact on the acceptance of a PA [51]; it is expected that farmers located in the low part of the valley, which is close to the PA, would show less support for it than the other farmers.
- *Being a member of the coffee cooperatives.* In the research area, a particular cooperative membership is associated with both location and institutional/social capital factors; as such, the direction of the effect of this variable is unclear.

Following Breen [52], in the probit model, the decision for stating a positive opinion about BSNP (*y*), given a set of explanatory variables (*x* = socio-economic characteristics; agricultural plot characteristics; farmer's finance and income variables; environment and deforestation variables; identity, social capital, and perception variables; risk aversion and religion; coca-related characteristics; and location) is:

$$\text{Prob } (y_i > 0 | x_i) \tag{1}$$

$$y_i = x_i' \beta + u_i \tag{2}$$

Equations (1) and (2) imply that $x_i'\beta + u_i > 0$ or $u_i > -x_i'\beta$. The distribution of the error, u_i, is normal and symmetric, therefore

$$\text{Prob } (u_i \leq x_i'\beta) \tag{3}$$

The probability that a normally distributed random variable with a zero mean and variance of σ^2 is less or equal to $x_i'\beta$ is denoted by

$$\Phi_i = \Phi\left[\frac{x_i'\beta}{\sigma}\right] = \int_{-\infty}^{\frac{x_i'\beta}{\sigma}} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{t^2}{2}\right) dt \tag{4}$$

which is called the standard normal distribution function. It provides the proportion of the area under the standard normal distribution curve that lies between $-\infty$ and $x_i'\beta/\sigma$. This probability calculation is the probit model, where σ is assumed to be equal to 1.

3. Results and Discussion

The description of the dependent and explanatory variables included in the econometric models is presented in Table 1. As indicated before, the questionnaires from 2006–2007 and 2008 were different. In the latter year, more extensive data were collected; as such there are more variables in the column for 2008.

Table 1. Descriptive statistics of farmers' characteristics (2006–2008).

Variables	Mean				
				Pooled	
	2006	2007	2008	Negative opinion	Positive opinion
Dependent variable					
Positive opinion about BSNP (if farmer has a positive opinion about BSNP = 1; 0 otherwise) *	0.26	0.33	0.35	0.00	1.00
Socio-economic characteristics					
Age (farmer's age in years)	40.72 (12.12)	41.04 (11.23)	41.55 (11.97)	41.80 (12.12)	40.29 (11.29)
Male (if male = 1; 0 otherwise) *	0.90	0.86	0.94	0.91	0.93
Aymara (if the farmer has Aymara ethnicity = 1; 0 otherwise)	0.74	0.80	0.82	0.81	0.78
Education (years of formal education) **	8.64 (2.96)	8.66 (2.93)	8.51 (3.17)	8.35 (3.16)	9.00 (2.90)
Experience (years of experience as farmer)	-	-	16.38 (10.43)	16.18 (10.52)	16.65 (10.31)
Number of children (in the household)	2.76 (1.92)	2.86 (1.94)	2.83 (1.95)	2.86 (1.93)	2.73 (1.96)
Farmer's agricultural plot characteristics					
Total area (in hectares) *	10.14 (9.72)	8.85 (7.89)	6.55 (4.61)	7.59 (6.58)	7.74 (6.92)
Coffee area (in hectares) *	1.98 (1.08)	2.56 (1.46)	2.03 (1.09)	2.10 (1.21)	2.17 (1.13)
Primary forest area (in hectares) *	5.94 (8.76)	5.20 (7.13)	2.96 (3.89)	3.88 (5.78)	4.01 (6.15)
Steep slope (if the farmer's agricultural plot has steep slope = 1; 0 otherwise) [b] *	0.86	0.47	0.25	0.42	0.36
Slope (type of slope in the agricultural plot: 1 = flat slope, 2 = moderate slope, 3 = steep slope)	-	-	2.21 (0.53)	2.18 (0.57)	2.24 (0.48)

Table 1. *Cont.*

Variables	Mean			Pooled	
	2006	2007	2008	Negative opinion	Positive opinion
Farmer's agricultural plot characteristics					
Soil quality (farmer's perception of soil quality, from 1 = very low soil quality to 5 = very high soil quality)	-	-	3.42 (0.64)	3.38 (0.63)	3.47 (0.65)
Finance and income variables					
Coffee as main economic activity (if farmer's main economic activity is coffee production = 1; 0 otherwise)	-	-	0.96	0.97	0.95
Relative profit of coffee *versus* coca (ratio of farmer profit of coffee divided by the profit of coca) **	-	-	0.52 (0.39)	0.48 (0.34)	0.57 (0.43)
Experience shocks due to coffee pests (if farmer experienced economic shock due to coffee pest last year = 1; 0 otherwise)	-	-	0.46	0.48	0.44
Other economic activities (if farmer performs other non-agricultural activities; 0 otherwise)	0.50	0.49	0.54	0.50	0.56
Debt (if farmer has debt = 1; 0 otherwise)	-	-	0.09	0.07	0.10
Environmental and deforestation related variables					
Organic coffee certification (if farmer participates in the organic coffee program = 1; 0 otherwise) **	0.66	0.56	0.56	0.55	0.64
Environmental education meetings (number of times the farmer attended environmental meetings last year)	-	-	1.11 (1.38)	1.04 (1.28)	1.19 (1.48)
Expect to continue cultivating coffee (if farmer expects to continue cultivating coffee as main economic activity in the future = 1; 0 otherwise)	-	-	0.74	0.71	0.77
Planning to increase coffee areas in primary forest (if farmer is planning to increase coffee areas in primary forest next year = 1; 0 otherwise)	0.55	0.64	0.48	0.52	0.52
Born in the area (if farmer was born in Amazon rainforest = 1; 0 otherwise) **	0.30	0.27	0.26	0.24	0.32
Pride in being a coffee farmer (farmer's pride of being coffee farmer; from 1 = not proud of being coffee farmer to 3 = proud of being a coffee farmer) **	-	-	2.55 (0.68)	2.43 (0.72)	2.72 (0.59)
Public position (if the farmer has had a public position in the community in the past = 1; 0 otherwise) *	0.59	0.88	0.77	0.75	0.77
Trust in authorities (farmer's trust in authorities; from 1 = low trust to 3 = high trust in authorities)	-	-	2.55 (0.68)	2.43 (0.72)	2.72 (0.59)

Table 1. *Cont.*

Variables	Mean			Pooled	
	2006	2007	2008	Negative opinion	Positive opinion
Identity, social capital and perception variables					
Security in the neighborhood (farmer's sense of security inside the neighborhood; from 1 = low sense of security to 3 = high sense of security in the neighborhood)	-	-	2.75 (0.58)	2.73 (0.60)	2.78 (0.55)
Prestige of money (farmer's perception of the prestige of money; from 1 = low prestige to 3 = high prestige)	-	-	2.28 (0.72)	2.25 (0.71)	2.33 (0.74)
Prestige of good quality coffee (farmer's perception of the prestige of obtaining good quality coffee; from 1 = low prestige to 3 = high prestige) **	-	-	2.77 (0.51)	2.72 (0.55)	2.84 (0.45)
Prestige of large areas of coffee (farmer's perception of the prestige of having large areas of coffee; from 1 = low prestige to 3 = high prestige)	-	-	2.40 (0.73)	2.38 (0.76)	2.43 (0.69)
Risk aversion and religion					
Risk aversion [a] (from 1 = low risk aversion to 3 = high risk aversion)	-	-	2.05 (0.67)	2.02 (0.67)	2.08 (0.68)
Catholic (if the farmer is Catholic = 1; 0 otherwise)	-	-	0.57	0.54	0.62
Coca related characteristics					
Coca cultivation (if farmer cultivates coca = 1; 0 otherwise) *, **	0.10	0.31	0.65	0.46	0.54
Number of coca bushes (farmer's number of coca bushes in his/her agricultural plot) **	-	-	2328.00 (6332.77)	2124.05 (7041.10)	2595.98 (5248.71)
Increment of coca cultivation during the last 5 years (farmer's perception about the changes of coca cultivation during the last 5 years; from 1 = if farmer believes that the number of coca bushes have decreased to 3 = if the number of coca bushes have increased in the research area)	-	-	2.36 (0.66)	2.29 (0.66)	2.46 (0.64)
Coca is more profitable than coffee (if farmer believes that other farmers in the community cultivate coca because it is more profitable than coffee = 1; 0 otherwise)	-	-	0.59	0.62	0.55
Coca is easier than coffee cultivation (if farmer believes that other farmers cultivate coca because it is easier than cultivate coffee = 1; 0 otherwise)	-	-	0.45	0.43	0.47
Coca growing due to shortage of primary forest for coffee (if farmer believes that coca growers do so because they do not have more primary forest for cultivating coffee = 1; 0 otherwise)	-	-	0.23	0.25	0.20
Coca only for traditional purposes (if farmer believes that farmers cultivate coca only for traditional uses = 1; 0 otherwise)	-	-	0.04	0.05	0.04

Table 1. *Cont.*

Variables	Mean			Pooled	
	2006	2007	2008	Negative opinion	Positive opinion
Coca related characteristics					
Location					
Time to road (in walking minutes)	88.06 (76.79)	71.78 (73.13)	81.37 (62.74)	80.53 (67.81)	81.59 (67.51)
Location low (if farmer's plot is located in the low part of the valley = 1; 0 otherwise) *	0.36	0.39	0.20	0.26	0.28
Location medium (if farmer's plot is located in the middle part of the valley = 1; 0 otherwise) **	0.41	0.44	0.39	0.43	0.35
Location high (if farmer's plot is located in the high part of the valley = 1; 0 otherwise) *	0.23	0.17	0.41	0.31	0.37
Cooperative 1 (if farmer is member of cooperative 1 = 1; 0 otherwise) *, **	0.11	0.10	0.21	0.15	0.20
Cooperative 2 (if farmer is member of cooperative 2 = 1; 0 otherwise)	0.34	0.35	0.28	0.31	0.30
Cooperative 3 (if farmer is member of cooperative 3 = 1; 0 otherwise)	0.30	0.26	0.28	0.29	0.27
Cooperative 4 (if farmer is member of cooperative 4 = 1; 0 otherwise) *	0.25	0.30	0.23	0.25	0.23
Number of observations [c]	128	125	431	459	225

Standard deviation in parentheses. * Multivariate test of equality of means (for years 2006, 2007 and 2008) is statistically significant at 0.05; ** t-test of equality of means between farmers who had positive opinion and farmers who had negative opinion about the PA is statistically significant at 0.05. [a] Risk aversion test followed Binswanger [53]; [b] The slopes were reported by farmers in a Likert scale from 1 = flat to 3 = steep slope in 2007 and 2008. As such, for these two years the reported results were transformed and correspond to the percentage of farmers who responded 3 in the Likert scale; [c] The number of observations for variables that were measured in 2008-only was 280 for farmers who had a negative opinion, and 151 for farmers who had a positive opinion about the PA.

About 33 percent of all the farmers who participated in the different surveys (2006–2008) had a positive opinion about the PA. There were no statistically significantly differences among the farmers who stated a positive opinion and the farmers who stated a negative opinion about the PA in most of the socio-economic characteristics (age, gender, ethnicity, years of experience as farmers, and number of children). On average farmers were about 41 years old, mostly male (92 percent), Aymara (80 percent), with 16 years of experience as farmers, and had 3 children. The only exception was education: farmers who stated a positive opinion showed a slightly higher number of years of education than farmers who stated a negative opinion about the PA (9.0 and 8.4, respectively).

There were also not statistically significant differences in agricultural plot characteristics and the values of the finance and income variables among the farmers who stated a positive opinion and negative opinion about the PA. On average, farmers indicated they had about 7.6 hectares of total agricultural

plot areas; 2.1 hectares of coffee-growing areas; about 4 hectares of primary forest; 40 percent indicated their terrains had steep slopes; and moderate soil quality (3.4 in a scale from 1 to 5). Most of the farmers indicated that coffee production was their main economic activity (95 percent); had experienced shocks due to coffee pests the previous year (46 percent); performed non-agricultural activities (52 percent); and had debts (9 percent). The only exception was the coffee to coca profit ratio which was higher for farmers who had a positive opinion than for farmers who had a negative opinion about the PA (0.6 and 0.5, respectively).

In relation to the environmental and deforestation related variables, on average farmers attended one environmental meeting per year; expected to continue cultivating coffee in the future (74 percent); had planned to increase coffee cultivation in primary forest areas (52 percent). There were only differences among farmers who had a positive opinion and farmers who had a negative opinion about the PA in the percentage of farmers participating in the organic coffee certification program (64 and 56 percent, respectively).

Also on average, farmers had held a public position inside the community (76 percent); had a mid-level of trust in the authorities (2.6, in a scale from 1 to 3); experienced a relatively high sense of security in the neighborhood (2.8, in a scale from 1 to 3); and had moderate beliefs that having money and holding large areas of coffee are prestigious (2.3 and 2.4, respectively, in a scale from 1 to 3). Differences between farmers who stated a positive opinion and farmers who stated a negative opinion about the PA were observed in the following variables: being born in the research area (32 and 24 percent, respectively); pride in being a coffee farmer (2.7 and 2.4 in a scale from 1 to 3, respectively); and believing that producing good quality coffee is prestigious (2.8 and 2.7 in a scale from 1 to 3, respectively).

In relation to risk aversion, religion, coca related characteristics, and location; on average, farmers had a moderate level of risk aversion (2, in a scale from 1 to 3); were Catholic (57 percent); believed that coca cultivation had remained the same in their neighborhood in the previous five years (2.4, in a scale from 1 to 3); and believed that farmers cultivate coca because it is more profitable than coffee (59 percent). Relatively few farmers believed that: other farmers cultivate coca because it is easier than coffee (45 percent); farmers grow coca because they do not have primary forest to cultivate coffee (23 percent); and farmers cultivate coca only for traditional uses (e.g., coca chewing, tea drinking, and similar; 5 percent). About 54 percent of farmers who stated a positive opinion about the PA cultivated coca (*ca.* 2600 coca bushes), while 46 percent of farmers who stated a negative opinion cultivated coca (about 2100 coca bushes). In addition, a lower number of farmers who stated a positive opinion were located in the middle part of the valley (35 *versus* 43 percent) and a higher number were members of cooperative one (20 *versus* 15 percent) in comparison with farmers who stated a negative opinion about the PA.

Finally, important to note is that there were also statistically significant differences in agricultural plot characteristics among the farmers, depending on the year in which the survey was conducted. In 2006, farmers indicated they had larger agricultural plot areas (10 hectares *versus* about 7 hectares in 2008); smaller coffee-growing areas (2 hectares *versus* 2.6 hectares in 2007); larger primary forest areas (6 hectares *versus* 3 hectares in 2008); and steeper slope terrains (86 percent *versus* 25 percent in 2008) than the farmers surveyed in the subsequent years. These results may suggest a rapid decrease in land resources among the participating farmers. However, farmers could have also become sensitive to

truthful indication of the full extent of their agricultural plots and may have started to understate their plots post-2006. Farmers in the research area lack property rights [27], and as such may become anxious when outsiders ask them land availability questions. Unfortunately, in the case of slope, the results were reported using different scales in different years which seem to have influenced the recorded values. Also fewer farmers indicated they cultivated coca in 2006 (10 percent) compared with the farmers who participated in the later surveys (2007 and 2008; 31 and 65 percent, respectively). The differences in coca cultivation seem to be related to the increase of coca cultivation observed in 2006, 2007, and 2008 in the research area (49, 129, and 10 percent per year, respectively; UNODC calculated by [29]); however, the large increase observed during the last year may also be related to the inclusion of 'best practices' for reducing social desirability bias in the 2008 questionnaire. The aggregate descriptive statistics for years (2006–2008) between coca and non-coca growers are included in the Appendix.

The results of the probit model for the determinants of a positive opinion about BSNP for the pooled sample (2006–2008) and for the 2008 sample only (which includes a large number of explanatory variables) are presented in Table 2. The study uses panel data. However, the samples in each panel are convenience samples obtained using two different questionnaires (2006–2007 and 2008's questionnaires). Therefore, no attempts were made to discuss temporal trends from the models, as differences between panels could simply be artefacts due to different samples and questionnaires. For 2008 only, Table 2 shows the results for various econometric models: a model using all variables; a restricted model with selected variables, for which highly non-significant variables were excluded from the model ($p > 0.5$); and a restricted model with selected variables with interaction effects. The latter model was preferred based on the lower Akaike Information Criterion (AIC). AIC is a measure of the relative quality of a model and provides a means for model selection [54]. Therefore, the discussion focuses on the model for the pooled data and the model with interaction effects for 2008 only, while the models without interactions are included as references.

The results correspond to the marginal effects evaluated at the sample mean. For the continuous variables, the marginal effect is the marginal increment in the likelihood of a positive opinion about BSNP associated with a marginal increment in the corresponding explanatory variable. For the dummy variables, the marginal effect is the increment in the likelihood of a positive opinion about BSNP associated with a discrete change of the explanatory variable (e.g., male *versus* female).

In general, the results suggest that the higher the farmer's level of formal education and experience, the higher the likelihood of acceptance of the PA. These results correspond with previous research findings such as those from Gorner *et al.* [43] and Karanth and Nepal [20]. Also, as expected, farmers who attend environmental meetings are more likely to state a positive opinion about the PA; similar results were found by Allendorf *et al.* [48]. In addition, farmers with a high level of attachment to the landscape (e.g., who were born in the area) were more likely to support the PA, as suggested by Gorner *et al.* [43].

Table 2. Determinants of positive opinion about PNBS.

	Pooled [a] (2006–2008)	Only 2008 (With additional variables from a different questionnaire)		
		All variables	Selected variables	Selected variables with interactions [b]
Socio-economic characteristics				
Age	−0.0006	−0.0069	−0.0070	−0.0065
	(0.0010)	(0.0043)	(0.0041)	(0.0041)
Male	0.0485	0.0234	-	-
	(0.0768)	(0.1192)		
Aymara	−0.0370	0.0283	0.0330	0.0274
	(0.0501)	(0.0706)	(0.0666)	(0.0666)
Education	0.0136 ***	0.0107	0.0109	0.0117
	(0.0013)	(0.0105)	(0.0096)	(0.0095)
Experience	-	0.0074 *	0.0076 **	0.0067 *
		(0.0040)	(0.0038)	(0.0038)
Number of children	0.0039	0.0256	0.0269 *	0.0282 *
	(0.0097)	(0.0177)	(0.0168)	(0.0168)
Agricultural plot characteristics				
Total area	−0.0017	−0.0097	−0.0111	−0.0114
	(0.0067)	(0.0145)	(0.0139)	(0.0139)
Coffee area	0.0095 **	0.0263	0.0280	0.0281
	(0.0047)	(0.0298)	(0.0287)	(0.0288)
Primary forest area	0.0026	0.0106	0.0099	0.0101
	(0.0073)	(0.0167)	(0.0154)	(0.0153)
Steep slope	−0.0051	-	-	-
	(0.0167)			
Slope	-	0.0498	0.0331	0.0365
		(0.0497)	(0.0471)	(0.0469)
Soil quality	-	0.0378	0.0368	0.0361
		(0.0422)	(0.0403)	(0.0401)
Finance and income variables				
Coffee as main economic activity	-	−0.0451	-	-
		(0.1561)		
Relative profit of coffee *versus* coca	-	0.0927	0.0975 *	0.0981
		(0.0678)	(0.0647)	(0.0642)
Experience of shocks due to coffee pests	-	0.0159	-	-
		(0.0537)		
Other economic activities	0.0349	0.0718	0.0813 *	0.0729
	(0.0299)	(0.0518)	(0.0485)	(0.0485)
Debt	-	0.0321	-	-
		(0.0940)		
Organic coffee certification	0.0724	−0.0587	−0.0427	−0.0367
	(0.0498)	(0.0559)	(0.0542)	(0.0542)
Environmental education meetings	-	0.0422 **	0.0426 **	0.0423 **
		(0.0203)	(0.0192)	(0.0191)

Table 2. *Cont.*

	Pooled [a] (2006–2008)	Only 2008 (With additional variables from a different questionnaire)		
		All variables	Selected variables	Selected variables with interactions [b]
Environmental- and deforestation-related variables				
Expect to continue cultivating coffee	-	−0.0162 (0.0619)	-	-
Planning to increase coffee areas in primary forest	−0.0118 (0.0500)	−0.0135 (0.0542)	-	-
Identity, social capital and perception variables				
Born in the area	0.0586 (0.0496)	0.0935 (0.0668)	0.1164 * (0.0623)	0.1166 * (0.0617)
Pride in being a coffee farmer	-	0.0902 ** (0.0392)	0.1035 *** (0.0375)	0.1031 *** (0.0372)
Public position	0.0135 (0.0465)	−0.0718 (0.0736)	−0.0666 (0.0671)	−0.0765 (0.0671)
Trust in authorities	-	−0.0214 (0.0341)	−0.0269 (0.0325)	−0.0224 (0.0324)
Security in the neighborhood	-	0.0286 (0.0498)	0.0181 (0.0458)	0.0134 (0.0454)
Prestige of money	-	0.0535 (0.0399)	0.0374 (0.0381)	0.0319 (0.0380)
Prestige of good-quality coffee	-	0.0820 * (0.0517)	0.0898 * (0.0499)	0.0950 * (0.0498)
Prestige of large areas of coffee	-	−0.0292 (0.0407)	−0.0241 (0.0389)	−0.0243 (0.0387)
Risk aversion and religion				
Risk aversion	-	0.0282 (0.0382)	0.0279 (0.0367)	0.0293 (0.0365)
Catholic	-	0.0456 (0.0539)	0.0259 (0.0501)	0.0104 (0.0504)
Coca-related characteristics				
Coca cultivation	0.0488 ** (0.0206)	-	-	-
Number of coca bushes	-	0.3158E-05 (0.4260E-05)	0.2215E-05 (0.3835E-05)	0.2845E-04 ** (0.1367E-04)
Increment of coca cultivation during the last 5 years	-	0.0870 ** (0.0410)	0.0936 ** (0.0380)	0.1214 *** (0.0401)
Number of coca bushes X Increment of coca cultivation during the last 5 years	-	-	-	−0.1494E-04 ** (0.7489E-05)
Coca is more profitable than coffee	-	−0.1212 ** (0.0596)	−0.0937 * (0.0546)	−0.0934 * (0.0543)
Coca is easier than coffee cultivation	-	0.0285 (0.0572)	0.0401 (0.0512)	0.0427 (0.0508)

Table 2. *Cont.*

	Pooled [a] (2006–2008)	Only 2008 (With additional variables from a different questionnaire)		
		All variables	Selected variables	Selected variables with interactions [b]
Coca-related characteristics				
Coca growing due to shortage of primary forest for coffee	-	−0.0671 (0.0682)	−0.0541 (0.0629)	−0.0528 (0.0626)
Coca only for traditional purposes	-	−0.0112 (0.1373)	-	-
Location				
Time to road	0.0001 (0.0003)	0.0003 (0.0004)	0.0004 (0.0004)	0.0004 (0.0004)
Location low	0.0027 (0.0578)	-	-	-
Location medium	−0.0709 ** (0.0351)	−0.0081 (0.0759)	-	-
Location high	-	0.0663 (0.0806)	0.0510 (0.0530)	0.0465 (0.0528)
Cooperative 1	0.0711 * (0.0429)	0.0454 (0.0797)	0.0565 (0.0634)	0.0641 (0.0630)
Cooperative 2	0.0248 (0.0226)	0.0052 (0.0716)	-	-
Cooperative 3	0.0084 (0.0294)	−0.0114 (0.0718)	-	-
Others				
Year 2006	−0.0837 *** (0.0228)	-	-	-
Year 2007	0.0063 (0.0223)	-	-	-
AIC	1.2910	1.3830	1.309	1.304

Number of observations: pooled = 648; year 2008-only = 431. All models had McFadden Pseudo R-squares between 0.10 and 0.20. Variable statistically significant at * 0.1, ** 0.05, *** 0.01; [a] Model with covariance matrix correction for cluster errors by year. Time series models (e.g., fixed or random effects models) are not applicable in this case given that the surveys were anonymous and there is no information whether any particular farmer participated in one or more of the surveys; [b] The results of partial effects are reported in the case of the interaction effect variable (increment of coca cultivation × number of coca bushes), given that the interaction is non-linear and this type of calculation is needed for correction [55]. Also as indicated by Jaccard [56], high correlation (> 0.8) between two interacted factors may cause spurious results. In this case, the two interacted factors had a correlation of 0.20. Standard errors in parentheses.

Other identity variables, such as pride in being a coffee farmer and believing that cultivating good-quality coffee is prestigious, were also significant, although the direction of the effect was contrary to expectations. The results suggest that the higher the value of these variables, the greater the likelihood

that the farmers state a positive opinion about the PA. This may indicate that farmers who seek to obtain good profits based on improving the quality of their coffee are more prone to accept the PA in contrast to farmers who mostly concentrate on maximizing coffee production. In addition, farmers who do not believe that cultivating coca is more profitable than coffee are more likely to support the PA (based on their opinion about the beliefs of their neighbors' behavior, which are associated with their own beliefs and behavior [57]).

The results support the hypothesis that farmers with large coffee-growing areas would be more likely to support the PA. Conversely, the results do not support the hypothesis that high labor availability would decrease acceptance of the PA. It is possible that farmers are using their additional labor to improve the quality of their coffee production or coca cultivation and do not need to increase their cash crop areas (which would decrease support for the PA). Moreover, none of the farmers' finance and income variables in the models selected for discussion in this paper were significant, which suggests that overall farmers' direct economic needs are not related with acceptance of the PA.

Farmers located in the high part of the Tambopata valley (the omitted location variable to avoid perfect collinearity) compared with those in the middle part of the valley are more likely to state a positive opinion about the PA. Interestingly, there were no statistically significant differences in relation to the acceptability of the PA between farmers located in the high and low parts of the valley. In this sense, the farmers in the middle part of the valley may be more dependent on additional land resources. First immigrants were located in the high part of the valley and may have accumulated capital to start their own business over time (e.g., local shops). Also, better quality coffee is usually obtained in high-altitude regions; therefore farmers in high-altitude areas may currently focus on producing premium quality coffee with differential prices in the market. Conversely, farmers located in the low part of the valley may have recently moved there and as a consequence may not yet have land availability problems or soil quality associated problems.

Other factors that significantly affect the PA's acceptance are being a member of cooperative one (in comparison to cooperative four) and the year of survey conduction (respondents of the 2006 survey clearly indicated a lower level of acceptance of the PA compared with the 2008 respondents). Each cooperative has its own rules and regulations as well as different types of capacity meetings, some of which seem to have influenced farmers' support for the PA. Also, following years of low coffee prices, 2005 saw a sharp increase in coffee prices worldwide [58], and farmers would have been willing to increase their coffee-growing areas immediately thereafter. Nevertheless, since 2006 the cooperative authorities have been increasingly using the image of BSNP for coffee commercialization purposes (e.g., Cafe Bahuaja) which may have boosted acceptance of the PA in the subsequent years.

Important to note is that the decision to cultivate coca, cultivating a large number of coca bushes, and believing that coca cultivation has increased during the last five years increases acceptance of the PA. As indicated before, coca is a highly profitable cash crop, which seems to reduce the dependency on PA's resources. Nevertheless, the positive influence of the high of number of coca bushes on the acceptability of the PA decreases when farmers believe that their neighbors are increasing their coca cultivation as well (interaction effect). In 2003, the Supreme Decree 044-2003-PCM ordered a study to determine the actual demand for coca in Peru. The results from a 2004 national survey indicated that traditional use demand would account for 8.0 percent of total production, and 0.2 percent were attributable to industrial uses (e.g., coca tea bags). The remaining national coca production (91.8 percent) supplied

cocaine traffic. This national survey currently constitutes, although with limitations, the only reliable measurement of coca demand for traditional uses [59]. Therefore, almost all the coca supplies narcotics traffic. This also holds for the research area, which later coca cultivation increases seem to be practically related only to narcotic traffic supply. There has not been increases in the amount of coca derived to traditional uses in the area, which is associated with the bitterness of the coca variety produced there [14]. As coca cultivation for supplying narcotics traffic is an illegal activity, farmers may be afraid that very large coca areas would draw the attention of authorities, who could intervene in the area (e.g., conduct coca eradication activities). In such a case, the BSNP would restrict the access to remote land resources, which in turn decreases the support for this PA.

4. Conclusions

Principals in the global drug war are increasingly under pressure by grassroots organizations to address underlying problems that encourage illicit crop cultivation and to support alternative development in supply countries [60]. However, well-targeted drug-control policies should also mitigate the impacts on biodiverse forests through encouraging acceptance of PAs. As such, rethinking the war on drugs could yield important ecological benefits [61].

In particular, extending PA benefits to less educated residents and households that are highly resource-dependent (e.g., farmers who produce low-quality coffee) is particularly important in order to balance the costs and losses associated with living in the vicinity of protected areas. Outstandingly, the role of cooperatives, which can provide incentives for good-quality coffee production and promote pride in being a coffee farmer, seems to be a decisive factor in the acceptance of BSNP. In general, the results provide a strong argument for providing environmental education to local farmers and sponsoring cooperatives' efforts to improve the producers' coffee quality. In this paper, coffee quality is not necessarily associated with organic coffee certification (variable that was not significant in the models after controlling for other factors such as environmental education), but with specialty coffee with differential prices (e.g., with unique flavor profiles). Specialty coffees give credit to the dedication and hard work that goes into the careful hand selection and processing. Farmers in this area have won several specialty coffee awards [62].

Coca cultivation is blamed as one of the main causes of deforestation in the tropical Andes region; however, deforestation is actually caused by the slash-and-burn techniques used to clear rainforest land to be used for both illicit crops and conventional agriculture [60]. In fact, the results suggest that coca growers are more likely to support the PA than non-coca growers. The high profits obtained from this crop may make farmers less dependent on the PA's land resources. Nevertheless, coca growers are expected to change their positive attitude over time, as coca cultivation increases and they may become afraid of future governmental eradication activities. Hardly any other crop can compete with the economic benefits obtained from illicit crop production, but the fact that producers of high-quality coffee also support the PA offers encouragement that alternative development activities in the region could support conservation efforts. In this sense, it is crucial to "sell" the direct benefits of the PA to the local population [63]. For example, cooperatives have already been doing this through the introduction of local coffee brands (e.g., "Bahuaja café").

The study has limitations that are worth mentioning. First at all, there may be a number of alternative explanations of why coca growers hold a more favorable opinion about BSNP, some of which may have little to do (at least directly) with the amount of land used. For example, it could simply be that coca growers favor PAs because PAs so far have been, at least for the farmers surveyed, safe areas to produce coca. Additional data would need to be collected to test this kind of hypothesis. Secondly, it is important to clarify that the analysis overall does not provide support for coca cultivation as conservation measure. In particular, it does not consider the full-range of environmental consequences associated with coca growing, such as contamination with toxic chemicals from potential *in-situ* cocaine production.

Finally, as indicated by Fjeldsa *et al.* [4], some indigenous communities are well organized and may oppose narcotic traffic interests, as demonstrated by the Pichis' revolt in Peru in 1990. Back then, many indigenous communities were strongly against coca for narcotic traffic, which they associated with colonists and the terrorist group *Sendero Luminoso*. The research area has only recently started to cultivate coca in large quantities and has not yet fully experienced the violence associated with supplying coca for narcotic traffic, as current and potential civil and political conflict is easily fueled by the illegal financial opportunities that coca provides [64]. As local farmers could focus on good quality coffee production, they do have an alternative crop, which can partially replace the income provided by illicit crop cultivation. Many local farmers are starting to oppose illicit coca cultivation, but they may need governmental or external support to avoid becoming permanently trapped in narcotic traffic activities.

Acknowledgments

Conflicts of Interest

The author declares no conflict of interest.

Appendix

Table A1. Descriptive statistics of coca and non-coca growers.

Variables	Pooled (2006–2008)	
	Non-coca growers	Coca growers
Dependent variable		
Positive opinion about BSNP (if farmer has a positive opinion about BSNP = 1; 0 otherwise)	0.29	0.37
Socio-economic characteristics		
Age (farmer's age in years)	40.73 (11.76)	41.91 (11.97)
Male (if male = 1; 0 otherwise)	0.92	0.92
Aymara (if the farmer has Aymara ethnicity = 1; 0 otherwise)	0.79	0.82

Table A1. *Cont.*

Variables	Pooled (2006–2008)	
	Non-coca growers	Coca growers
Farmer's agricultural plot characteristics		
Education (years of formal education)	8.88	8.22
	(2.94)	(3.21)
Experience (years of experience as farmer) *	15.30	16.98
	(10.51)	(10.34)
Number of children (in the household)	2.75	2.89
	(1.95)	(1.93)
Total area (in hectares)	8.00	7.26
	(7.62)	(5.51)
Coffee area (in hectares)	2.15	2.09
	(1.24)	(1.11)
Primary forest area (in hectares)	4.32	3.50
	(6.73)	(4.85)
Steep slope (if the farmer's agricultural plot has steep slope = 1; 0 otherwise)	0.52	0.28
Slope (type of slope in the agricultural plot:1 = flat slope, 2 = moderate slope, 3 = steep slope) *	2.27	2.17
	(0.56)	(0.51)
Soil quality (farmer's perception of soil quality, from 1 = very low soil quality to 5 = very high soil quality) *	3.48	3.39
	(0.64)	(0.64)
Finance and income variables		
Coffee as main economic activity (if farmer's main economic activity is coffee production = 1; 0 otherwise) *	0.99	0.95
Relative profit of coffee *versus* coca (ratio of farmer profit of coffee divided by the profit of coca) *	0.47	0.55
	(0.34)	(0.41)
Experience shocks due to coffee pests (if farmer experienced economic shock due to coffee pest last year = 1; 0 otherwise) *	0.50	0.44
Other economic activities (if farmer performs other non-agricultural activities; 0 otherwise)	0.50	0.54
Debt (if farmer has debt = 1; 0 otherwise) *	0.05	0.11
Environmental and deforestation related variables		
Organic coffee certification (if farmer participates in the organic coffee program = 1; 0 otherwise)	0.57	0.59
Environmental education meetings (number of times the farmer attended environmental meetings last year) *	0.94	1.20
	(1.29)	(1.41)
Expect to continue cultivating coffee (if farmer expects to continue cultivating coffee as main economic activity in the future = 1; 0 otherwise) *	0.72	0.75
Planning to increase coffee areas in primary forest (if farmer is planning to increase coffee areas in primary forest next year = 1; 0 otherwise)	0.52	0.52

Table A1. *Cont.*

Variables	Pooled (2006–2008)	
	Non-coca growers	**Coca growers**
Identity, social capital and perception variables		
Born in the area (if farmer was born in Amazon rainforest = 1; 0 otherwise)	0.27	0.26
Pride in being a coffee farmer (farmer's pride of being coffee farmer; from 1 = not proud of being coffee farmer to 3 = proud of being a coffee farmer) *	2.50 (0.71)	2.59 (0.66)
Public position (if the farmer has had a public position in the community in the past = 1; 0 otherwise)	0.72	0.80
Trust in authorities (farmer's trust in authorities; from 1 = low trust to 3 = high trust in authorities) *	2.39 (0.80)	2.48 (0.71)
Security in the neighborhood (farmer's sense of security inside the neighborhood; from 1 = low sense of security to 3 = high sense of security in the neighborhood) *	2.74 (0.59)	2.76 (0.57)
Prestige of money (farmer's perception of the prestige of money; from 1 = low prestige to 3 = high prestige) *	2.36 (0.75)	2.24 (0.70)
Prestige of good quality coffee (farmer's perception of the prestige of obtaining good quality coffee; from 1 = low prestige to 3 = high prestige) *	2.73 (0.56)	2.80 (0.48)
Prestige of large areas of coffee (farmer's perception of the prestige of having large areas of coffee; from 1 = low prestige to 3 = high prestige) *	2.38 (0.75)	2.41 (0.72)
Risk aversion and religion		
Risk aversion (from 1 = low risk aversion to 3 = high risk aversion) *	1.96 (0.64)	2.10 (0.69)
Catholic (if the farmer is Catholic = 1; 0 otherwise) *	0.59	0.56
Coca related characteristics		
Coca cultivation (if farmer cultivates coca = 1; 0 otherwise)	0.00	1.00
Number of coca bushes (farmer's number of coca bushes in his/her agricultural plot) *	0.00 (0.00)	3617.17 (7592.69)
Increment of coca cultivation during the last 5 years (farmer's perception about the changes of coca cultivation during the last 5 years; from 1 = if farmer believes that the number of coca bushes have decreased to 3 = if the number of coca bushes have increased in the research area) *	2.39 (0.61)	2.35 (0.68)
Coca is more profitable than coffee (if farmer believes that other farmers in the community cultivate coca because it is more profitable than coffee = 1; 0 otherwise) *	0.59	0.59

Table A1. *Cont*.

Variables	Pooled (2006–2008)	
	Non-coca growers	**Coca growers**
Coca related characteristics		
Coca is easier than coffee cultivation (if farmer believes that other farmers cultivate coca because it is easier than cultivate coffee = 1; 0 otherwise) *	0.40	0.47
Coca growing due to shortage of primary forest for coffee (if farmer believes that coca growers do so because they do not have more primary forest for cultivating coffee = 1; 0 otherwise) *	0.22	0.23
Coca only for traditional purposes (if farmer believes that farmers cultivate coca only for traditional uses = 1; 0 otherwise) *	0.04	0.05
Location		
Time to road (in walking minutes)	81.39 (72.05)	80.33 (62.82)
Location low (if farmer's plot is located in the low part of the valley = 1; 0 otherwise)	0.29	0.24
Location medium (if farmer's plot is located in the middle part of the valley = 1; 0 otherwise)	0.44	0.36
Location high (if farmer's plot is located in the high part of the valley = 1; 0 otherwise)	0.27	0.40
Cooperative 1 (if farmer is member of cooperative 1 = 1; 0 otherwise)	0.14	0.20
Cooperative 2 (if farmer is member of cooperative 2 = 1; 0 otherwise)	0.31	0.29
Cooperative 3 (if farmer is member of cooperative 3 = 1; 0 otherwise)	0.28	0.28
Cooperative 4 (if farmer is member of cooperative 4 = 1; 0 otherwise)	0.27	0.22
Number of observations	353	331

* Data correspond to year 2008 only.

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