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COLOMBIA LAND FOR PROSPERITY—SOUTHERN META AND THE VICINITY OF CHIRIBIQUETE NATIONAL PARK

Impact & Performance Evaluation Baseline Report

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ACRONYMS

ANT	National Land Agency
CNP	Chiribiquete National Park
COP	Colombian Peso
Cormacarena	*Corporación para el Desarrollo Sostenible de la Macarena* (tr.: Corporation for the Sustainable Development of the Macarena)
Corpoamazonia	*Corporación para el Desarrollo Sostenible del Sur de la Amazonia* (tr.: Corporation for the Sustainable Development of the Southern Amazon)
CSO	Civil society organization
EQ	Evaluation question
ET	Evaluation team
FA	Feasibility assessment
FARC	Revolutionary Armed Forces of Colombia
FGD	Focus group discussion
GFW	Global Forest Watch
GoC	Government of Colombia
IDEAM	Institute of Hydrology, Meteorology, and Environmental Studies
IE	Impact evaluation
JAC	Community Action Board
LfP	Land for Prosperity
MADS	Ministry of Environment and Sustainable Development
MDI	Minimum Detectable Impact
MLO	Municipal Land Office
MODIS	Moderate Resolution Imaging Spectroradiometer
PE	Performance evaluation
PNIS	National Program for the Substitution of Illicit Crops
PNN	National Natural Parks Unit
PPP	Public-private partnerships
RLO	Regional Land Office
SEI	*Soluciones Estratégicas en Información*
SIMCI	*Sistema Integrado de Monitoreo de Cultivos Ilícitos* (tr.: Integrated Illicit Crops Monitoring System)
SMVC	Southern Meta and the Vicinity of Chiribiquete National Park
SRD	Spatial regression discontinuity
SSI	Semi-structured interview
ToC	Theory of change

EXECUTIVE SUMMARY

This report presents the baseline findings of the Land for Prosperity (LfP)—Southern Meta and the Vicinity of Chiribiquete National Park (SMVC) project (2019–2024) evaluation. The Cloudburst Group (Cloudburst) was tasked by the United States Agency for International Development (USAID) to complete the evaluation design, baseline data collection, and baseline analysis. This work builds upon a feasibility study previously conducted by NORC.[1]

In the short term, the LfP SMVC evaluation will provide baseline measures on indicators of interest to USAID. This baseline data will provide LfP with insight to refine its understanding of needs and approaches for programming. While this tasking covers baseline data collection and analysis, the evaluation team (ET) recommends three rounds of data collection over time: baseline, endline at least one year after the completion of project activities, and follow-up five years after the activity end date. At each round, the data will be used to adapt LfP activities and inform government and other donor programs in the Amazon region. Finally, endline and follow-up evaluation results will provide evidence-based policy inputs for USAID and the Government of Colombia (GoC) to attempt similar strategies at a larger scale in deforestation hotspots throughout the Amazon region.

LFP ACTIVITY DESCRIPTION

The LfP activity builds on prior USAID investments in the land sector in Colombia and is intended to improve the conditions of conflict-affected rural households in a sustainable manner. In late 2020, LfP and the GoC agreed to expand LfP's previous geographic footprint to include selected SMVC deforestation hot spots. The goal of implementation in the additional geographies is to explore methods that focus on the integration of three thematic areas—licit, sustainable livelihood promotion, land formalization, and environmental conservation, with a particular focus on changing behaviors associated with deforestation and biodiversity conservation. Within the SMVC, LfP will pursue three separate interventions at four proximate, but discrete locations: the Chiribiquete National Park (CNP), small communities in the vicinity of the CNP's northwest border, and Puerto Rico municipality.

EVALUATION QUESTIONS

Three evaluation questions (EQs) motivate the LfP SMVC evaluation:

- **EQ1:** What changes in (i) land use and behaviors driving deforestation and biodiversity loss and (ii) participation in sustainable, improved livelihoods occurred among households in the formalization pilot communities and Puerto Rico municipality following LfP's interventions? What evidence is there that these changes may have been caused directly or indirectly by LfP, and through what mechanisms?
- **EQ2:** What changes occurred in regional and local land governance, environmental governance, and the reduction of environmental crime and corruption within the CNP and its buffer zones following the provision of high-resolution imagery of the CNP, the updated cadaster within the CNP, capacity-building with relevant GoC authorities, and socialization of the CNP border with local communities? What evidence is there that LfP's activities contributed directly to these changes, and through what mechanisms? To what extent were results bolstered by complementary measures from other programs or the GoC?

[1] The Evaluation Feasibility Assessment (completed by NORC) and Design Report in this evaluation are available online on USAID's LandLinks platform.

- **EQ3:** What impact does the delineation and enforcement of the CNP border have on deforestation, habitat connectivity, and biodiversity conservation within the CNP and in portions of the buffer zones where LfP conducted complementary activities to decrease activities driving deforestation? What are the reasons for observed impacts? Is there evidence of any effect on deforestation or biodiversity conservation elsewhere in SMVC geography to which LfP may have contributed?[2]

EVALUATION DESIGN

To thoroughly address all EQs, this mixed-methods evaluation includes impact evaluation (IE) and performance evaluation (PE) components. The team will implement a comprehensive approach that examines outcomes and impacts across LfP SMVC's theory of change (ToC). This proposed evaluation methodology draws from the feasibility assessment (FA) conducted by NORC at the University of Chicago.

The evaluation includes a causal impact analysis for deforestation measures. The ET will assess human and social outcomes through a PE that utilizes multiple quantitative and qualitative sources through a mixed-methods approach. Because of the largely distinct geography and content between the three LfP SMVC region intervention components, the evaluation explores outcomes separately for the two geographies. It will track deforestation rates near Puerto Rico and the pilot communities, as well as in/near the CNP for evidence that the interventions in those areas affected conservation outcomes.

The evaluation combines data analysis of spatial administrative data, spatial data derived from satellite imagery, household surveys with beneficiary community members, focus group discussions (FGDs), and semi-structured interviews (SSIs) with stakeholders and beneficiaries. Where the design and sample size permit, the evaluation will conduct rigorous quantitative analyses comparing trends in project and comparison communities. The evaluation design incorporates survey modules of female decision-makers to improve understanding of the gendered effects of the programming. Additional analyses may be conducted on other subgroups of interest, such as large land holders, households headed by ethnic minorities (Afro-Colombian and Indigenous) or migrants, and conflict-affected households.

Key outcomes included in the evaluation include:

- Perceived tenure security of household land.
- Frequency and severity of land conflicts.
- Livelihoods and well-being, including participation in licit and sustainable income activities.
- Field investments to improve agricultural productivity and non-productive property/housing investments.
- Understanding of CNP and other protected area border locations and regulations.
- Perceived capacity of the GoC to engage in land-use monitoring and enforcement, including the expectation of penalties for illicit activity in protected areas.
- Satisfaction with and confidence in forest governance and management.
- Satisfaction with and confidence in land administration and governance.
- Unauthorized land clearing.

[2] Because it is a geospatial IE, without triangulating primary data collection, the ability of the CNP border delineation to identify reasons for observed impacts will be limited.

- Total forested area, new incidents of deforestation (forest loss) and forest degradation, and forest recovery and connectivity in previously deforested areas.
- Incidence and extent of fires.

BASELINE SAMPLE

The baseline household survey sample consists of 2,024 household survey responses:

- 513 treatment respondents in Puerto Rico municipality.
- 520 respondents in Puerto Rico comparison areas in Puerto Concordia, San José del Guaviare, and La Macarena municipalities.
- 33 respondents in original treatment polygons[3] in San José del Guaviare and San Vicente del Caguán.
- 958 respondents in comparison/treatment expansion polygons and around polygons in Calamar, Miraflores, San José del Guaviare, San Vicente del Caguán, and Solano municipalities.

Twenty-two percent of households included in the household survey sample are female-headed households. Eleven FGDs with women, men, and public-private partnership (PPP) participants and 54 SSIs with implementing partners, local authorities, and government stakeholders supplement the primary household survey data. This report also relies on geospatial data to present baseline and 10-year tree cover trends within and across a 5-km buffer for the *veredas* and polygons in the study area.

FINDINGS: PUERTO RICO

HOUSEHOLD, FIELD, AND LIVELIHOODS INFORMATION

- Across both comparison and treatment areas, the overwhelming majority of respondents report that they were not born in the municipality where they currently reside (approximately 75 percent of treatment respondents and 81 percent of comparison respondents).
- A majority of respondents in the treatment municipality (82 percent) report that they own the land they reside on, approximately 6 percent rent, and 12 percent borrow. This finding may highlight a difference in perception of ownership versus what the statutory system would designate as ownership based on actual documentation.
- Sixty percent of respondents report having natural forests on their fields. Fifteen percent of household fields are reported to be "in protected areas."
- There is evidence of relatively high levels of investments into fields and residences. Nearly half of households (49 percent) invested in fertilizer, seed, and pesticide within the past year.
- In Puerto Rico municipality, approximately 75 percent of respondents reported that they or someone in their household had cultivated crops in their fields within the past year. The three most frequently planted crops were plantains, manioc, and yellow or white corn.
- Approximately 35 percent of respondents in the treatment municipality have benefited from alternative livelihoods or sustainable development projects.
- Almost all respondents identified themselves and their households as very poor or poor in comparison to their neighbors.

[3] The program identified two areas for implementation of the community land formalization pilots from a set of eligible polygons defined by the National Land Agency (ANT) and the Ministry of Environment and Sustainable Development (MADS) in the forest reserve zone and the buffer zone of the National Natural Park (PNN) Chiribiquete.

- About half of respondents in both treatment and comparison areas report owning or working with cows, bulls, calves, or steers. The estimated average number of livestock that treatment respondents work with is approximately 37, and the number owned is 21. The average amount of land used to support livestock is approximately 36 hectares for treatment respondents and 42 hectares for comparison respondents.
- Fourteen percent of treatment respondents cited that all of their household income comes from raising/herding livestock and approximately 12 percent report that half to most of their income comes from these activities.
- Only 16 percent of respondents in the treatment municipality received credit or any other financing from outside the household. Deeds and documents of possession are important for loans. Thus, in addition to the expected benefits of tenure security, there is a strong desire for titles to support loan-taking.

FOREST DEPENDENCE AND VALUATION

- In Puerto Rico municipality, 70 percent of households rely on the forest for their basic needs; however, the overwhelming majority of respondents (84 percent) report that their household receives no income from forest products or activities.
- Deforestation and the clearing of virgin lands are not a top development challenge for most respondents in Puerto Rico.
- Whereas several forest governance indicators and questions show a high level of discontent with environmental authorities and limited action to curb deforestation, other indicators show some belief that actions to reduce deforestation are working. In areas where local authorities are engaged in forest initiatives, respondents reported that local authorities work to support conservation jobs, training, environmental education, and the spread of other forms of knowledge to stop unauthorized tree cutting or the clearing of virgin land in their *veredas*.
- The geospatial data shows that there is a significant difference in forest cover in treatment versus comparison areas. In 2022, the estimated tree cover in the treatment areas of Puerto Rico was 46 percent, compared to an estimated tree cover of 33 percent in the comparison areas.
- In the last five years (2018–2022) there has been a 5.48 kha loss in tree cover in the treatment areas of Puerto Rico, totaling six percent of the total area, compared to a 1.75 kha loss in tree cover in the comparison areas, totaling two percent of the total area.
- Eleven percent of households in Puerto Rico municipality cleared virgin land in the past year, and 9 percent of respondents in Puerto Rico plan to clear more land in the next 12 months.
- Generally, people consume bushmeat as a protein source versus as a cultural, spiritual, or preferred source of food. At baseline, the evaluation does not find evidence of a belief that bushmeat is more nutritious than domestic meat.

GOVERNANCE

- In treatment areas, 65 percent of respondents are members of the Community Action Board (JAC). Approximately 67 percent of treatment respondents report that they trust the JAC compared with 59 percent in comparison areas.
- Among treatment respondents, 40 percent trust the ANT, 35 percent trust the Municipal Hall, and 29 percent trust the police. There are slightly higher levels of distrust for the police among comparison respondents. Among respondents who are aware of the existence of the Municipal Land Office (MLO), approximately 36 percent report that they trust the MLO.
- According to the qualitative data from key informants, the government's strength is in knowledge and awareness raising—but this is countered by the issues of inequality and corruption.

- A large percentage of respondents in the treatment area (77 percent) report the existence of rules in their villages that regulate or restrict clearing virgin land in forested or wooded areas, and around 85 percent of respondents from treatment areas report that there are penalties for breaking rules regarding clearing virgin land.
- The majority of respondents report that they are only "somewhat familiar" with rules about forest use and access. Respondents identified JACs and the *Corporación para el Desarrollo Sostenible de la Macarena* (Cormacarena) as critical actors for making rules about forest use and access in their *veredas*.
- Residents of Puerto Rico municipality and those in the comparison areas identified JACs and Cormacarena as critical actors for making rules about forest use and access in their *veredas*. They also identified the Municipal Mayor's Office and armed groups as the third and fourth most important groups, respectively.
- Thirty-one percent of respondents in Puerto Rico municipality stated that rules were strongly enforced, whereas 32 percent reported that environmental authorities never monitor their communities for rule violations.

FORMALIZATION, TENURE, AND LAND CONFLICT

- Survey respondents report that land disputes on or about household fields are relatively rare—but when they occur, they are somewhat serious and protracted. Less than 5 percent of respondents in both treatment and comparison areas reported that they or someone else in their household had conflicts on their land within the past four years.
- A total of 53 percent of treatment respondents report that someone in their household has a legal title or legal document certifying their rights of occupation of their fields. Out of the 53 percent, 35 percent have sales letter documents, 24 percent have registered titles, 15 percent have public deeds (either registered or unregistered), and 14 percent have promises of purchase sales.
- Regarding household land tenure security, whereas 40 percent of respondents report some degree of perceived tenure insecurity on their household land, 60 percent say it is not at all likely that they or someone else in their household will involuntarily lose ownership or rights to use their fields within the next five years. The greatest perceived source of tenure insecurity is armed groups, followed by the GoC, investors, neighbors, and extended family.
- The results of the conjoint survey experiment highlight that state security monitoring versus armed group monitoring is more important to tenure security than titling. Put differently, people will feel more secure if they do not have a title but their land is monitored by state security forces versus cases where they have a title but their land is monitored by armed groups.

COCA PRODUCTION AND ILLEGAL CATTLE GRAZING

- A list experiment within the household survey to understand the extent and distribution of coca production in the study area produced inconclusive results that were similar across treatment and comparison respondents. The findings are in opposition to qualitative reports of increases in coca production in the past year, as well as *Sistema Integrado de Monitoreo de Cultivos Ilícitos* (SIMCI) data about the extent of coca cultivation in the region, likely due to bias associated with underreporting this behavior in the household survey.
- Eighty-two percent of respondents in Puerto Rico believe that people should not be allowed to produce coca as a local livelihood. In comparison, only 60 percent of Puerto Rico respondents reported that people should not be allowed to conduct illegal cattle grazing for local income generation.

FINDINGS: POLYGONS

HOUSEHOLD, FIELD, AND LIVELIHOODS INFORMATION

- Approximately 82 percent of respondents in the treatment area were not born in the municipality they currently reside in, compared to 69 percent in comparison polygons.
- Ninety-four percent of respondents in the treatment area own the land they reside on, while 6 percent rent or borrow. As discussed above, responses to this question may stem from differences in perception of ownership versus what the statutory system would designate as ownership based on actual documentation.
- Ninety percent of respondents said that there are natural forests on the field, compared with 68 percent of comparison respondents. All respondents in the treatment polygons said that the field was not in a protected area versus 86 percent of comparison respondents.
- In the last 12 months, respondents in the treatment area made no investments in irrigation, compared with 2 percent of comparison respondents. Beyond irrigation, respondents have made investments in the following areas in the past 12 months: fertilizer, seed, or pesticide (70 percent treatment, 47 percent comparison); roads and road repair (45 percent treatment, 27 percent comparison); construction or improvement of residence/living structures (42 percent treatment, 33 percent comparison); construction or improvement of permanent and semi-permanent structures (non-residence) (36 percent treatment, 30 percent comparison); planting fruit or coffee trees (6 percent treatment, 20 percent comparison); and planting timber trees (6 percent treatment, 11 percent comparison).
- In the treatment area, 85 percent of respondents indicated that their household cultivated crops (mostly plantains, manioc, and yellow or white corn) on their fields in the last 12 months, and in the comparison area, 81 percent indicated the same.
- Most respondents in the treatment area (91 percent) did not benefit from alternative livelihoods or sustainable development projects, while three have. Whereas in the comparison area, 64 percent of respondents did not benefit from alternative livelihoods or sustainable development projects, while 36 percent have. The three programs that respondents in the treatment polygons reported benefitting from are Ranger Families, National Program for the Substitution of Illicit Crops (PNIS), and *Incentivos Forestales*.
- On a scale from 1 to 10, with 10 representing people at the top who are the wealthiest and live comfortably and 1 representing the people at the very bottom who are the poorest, almost half of the respondents (48 percent) in the treatment area selected 1 (poorest), 21 percent chose 2, and 12 percent selected 3. The distribution is similar in comparison areas.
- Ninety-four percent of respondents in the treatment area own and work with cows, bulls, calves, or steers, compared with 64 percent in comparison areas. The average number of cows, bulls, calves, or steers that respondents in the treatment area currently own is 24 and work with is 45. The total average use of pasture used to support their livestock is estimated at 46.5 hectares for treatment respondents and 49.6 hectares for comparison respondents.
- Most households note a reliance on livestock raising and herding activities for income; 18 percent of treatment respondents versus 42 percent of comparison respondents noted that they do not rely on livestock activities for any household income.
- Despite the possibility of accessing credit/loans, less than a quarter of respondents in the treatment area (24 percent) received credit or other financing from outside the household.

FOREST DEPENDENCE AND VALUATION

- In the treatment area, 27 percent of respondents said their household depends a lot on the forest for basic needs, 42 percent said they depend somewhat, and 30 percent said they do not depend at all. In the treatment area, 97 percent of respondents report that they did not derive any household income from forest products or activities, compared with 83 percent of respondents from comparison polygons.
- When asked what benefit the nearby forest provides to respondent households besides harvested products, the three most popular answers in both the treatment and comparison areas were fresh air, water conservation, and shade. The most important benefit that the nearby forests provide to their household is water conservation.
- Although respondents did not express the opinion that deforestation was a development priority in their area, a majority of respondents indicated support for conservation or the belief that conservation did not need to occur to the detriment of economic development.
- Overall, the team found that the household survey respondents noted significantly more positive forest conditions and less forest loss than is evident in the geospatial data. In the geospatial data, there was 2.01 kha of tree cover lost in the last five years, equivalent to 11 percent of the total treatment area. In the comparison area, there are also higher rates of tree cover loss than indicated by the household survey with 29.48 kha lost, equivalent to 9 percent of the total treatment area in the last five years.
- Local communities cannot participate safely and effectively in monitoring and reporting deforestation. Although not universal, most respondents indicate that local communities are afraid of reprisals by the entities engaging in deforestation and cannot be expected to take on that role.
- In the treatment area, 48 percent of respondents report that "no one" is actively engaged in land clearing in forests in the *vereda*, while 42 percent say that local village members are the most actively engaged. Nevertheless, 12 percent of respondents in the treatment area reported clearing virgin land in the past year. The mean amount of land cleared was 4.6 ha, and the maximum amount was 15 ha.
- Most respondents note a decrease in bushmeat hunting, which is linked to a decrease in available animals due to reduced habitat.
- In the treatment area, only 45 percent of respondents agreed or strongly agreed that the government's efforts to combat illegal deforestation are effective. Correspondingly, 30 percent of respondents agreed that if deforestation activities are reported in this *vereda*, environmental authorities act based on these reports.

GOVERNANCE

- Thirty-nine percent of respondents in treatment polygons belong to the JAC, whereas 14 percent do not belong to any organization.
- The highest level of trust is directed toward the JAC or similar associations (79 percent treatment, 73 percent comparison). In contrast, trust in state entities is relatively low. Ranked from highest to lowest for treatment polygons, this includes the ANT (40 percent treatment, 28 percent comparison), the Municipal Hall (31 percent treatment, 29 percent comparison), and the police (27 percent treatment, 23 percent comparison).
- In the treatment area, almost all respondents (96 percent) report the presence of rules in their village that regulate or restrict clearing virgin land in forested or wooded areas, and 84 percent report the presence of penalties for breaking the rules about clearing virgin land. However, according to most households, monitoring for rule-breaking is rare or infrequent.

- When asked to identify the three most important actors for making rules about forest use and access in their *vereda*, respondents from the treatment area replied with the JAC, armed groups, and Cormacarena/Corporación para el Desarrollo Sostenible del Norte y el Oriente Amazónico Guaviare. In both treatment and comparison areas, these are the same three actors (and with equivalent rankings) that are the most important for monitoring and enforcing rules.
- Overall, there is a consistent thread in the qualitative and quantitative data of a governance vacuum left by an absent state. This vacuum is currently filled by JACs and armed groups.
- A high level of corruption is reported in the study area. Only around half of both treatment and comparison respondents agreed that local authorities do not take bribes around forest issues, such as those related to forest management, permits, fines, or other forest use. However, there are low levels of respondents actually witnessing these events.

FORMALIZATION, TENURE, AND LAND CONFLICT

- In the treatment area, only one respondent reports having had a (moderately serious) conflict on their land (with a neighbor in the village over an inheritance issue) in the past four years. Seventy percent of treatment respondents and 78 percent of respondents from comparison polygons said they were not worried about being in a land conflict with someone.
- In the treatment area, 72 percent of respondents report that they have a legal title or legal document certifying the rights of occupation, compared to 46 percent in the comparison areas. These findings point to a lack of knowledge and awareness among respondents about what represents formal or "statutory" documentation.
- In the treatment area, 82 percent of respondents said they would be willing to pay for a formal state-issued document proving ownership of the field, compared with 75 percent in comparison areas. However, the amount they are willing to pay for a formal state-issued document is extremely low, at an average of 1.8 Colombian pesos (COP) among treatment respondents and 7.04 for treatment respondents.
- Regarding household land, in the treatment area, 68 percent of treatment and 71 percent of comparison respondents said it was not at all likely that their household would involuntarily lose ownership or rights to use the field in the next five years. Absolute levels of perceived tenure security are fairly high across the potential sources of tenure insecurity.
- In the treatment area, approximately 12 percent of respondents said there are areas of the forest that their household used to access in the last four years that their household is no longer allowed to access.
- In the treatment area, 88 percent of respondents believe that it is unlikely, highly unlikely, or impossible that migrants from outside this *vereda* will trespass and settle on forest land without permission from local authorities in the next 12 months, and 94 percent report that it is unlikely or impossible that local people from the *vereda* will trespass or settle. In contrast, 41 percent of respondents in treatment polygons report that it is likely, highly likely, or happening right now that armed groups will trespass and occupy forest land without permission from local authorities in the next 12 months, compared with 29 percent in comparison polygons.

COCA PRODUCTION AND ILLEGAL CATTLE GRAZING

- In the treatment area, 79 percent of respondents disagreed or strongly disagreed that people should be allowed to produce coca to provide money to feed their families. Only 21 percent of treatment respondents disagreed that illegal cattle grazing is part of local income-generating opportunities.
- In the treatment area, 85 percent of respondents said that there are no penalties for coca production in their *vereda*.

BALANCE AND POWER

The team looked at balance across more than 50 indicators between Puerto Rico municipality and its comparisons. Overall, the team found balance between treatment and comparison groups on just under 70 percent of indicators. Indicator balance is mixed between Puerto Rico municipality and its comparisons. While many indicators are similar, they also differ in some fundamental ways: livelihoods, displacement, born locally, documentation, reported familiarity with forest rules, and income from forests. The ET will use matching (entropy balancing) in endline regression analysis to improve balance. For forest condition analysis, the evaluation will restrict analysis to the treatment and comparison *veredas* that are a) closer to forests or b) contain enough forest within the *vereda* to justify analysis of forest cover trends.

Additionally, the team conducted power calculations to determine the Minimum Detectable Impact (MDI) measurable given the baseline mean, standard deviation, and sample sizes for each indicator. At the household level, the study is powered to detect medium to large changes—the necessary MDI is between 18 to 34 percent from the baseline mean across all indicators. The only indicator that would require an effect size greater than 30 percent is the total area owned and used by the household.

CONCLUSIONS

- There is a significant amount of variation across the study area for contextual issues and several key indicators, including variation in knowledge of government regulations, land tenure structure (i.e., possession versus deeded properties[4]), reports about the extent of forest logging, most important entities to govern land rights, and reports of coca growing. This is partly due to the large land area that this project intends to cover across three municipalities, each with its own land types and dynamics. Another reason for this might be how quickly the dynamics are changing on the ground—as witnessed and emphasized by the data collection partner, *Soluciones Estratégicas en Información* (SEI), during the household data collection.
- Generally, there is a high level of heterogeneity in the study area about the extent and primary factors driving deforestation. Respondents emphasize the "tragedy of the commons" and weak property rights over land as major factors leading to further environmental degradation. This is particularly evident in the polygon areas. Correspondingly, the project should not disregard the role of coca because it appears to have made a resurgence in some areas.

[4] Note that there are a number of distinct land tenure statuses in Colombia, including occupations (on vacant government lands), possessions (on informal private lands), consolidated property, and invasions on that property. For more information, see USAID's Property Rights and Resource Governance profile on Colombia: https://www.land-links.org/wp-content/uploads/2017/01/USAID_Land_Tenure_Colombia_Profile_Revised_December-2017.pdf.

EVALUATION PURPOSE AND QUESTIONS

INTRODUCTION

Scientific studies are demonstrating that increased tenure security through land registration helped reduce deforestation in various places, such as the Brazilian Amazon (Ben Yishay et al., 2017) and Benin (Wren-Lewis, 2020). A 2021 report from the Food and Agriculture Organization of the United Nations and the Fund for the Development of the Indigenous Peoples of Latina America and the Caribbean in Latin America suggests that deforestation is over two times lower in areas where land rights have been secured. Improved tenure security is assumed to reduce deforestation due to i) increasing productivity of existing agricultural lands; ii) reduced commercial-scale land acquisitions in forested landscapes; iii) and demarcation of land holdings reducing open access-based harvesting of forests.[5] However, studies have also come to uncertain or even opposite outcomes. A meta-analysis by Robinson et al. (2014) suggests that "clear, secure tenure is necessary but not sufficient for successful incentive-based forest policy." Liscow (2013) and Walker (2021) showed that private land titling actually led to increasing deforestation in Nicaragua and Panama. Furthermore, studies are often focused on the positive forest impacts of enhanced tenure of Indigenous Peoples' and local communities' customary communal lands; however, many—if not the majority—of people residing in state forest areas are non-Indigenous private landholders. Thus, the total number of rigorous studies is low, especially counterfactual-based studies; there remains a publication bias against studies that show negative or null results, and the current body of evidence is spread across very different types of interventions to improve tenure (e.g., titling versus land use planning), as well as different tenure types of focus (e.g., individual versus community).[6] Therefore, more research is needed to understand what types of interventions produce positive forest cover outcomes across different contexts.

PROJECT CONTEXT

The geographic region of the SMVC is comprised of environmentally protected territories, including four national parks, one national nature reserve, and the surrounding Amazon Forest Reserve Zone. There are several drivers of deforestation in and around SMVC such as land grabbing, cattle ranching, licit and illicit crop cultivation, timber extraction, wildlife trafficking, gold mining, and others (Albornoz et al., 2022). Among these, a complex linkage between cattle grazing, coca leaf production, and land grabbing is driving a significant amount of forest clearing (Castro-Nunez et al., 2017). Specifically, cattle grazing is the main driver of deforestation in the study area, as protected areas are deforested and burned to promote grass for cows to graze and people are paid to log and raise cattle in these areas. Cattle ranching is appearing

[5] Enhancing land tenure security in forested landscapes is often suggested as a win-win solution to reduce deforestation and poverty. Thus, international bodies, such as the Intergovernmental Panel on Climate Change and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, have stressed the importance of recognition of Indigenous peoples' customary land rights as a means to reduce deforestation and greenhouse gas emissions and enhance carbon sequestration. In 2016, over 300 institutions and civil society organizations (CSOs) signed a Global Call to Action arguing that "insecure land rights are a global crisis...undermining our ability to confront climate change." In the 2021 United Nations Climate Change Conference, five countries and 17 institutions pledged 1.7 billion USD "to support the advancement of Indigenous peoples' and local communities' forest tenure rights and greater recognition and rewards for their role as guardians of forests and nature" between 2021 and 2025.

[6] More specifically, out of counterfactual-based studies on the impact of land tenure and administration programs, nine studies present findings for sustainable resource management and environmental outcomes. Seven studies find a positive impact, and two studies find null effects. Mongolia PURLS Phase I finds an improvement in perceived winter pastureland quality (IPA, 2021). A study in Peru finds that titling of indigenous communities reduces clearing by more than three-fourths and forest disturbance by two-thirds (Blackman et al., 2017). Similarly, a development program in the Northern Boundary Amazonian Region of Ecuador finds a 37 percentage point reduction in deforestation (Holland et al., 2017). A systematic titling initiative in Nicaragua finds a 14 percentage point increase in deforestation among titled properties. The evaluation of the Rural Environmental Registry in Brazil finds a 0.5 percentage point reduction in deforestation (Ben Yishay et al., 2017). In Argentina, implementation of the 2007 Forest Law 26.331 finds positive treatment effects for land use planning (Nolte et al., 2017), and a randomized controlled trial in Benin found a 0.1 to 0.3 percentage point reduction in annual tree cover loss in treatment version control villages (Wren-Lewis, 2020).

in areas where alternative livelihoods have failed. Reports indicate significant corruption in the paperwork to get cattle and timber into the legal supply chain and in the security forces (International Crisis Group, 2021).

Several studies have documented increased rates of deforestation following the 2016 peace accord, including in territories previously controlled by the Revolutionary Armed Forces of Colombia (FARC). This is due to a governance vacuum left by the FARC; to protect the canopy that provided security for location and movement during the conflict, FARC rebels had a system of resource management in place to mitigate cutting woodland and clearing jungles. With the end of FARC control of these areas, many groups now contribute to deforestation, although everyone's role in the process is different. These actors include right-wing paramilitary groups, FARC dissidents (i.e., former fighters who have reneged on the peace process and returned to arms), criminal groups, smallholder and landless farmers, and internally displaced people along with conflict victims. FARC dissidents retain control over a large part of the study area for this evaluation. Insurgents and criminal groups use the income from the economic activities on cleared land to fund criminal activity. Impoverished local residents provide labor to support land clearing for cattle ranching and illicit crop cultivation. Crime rings displace rural families and force them to clear and settle land for planting coca. Although the compensation varies by location, coca cultivation provides many families with a viable livelihood opportunity. All of this is compounded by corruption through bribes to law enforcement officials, information leaks, and manipulations of judicial investigations; prominent public and political figures are involved in financing illegal land clearing, including through engagement in activities such as illegal cattle ranching (International Crisis Group, 2021).

As part of the 2016 peace accords—and after—the GoC adopted or pursued several environmental laws and policies that focus on property rights, access to land, land restitution, crop substitution from coca farming, rural development, and security campaigns. With regards to land and property rights, the 2016 peace accord includes provisions to support land formalization including for use rights, access to land, and resource governance; improved land management through the implementation of a multipurpose cadastre was central to the peace accord commitments. In addition, an Environmental Zoning Plan (*Plan de Zonificación Ambiental*) was designed to designate protected areas and manage land use in areas with specific environmental characteristics. Local development plans include a plan to shift cultivation from coca farming.[7] There are also key provisions for the expansion of existing Campesino Reserve Zones where unused or inefficiently used land is reallocated to small-holders to promote more productive and sustainable ownership. One of the first tasks of these zones is to formalize and regularize the property. In addition to this, the 2011 Victims' Law (Law 1448) established a mechanism for restitution of land to displaced persons and funding for compensation to victims.[8]

Other initiatives include *Visión Amazónica*, Operation Artemisa, and the 2021 Environmental Crimes Law. *Visión Amazónica* is a key international cooperative initiative that started in 2016 with the purpose of avoiding deforestation through sustainable development programs. Operation Artemisa was a military campaign to prosecute illegal activities in the Amazon, which intended to allocate land for restoration and reduce environmental crime, in part through the deployment of security officers and coca crop eradication. Additionally, the July 2021 Environmental Crimes Law provides a comprehensive penal

[7] Colombia's post-conflict rural development mechanisms include the *Programas de Desarrollo con Enfoque Territorial* and the Alternative Development Integral Plans. In areas with both, the two plans must be reconciled. Kroc Institute for International Peace Studies. 2021. "The Colombian Final Agreement in the Era of COVID-19: Institutional and Citizen Ownership is Key to Implementation." https://peaceaccords.nd.edu/wp-content/uploads/2021/09/Fifth-Report-State-of-Implementation-Four-Years-after-the-Accord-Signing.pdf

[8] Morales, Laura Maria Rojas. 2023. "Colombia's Measures for Armed Conflict, Victim Reparations, and Land Restitution." https://www.sdg16.plus/policies/colombias-measures-for-armed-conflict-victim-reparations-and-land-restitution/#:~:text=In%202011%2C%20the%20Colombian%20government,four%20million%20were%20internally%20displaced.

framework for deforestation, wildlife trafficking, and pollution. As of this report's drafting, the ET is not aware of rigorous studies on the effectiveness of these interventions, though there seems to be a general understanding that they did more harm than good.

Overall, the implementation of several environmental and property rights measures has been slow. According to the International Crisis Group, as of early 2021, only approximately 15 percent of the total land (nationally) is in the Land Registry; most arable land is occupied—although not in the registry—and it remains difficult to establish rightful ownership of land. Finally, although coca production in this study area represents less than 4 percent of the national total, many reports indicate that given the stable income provided through coca farming, many alternative livelihood programs are failing to provide sufficient incentives to promote a switch from growing coca (International Crisis Group, 2021). The reasons and lessons learned for failing substitution programs might be transferable to efforts to promote a switch from cattle grazing, which represents a larger threat to forests in the study area covered by this evaluation. Additionally, certain types of alternative livelihood programming may be more successful if sufficiently supported through inputs and the market prices hold.

PROJECT BACKGROUND

This evaluation is focused on an adapted version of USAID/Colombia's LfP activity in the SMCV geography. The LfP activity is a five-year activity (September 2019–August 2024) meant to formalize land tenure and property rights to foster licit, rural economic development.[9] The LfP activity comprises three main components involving 1) massive land titling, 2) strengthening local government capacity, and 3) promoting PPPs. LfP targets interventions holistically in sites, as appropriate. In total, these components will provide access to land titles while supporting land restitution as part of a broader land title policy support, strengthening local government capacity, and supporting citizens to engage in licit socio-economic opportunities in target areas.

In late 2020, USAID and the GoC agreed to expand LfP's previous geographic footprint to include selected deforestation hot spots in SMVC. The goal of implementation in the additional geographies is to explore methods that focus on the integration of three thematic areas—licit and sustainable livelihood promotion, land formalization,[10] and environmental local capacity strengthening—with a particular focus on changing behaviors associated with deforestation. This evaluation covers the expansion of LfP activities in the SMVC.[11]

The broad objective of LfP's activities in the SMVC is to contribute to reducing drivers of deforestation, conserving biodiversity, and promoting sustainable, improved livelihoods in SMVC by providing learning on how to adapt formalization and cadastral assistance methods to various contexts.[12] To achieve this, LfP is undertaking interventions focused on strengthening land tenure and regularization, improving resource governance and protection through updated cadastral information and imagery and training local environmental entities to use the information more effectively, and supporting sustainable economic

[9] LfP builds on prior USAID investments in the land sector in Colombia to sustainably improve the conditions of conflict-affected rural households. LfP is implemented by TetraTech in conflict-affected regions in Bajo Cauca-Sur de Córdoba, Catatumbo, Meta-Ariari, Montes de María, Northern Cauca, Southern Tolima, Tumaco, and SMVC. A total of 11 municipalities across the seven micro-regions were selected as pilot municipalities that will receive all three LfP components. An additional corridor of contiguous municipalities will not have a massive parcel sweep but will have other elements of the three activity components implemented.

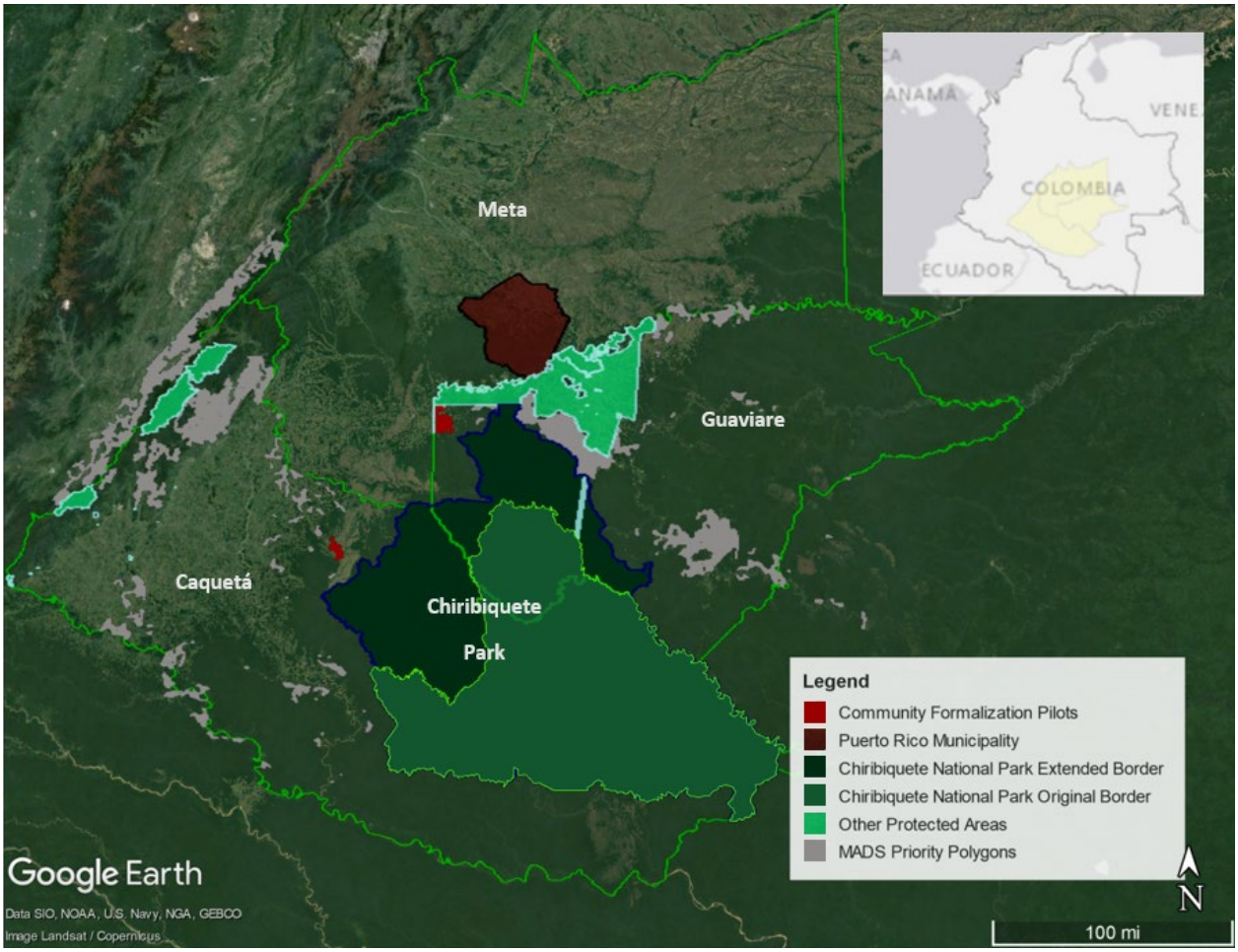
[10] In Colombia, "land formalization" could be interpreted narrowly as providing legal title to private land; however, it is intended here and throughout the document to refer broadly to also include the adjudication of public lands, conservation contracts, or use rights agreements.

[11] A separate IE, undertaken by NORC at the University of Chicago, focuses on ten of the 11 so-called pilot LfP municipalities receiving the LfP intervention. More information about the core LfP IE is available at https://www.land-links.org/evaluation/evaluation-of-the-land-for-prosperity-lfp-activity-in-colombia-baseline-report/.

[12] However, as discussed in the ToC subsection, LfP SMVC pilot activities alone are not sufficient to achieve these objectives.

development. Within the SMVC, LfP will undertake these activities in three primary sites: the CNP, small communities in the vicinity of the CNP's northwest border,[13] and Puerto Rico municipality, as shown in Figure 1.

Figure 1: Map of LfP Activities in SMVC Additional Geographies



Across each of the three intervention sites, LfP will provide differentiated interventions tailored to the local needs and context. Table 1 presents a summary from the FA in this evaluation on the content of the interventions across the three geographies (CNP, pilot communities, and Puerto Rico), and the following section presents each component in more detail. For a timeline of project activities, refer to Annex 1: Project Timeline.

[13] The final number of these communities is to be determined as of this report's drafting (January 2023).

Table 1: Summary of LFP Amazon Intervention Components[14]

INTERVENTION COMPONENT	GREEN FORMALIZATION, TENURE SECURITY, CADASTER, AND IMAGERY	LAND POLICY CAPACITY ACTIVITIES	GREEN VALUE CHAIN OPPORTUNITIES
1. Delineation of CNP Border and Key Features Therein	Imagery for precise border and key feature delineation. Facilitating cadaster update for 4.3 million hectares of CNP land.	Capacity-building with the PNN and the MADS for managing cadaster data and monitoring land use. Capacity-building with the Institute of Hydrology, Meteorology, and Environmental Studies (IDEAM) to monitor risks and presence of deforestation using imagery and cadaster. Socialization of park boundary with local communities.	N/A
2. Community-level Formalization Pilots	Geospatial survey of geography. Demand-driven formalization via land use contracts. Training and community socialization of land use contract strategy.	Capacity-building with local authorities and CSOs for monitoring and enforcing terms of land use contracts, integrating agrarian and environmental objectives of land use.	PPPs tailored to the local population in each community.
3. Puerto Rico Parcel Sweep	Parcel sweep for the formalization of land titles/land use contracts, as appropriate for local use restrictions (e.g., PNN Macarena, mining/energy concessions, illicit crop restrictions, etc.). Facilitate updated multipurpose municipal cadaster.	MLO establishment with environmental objectives. Capacity-building for local land and environmental authorities.	PPP tailored to the local population in the municipality. Training of/engagement with community members.

DEVELOPMENT HYPOTHESIS

This section draws heavily from program documentation and the FA developed by NORC for the LfP/SMVC evaluation.

LfP's expansion into SMVC—a priority geography rich in ecological and biological resources under threat—is based on the hypothesis that addressing land tenure uncertainty disincentivizes further deforestation, promoting biodiversity conservation and climate change mitigation, and that proper land

[14] LfP SMVC elements are referred to as "intervention components." These are site-specific packages of interventions with activities that fall under one or more of the LfP activity components.

use management and administration in and around PNN disincentivizes illicit crop cultivation in environmentally protected areas. Specifically, according to the LfP Biodiversity and Sustainable Landscapes Plan:

IF "green" formalization (use rights), tenure security, an up-to-date cadaster, and related imagery for priority sites are achieved through formalization pilots and local land policy capacity activities adapted to SMVC's context (environmental restrictions, illicit crops, and ethnic lands) and enhanced by biodiversity and sustainable landscapes-relevant guiding principle actions, **THEN** incentives for deforestation will be reduced and institutional and community capacity to monitor deforestation and enforce sustainable land uses will be improved; **AND IF** strategic partnerships expand "green" value chain opportunities for local people,[15] **THEN** a virtuous cycle of sustainable, improved livelihoods and biodiversity conservation will gain momentum, helping to preserve buffer zones and protected areas.

Each of the interventions described below operationalizes the general ToC in a different way and at a different scale.

CNP BORDER DELINEATION

First, LfP will facilitate more precise delineation of the recently expanded CNP border and thereby support GoC officials in their efforts to enforce it for improved land use management on and around the park's border. Specific activities under this component are: providing imagery for precise border verification and key feature delineation; providing information for cadaster updates for almost 4.3 million hectares of CNP land; capacity-building with the National Parks authority and the MADS and monitoring land use and land cover change; capacity-building with the Colombia IDEAM to monitor risks and deforestation with imagery and cadaster; capacity support to Regional Environmental Autonomous Corporation officials to improve their management of protected areas; and socializing park boundaries with local communities.

The core activity in this intervention is the provision of high-resolution imagery to support an updated cadaster for the CNP to permit delineation of the park boundary, indigenous reserve zones within the park, and the (likely illegal) claims of other occupied areas within the park with increased precision. The imagery provided by LfP may additionally facilitate follow-up analysis of land use patterns and opportunities. LfP will complement the provision of high-resolution imagery with capacity-building and technical assistance to the PNN and MADS, which will permit them to effectively manage cadastral data, monitor land use, and conduct sustainable land use planning consistent with established regulations for protected areas once the imagery is in hand. The final component of this intervention is a process to socialize the CNP border's delineation and its implications with communities and local land governance and environmental authorities who live near the CNP. This includes communicating the CNP's precise boundary location and allowable land use.

Supposing that the border is delineated with sufficient precision to permit its enforcement by the GoC, that communities are aware of and abide by its precise location, and that GoC and other projects capitalize on inputs to provide law enforcement capacity and replicate LfP formalization approaches to other communities in the buffer zones, USAID anticipates that the activities comprising LfP SMVC will lead to a reduction in the drivers of deforestation and environmental crimes in treatment sites (including land grabbing, cattle ranching, licit and illicit crop cultivation, timber extraction, wildlife trafficking, and others). Reduced deforestation is expected to improve biodiversity conservation through the avoidance of habitat

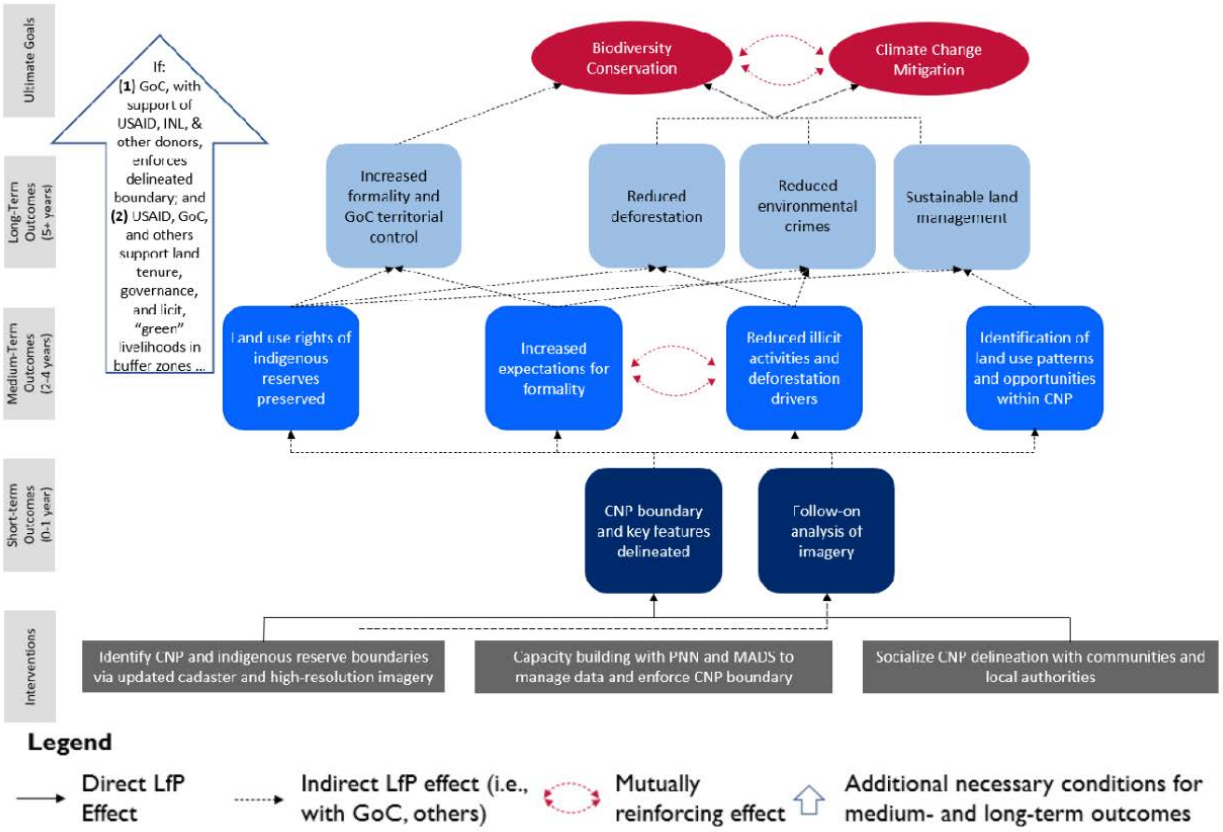
[15] Please note that the portions of the overall ToC covering green value chains do not apply to the CNP border delineation component, where green value chain activities are not taking place.

loss and the preservation of wildlife corridors. Reduced burning and clearing of forests for cattle ranching is expected to have a positive impact on climate change mitigation through reduced emissions, while forest cover retention will further support this impact through carbon storage and sequestration.

In contrast to LfP's other interventions in SMVC, the border delineation intervention cannot offer contractual instruments to support increased land tenure for individuals living in the CNP. This intervention focuses on increasing the GoC's capacity to enforce land use restrictions and administer land governance in a way that closes current pockets of opportunity to cross into the park, along with a viable enforcement mechanism to prosecute environmental crimes. This intervention will also occur at a much greater geographic scale than the other two interventions LfP will implement in this geography, as its reach spans the entire CNP park boundary, while the other intervention components take place at the scale of a single municipality or two communities.

Figure 2, below, contains a logic model for this intervention component.

Figure 2: LfP SMVC Component 1—CNP Border Delineation—ToC



COMMUNITY-LEVEL FORMALIZATION PILOTS

LfP SMVC's second intervention component focuses on community-level formalization pilots in small communities in the vicinity of the CNP's northwest border to reduce incentives for deforestation and promote sustainable, licit livelihoods in the targeted area. These communities, the first two of which are located near San José del Guaviare in the Guaviare department and San Vicente del Caguán in the Caquetá department, are not formal administrative entities (e.g., *veredas*), but rather agglomerations of farms and residences that have colonized Amazon forest reserve areas near the CNP border.

LfP's standard approach to multipurpose cadaster updates and promoting increased tenure security and formalization through massive titling is not feasible in the forest reserves where the pilot communities are located.[16] Instead, LfP will test a collaborative approach (one of three methods allowed by the GoC) to update the cadaster and support the issuance of land use contracts (a novel contract instrument only adopted in recent years in Colombian law) to increase tenure security and promote accountability for land use.[17] As part of this approach, LfP will conduct a geospatial survey of each community and subsequently support the GoC to offer land use contracts to individuals for parcels whose territory falls within or overlaps with the community boundary. LfP will also complete training and community socialization on the land use contract strategy, capacity-building with local authorities and CSOs for monitoring and enforcing the terms of land use contracts and with PPPs that will incentivize local community members to transition from illicit or unsustainable income-generating activities to participation in green value chains.[18]

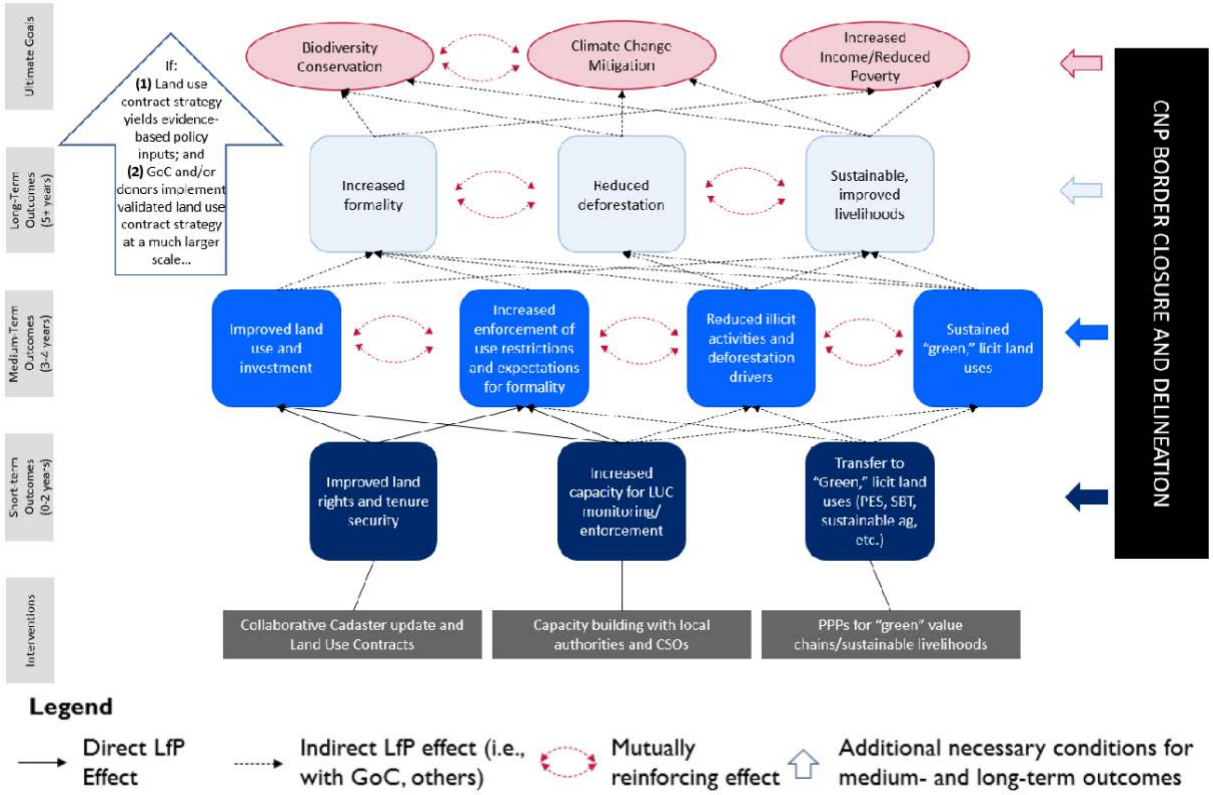
The Community Formalization Pilot ToC (Figure 3 below) presumes that an increase in landholders' tenure security through land use contracts[19] coupled with effective monitoring of and compliance with the terms of these contracts will lead landholders to make increased investments in the land, reduce deforestation and forest-degrading land uses, and alter their land use behavior toward more sustainable, licit uses supported by PPPs. The presence of land use contracts and enforcement of associated restrictions will not only increase formality and decrease drivers of deforestation directly but also work together with an increased presence of land governance authorities and green, licit livelihood opportunities to increase community members' expectations for formality in the future. Together with increased knowledge of themes related to sustainable land use, these expectations will influence community members' decisions to choose licit, sustainable livelihoods that conserve their land and forego illicit behaviors that drive deforestation and biodiversity loss such as land grabbing, agricultural frontier expansion, cattle ranching, timber extraction, and illicit crop cultivation.

LfP expects that in the short term, there will be changes in land use behaviors and indirect measures of land use changes that drive deforestation and biodiversity loss at the level of individual landholders and parcels. Then, if the community formalization pilots are expanded in the future, the GoC may be able to realize impacts on the long-term outcomes of deforestation and biodiversity loss at the landscape scale.

This ToC also stands to be indirectly influenced by the CNP border delineation—given that these communities are in buffer zones of the CNP, enforcement of the CNP border following its precise delineation by LfP should simultaneously reduce the availability of land for deforestation and increase the costs of deforestation in the vicinity of the park if communities engage in resource use near the park boundary.

[16] It is not permitted to hold formal land titles or transition contracts in these areas.
[17] These ten-year contracts give the contract holder exclusive use rights aligned with relevant regional land use restrictions that are monitored and enforced by local authorities, although they do not give the contract holder ownership over the land and are not inheritable. It is possible that these land use contracts could become "conservation contracts" if the GoC additionally offers "voluntary conservation agreements" to individuals who take up land use contracts, though LfP believes it is unlikely that the intervention will issue many conservation contracts given GoC's previous difficulties coordinating the administration of land use contracts and voluntary conservation agreements.
[18] This element will not be completed as a package with the other community-level formalization pilot interventions. Rather, PPP interventions in the wider area will be intentionally targeted to benefit these formalization communities.
[19] The LfP SMVC FA notes that, although the land use contract instrument has been issued previously in Colombia, there are significant gaps in evidence regarding the optimal process to issue these contracts. These evidence gaps include the lack of an adequate methodology to socialize this mechanism with communities, the lack of coordination of all GoC entities needed to turn land use contracts into a tool for conservation, and the lack of capacity to regulate their use for environmental conservation and monitor their enforcement. Further, in previous use cases, land use contracts have not been implemented with complementary support for alternative livelihoods, which could affect the extent to which prospective contract-holders are sufficiently incentivized to take up the contracts and abide by land use restrictions that the contracts impose.

Figure 3: LfP SMVC Component 2—Community-Level Formalization Pilots—ToC



PUERTO RICO PARCEL SWEEP

The final SMVC intervention component is a municipality-wide massive formalization effort in Puerto Rico municipality using the parcel sweep method. In addition to the parcel sweep of land titles/land use contracts, under this component, LfP will facilitate the update of a multipurpose municipal cadaster by providing imagery to the GoC, establishing an MLO with environmental objectives, conducting capacity-building for local land and environmental authorities, developing PPP tailored to the local population, and training and engaging with community members on environmentally friendly formalization.[20] Like the community formalization pilots, it will also attempt to pursue PPPs that connect community members with opportunities to participate in "green" value chains.

This component extends LfP's standard approach to massive land titling and land administration strengthening (establishment of an MLO) into a new area of SMVC's geography, with minor adaptations.[21] Puerto Rico municipality was selected as a new project site within the SMVC geography because it is contiguous with LfP's other activities; LfP's activities in Puerto Rico will expand upon existing formalization efforts in two adjacent municipalities (Fuente de Oro and Puerto Lleras). Also, Puerto Rico provides an example of agrarian frontier land around the border of the La Macarena National Park; formal land tenure and the presence and land governance capacity of the state are expected to increase at a significant scale

[20] MLO establishment and capacity development in Puerto Rico are not conducted under the Puerto Rico parcel sweep. Rather, they will be conducted in Puerto Rico under the LfP overall implementation strategy, which features 11 municipalities benefitting from all three components, plus a corridor of contiguous municipalities that will not have a massive parcel sweep but may have elements of all three activity components implemented. Some activities will benefit households beyond these corridors in each region.

[21] These modifications account for environmental zoning and use restrictions that are less prevalent in LfP's original geography. Additionally, while the standard LfP approach also pursues PPPs that promote licit and improved livelihoods, these PPPs less often target environmentally sustainable livelihoods explicitly.

along a strategic corridor with critical access points to the Macarena. The expectation is that the Puerto Rico site will demonstrate the value of formalization to slow incursion into the La Macarena National Park.

Through this intervention, LfP aims (Figure 4 below) to improve land administration and governance for conservation and increase investment via strengthened tenure security with the ultimate goals of improving sustainable livelihoods, reducing poverty, and, in the long term, reducing deforestation and increasing biodiversity. Specifically, LfP expects that the Puerto Rico formalization pilot will limit deforestation and promote environmental recovery from the expansion of the agricultural frontier into the Macarena national park by providing secure land tenure to farmers and reducing incentives to clear the forests and expand settlement. Establishing property rights and tenure security and updating the cadaster through the parcel sweep will reduce incentives for deforestation and improve institutional and community capacity to enforce existing land use rules, together with improved access to land information and services via the MLO and Regional Land Office (RLO). PPPs that demonstrate viable and sustainable context-relevant value chains will motivate sustainable land use, over time contributing to carbon sequestration and regulation of temperature and water cycles if pursued at scale. Establishing an MLO in Puerto Rico and an RLO covering La Macarena, Mesetas, Puerto Concordia, La Uribe, and Vista Hermosa and building local land policy capacity is also expected to help sustain formality. Both the MLO and the RLO are expected to contribute to the implementation of policies on land governance and conservation of biodiversity by promoting training and awareness of landowners about environmentally friendly formalization, along with strong articulation with natural parks and environmental authorities to reinforce their control and surveillance.

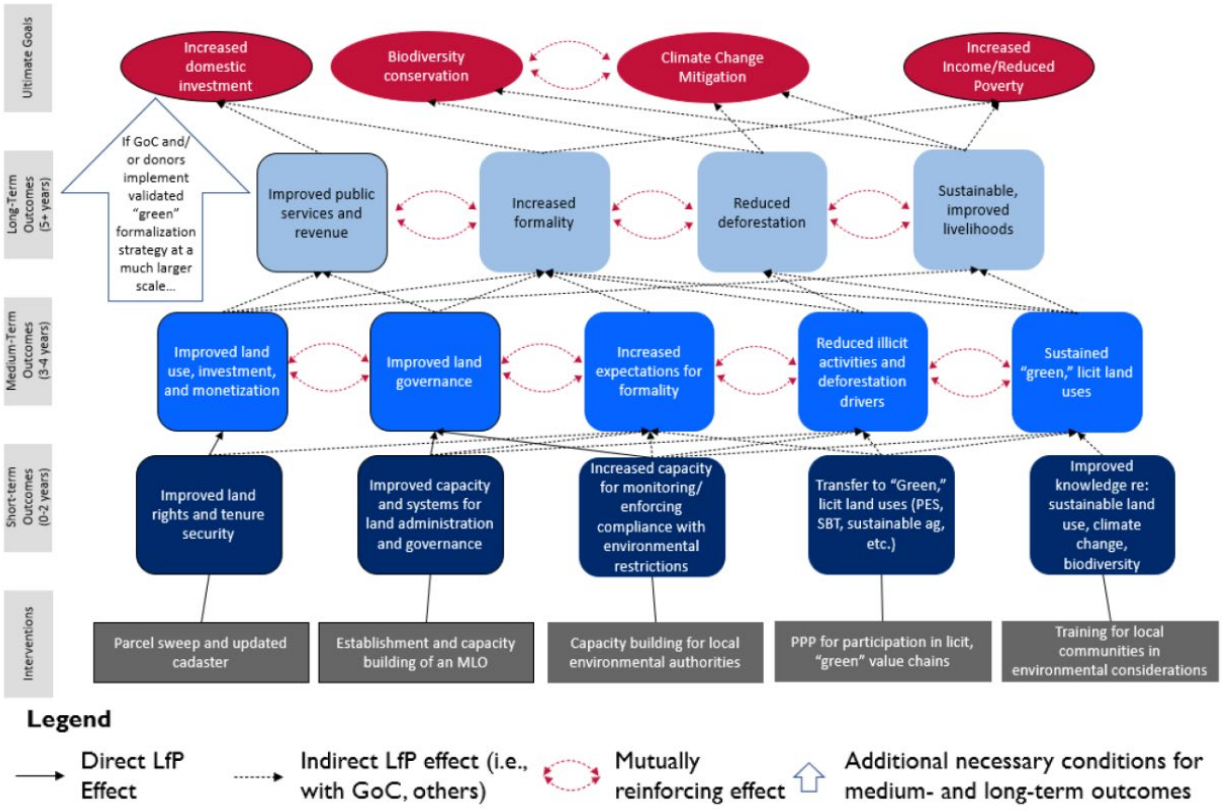
It is expected that municipal-scale mass formalization in the rural areas of three contiguous municipalities (Puerto Rico, as well as core LfP municipalities Fuente de Oro and Puerto Lleras) will create a cluster of land formalization in the area that may provide an additionally important demonstration effect with respect to the role of the interventions in reducing drivers of deforestation and biodiversity loss, slowing the advancement of the agricultural frontier, and dampening the spread of illicit activity in the region.

It is also possible that this coordinated approach across the three municipalities could help to reduce the risk of negative spillovers, whereby environmentally destructive land use activities are merely displaced to other areas—to nearby communities with weaker land tenure, governance, and sustainable livelihood opportunities. Increased formality in these areas could also indirectly reduce negative spillovers by incentivizing actors who might pursue environmentally destructive activities to change their behavior in favor of more formal and less environmentally destructive activities.[22]

Results from this intervention component will provide additional learning and evidence-based policy inputs for the GoC to apply in deforestation hotspots, and perhaps particularly so in areas with a similar balance of land under restricted uses and land available for private ownership and hence eligible for titling.

[22] This dynamic not only applies to LfP's efforts in access points to the Macarena and CNP but also more broadly to contemporary efforts by USAID (e.g., Amazon Alive), the GoC, and other actors (e.g., UK Aid, etc.) to "squeeze out" informality and promote licit, sustainable livelihoods throughout SMVC.

Figure 4: LfP SMVC Component 3—Puerto Rico Parcel Sweep—ToC



EVALUATION PURPOSE

The purpose of this evaluation is twofold.

First and foremost, endline and follow-up evaluation results will provide evidence-based policy inputs for USAID and the GoC to attempt similar strategies at a larger scale in deforestation hotspots throughout the Amazon region, including in areas with overlapping use restrictions where land titles cannot be issued throughout the Amazon region. The ET will use data collected during endline and follow-up to analyze the linkages between the LfP interventions in the SMVC region and 1) the promotion of licit, sustainable livelihoods, 2) reduced deforestation, 3) reduced corruption, 4) wildlife and biodiversity conservation, and 5) climate change mitigation, to which LfP is meant to contribute.

Primarily, in the SMVC, LfP's interventions are serving as a proof of concept to determine whether the methodologies employed will improve conservation and livelihood outcomes; the methodologies the activity will employ to promote formalization, monitor and enforce land use restrictions, and advance licit economic opportunities are without precedent in the local context. LfP's interventions thus serve as a test of these methodologies in pilot contexts, with the aim of demonstrating evidence-based policy inputs for the GoC. Should LfP demonstrate that these methodologies succeed in achieving their short-term goals for improving tenure security and land governance in ways that favor environmental conservation and reduce deforestation, the GoC could expand these methodologies to other deforestation hotspots at a scope that is sufficient to yield desired changes in deforestation, biodiversity, and improved livelihoods at a landscape scale.

Second, in the short term, the LfP SMVC evaluation will provide baseline measures on indicators of interest to USAID. This includes baseline statistics on initial behaviors and attitudes among beneficiaries and other key stakeholders relating to livelihoods, land use, conflict, and land administration outcomes, in addition to initial deforestation conditions, to compare to measures taken after the intervention. In addition, the baseline data will provide LfP with insight to refine its understanding of needs and approaches for programming. While this tasking covers baseline data collection and analysis, the ET recommends three rounds of data collection over time: baseline, endline, and follow-up five years after the activity end date. At each round, the data will be used to adapt LfP activities and inform government and other donor programs in the Amazon region.

EVALUATION QUESTIONS

The principal aim of the evaluation is to improve the knowledge base about:

- Drivers of deforestation and biodiversity loss in the intervention implementation areas and the impacts of the proposed LfP activities on reducing deforestation, biodiversity loss, and maintaining intact forest landscapes.[23]
- Linkages between increased tenure security through land titling, land use contracts, or any other means and behavioral changes that could drive conservation outcomes, and the extent to which impacts on such outcomes are sustainable given the socio-political context of the additional geographies.
- Learning interests related to cadaster update work, including the process and decision-making around resolving conflicts about overlapping or multi-use land areas.
- Effectiveness of anti-corruption interventions or activities on deforestation, biodiversity loss, and maintaining intact forest landscapes.[24]
- Understanding changes in land management as a whole in the SMVC directly or indirectly linked to the intervention and how these interact with reducing deforestation and estimated land-based greenhouse gas emissions.
- Determining whether and how the GoC leverages resources and capacity-building provided by LfP for improved national, regional, and local environmental and land governance, reduced deforestation, and reduced environmental crime.

The evaluation will focus on the following three EQs:

- **EQ1:** What changes in (i) land use and behaviors driving deforestation and biodiversity loss and (ii) participation in sustainable, improved livelihoods occurred among households in the formalization pilot communities and Puerto Rico municipality following LfP's interventions? What evidence is there that these changes may have been caused directly or indirectly by LfP, and through what mechanisms?
    - 1.1 How did changes differ between pilot areas and Puerto Rico municipality, based on the specific contract instruments used in each? How do the different instruments, methodologies, and activities employed affect the perceived sustainability of changes?
    - 1.2 What, if any, important contextual influences on LfP's ability to update cadasters and formalize land tenure arrangements result from the presence of different types of overlapping areas with defined use restrictions (e.g., forest reserve zones, campesino

[23] USAID is interested in the feasibility of incorporating design options to measure biodiversity conservation outcomes directly and rigorously. Amazon Alive will be incorporating this learning activity into their evaluation and it will not be part of this evaluation.
[24] The evaluation will use qualitative data to assess the contribution of corruption as a contextual factor to outcomes observed, but will not measure it as an outcome of LfP because direct changes in corruption and environmental crime are outside the scope of LfP activities (i.e., within the scope of other programs and/or follow-on actions by the GoC).

reserve zones, indigenous reserves, national parks, etc.)? If areas with overlapping use restrictions are found, how does the presence of these areas affect LfP's outcomes and sustainability?

- 1.3 Is there any evidence that LfP's activities caused a spillover of deforestation drivers and illicit activities into surrounding areas?[25] Are there any other possible unintended outcomes of LfP's activities, whether positive or negative?

- **EQ2:** What changes occurred in regional and local land governance, environmental governance, and the reduction of environmental crime and corruption within the CNP and its buffer zones following the provision of high-resolution imagery of the CNP, the updated cadaster within the CNP, capacity-building with relevant GoC authorities, and socialization of the CNP border with local communities?[26] What evidence is there that LfP's activities contributed directly to these changes, and through what mechanisms? To what extent were results bolstered by complementary measures from other programs or the GoC?
- **EQ3:** What impact does the delineation and enforcement of the CNP border have on deforestation, habitat connectivity, and biodiversity conservation within the CNP and in portions of the buffer zones where LfP conducted complementary activities to decrease activities driving deforestation? What are the reasons for observed impacts? Is there evidence of any effect on deforestation or biodiversity conservation elsewhere in SMVC geography to which LfP may have contributed?[27]

Following these questions, the evaluation will seek to test the following hypotheses that correspond to the main quantitative outcomes:[28]

TENURE SECURITY

- **H1:** Households receiving land titles/land use contracts through the LfP SMVC will have greater perceived tenure security.
- **H2:** Households receiving land titles/land use contracts through the LfP SMVC will experience lower frequency and severity of land conflicts.[29]

LIVELIHOODS

- **H3:** Households receiving the LfP SMVC interventions will have greater participation in licit and sustainable income activities.
- **H4:** Households receiving the LfP SMVC interventions will have improved livelihoods and well-being.

INVESTMENT

- **H5:** Households receiving the LfP SMVC interventions will make more field investments to improve productivity.
- **H6:** Households receiving the LfP SMVC interventions will make more non-productive property/housing investments.

[25] The evaluation will only be able to track spillover of illicit activities in the selected comparison geographies.
[26] Because surveys are not taking place in these areas, the evaluation will measure the effect of the CNP border delineation interventions as a package.
[27] Because it is a geospatial IE, without triangulating primary data collection, the ability of the CNP border delineation to identify reasons for observed impacts will be limited.
[28] PE questions that will be answered primarily through qualitative data do not have an associated hypothesis.
[29] Note that reported land conflicts at baseline are low. It is possible that in the short term (at endline) conflicts may increase due to the formalization process. The ET will use qualitative data to understand the processes and mechanisms observed during endline data collection.

GOVERNANCE

- **H7:** Households in areas receiving LfP interventions will report a greater understanding of CNP border location and regulations.
- **H8:** Households in areas receiving LfP interventions will perceive a greater capacity of the GoC to engage in land use monitoring and enforcement.
- **H9:** Households receiving the LfP SMVC interventions will be more likely to expect penalties for illicit activity in protected areas.
- **H10:** Households receiving the LfP SMVC interventions will engage in less unauthorized land clearing.
- **H11:** Households in areas receiving LfP interventions will report greater satisfaction with and confidence in land administration and governance.

DEFORESTATION AND BIODIVERSITY

- **H12:** Areas receiving LfP SMVC interventions will experience fewer new incidents of deforestation (forest loss).
- **H13:** Areas receiving LfP SMVC interventions will experience less forest degradation.
- **H14:** Areas receiving LfP SMVC interventions will experience lower incidence and extent of fires.
- **H15:** Areas receiving LfP SMVC interventions will experience greater forest recovery and connectivity in previously deforested areas located near the main forest.
- **H16:** Areas receiving LfP SMVC interventions will have a greater total forested area.
- **H17:** Areas receiving LfP SMVC interventions will have greater biodiversity (species abundance and richness).[30]

[30] Because of the ecological context, budget restrictions, and link between biodiversity outcomes and habitat loss, the evaluation will not use direct biodiversity measures. Rather, this study will approach the study of biodiversity through proxy and predictive approaches. The ET assumes that reduced deforestation and improved habitat connectivity translate to improved biodiversity. Proxy measurements of species diversity and abundance will then be applied based on forest loss. See Annex V: Measuring Forest Condition and the Design Report in this evaluation for more information.

EVALUATION DESIGN AND METHODS

DESIGN OVERVIEW[31]

To thoroughly address all EQs, this mixed-methods evaluation includes IE and PE components. The team will implement a comprehensive approach that examines outcomes and impacts across LfP SMVC's ToC. This proposed evaluation methodology draws from the FA conducted by NORC at the University of Chicago.

The evaluation includes a causal impact analysis for deforestation measures; the ET will assess performance indicators and outcomes through a mixed-methods approach that triangulates findings from multiple quantitative and qualitative sources. Because of the largely distinct geography and content between the three LfP SMVC region intervention components, the evaluation explores outcomes related to each distinct intervention component, as well as tracking CNP deforestation rates near Puerto Rico and the pilot communities for evidence that the interventions in those areas affected conservation outcomes in or near the CNP.

The evaluation combines data analysis of spatial administrative data, spatial data derived from satellite imagery, household surveys with beneficiary community members,[32] FGDs, and SSIs with stakeholders and beneficiaries. Where possible, the evaluation will conduct rigorous quantitative analyses comparing trends in project and comparison communities. The evaluation design incorporates survey modules of female decision-makers to improve understanding of the gendered effects of the programming. Additional analyses may be conducted on other subgroups of interest, such as large land holders, households headed by ethnic minorities (Afro-Colombian[33] and Indigenous) or migrants, and conflict-affected households.

INDICATORS AND OUTCOME MEASURES

A summary of primary outcomes and data sources used to answer each EQ is presented in Table 2 below.

Table 2: Summary of EQs, Key Outcomes, and Data Sources

EVALUATION QUESTION	OUTPUTS AND PERFORMANCE MEASURES	OUTCOMES	DATA SOURCE (E.G., QUANTITATIVE OR QUALITATIVE COLLECTION)
Tenure Security	Land titles granted and land use contracts executed. Beneficiary experience (with analysis by subgroups) LfP SMVC performance.	Perceived tenure security. Index of land rights. Frequency and severity of land conflicts.	• Household survey • Administrative data • SSIs • FGDs • Program documents

[31] This subsection presents an overview of the evaluation design. For additional details please refer to the LfP SMVC Evaluation Design Report and Annex III: Measuring Forest Condition Methods Explanation.
[32] The evaluation stratified the baseline sample to include known household beneficiaries. Because not all beneficiaries were identified at the time of baseline data collection, the baseline sample will not overlap with all program beneficiaries.
[33] While Afro-Colombian communities are not officially granted territory in this area, the ET will survey a random sample of residents in the study area and conduct subgroup analyses for differential effects if there is a sufficient number of residents who identify as Afro-Colombian/Indigenous.

EVALUATION QUESTION	OUTPUTS AND PERFORMANCE MEASURES	OUTCOMES	DATA SOURCE (E.G., QUANTITATIVE OR QUALITATIVE COLLECTION)
Livelihoods	LfP SMVC performance. Beneficiary experience (with analysis by subgroups).	Participation in licit and sustainable income activities. Household income. Livelihood and well-being.	• Household survey • SSIs • FGDs • Program documents
Investment	LfP SMVC performance.	Field investments for improved productivity. Non-productive property/housing investments. Land clearing (negative externality).	• Household survey • Administrative data • Satellite data • SSIs • FGDs • Program documents
Governance	Establishment of MLOs. Park and illegal land occupation borders clearly delineated. Establishment of MLOs. Land administration and management institutions created/strengthened. LfP SMVC performance. Beneficiary experience (with analysis by subgroups).	Household understanding of CNP border location and regulations. Perceived capacity within GoC for land use monitoring and enforcement. Household expectations of the consequences of illicit activity in pilot communities. New incidents of illegal land grabbing. Satisfaction with and confidence in land administration and governance. Prosecution of environmental crimes.	• Household survey • Administrative data • SSIs • Program documents
Deforestation and Biodiversity	Park border and illegal land occupation borders clearly delineated. Land use clearly communicated to residents. LfP SMVC performance.	New incidents of deforestation (forest loss)/deforestation alerts. Forest degradation. Habitat connectivity. Incidence and extent of fires (burned area). Land use alignment with permitted uses along the PNN Chiribiquete border. Forest recovery and connectivity in previously	• Administrative data • Satellite data • SSIs • Program documents

EVALUATION QUESTION	OUTPUTS AND PERFORMANCE MEASURES	OUTCOMES	DATA SOURCE (E.G., QUANTITATIVE OR QUALITATIVE COLLECTION)
		deforested areas located near the main forest. Total forested area. Biodiversity—species abundance and richness (proxy/predictive measures). Land cover type. Normalized difference vegetation index.	

This evaluation will also track secondary outcomes and outputs to further assess program progress and effects. For a timeline of evaluation activities, \refer to Annex 2: Evaluation Timeline.

SAMPLING METHODOLOGY

CNP BORDER DELINEATION

The CNP border delineation IE includes a forest condition analysis of several treatment groups for LfP SMVC:

- The full CNP park border.
- Indigenous reserves within or overlapping the borders of CNP.
- Indigenous communities[34] within the park that may have valid claims but are not in formal reserves.
- Other communities with no legal standing to be inside the park.

COMMUNITY-LEVEL FORMALIZATION PILOTS

LfP defined the areas selected for the first two community-level formalization pilots in coordination with the ANT and MADS by overlapping geospatial datasets to locate deforestation hotspots, key locations from ecological connectivity analyses, and settlements in areas where informality in land tenure represented a significant threat to deforestation and biodiversity. According to LfP program documentation, the pilot sites were chosen according to the following criteria: 1) areas are within the CNP buffer zone; 2) areas are prioritized by MADS for right-of-use contracts; 3) areas are located in the ecological connectivity corridors defined by MADS; 4) polygons are in deforestation hotspots; 5) polygons fall within areas of influence, presence, or risk of illicit crops; 6) ANT and other relevant GoC institutions agree to the polygons' selection; and 7) there are no concurrent programs such as the PNIS,[35] *Visión Amazonía*, etc. in these areas. Table 3 below lists the areas chosen, taking into account these criteria.[36]

[34] These indigenous communities are uncontacted and have special status under the law.
[35] While no concurrent programs such as PNIS was a selection criteria for the pilot polygons, LfP and this evaluation found that PNIS had operated in the area.
[36] After the evaluation was designed and baseline data collected, LfP indicated that the GoC may reverse its decision and allow the community-level formalization pilots to occur in these municipalities outside of the territorial polygons. After programming is complete, endline evaluation

Table 3: Characteristics of Community-Level Formalization Pilot Polygons

POLYGON	LOCATION	SIZE / ALTITUDE / MINING AND ENERGY EXTRACTION SITE TYPE	WITHIN ECOLOGICAL CONNECTIVITY CORRIDOR	RISK AREA FOR ILLICIT CROPS	OTHER PROGRAMS PRESENT
Polygon 1 (Guaviare)	West of the municipality of San José del Guaviare, approx. 6 km from CNP border, in the vicinity of the villages of Peña Roja, La Unión, Fundación, Buenos Aires, La Orquídea, and Itilla.	12,784 ha. 300 meters above sea level. Type B (allowing sustainable forestry activities).	Yes, within the ecosystem connectivity corridor defined by MADS and Natural Wealth.	Yes	Yes, PNIS
Polygon 2 (Caquetá)	In the municipality of San Vicente del Caguán, approx. 13 km from CNP border, in the vicinity of the villages Candilejas Este and Ciudad Yarí.	4,787 hectares. 250 meters above sea level. Type A (allowing no intervention).	Yes, intersects with the ecological connectivity corridor defined by MADS.	Yes	No[37]

After additional preparatory information gathering, LfP determined that it may be necessary to undertake community-level formalization pilots in more than two polygons to meet the target number of land use contracts to be delivered due to lower-than-anticipated numbers of residents in the two selected polygons.[38] The total number of polygons in which LfP will conduct community-level formalization pilots is still being considered due to: social resistance to the land use contracts, the government's lack of pedagogy, security conditions, and the geographic segmentation of polygons. Due to budget restrictions and the heavy presence of other actors working on use contracts in the area, LfP will partner with other organizations[39] to broaden the geographic reach of pilot work to other polygons. The intervention will be slightly different in these new polygons (less LfP-led), although work in the first two polygons will also

planning will need to include a stocktaking of the final locations of the pilot interventions and overlap with the baseline sample to confirm the evaluation approach.

[37] This is unspecified in the LfP memo. The ET will work with LfP to confirm that this information is correct.

[38] During project planning, it was estimated that 500 residents resided in each of the two polygons, but the actual number appears much lower (the evaluation was only able to locate 33 residents).

[39] These are: Fundación para la Conservación y el Desarrollo Sostenible, Amazonía Mía, World Wide Fund for Nature, Visión Amazonía, Instituto Sinchi, PNIS, Agencia Nacional de Tierras, Gobernación de Guaviare, and Gobernación del Caquetá.

involve partnerships. As of this report's drafting, these additional polygons have not been selected; additional polygons are likely to be selected in the next 12 months. According to LfP, additional polygons will be selected from the set of all priority polygons defined by MADS and that meet LfP's criteria in San José del Guaviare, Miraflores, Calamar, San Vicente del Caguán, Cartagena del Chairá, and Solano municipalities.

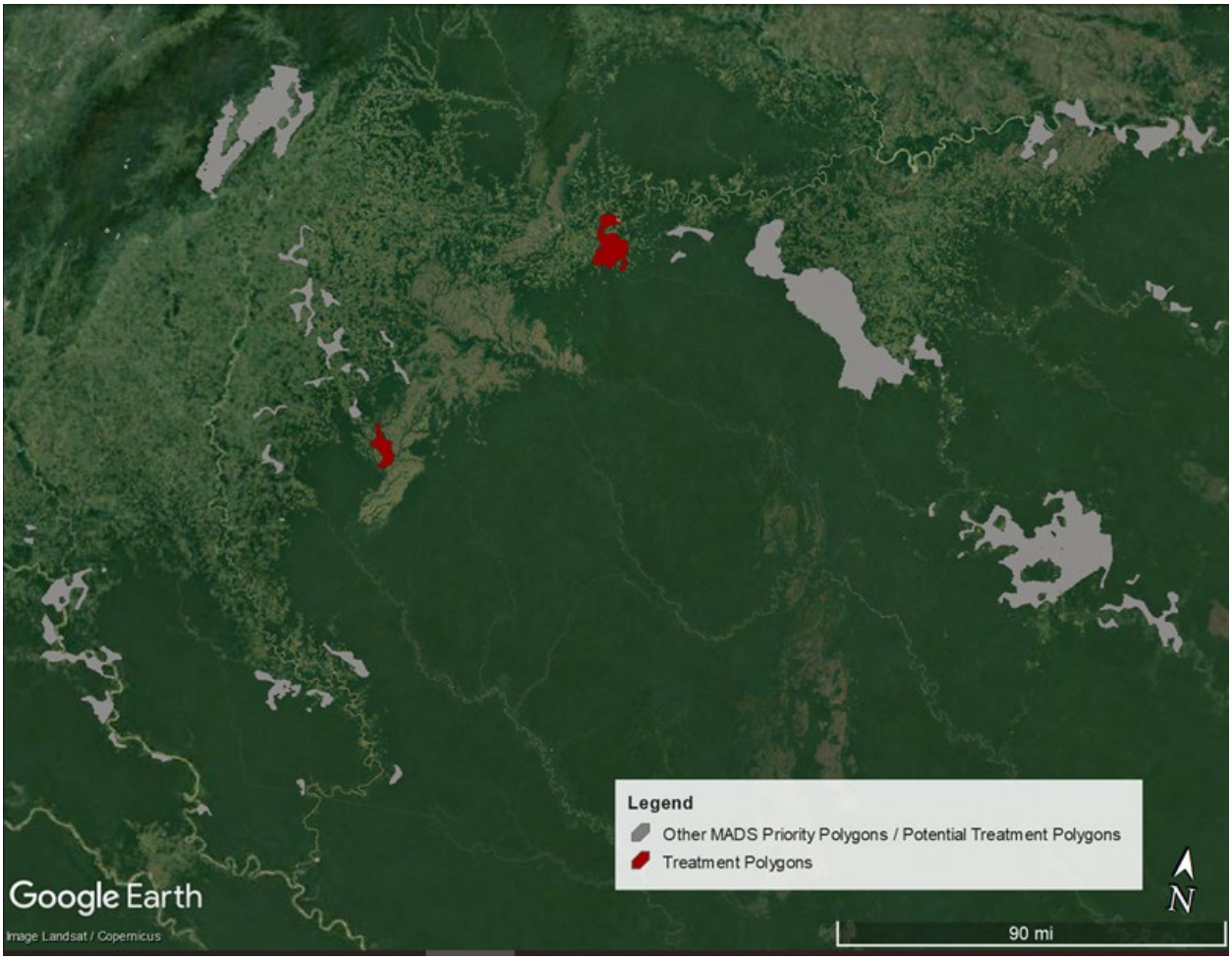
The ET collected baseline evaluation data in the maximum number of polygons possible in the six municipalities, including those selected for the community-level formalization pilots and polygons eligible for potential inclusion. Due to the large number of polygons in the area (with small population sizes) as well as the inconsistent sizes of polygons (ranging from 0.015 ha to 52,097.04 ha), the ET created 30 "macropolygons" from the group of 71 original polygons. The ET sought to sample a minimum of 20 households from one *vereda* in each macropolygon and oversample in original program polygons and large polygons. The target *vereda(s)* in each polygon were chosen according to the area of the *vereda* within the polygon, population, urban/rural character, and presence of forest. The location of the household within the polygon was confirmed by the field team using GPS with a 1 km buffer around the polygon boundary.

This strategy of collecting data in these discrete areas maximizes the chance that the evaluation will be able to measure environmental outcomes in communities receiving the formalization pilots. If there are any polygons that are not selected for treatment by LfP—or if treatment is staggered—they will form a comparison group, though in some instances the evaluation may need to account for the presence of other programming. To account for the low uptake of land use contracts at endline and follow-up data collection, a specific survey will be added for those who received land use contracts, in addition to the panel household survey with baseline respondents. Figure 5, below, depicts the first two selected community-level formalization pilot polygons (red) and the set of additional polygons eligible for LfP expansion (gray).

The ET also surveyed additional comparison households for the community-level formalization pilots by identifying households surrounding the selected polygons within the CNP buffer zone. To the extent possible, the ET excluded areas where other tenure and conservation programming are taking place or are planned (e.g., Amazon Alive, *Territorios Forestales*).

This strategy facilitates a rigorous case study PE comparison of the performance and project model across several LfP communities, including the partnership-based model. The final sample of treatment versus comparison polygons will not be determined until LfP selects the final set of expansion treatment polygons. For the purpose of this baseline report, the team only identified the two originally selected polygons for the treatment area and analyzed all remaining data as comparison polygons. Over time and as additional polygons are pegged for treatment, this distribution will shift. As this study represents a PE versus IE, the ET is not concerned with the lack of a "true" comparison for the case-study approach.

Figure 5: LfP Community-Level Formalization Pilot Polygons and Potential Additional Polygons



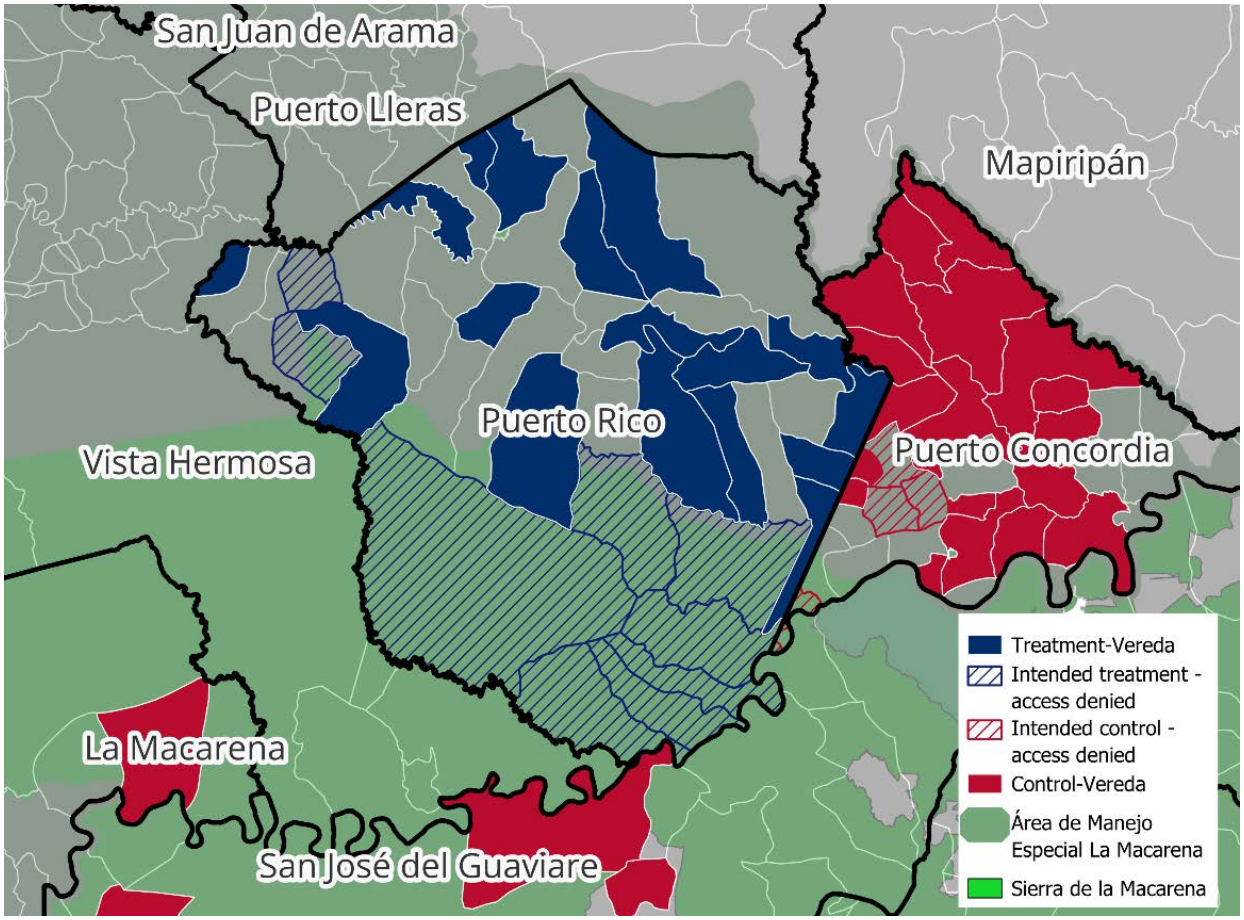
MUNICIPAL PARCEL SWEEP AND PPP ACTIVITIES

According to program documentation, LfP selected Puerto Rico municipality from a list of 13 municipalities covered by *Programas de Desarrollo con Enfoque Territorial* that are relevant to both deforestation hotspots and GoC priority areas, such as the Strategic Zones of Integral Integration (or Future Zones[40]). As noted earlier, LfP also considered synergies with its ongoing program of activities in Meta in selecting this site. Puerto Rico is considered the edge of the agricultural frontier bordering the PNN Sierra de La Macarena. Informality is high and illicit coca cultivation is emerging. All of the municipality is subject to some type of environmental restriction: 40 percent is PNN[41] (Sierra de La Macarena) and the other 60 percent is part of three *Área de Manejo Especial de La Macarena* Integrated Management Districts of different levels of restriction.[42] With the parcel sweep, LfP will cover 22 percent of the area of PNN Sierra de La Macarena and about half of the two focal areas of the environmental Future Zone. The ET randomly selected 21 *veredas* in Puerto Rico to form the treatment group and selected comparison households for this evaluation component in 25 similar *veredas* across the Puerto Rico municipal boundary in the municipalities of Puerto Concordia, La Macarena, and San José del Guaviare using a nearest neighbor matching

[40] However, the Future Zones no longer exist as a public policy under the new government.
[41] The formalization element of the parcel sweep is not applicable within the park—only the cadastre information updating.
[42] Sixty percent of land can be titled but there must be an Environmental Management Plan.

approach.[43] To the extent possible, the ET excluded areas where other tenure and conservation programming (e.g., Amazon Alive, *Territorios Forestales*) are taking place or planned. Figure 6, below, displays Puerto Rico municipality and comparison *veredas*.

Figure 6: Puerto Rico Municipality and Comparison Veredas



LIMITATIONS AND RISKS

There are five major limitation and risks to the evaluation design:

1. **Limited ability to make causal inferences:** While the evaluation will seek to apply quasi-experimental analysis strategies beyond the geospatial IE wherever possible, the evaluation components covering Puerto Rico and the polygons were designed as a rigorous PE because of the anticipated challenges with study power and treatment and comparison area selection that will limit the evaluation's ability to be sure whether observed changes are due to the LfP SMVC interventions.[44] In Puerto Rico, the sample is restricted to *veredas* where the research team was allowed to sample households, so there is some selection bias versus a truly "random" selection of *veredas* (see the following section for more information about this challenge). This means that the inferences are restricted to that set of *veredas*. Nevertheless, the inclusion of comparison communities will allow the ET to compare trends observed in similar communities, half of which

[43] The ET explored both nearest neighbor and best overall matching approaches based on available pre-treatment data. Prioritizing balance on pre-treatment tree cover loss, the nearest neighbor matching approach produced better balance on pre-treatment mean values.
[44] Refer to Annex IV: Balance and Power Calculation Summary for a full discussion of initial balance and power analysis.

received an LfP SMVC intervention and half of which did not, and report where and how those trajectories may be diverging due to project interventions.

2. The study will also lack the power to detect a statistically significant treatment effect in the polygon areas and for outcomes in Puerto Rico that are not measured at the household level. In particular, for the polygon areas, the ET expects 1) overlapping programming and 2) the possibility that the final treatment may not well cover the polygon areas where baseline data was collected, as it is the ET's understanding that the GoC has allowed programming to potentially occur outside of the spatial priority polygons after evaluation design and baseline data collection In these cases, the research team will explore descriptive trends and pre-post tests with a comparison group to assess "reasonable" attribution for any changes in outcomes of interest. As described above, the evaluation will mitigate this limitation by supplementing the quantitative data collection with qualitative data collection that can provide USAID and LfP with additional insights about suggestive changes in treatment areas and the mechanisms behind potential effects.
3. **Timeline of program activities:** The Specialty Cocoa PPP was signed in the Southern Meta region (including Puerto Rico) in 2022, prior to this baseline data collection. For this reason, PPP activities began before baseline data collection, and the evaluation lacks a true baseline on alternative livelihoods measures. However, because the PPP was operational and identified participants prior to baseline data collection, this gives the study the ability to identify and sample known PPP participants in the data collection rounds, beginning with baseline, allowing the evaluation to collect richer information about the participants' program experience.
4. Conversely, the non-traditional forest products PPP and the sustainable cattle ranching PPP were not signed prior to baseline data collection. While the evaluation did attempt to return to Guaviare and Caquetá to interview PPP participants after these agreements were signed in June 2023, the team was only able to interview one participant in the non-traditional forest products PPP. Citing a deteriorating security context, managers of the sustainable cattle ranching PPP declined all interview requests and refused to share information about participants with the evaluation for the household survey. Thus in Guaviare and Caquetá, the team cannot be sure whether members have interviewed anyone at baseline who will participate in the non-traditional forest products and the sustainable cattle ranching PPPs.
5. **Implementation challenges:** This evaluation is designed with several assumptions about project activities. For the CNP, the geospatial IE is based on an assumption that 1) the government will make use of the data and imagery supplied by LfP as per the program plan and 2) the research team will have access to the shapefiles. For the Puerto Rico and community-level formalization pilots, the evaluation assumes that most or all planned activities will take place in all identified treatment areas. For example, the team assumes that the framework for granting use contracts and forest concessions will be solidified, and communities will receive these interventions. If they do not unfold as planned—if legal issues surrounding these instruments persist or if the communities do not accept them—then the evaluation expects limited or no changes in the outcomes it is able to measure.
6. **Security concerns:** During the course of baseline data collection, security conditions were perceived to be worsening in all departments where data collection took place. As noted in the above map and in further detail in the next section, this led to the team lacking access to some respondents and participants for the purposes of baseline data collection. Post-baseline, these security challenges could delay or hinder project activities and/or create problems for the ET to access areas for follow-up rounds of data collection.

BASELINE DATA COLLECTION

SEI, a Colombian research firm, conducted the baseline data collection in close cooperation with the ET.

Training of the trainers began on February 13, 2023 and continued through February 15, 2023. Then enumerator training took place February 16–23, 2023, including a pilot day, in Puerto Rico, Meta. The SEI field manager led the training with assistance from the ET lead and a research assistant. Enumerators were trained on best practices for interviewing, the ethics of research with human subjects, household sampling protocols, locating households within polygons, and the household survey instrument. The training contained lectures, roleplaying, and group exercises and provided three days for enumerators to practice the survey in small groups, share their questions and advice, and practice using Survey CTO, the survey platform selected for this project. Feedback from this training allowed the ET to improve the instruments and further adapt them to the local context before data collection. The ET also selected and trained survey team supervisors on the household surveys, data and device management, and the randomization process.

A data collection pilot was conducted in four out of sample *veredas* in Puerto Rico on February 23, 2023, to give all team members direct experience using the survey instrument. The data collected from this pilot also led to several minor improvements in the survey instrument.

Household survey baseline data collection took place between February 26 and April 11, 2023.[45] The household survey was collected through a cloud-based mobile data collection effort. Data was entered directly into Android phones using a mobile data collection platform, SurveyCTO, and downloaded and formatted it into Excel spreadsheets. In total, the quantitative survey team consisted of one field manager, six supervisors, and 30 enumerators. The team was divided into six teams of five quantitative enumerators (at least one of whom was female per team) and one supervisor. All enumerators had at least some post-secondary education.

The qualitative team was trained separately on March 3 and 6, 2023 on best practices for qualitative data collection, the ethics of research with human subjects, the SSI and FGD instruments and objectives, respondent selection and recruiting, and qualitative data management. Each team of qualitative enumerators consisted of at least one female enumerator to ensure that women's FGDs would be led by a female enumerator. Qualitative team supervisors were also trained on word-for-word transcription best practices, transcription formatting guidelines, and qualitative data management. Researchers piloted the qualitative instruments on March 8 and 10, 2023, in a non-sample *vereda* in Puerto Rico municipality.

Qualitative data collection took place from April 14 and May 17, 2023.[46] In total, the team conducted 11 FGDs in four communities, outlined below in Table 4. The ET selected the Puerto Rico treatment *vereda* for focus groups randomly from the set of treatment *veredas* bordering forested areas that were accessible to the team and, following that, the ET selected its nearest accessible matched comparison *vereda* to also conduct focus groups. Following the selection of the two original polygons for focus groups, the ET selected a comparison/expansion polygon with a similar population and area to receive focus groups.

[45] Limited additional surveys were collected from May 10 to 16 in the municipalities of San Vicente del Caguán (Caquetá) and San José del Guaviare (Guaviare) and with non-traditional forest products PPP participants in September 2023.
[46] In addition, two interviews were conducted in September with non-traditional forest products PPP managers in Guaviare.

Table 4: Summary of Baseline FGDs

FGD TARGET GROUP	NUMBER OF FGDS	LOCATIONS OF FGDS
Women	5	Puerto Rico treatment *vereda* Puerto Rico comparison *vereda* Polygon treatment communities (2) Polygon comparison/expansion community
Men	5	Puerto Rico treatment *vereda* Puerto Rico comparison *vereda* Polygon treatment communities (2) Polygon comparison/expansion community
PPP Participants	1	Puerto Rico treatment *vereda*

The team also conducted 54 SSIs, summarized in Table 5, below.

Table 5: Summary of Baseline SSIs

TYPE OF SSI	NUMBER OF SSI	LOCATIONS OF SSI
LfP (chief of party, deputy chief of party, environmental expert, regional coordinator)	4	N/A (National)
National GoC stakeholders[47]	11	N/A (National)
Municipal mayors	4	Puerto Rico (2), San José del Guaviare, San Vincente del Caguán
Department/Municipal Land Authorities	1	Puerto Rico, Caquetá, Guaviare
PPP organizations (e.g., cacao, non-traditional forest products)	4	Puerto Rico (3), Guaviare (1)
CSOs targeted for capacity-building activities as part of community-level formalization pilots	2	Puerto Rico, Caquetá
LfP SMVC subcontractors/implementers	1	Puerto Rico treatment *vereda*
Indigenous authorities	3	Puerto Rico treatment *vereda* Polygon treatment communities (2)
Livestock local committees	3	Puerto Rico treatment *vereda* Polygon treatment communities (2)
Forest Roundtables	3	Meta, Caquetá, Guaviare
Sistema Departamental de Áreas Protegidas	2	Caquetá, Guaviare
JACs	4	Puerto Rico treatment *vereda* Polygon treatment communities (3)
Campesino associations	3	Meta, Caquetá, Guaviare
Corporación para el Desarrollo Sostenible del Norte y el Oriente Amazónico Guaviare	1	Guaviare

[47] PNN; IDEAM; Departamento Nacional de Planeación/Catastro Multipropósito; Ministry of National Defense; Ministry of Agriculture and Rural Development; Agustin Codazzi Geographic Institute; ANT; Agency for Territorial Renovation (2); Prosecutor's Office, Foundation for Conservation and Sustainable Development.

TYPE OF SSI	NUMBER OF SSI	LOCATIONS OF SSI
Corpoamazonia (Corporación para el Desarrollo Sostenible del Sur de la Amazonia)	1	Caquetá
Cormacarena (Corporación para el Desarrollo Sostenible de la Macarena)	1	Meta
Amazonia Mía	2	Caquetá, Guaviare
Territorios Forestales	1	N/A (National)
World Wide Fund for Nature	1	N/A (National)
CNP Park ranger	2	Caquetá, Guaviare

In line with the requirements for human subjects' protection, the ET received approval from the University of Pennsylvania Institutional Review Board in January 2023. Verbal informed consent was received from each participant after reading a statement about the purpose of the research, the content of the survey, any risks or benefits, and the time commitment. Participants were assured their participation was voluntary and could be withdrawn at any point and their answers would be kept confidential. They were also informed that their responses would be shared through public posting and publication in a way that protected their identities. Participants who agreed to participate in the research gave their consent orally, and consent was recorded in the electronic survey device.

DATA QUALITY

The LfP SMVC data collection effort utilized the following quality control measures: observation of enumerators by supervisors and the field manager, site presence by the field manager, daily quality control checks by the ET, and auditing/re-interviewing of respondents. Each enumerator was observed by their supervisor and the field manager a minimum of two times each week, and the supervisor or field manager was present for the entire interview. Feedback from the field manager and supervisors was continuously used to improve enumerator performance and discourage data falsification.

Finally, the most thorough checks were remote high-frequency checks conducted by the ET on 100 percent of all household surveys using SurveyCTO, the results of which the team compiled and shared with the survey firm. The high-frequency checks compared survey responses by each enumerator to search for patterns indicating data falsification or systematic errors that should be corrected, including short survey times, missing responses, a low average number of "other, specify" responses or multiple selections, the low average number of rows completed on each roster, and any other significant irregularities by day, *vereda*, team, or enumerator.

CHALLENGES ENCOUNTERED

In general, the data collection experienced challenges due to the presence of armed groups, coca production in the area, and dissatisfaction with the government. During the data collection, the security situation in the area was perceived by *Soluciones Estratégicas en Información* and their local government contacts to be worsening. In total, nine *veredas* in Puerto Rico and five *veredas* in Puerto Concordia were inaccessible to the data collection team due to the presence of armed groups. The team replaced these *veredas* with the nearest accessible *veredas*. The team was also denied entry into one municipality in Caquetá where six macropolygons were located (Cartagena Del Chairá).

During data collection, the LfP program also received some concerns from the communities about sensitive questions on coca production and deforestation on the other side of the river in Puerto Rico. When enumerators were asked at the end of the survey what was the respondent's reaction to the survey, the respondent's reaction was recorded as negative in less than five percent of cases. Nevertheless, in an abundance of caution, in response to this feedback, the ET removed questions about these sensitive topics from the household survey and the FGD tool in the macropolygons.

Finally, one component of baseline data collection (surveys, SSIs, and focus groups with PPP organizations and members in Guaviare and Caquetá) was delayed because the partner organizations on these activities were not engaged by LfP until June 2023. The data collection team returned to collect this data in September 2023 after these organizations were engaged by LfP, but the evaluation was only able to collect two interviews and two surveys with PPP organizations and their members in these areas; the remaining organizations declined to participate, citing security concerns.

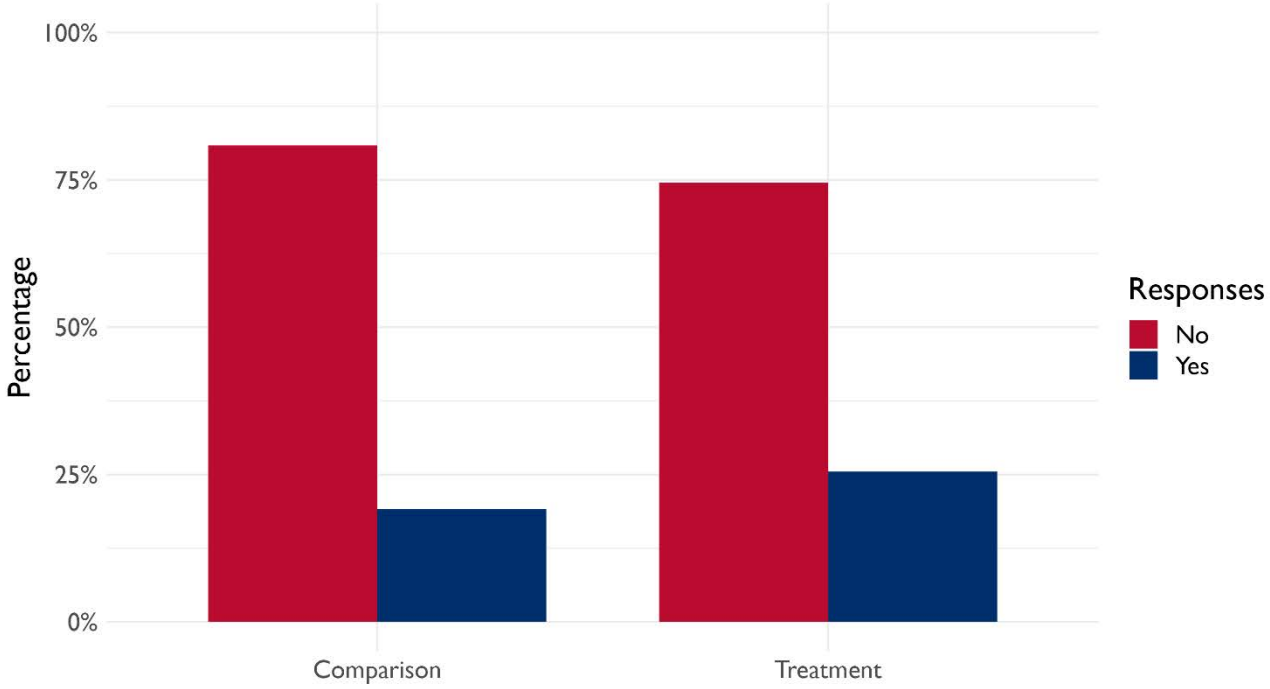
FINDINGS—PUERTO RICO

This section presents findings from treatment households in Puerto Rico municipality and comparison households in matched *veredas* in Puerto Concordia, La Macarena, and San José del Guaviare Municipalities.

RESPONDENT HOUSEHOLD AND FIELD INFORMATION

Approximately 46 percent of respondents in Puerto Rico municipality identified themselves as White, 28 percent selected Mestizo, and 18 percent chose "none of the above." A small percentage selected Black or Mulatto (2 percent), Afro-descendant/Afro-Colombian (2 percent), and Indigenous (3 percent). Respondents in comparison municipalities identify themselves with a similar distribution; however, comparison areas are defined by significantly more individuals who identify as White (59 percent).

Figure 7: Born in the Municipality by Treatment Status (Puerto Rico and Comparison)



Across both comparison and treatment areas, the overwhelming majority of respondents report that they were not born in the municipality where they currently reside (approximately 75 percent of treatment respondents and 81 percent of comparison respondents) (Figure 7). Among those not born in the areas, the average number of years lived in the municipality is 28 years for treatment areas. The main reasons cited for moving to the current municipality are 1) seeking job and business opportunities (53 percent), 2) moving due to household decisions (36 percent), and 3) needing land for agriculture and better yields/searching for more fertile land (6 percent). Descriptive statistics for comparison areas are similar. On average, there are about three habitual residents in both treatment and comparison households.[48]

[48] No respondents reported the presence of additional residents, such as domestic workers, in their households.

Table 6: Summary Statistics from Respondent Household Information (Puerto Rico and Comparison)

	COMPARISON					TREATMENT				
ITEM	N	MEAN	ST. DEV	MIN	MAX	N	MEAN	ST. DEV	MIN	MAX
Born Locally (Binary)	512	0.191	0.394	0	1	510	0.255	0.436	0	1
Years Lived in Municipality	414	23.795	16.285	0	70	380	28.403	16.188	0	66
Number of Habitual Residents	512	3.361	1.813	1	11	510	3.139	1.659	1	10

OVERALL LAND QUESTIONS

A majority of respondents in the treatment municipality (82 percent) report that they own the land they reside on, approximately 6 percent rent, and 12 percent borrow. This finding may highlight a difference in perception of ownership versus what the statutory system would designate as ownership based on actual documentation. The total average land area households currently own or use is 56.9 hectares, and the median is 26 hectares. There are similar baseline findings for land ownership characteristics in comparison areas. The three most common methods of household field acquisition in Puerto Rico municipality are purchase (50 percent), inheritance (21 percent), and rental (12 percent). When asked who their households purchased the land from, the top three responses were a friend from many years ago (43 percent), a neighbor (20 percent), and a relative (17 percent). Around one-third of respondents have acquired their fields within the past five years, with 13 percent acquiring them within the past year.

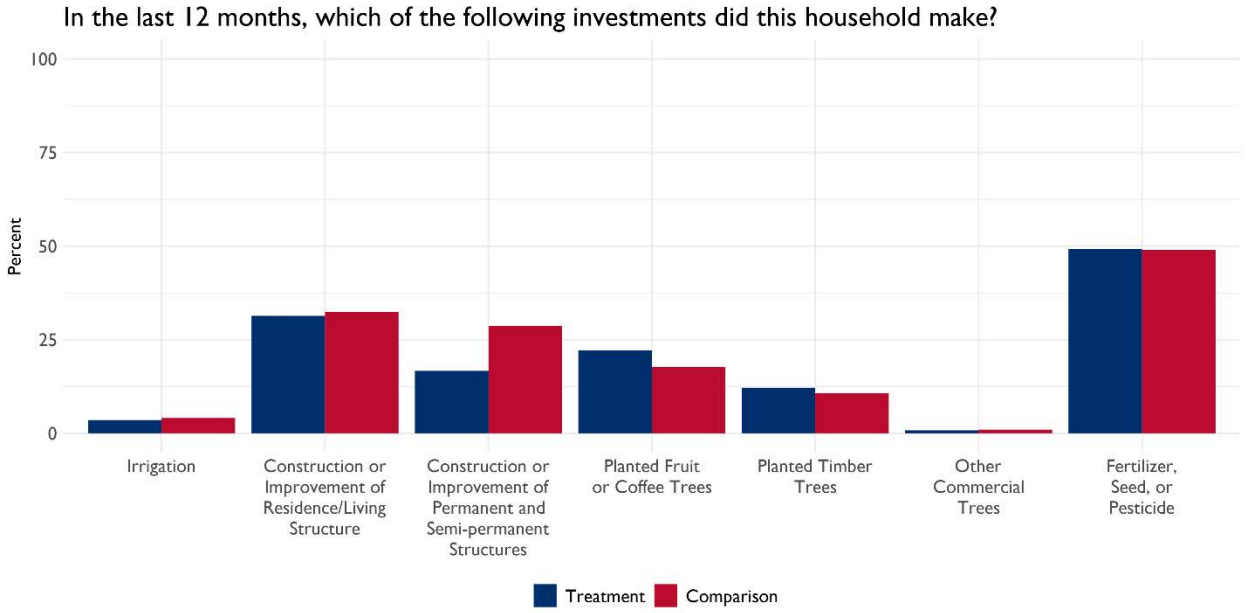
Sixty percent of respondents report having natural forests on their fields. Fifteen percent of household fields are reported to be "in protected areas." The average time needed to walk from respondents' residences to their fields is 47 minutes. For 34 percent of respondents, the commute is over one hour, and for 14 percent, it is over two hours. These longer commute times may be linked to fields in forested areas.

The top three uses of fields are for residences (76 percent), transient crops (44 percent), and livestock/pastures (42 percent). An overwhelming majority of respondents (97 percent) have irrigated fields. **There is evidence of relatively high levels of investments into fields and residences (Figure 8). Nearly half of households (49 percent) invested in fertilizer, seed, and pesticide within the past year.**[49] In total, 31 percent of households made investments in the construction or

[49] Previous studies echo these findings on farmer investments. One USAID assessment of rural and agricultural financial services in Colombia found that 63 percent of surveyed farmers planned to make an investment in their productive activity—most commonly, inputs and supplies—in the following two years. Another study found that the percentage of farmers in selected regions of Colombia using fertilizer ranged from 36–100 percent, and the percentage applying chemical pest control ranged from 70–97 percent. USAID Colombia. 2014. "Assessment of Rural and Agricultural Financial Services in Colombia." https://www.usaid.gov/sites/default/files/2022-05/ATTACHMENT%206.a%20ASSESSMENT%20OF%20RURAL%20AND%20AGRICULTURAL%20FINANCIAL%20SERVICES%20IN%20COLOMBIA.pdf; Diaz, R. T., D. P. Osorio, E. M. Hernandez, M. M. Pallares, F. A. Canales, A. C. Paternina, and A. Echeverria-Gonzalez. 2022. "Socioeconomic Determinants that Influence the Agricultural Practices of Small Farm Families in Northern Colombia." https://repositorio.cuc.edu.co/bitstream/handle/11323/9232/Socioeconomic%20determinants%20that%20influence%20the%20agricultural%20practices%20of%20small%20farm%20families%20in%20northern%20Colombia.pdf?sequence=1&isAllowed=y

improvement of their residence in the past year, while 22 percent invested in planting fruit or coffee trees within the past year. Investment trends are generally similar between treatment and comparison areas, with the exception of investment in non-residential structures, which is higher in comparison areas (29 percent comparison versus 17 percent treatment). The two lowest-ranked investments were timber tree planting and irrigation. Twelve percent of households invested in planting timber trees (and at a relatively low level of expenditure). Only four percent of households made investments in irrigation, likely because most of the study area is already irrigated and these investments are expensive.

Figure 8: Land Investments by Treatment Status (Puerto Rico and Comparison)



In Puerto Rico municipality, approximately 75 percent of respondents reported that they or someone in their household had cultivated crops in their fields within the past year. The three most frequently planted crops were plantains, manioc, and yellow or white corn. Comparison findings are similar. Only 40 percent of treatment respondents said that they had sold crops from their fields in 2022, compared with 29 percent for comparison respondents. The mean amount earned for treatment respondents who sold crops from their fields in 2022 was 8,882,475 COP, with the median being 4,000,000 COP.

Table 7: Summary Statistics for Overall Land Questions (Puerto Rico and Comparison)

	COMPARISON					TREATMENT				
ITEM	N	MEAN	ST. DEV	MIN	MAX	N	MEAN	ST. DEV	MIN	MAX
Total land area owned and used (ha)	479	47.856	68.901	0	399	467	42.262	46.97	0	230
Total land area rented (ha)	60	16.775	29.841	0.002	150	64	11.212	26.032	0	133
Total land area borrowed (ha)	40	8.384	18.072	0.006	100	43	16.704	30.125	0.003	118
Total land area rented out (ha)	7	25.573	27.794	0.012	80	19	3.321	4.024	0.010	17
Total land area lent out (ha)	2	0.750	0.354	0.500	1	3	0.917	0.629	0.250	1.500
Total land area owned and kept fallow (ha)	7	3.181	4.605	0	12	10	18.900	24.053	1	80
Land taken by authorities or external groups (binary)	512	0.002	0.044	0	1	510	0.002	0.044	0	1

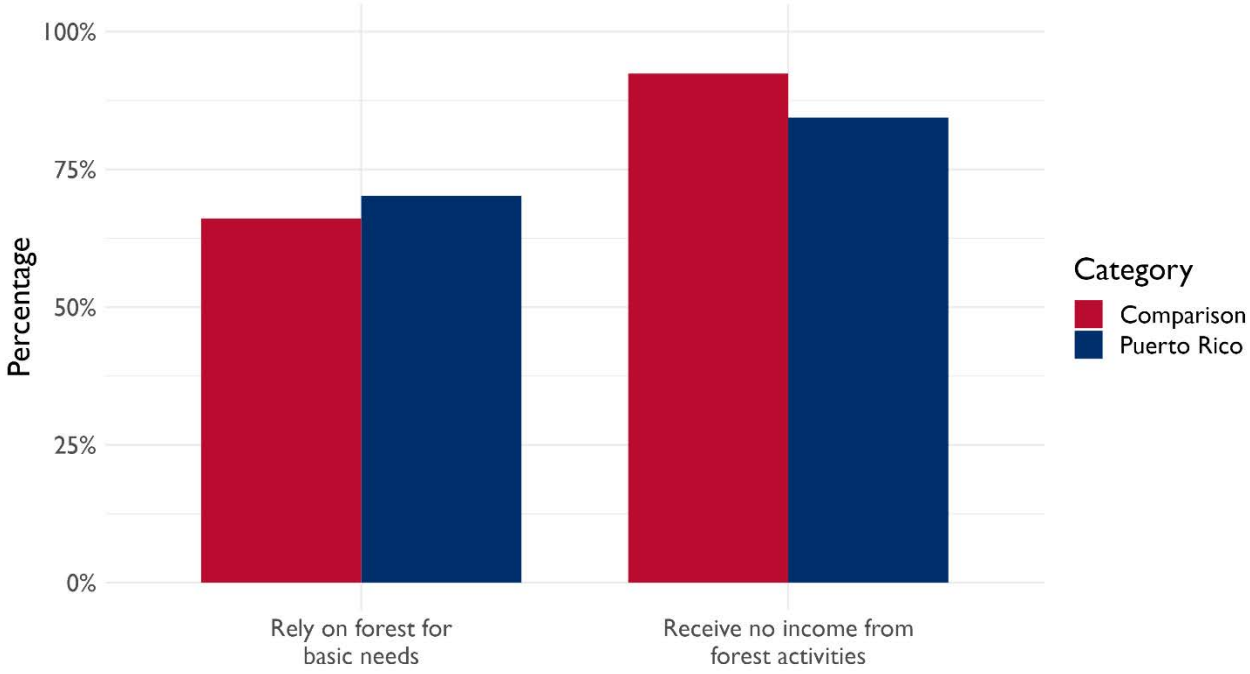
FOREST DEPENDENCE AND VALUATION

In Puerto Rico municipality, 70 percent of households rely on the forest for their basic needs; however, the overwhelming majority of respondents (84 percent) report that their household receives no income from forest products or activities. While forest reliance is generally equivalent in comparison areas, a larger percentage of respondents (93 percent) said their household receives no income from forest products or activities (Figure 9). This is in line with the geography of treatment and comparison settlements, since treatment *veredas* are closer to/directly bordering La Macarena National Park and areas of more contiguous forests.

Qualitative and quantitative data show that respondents are well aware of the ecological benefits of the forest. According to the survey data, the top three benefits of nearby forests were water conservation, fresh air, and water purification/shade. When asked to identify the singular most important benefit of nearby forests, nearly half of both groups said water conservation. The qualitative data indicate an especially strong knowledge of ecosystem and environment-health linkages between forest conditions and water quality, as well as temperature benefits. The link to water quality is well understood and has food security concerns related to the ability to access fish for livelihood purposes.[50] Water is also an important concern due to water needs for cropping and harvesting.

[50] Similar to men, women report that forests provide clean water and air, although they also mention firewood for cooking. The discussion seems to point to a reduction in the amount of available firewood; the cause is unclear, just that "the firewood is already very far away."

Figure 9: Forest Reliance for Basic Needs and Income by Treatment Status (Puerto Rico and Comparison)



> *"...we are suffering for water because if we do not have forestation, irrigation, well, water is being withdrawn much more and a farm without water, well, we all really suffer. We suffer, the animals suffer, every kind of animal, every living being suffers." (PPP FGD, Puerto Rico)*

As such, local communities are concerned with burning and logging near water bodies, and this seems to be the one area where communities organize and seek to enforce regulations about forest use.

There are generally positive attitudes to questions about efforts to conserve forests. Two-thirds of respondents disagree with the claims that 1) efforts to conserve forests do not benefit anyone in their *veredas* and 2) protecting the environment will hurt their *vereda's* economic development (Figure 10). Likewise, around 69 percent disagree that protecting forests is a waste of productive land while around 80 percent said they would receive criticism from their neighbors if they cut down trees in protected forest areas. These results are generally equivalent between treatment and comparison areas.

Despite generally positive attitudes toward forest conservation, not surprisingly, deforestation and the clearing of virgin lands are not a top development challenge for most respondents in Puerto Rico. In both treatment and comparison groups, over half of respondents said deforestation and the clearing of virgin lands were only minor or moderate problems in their communities (Figure 11). Likewise, only around 20 percent of respondents in both groups said it was a major issue, and 27 percent rank deforestation as a barrier to village development, although a nontrivial percentage (43 percent) of respondents report that changes in rainfall due to climate change are barriers to village development.

Instead, across both treatment and comparison areas, the three largest challenges to development include 1) health issues (approximately 80 percent of respondents) 2) lack of jobs and income opportunities

(approximately 50 percent), and 3) food security (approximately 46 percent). And, 33 percent of respondents in Puerto Rico and 40 percent in comparison areas indicated that lack of land for cultivation was a major development problem.

Figure 10: Conservation Norms by Treatment Status (Puerto Rico and Comparison)

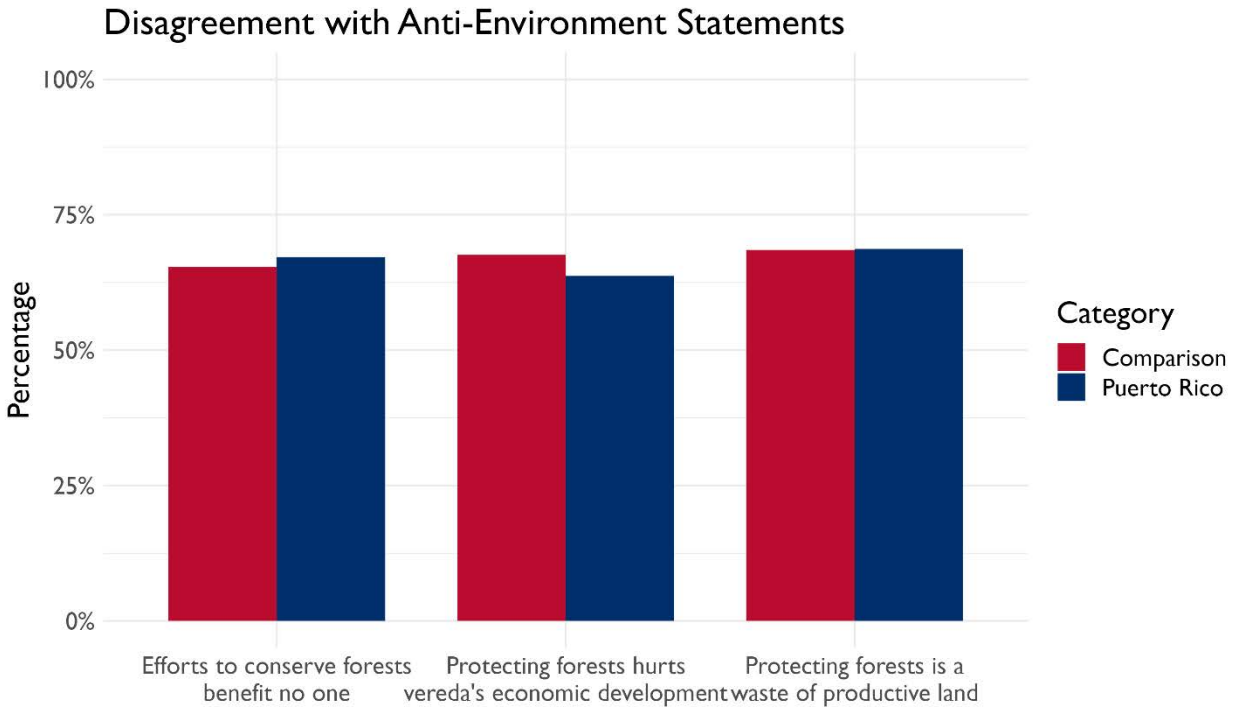
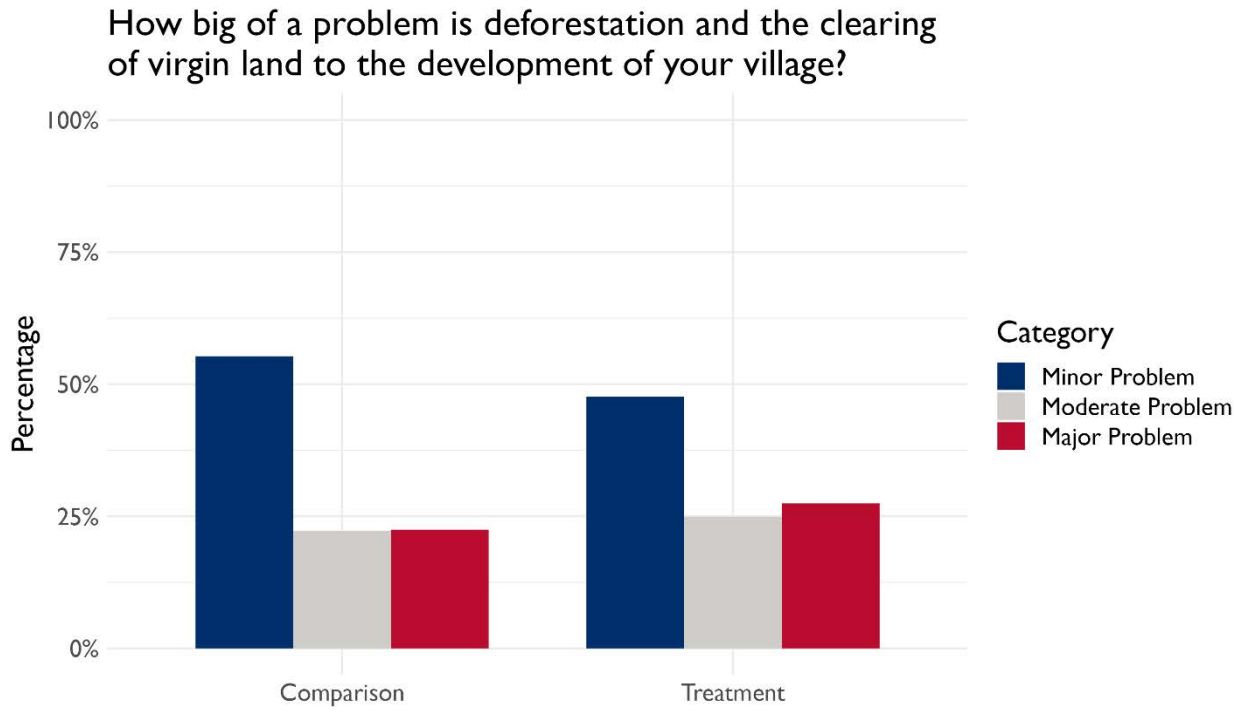


Figure 11: Deforestation as a Barrier to Development by Treatment Status (Puerto Rico and Comparison)



FOREST CONDITION

Seventy-nine percent of household survey respondents in Puerto Rico and 82 percent of respondents in comparison *veredas* described the overall condition of the forest as good or very good. In both cases, most remaining respondents described the forest condition as neither good nor bad, and less than three percent of respondents described the condition as bad. Compared to four years ago, most respondents in both geographies believe that the condition has improved or significantly improved (45 percent treatment and 47 percent comparison), followed by the belief that it remained the same (34 percent treatment and 35 percent comparison). Only 20 percent of treatment respondents and 17 percent of comparison respondents believe that the overall condition of the forest has worsened.

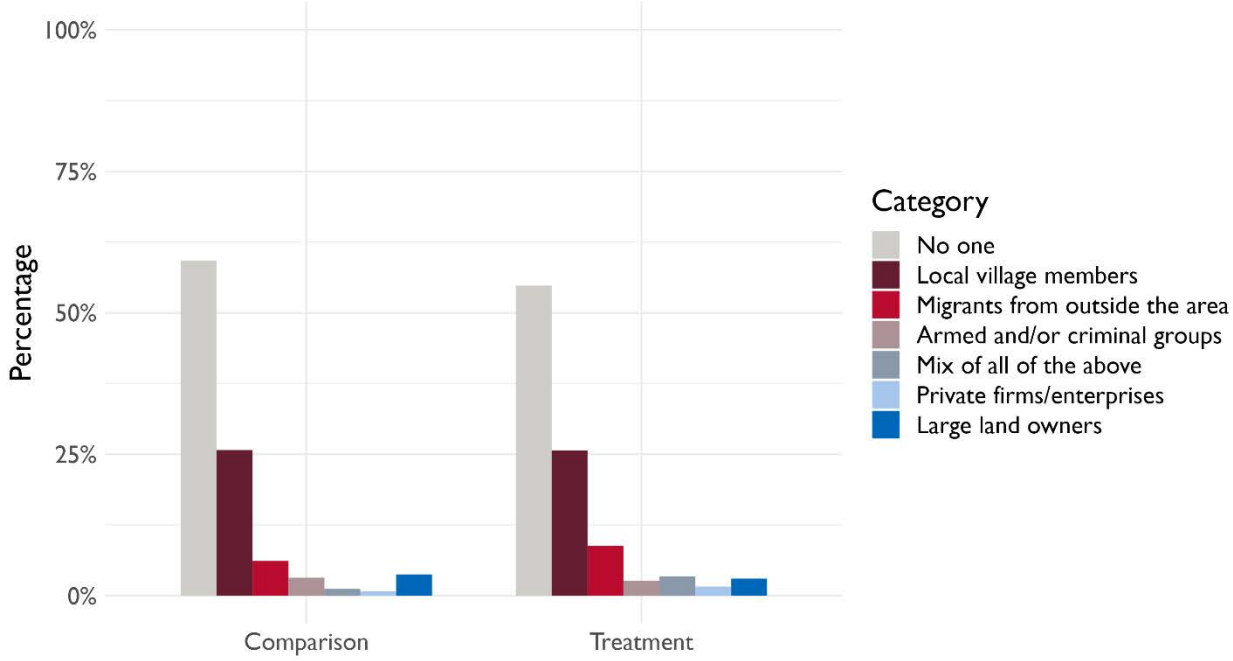
However, the geospatial data shows that in the last five years (2018–2022) there has been a 5.48 kha loss in tree cover in the treatment areas of Puerto Rico, totaling six percent of the total area, compared to a 1.75 kha loss in tree cover in the comparison areas, totaling two percent of the total area, in the same time period. In the last 10 years (2013–2022), there has been a 9.68 kha loss in tree cover in the treatment areas of Puerto Rico, totaling 11 percent of the total area, compared to a 3.93 kha loss in tree cover in the comparison areas of Puerto Rico, totaling to four percent of the total area, in the same time period. These trends in forest cover loss do not change significantly when the analysis is expanded to a 5km buffer beyond the boundaries of *veredas* (Annex V: Geospatial Findings).

There is a significant difference in forest cover in treatment versus comparison areas. In 2022, the estimated tree cover in the treatment areas of Puerto Rico was 46 percent, compared to an estimated tree cover of 33 percent in the comparison areas. This is also reflected in the difference in forest cover loss between the overall treatment and comparison areas (see Annex V: Geospatial Findings).

Qualitative data sources indicate mixed reports of forest condition, although they generally indicate that the forest condition has significantly worsened. However, there are some scattered reports that logging has decreased in the recent past, whereas respondents indicated an uptick in coca growing. Interestingly, respondents in FGDs with women are more likely to cite the presence of logging and bushmeat hunting as compared to respondents in FGDs with men.

When asked who represents the biggest threat to forests and biodiversity in the area, the most common answer in Puerto Rico and comparison areas was "no one," followed by local village members and migrants from outside the area (Figure 12).

Figure 12: Types of People who Represent the Biggest Threat to Forests (Puerto Rico and Comparison)

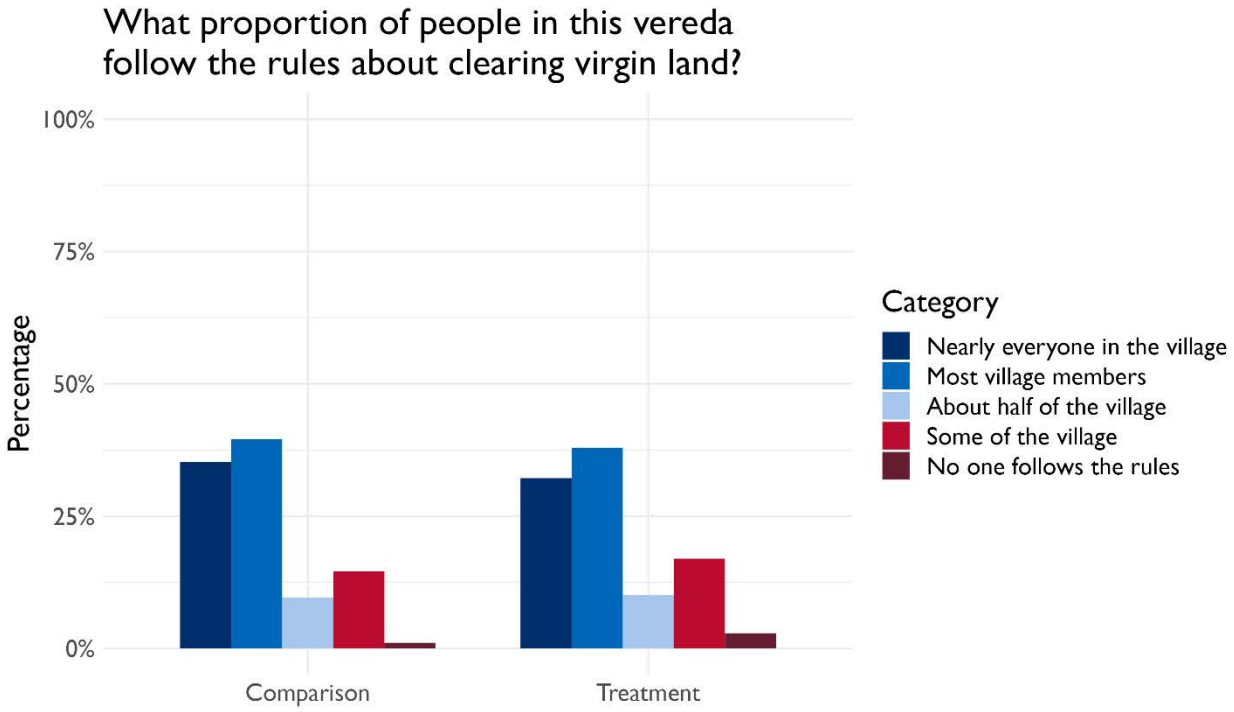


In both Puerto Rico and the comparison areas, the majority of respondents claimed that local authorities are not taking any action to stop deforestation. In areas where local authorities are engaged in forest initiatives, respondents reported that local authorities work to support conservation jobs, training, environmental education, and the spread of other forms of knowledge to stop unauthorized tree cutting or the clearing of virgin land in their *veredas*. Around 55 percent of respondents in Puerto Rico and 65 percent in comparison areas believe that these measures were effective at stopping unauthorized tree cutting and clearing of virgin land (Figure 14).

LAND CLEARING

According to the household survey results, 11 percent of households in Puerto Rico municipality cleared virgin land in the past year, and 9 percent of respondents in Puerto Rico plan to clear more land in the next 12 months. In line with other sensitive questions, questions on land clearing are likely subject to significant under-reporting due to respondent bias. The evaluation will utilize satellite imagery to help measure and triangulate land clearing. Nevertheless, as reported in the household survey, the mean amount of virgin land cleared by individual households in Puerto Rico municipality was 3.43 hectares, with one family clearing as much as 50 hectares. Of those who plan on clearing more land in the next few months, the mean planned amount is 4.2 hectares in Puerto Rico. Of those who cleared land, 81 percent in Puerto Rico municipality claimed the land they cleared belonged to their households, and 14 percent in Puerto Rico reported that the land belonged to someone else in their village. There are similar baseline findings across the land-clearing modules in comparison areas.

Figure 13: Frequency of Rule-Breaking: Clearing Virgin Land (Puerto Rico and Comparison)



Of those who cleared virgin land, approximately 11 respondents in Puerto Rico and 9 respondents in comparison areas applied for permission to do so. Overwhelmingly, forests were cleared for subsistence crops (66 percent) or cash crops (31 percent). Respondents also indicated that they needed more land because their previous land was too small (10 percent) or was no longer productive (12 percent).

BUSHMEAT HUNTING

There is variation in reports of the frequency and prevalence of bushmeat hunting. Women tend to highlight more bushmeat hunting than men—probably because they attend markets and do more of the kitchen preparation. **Generally, people consume bushmeat as a protein source versus as a cultural, spiritual, or preferred source of food. At baseline, the evaluation does not find any evidence of a belief that bushmeat is more nutritious than domestic meat.** Respondents in FGDs with men in Puerto Rico note that people consume bushmeat "because there is no money to buy beef...Because sometimes the situation gets heavy and it's not enough."[51] Focus group respondents consistently report that only a small amount of people in their villages depend on bushmeat for food—and that forest loss has led to a reduced number of animals for hunting. A group of women in Puerto Rico report:

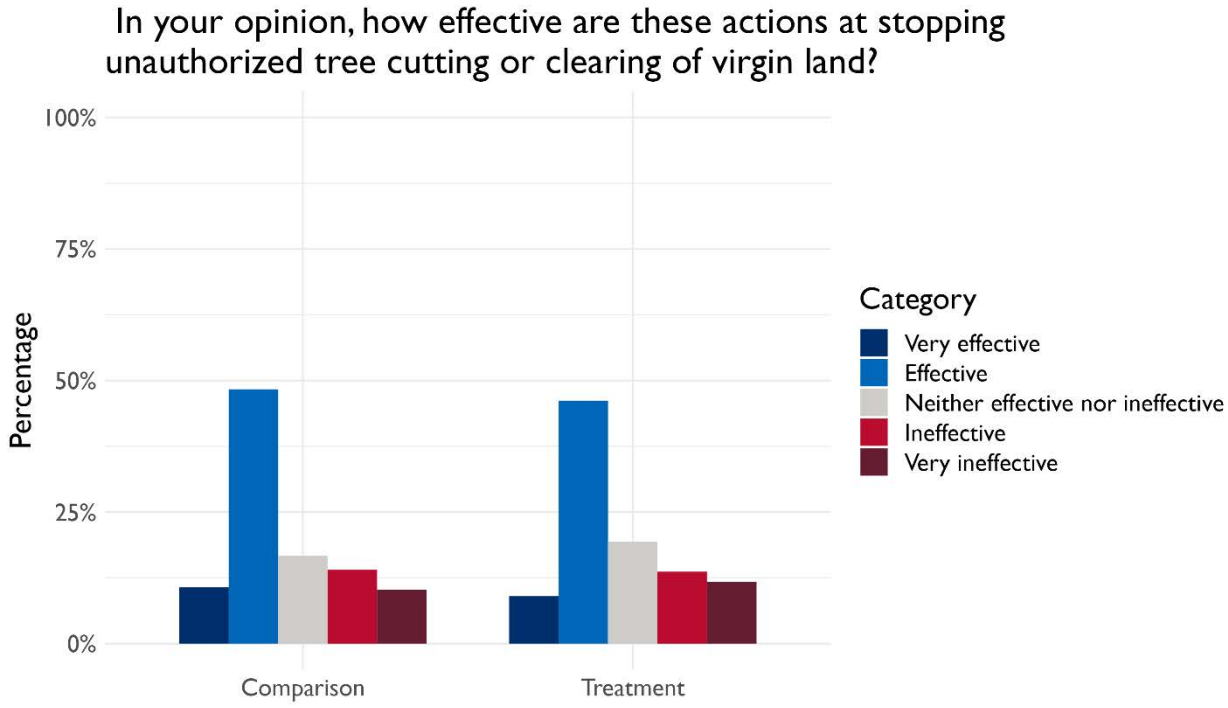
> *"People here from the same trail, but just as the trees were supposedly cut down, the animals have also decreased because they also used to bother them a lot and now they are no longer there. But people here only eat the bush meat because they don't have other meat from their domestic sources."*

[51] Women note that the following animals are hunted for bushmeat: armadillo, guru, veneer, limpet, macaw, zaino, and capuche.

EFFECTIVENESS OF DEFORESTATION INITIATIVES

The evaluation found mixed reports about the effectiveness of forest governance and regulations. **Whereas several forest governance indicators and questions show a high level of discontent with environmental authorities, other indicators show some belief that actions to reduce deforestation are working.** According to the household survey, approximately 55 percent of respondents from Puerto Rico agree that efforts to reduce deforestation have been effective. Additionally, the majority of respondents in both groups agreed that environmental authorities act on reports of deforestation activities in their communities.

Figure 14: Effectiveness of Efforts to Stop Unauthorized Deforestation (Puerto Rico and Comparison)



In line with this trend, respondents in FGDs with women (not seen in FGDs with men) in Puerto Rico note that the presence of Cormacarena is associated with some reduction in the level of logging: "Well, if not, then this year everyone would have cut, but since Cormacarena came in, they have not cut again."

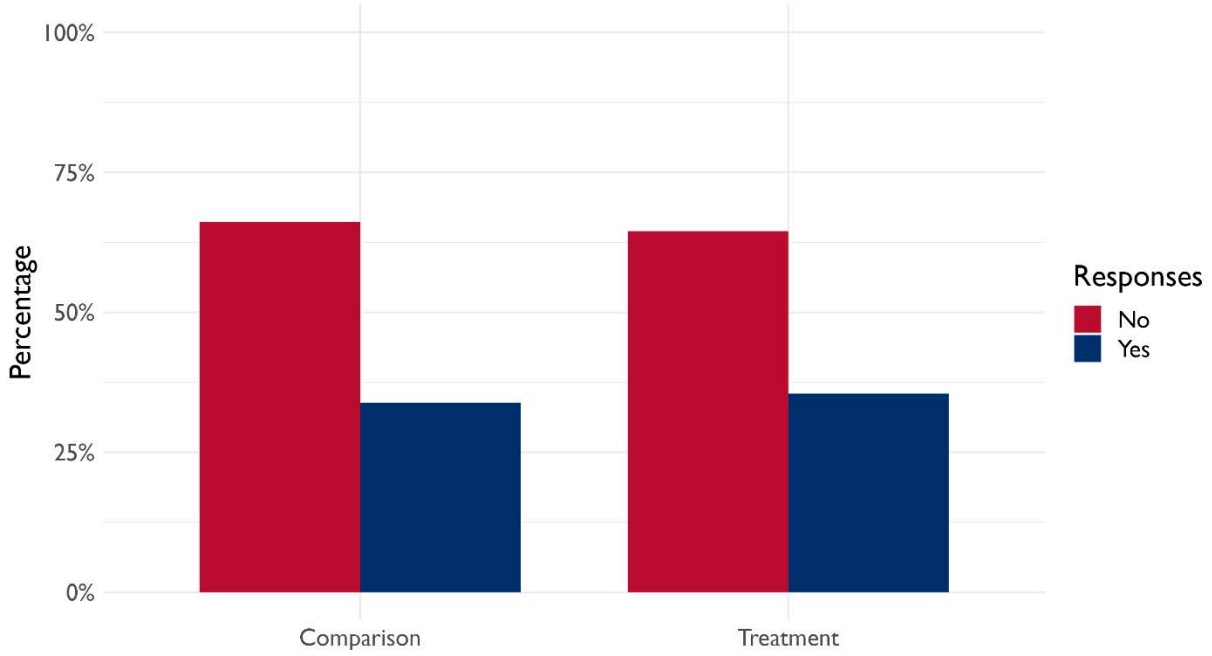
ALTERNATIVE DEVELOPMENT PROGRAMS AND NON-FARM INCOME-GENERATING ACTIVITIES

Approximately 35 percent of respondents in the treatment municipality have benefited from alternative livelihoods or sustainable development projects. The baseline levels are similar for comparison respondents (Figure 15).

Among those who have benefited in the treatment municipality, 25 percent of respondents were participants in the Ranger Families program, 42 percent were part of the PNIS program, 15 percent

received support from USAID, and 8 percent cited "other" programs.[52] A slightly higher number of comparison respondents benefited from PNIS (51 percent) and fewer benefited from USAID (4 percent). Of the other programs that respondents in the treatment group were participants in, the majority were in the *Visión Amazonía* program. Likewise, for the comparison groups, the majority were in the *Visión Amazonía* program and the *Familias en su tierra* program.

Figure 15: Beneficiaries of Alternative Development Programs by Treatment Status (Puerto Rico and Comparison)



Among participants in treatment areas, 35 percent cited their program as a type of planting other/sustainable crops (mostly cacao[53]), 16 percent selected payments for environmental services, 14 percent selected sustainable cattle ranching, 8 percent cited reforestation, and 6 percent chose "other." Trends in the comparison area were relatively similar.

The reported benefits from these programs are quite mixed. Of the respondents in the treatment group that harvest cacao, approximately 32 percent of them sold 100 percent of their cacao crops in the year they participated in their program while 23 percent reportedly sold no products during their year of participation. A larger number of comparison respondents appear to have struggled with production and harvesting, as 44 percent reportedly had no production during the year that they participated in the program.

A majority of respondents in the treatment group (59 percent) who participated in the *Familias en su tierra* program cite the program as not important in supporting their household's livelihood, compared to 41 percent who cite the *Familias* program as being very important in supporting their household's livelihood. Respondents in comparison areas were even more likely to respond that the *Familias* program was not

[52] Of the respondents in the treatment municipality who were beneficiaries of the PNIS program, 43 percent reported no challenges while participating compared to 50 percent of comparison respondents. As for those who participated in the *Familias de guardabosques* program, 26 percent cited no challenges as well.

[53] Among those participating in an alternative livelihood program that involved planting other/sustainable crops, 75 percent of respondents in the treatment municipality and 83 percent of comparison respondents reported that they harvested and produced "cacao" as part of their coca substitution program; *platano* is the next most frequently cited crop.

important for supporting their household's livelihood (68 percent). Correspondingly, there are mixed reports about the sustainability of the *Familias* program; 52 percent of respondents in the treatment group who participated in the program are not likely to continue with it over the next five years, while 48 percent of them are likely to continue. The ET found very similar distributions in comparison areas.

The qualitative interviews and FGDs captured information on respondents' experiences with coca substitution and alternative livelihoods programs, including programs focused on livestock/dairy, fish, cocoa, and banana. In line with the quantitative findings, excluding PNIS, respondents report mixed feelings about alternative livelihood projects. While some report that these are profitable (especially cocoa[54] and bananas) and support local livelihoods, others highlight that these projects are plagued by many technical/field issues that hamper implementation. And many respondents openly note that these projects are more difficult and not as profitable as coca production. In one men's FGD in San Jose del Guaviare, a respondent also noted that the alternative development programs in their community have not addressed underlying environmental issues like water quality and access that affect success in cultivation: "…They talk a lot about food and fences, but they never talk about the water system."

Overall, respondents in the sample highlight that coca substitution and some alternative livelihood or conservation contract programs are not working for several reasons. Primarily, they are not providing the promised benefits. The income provided by coca substitution programs has been insufficient and below the promised levels.

> *"Well, the PNIS project arrived here in the village, but the truth is that this project has not been implemented yet; we have been working on it for several years and no, no, they have not fulfilled the expectations of the project or anything else..." (Men's FGD, Puerto Rico)*

As one group of men's FGD respondents reported in Puerto Rico: *"There are visits from intermediaries but nothing materializes—only promises...They have started with some incentives, but they are not going well for the people who are benefiting from them."*

These challenges surrounding PNIS have contributed to distrust of the state and generated substantial animosity toward the government. It is reported to be unfair and does not provide the necessary livelihood benefits for the damage caused by destroying crops and farms.

> *"They replaced the coca crops, they uprooted them, they promised them something, but they have not delivered...They hurt the people because there were people who sustained themselves from that..." (Women's FGD, Puerto Rico)*

> *"At least here they had their coca plants and they had them uprooted, they got into that program. The truth is, I didn't get involved in that, but right now I don't have any coca and there is very little coca to be seen...the collectors have not been paid what they were promised and have not received any benefits...The government did not comply with anything." (Women's FGD, Puerto Rico).*

In other cases, funding from conservation work has also either not materialized or been well below a sustainable threshold.

[54] The cocoa work has been made possible through free seeds and fertilizer provided by non-governmental organizations and donors—they note no help from the government. Cocoa is perceived to be especially valuable because it is a longer-term "pension" crop that they can hand down to their children: "You can dry and store the cocoa...it is productive, good conditions to work in."

> *"There was another project connected with Vision Amazonia (for conservation contracts). This also did not work because the benefits provided were not sustainable. So I told him that, well, the truth is that it did not work because, to protect 50 or 30 hectares of mountain for 200,000 or 100,000 COP every two months, that is, it is not sustainable." (Men's FGD, Puerto Rico)*

Subsidies also have not been sufficient to offset planting coca, and they have inadvertently prompted more deforestation deeper inside the forest.

In terms of specific feedback on the LfP alternative livelihoods partnerships, participants noted that cocoa PPP has been profitable, and donor support has been critical to facilitating their work in cocoa (they do not receive government support). Participants decided to plant cocoa because it is a long-term crop and something that they can hand down to their children. They also note that it is productive, and they can dry and store the cocoa. The seeds and fertilizers have been given free of charge, and they are receiving training on processing the cocoa. Some participants have cut down secondary forests to plant cocoa.

Respondents reiterate that alternative development programs remain important for improving livelihoods and creating opportunities for young people in their communities.

> *"…The farmers still need support from the State, in technical assistance, in support for the implementation of productive projects. [The] ideal scenario would be to give them right to the land, a subsidy to carry out a project (a development project, agricultural or livestock), technical assistance, to provide them with a technological package so that they can achieve. So that they do not remain so small and so weak in front of the market, so that they can pay a little less expensive inputs." (Interview with Indigenous Authority, Meta).*

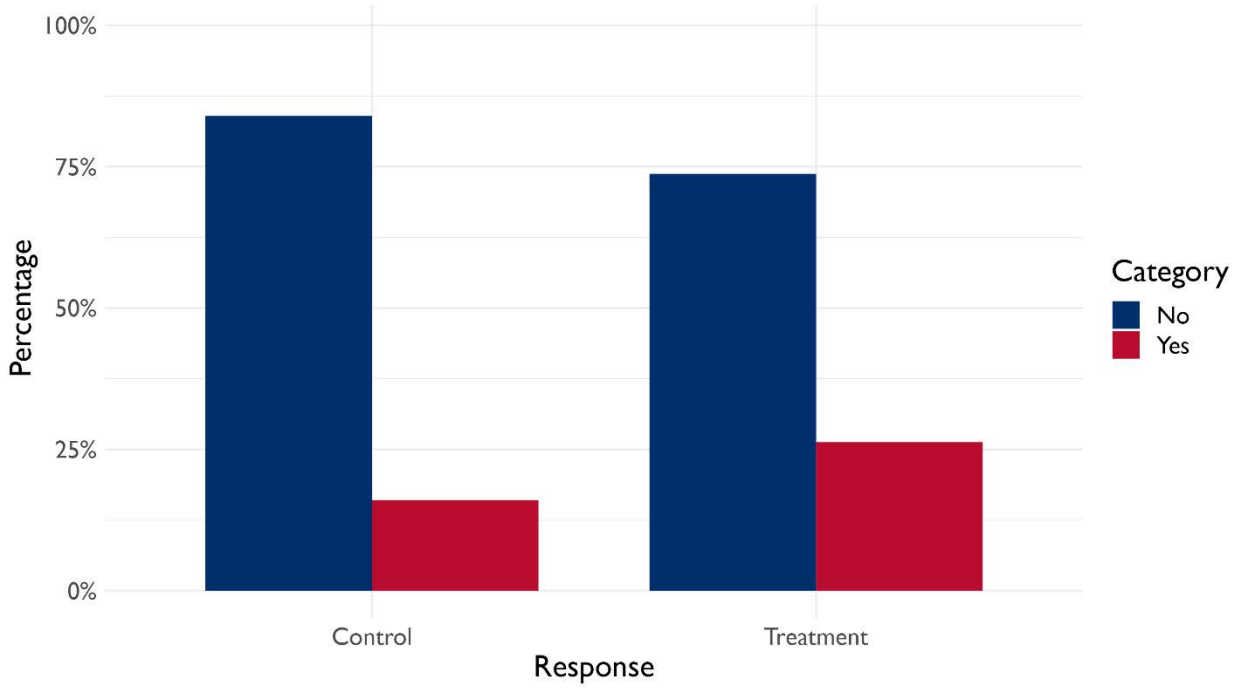
CONFLICT

Qualitative and quantitative data indicate that local land conflict is generally low in Puerto Rico municipality. **Survey respondents report that land disputes on or about household fields are relatively rare—but when they occur, they are somewhat serious and protracted. Less than 5 percent of respondents in both treatment and comparison areas reported that they or someone else in their household had conflicts on their land within the past four years.** Of the 24 respondents who have had conflicts, 20 reported only having one conflict.

Among those who have experienced conflict, 49 percent of respondents described their conflict(s) as a little serious, with 32 percent describing the conflict(s) as very serious. Approximately 63 percent report that the conflict is ongoing. Of these conflicts, 57 percent were with neighbors in the village, 20 percent were with siblings, 13 percent were with the central or local government, and 10 percent were with other family members. The main cause of the conflict was related to plot boundaries in 54 percent of the conflicts. Land titling was to blame for 14 percent of the conflicts, and land misuse and property inheritance disputes each caused 11 percent of conflicts.

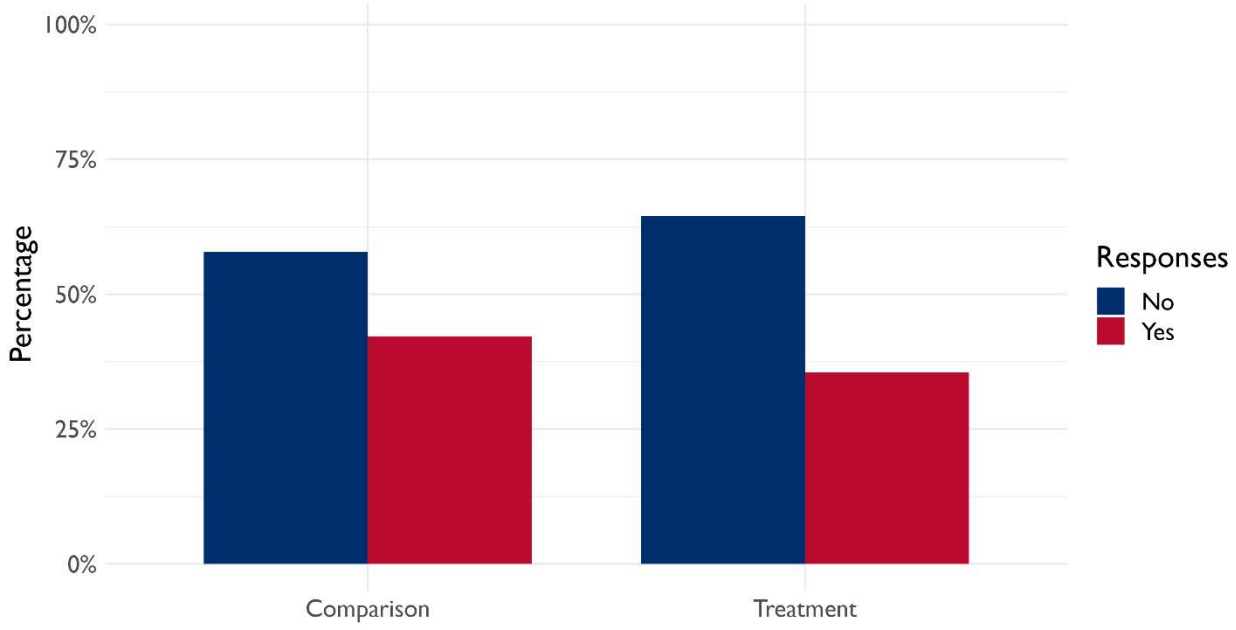
A total of 26 percent of treatment respondents compared with 16 percent of comparison respondents report being worried about starting a land conflict with someone else (Figure 16). The top three entities that treatment respondents report as entities with whom they could potentially have a land conflict are neighbors in the village, armed groups, and other family members.

Figure 16: Worried about Future Land Conflict (Puerto Rico and Comparison)



A total of 36 percent of respondents in Puerto Rico municipality were forced to leave their land or had to leave their land due to armed conflict. Seventeen percent of treatment respondents said the reason they were forced to leave their land was that it was "too dangerous to stay," while 43 percent of those who were displaced said that they were threatened by armed groups. At 42 percent, the level of forced displacement is slightly higher in comparison areas (Figure 17).

Figure 17: Land Displacement Due to Conflict by Treatment Status (Puerto Rico and Comparison)



Approximately 41 percent of respondents in the treatment group are registered in the National Registry of Victims, compared to 49 percent in comparison areas. Similarly, only 4 percent of respondents in the treatment group have been affected by a land restitution case (either as someone claiming land or defending a claim against someone else), compared with 10 percent in comparison areas.

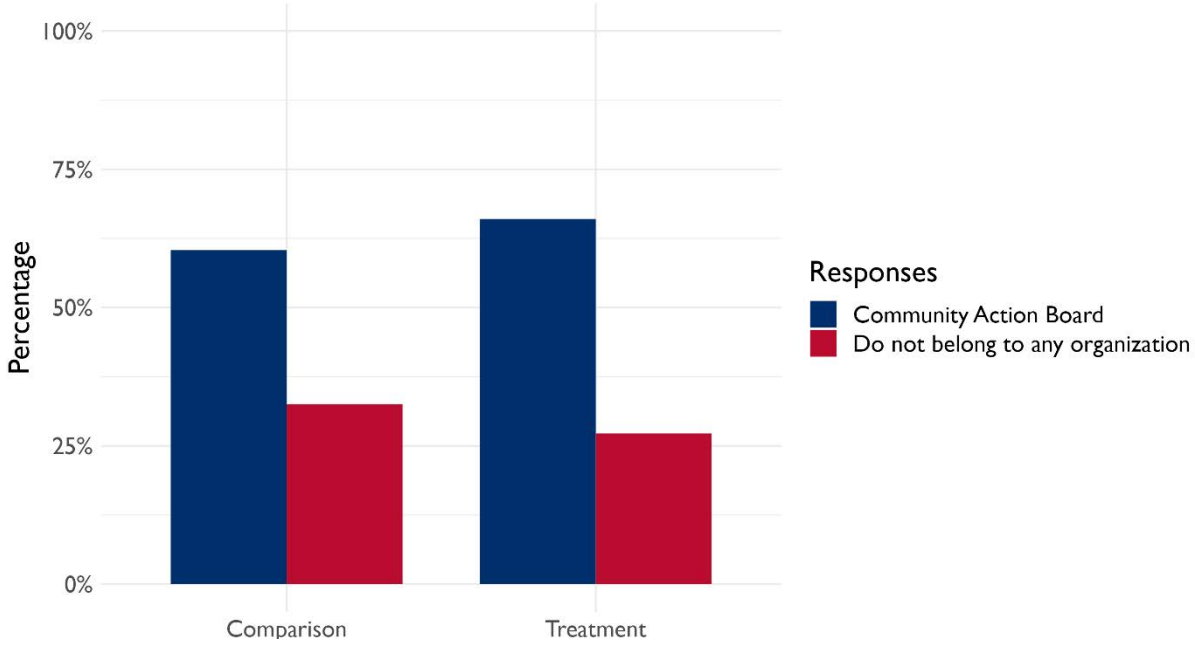
GOVERNANCE

COMMUNITY GOVERNANCE AND COLLECTIVE ACTION

Almost all respondents (99.6 percent) in both treatment and comparison areas report the presence of a JAC. **In treatment areas, 65 percent of respondents are members of the JAC** (Figure 18).

Most indicators point to variations in levels of collective action and social capital in the study area. Over three-fourths (78 percent) of treatment respondents note that people usually organize to solve programs when they emerge in a community. At 62 percent, a lower level of respondents report trust in their neighbors. Similarly, for questions about lending, the majority of respondents stated that very few neighbors (39 percent) or no neighbors (16 percent) would loan them 50,000 COP for emergency medical expenses as a loan if needed, although this is likely also picking up on poverty. In contrast, approximately 18 percent of respondents in the treatment group agree that the majority of their neighbors would lend them funds. Overall, the distributions for collective action and social capital indicators are similar between treatment and comparison respondents.

Figure 18: Membership in JAC by Treatment Status (Puerto Rico and Comparison)



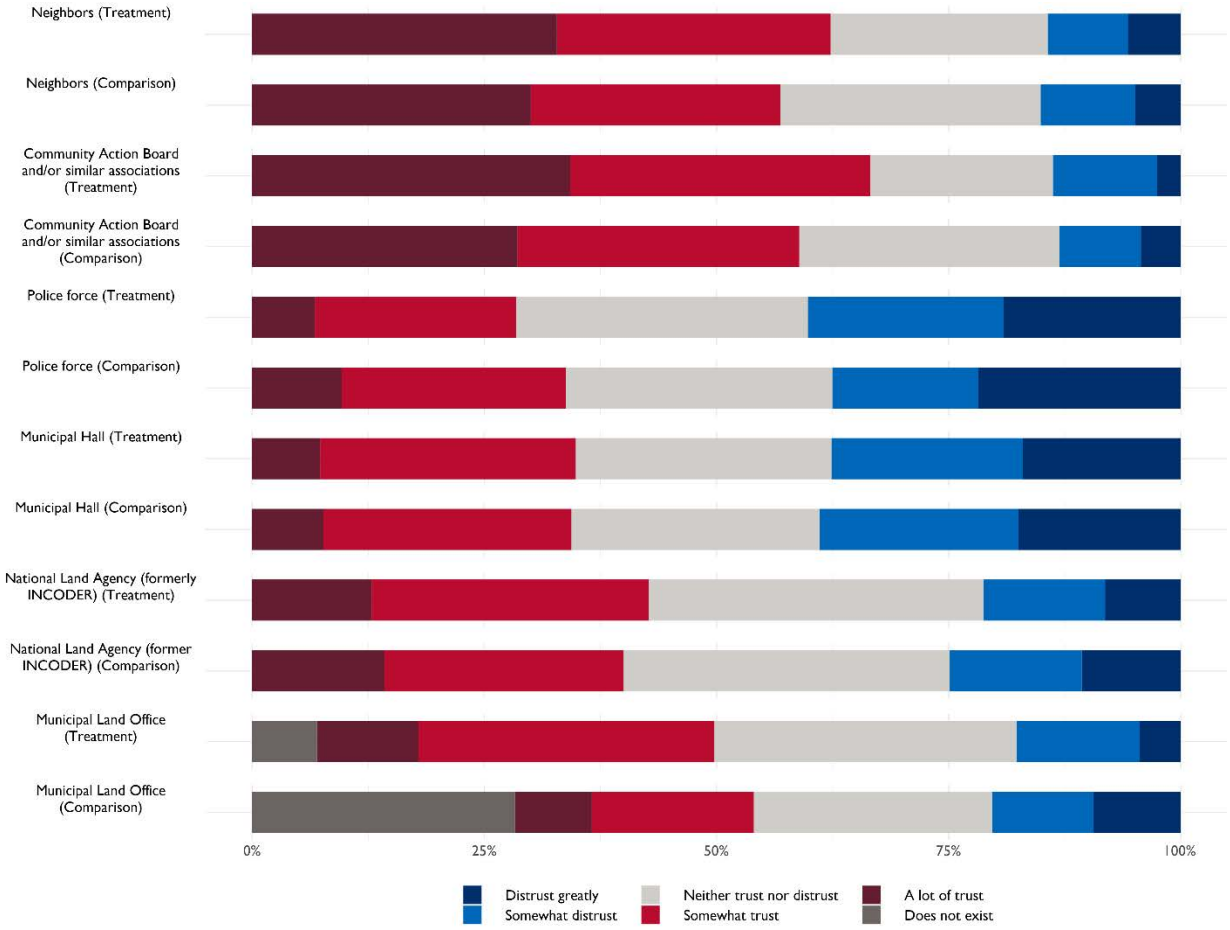
STATE AND OFFICIAL ACTORS

Approximately 67 percent of treatment respondents report that they trust the JAC compared with 59 percent in comparison areas.

The evaluation also asked about levels of trust for the MLO, police, judges, and ANT. Compared with the JAC, levels of trust for these other organizations are significantly lower. **Among treatment respondents, 40 percent trust the ANT, 35 percent trust the Municipal Hall, and 29 percent**

trust the police. There are slightly higher levels of distrust for the police among comparison respondents. Among respondents who are aware of the existence of the MLO, approximately 36 percent report that they trust the MLO (Figure 19).

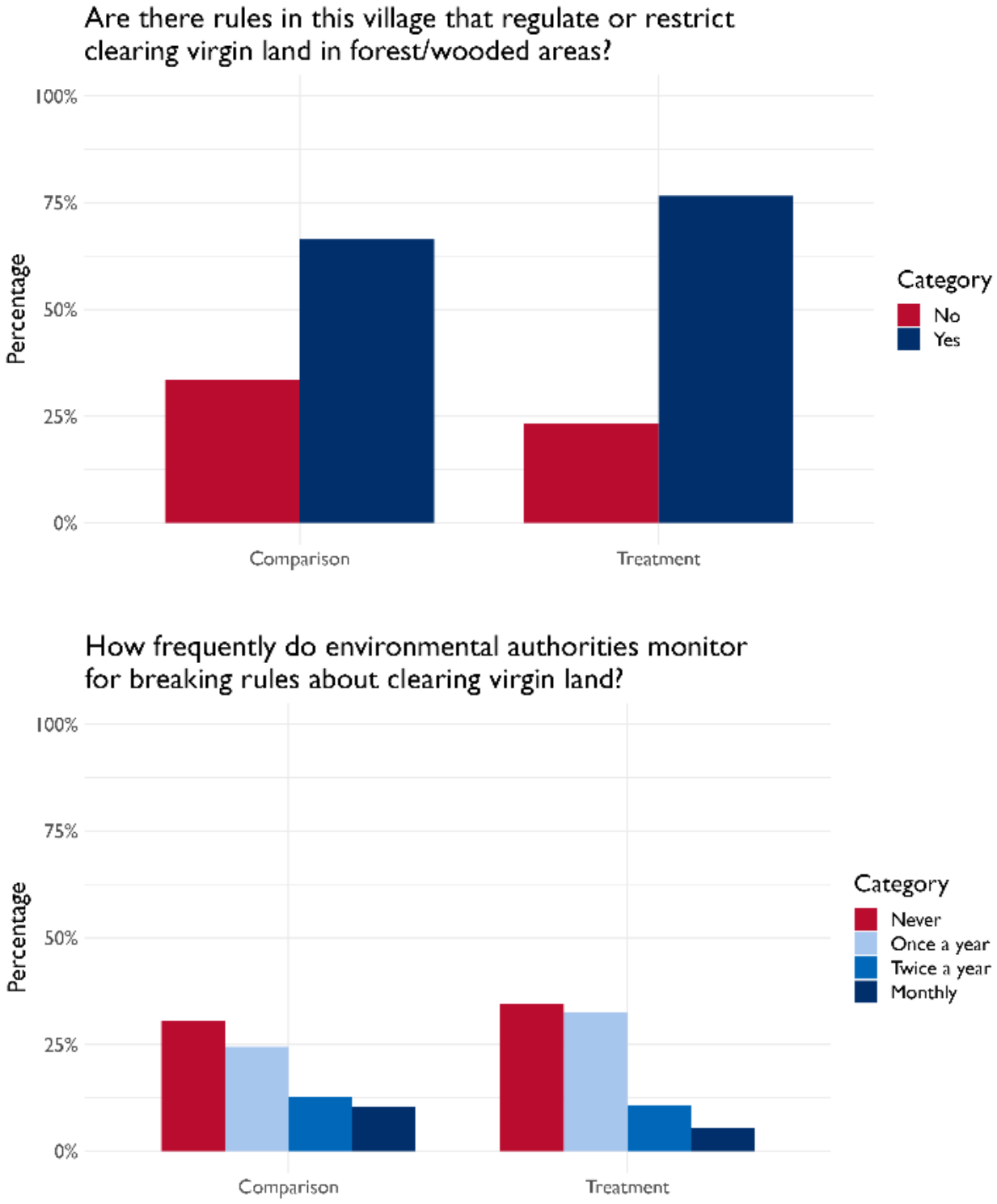
Figure 19: Trust Toward Governance Actors by Treatment Status (Puerto Rico and Comparison)



RULES, MONITORING, AND ENFORCEMENT

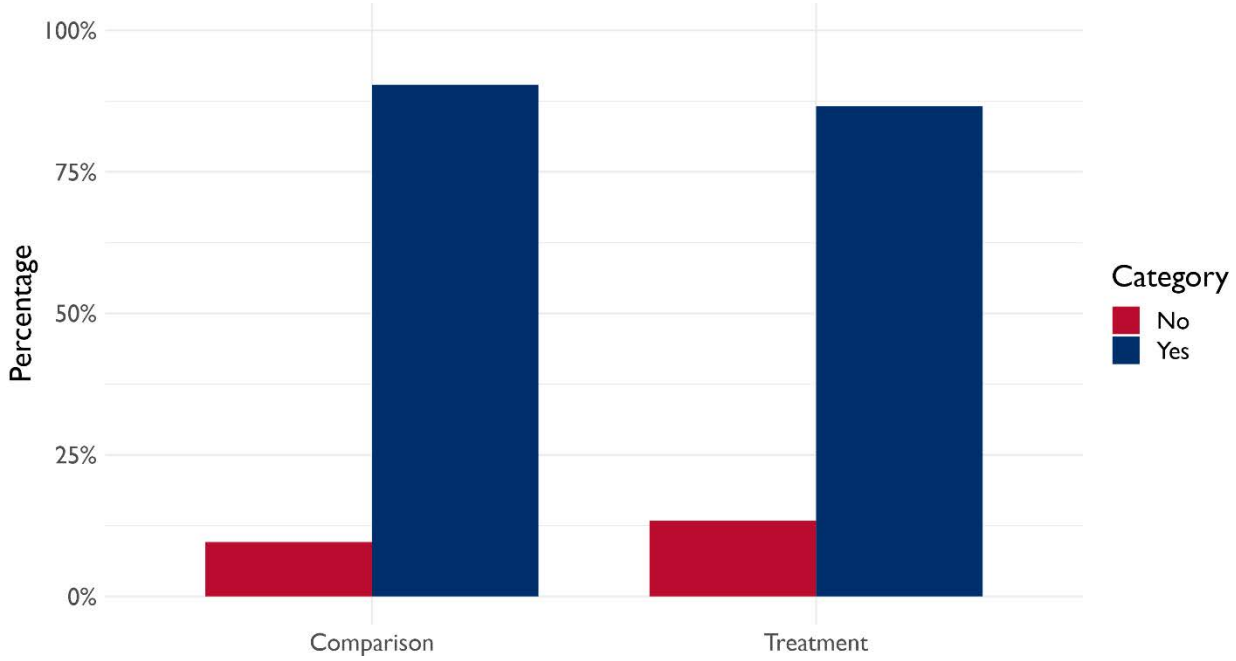
According to the qualitative data from key informants, the government's strength is in knowledge and awareness raising—but this is countered by the issues of inequality and corruption. There is general agreement that knowledge and awareness raising and conservation messaging have penetrated, and this is noted as one reason for a reduction in deforestation. This awareness raising is also coming from a variety of entities, including the Mayor's Office and Cormacarena. **Similarly, a large percentage of respondents in the treatment area (77 percent) report the existence of rules in their villages that regulate or restrict clearing virgin land in forest or wooded areas** (Figure 20).

Figure 20: Land Clearing Rules and Monitoring by Treatment Status (Puerto Rico and Comparison)



Around 85 percent of respondents from treatment areas report that there are penalties for breaking rules regarding clearing virgin land (Figure 21). Of those who say there are penalties, the three most common are monetary fines, arrest or a court summoning, and community service.

Figure 21: Existence of Penalties for Land Clearing by Treatment Status (Puerto Rico and Comparison)



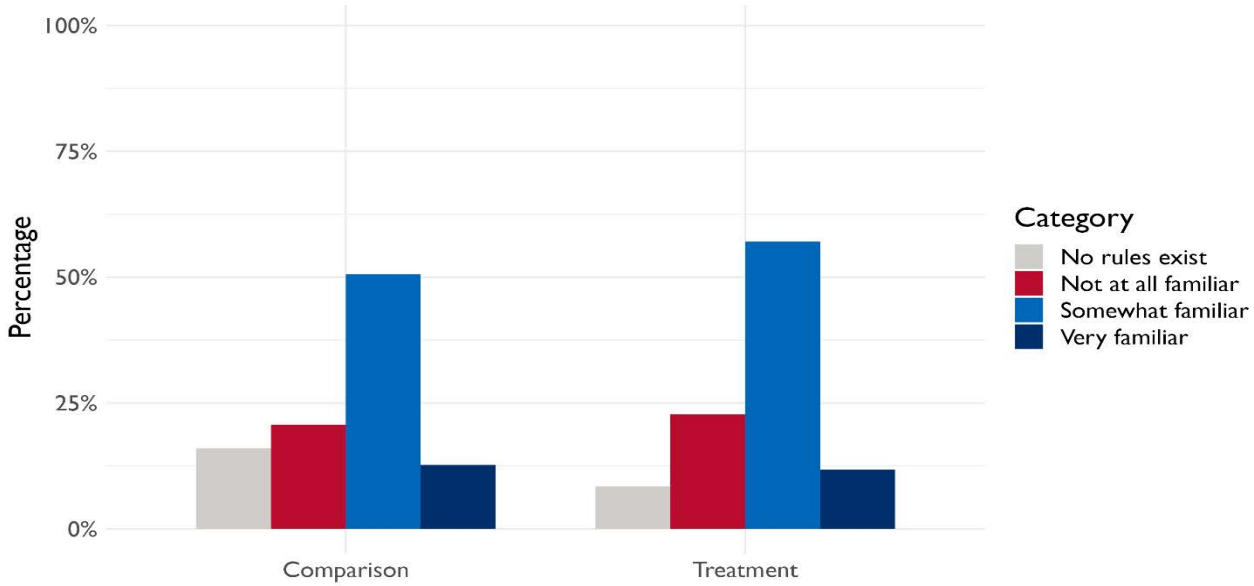
In the qualitative data, there is inconsistency about rule awareness and perceived enforcement. In focus groups, respondents feel that officials have succeeded in making citizens aware of rules but not enforcing them:

> *"Yes, there are strengths. I mean, coming to training, yes…nobody in Puerto Rico can say that they are unaware and that we have not been trained—that is a big lie. But what we are missing is that they apply the law to those who, as I was saying at the beginning, really to the big mountain loggers, because we are watching." (PPP FGD, Puerto Rico)*

However, aside from direct questions about clearing virgin land, responses from FGDs—and particularly male and female citizens—also reveal a lack of clarity about forest rules and access rights, including a lack of knowledge on boundaries and sanctions and where various activities can take place. A number of focus group respondents were not clear about boundaries or sanctions, although they report that governmental organizations do the sanctions. However, with some prompting, respondents note that individuals can go to jail or be fined for illegal forest activities.

Similarly, the quantitative findings of household respondents highlight that there is room to improve understanding and knowledge of forest use and access through more direct interventions with the population. **The majority of respondents report that they are only "somewhat familiar" with rules about forest use and access.** Thirty-one percent of respondents report that they are either not at all familiar with rules or that "no rules exist" (Figure 22). Similarly, less than half (46 percent) of respondents said the majority of people in their communities understand these rules. These distributions are generally similar between treatment and comparison areas, though comparison areas are less likely to report the existence of rules (84 percent versus 92 percent).

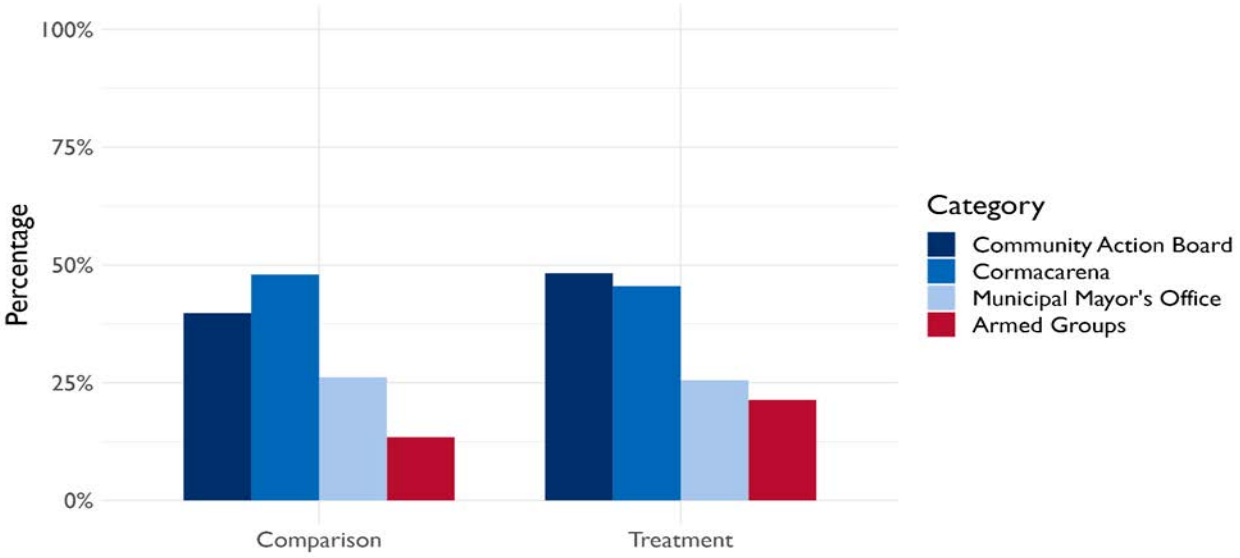
Figure 22: Familiarity with Rules About Forest Use and Access by Treatment Status (Puerto Rico and Comparison)



ENVIRONMENTAL AUTHORITIES

Residents of Puerto Rico municipality and those in the comparison areas identified JACs and Cormacarena as critical actors for making rules about forest use and access in their *veredas*. However, Puerto Rico municipality residents identify JACs as the most important, whereas Cormacarena ranked first in comparison areas. The Municipal Mayor's Office and armed groups are identified as the third and fourth most important groups, respectively. It should be noted that armed groups are ranked slightly higher in Puerto Rico compared to the comparison areas (Figure 23).

Figure 23: Primary Rule-Makers about Forest Use and Access by Treatment Status (Puerto Rico and Comparison)



Results were slightly different for reports about the most important actors in *enforcing* these rules. In Puerto Rico, 45 percent said JACs were the most important actors in enforcement, 28 percent identified Cormacarena, and 24 percent identified armed groups. On the contrary, in the comparison areas, 31 percent said JACs were the most important actors, with Cormacarena and the Municipal Mayor's Office following closely with 27 percent and 21 percent, respectively (Figure 23).

In terms of enforcement, 31 percent of respondents in Puerto Rico municipality stated that rules were strongly enforced (Figure 24). Approximately 30 percent of residents said environmental authorities monitor for breaking rules about clearing land on a yearly basis, whereas 32 percent report that environmental authorities never monitor their communities for rule violations. Only around 42 percent said that rules about forest use and access were effectively monitored in their communities, whereas 23 percent stated that monitoring is ineffective. When asked about the likelihood of being sanctioned if caught, a group of women in Puerto Rico note that "well, nothing like that has been seen so far." Similarly, 65 percent of respondents in Puerto Rico claim they have never seen environmental authorities arrest or fine people who engage in illegal deforestation. Around 25 percent said such punishments happen once or twice a year, and only around one percent say this happens daily or weekly. Rule compliance, enforcement, and types of penalties are generally equivalent in treatment and comparison areas. However, respondents in comparison areas are about 7 percent less likely to report that monitoring is ineffective, which could relate to the higher presence of Cormacarena (Figure 25).

Figure 24: Primary Enforcers of Rules about Forest Use and Access by Treatment Status (Puerto Rico and Comparison)

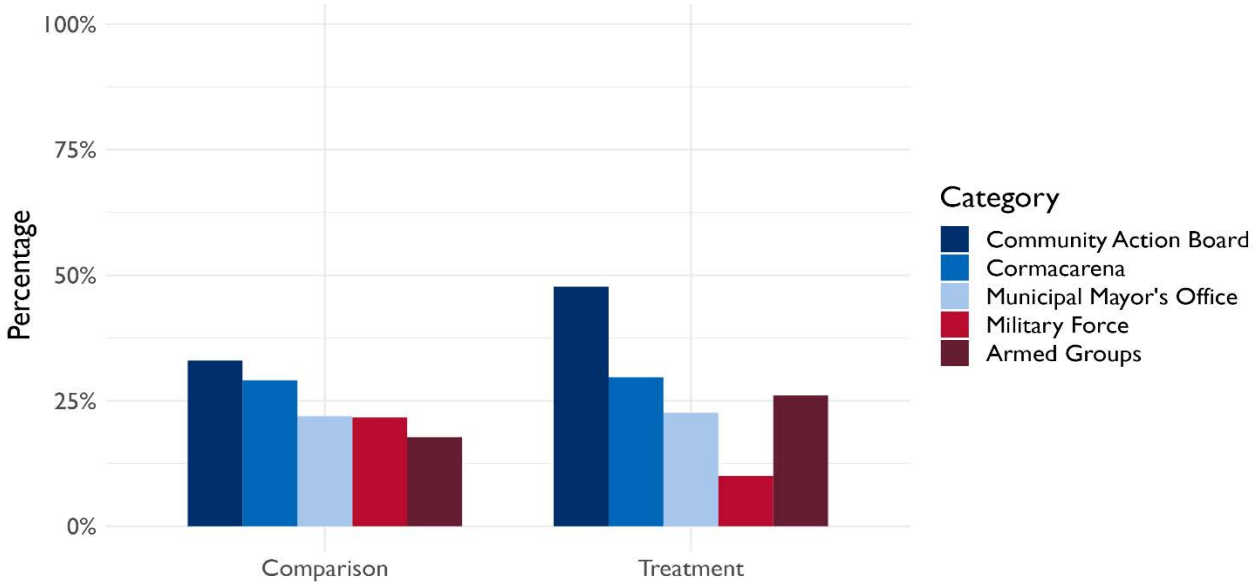
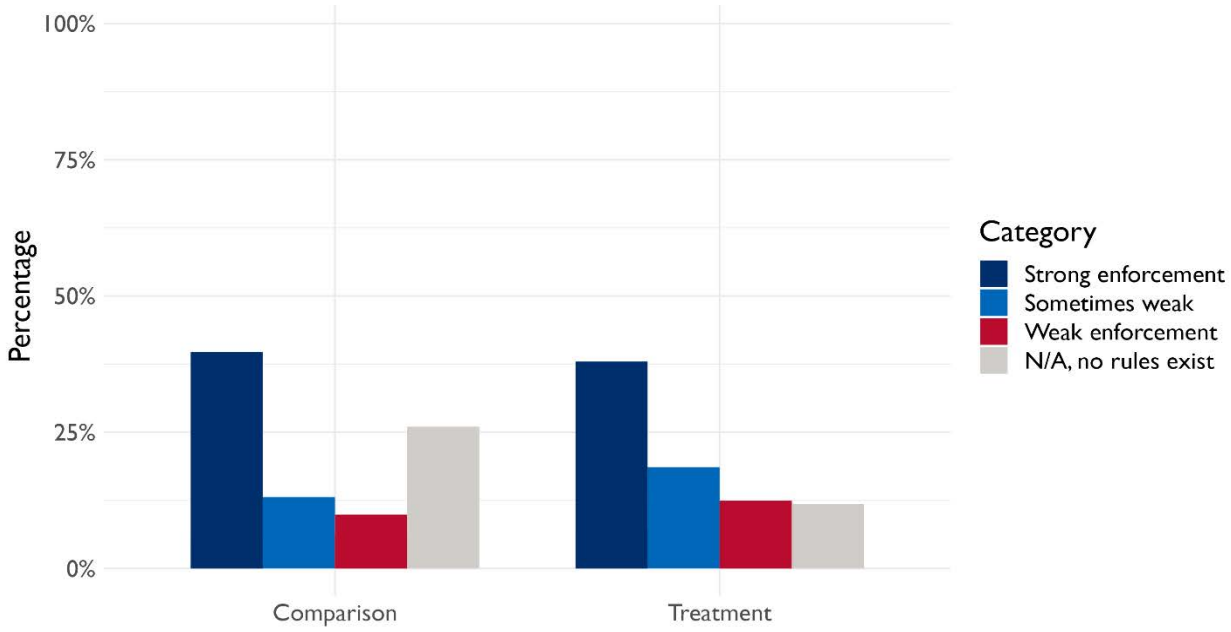


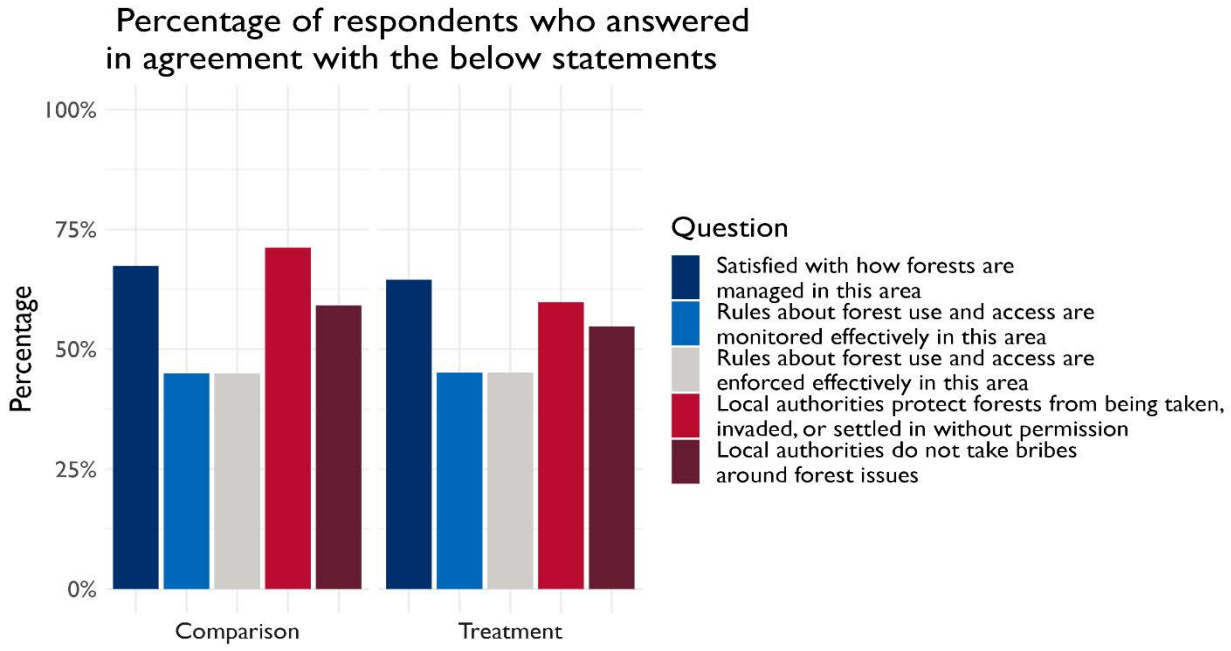
Figure 25: Forest Use Rule Enforcement Strength by Treatment Status (Puerto Rico and Comparison)



SATISFACTION WITH FOREST MANAGEMENT

Around 65 percent of respondents in Puerto Rico municipality were satisfied with how forests were managed in the area and only around 18 percent were dissatisfied (Figure 26).

Figure 26: Satisfaction with Rule Management and Monitoring by Treatment Status (Puerto Rico and Comparison)

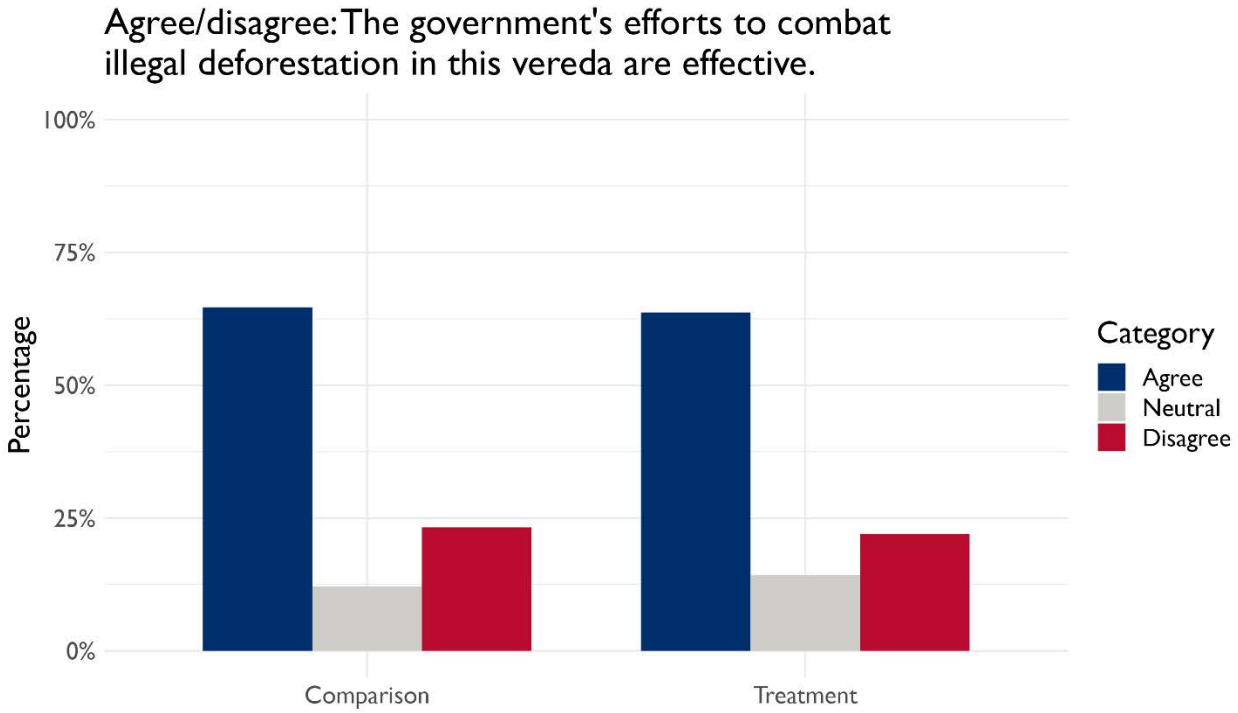


While the quantitative data generally presents a perception of effectiveness in forest regulation by the government (Figure 27), qualitative data highlights that attitudes toward the state actors responsible for environmental regulation are generally negative, which is linked to failed alternative livelihood and coca substitution programs.

> *"Because so far, let's say, they only send intermediaries, but there is never an entity that is supposed to really help to do things right, that the forests are protected, because that is why, the community and the farmers have deforested because they should pay the people correctly. That would be my opinion." (Men's FGD, Puerto Rico)*

In line with general comments about the absence of the state to support livelihood activities, FGD respondents report a lack of support from governmental entities for local forest regulation.

Figure 27: Effectiveness of Government Efforts to Combat Illegal Deforestation by Treatment Status (Puerto Rico and Comparison)

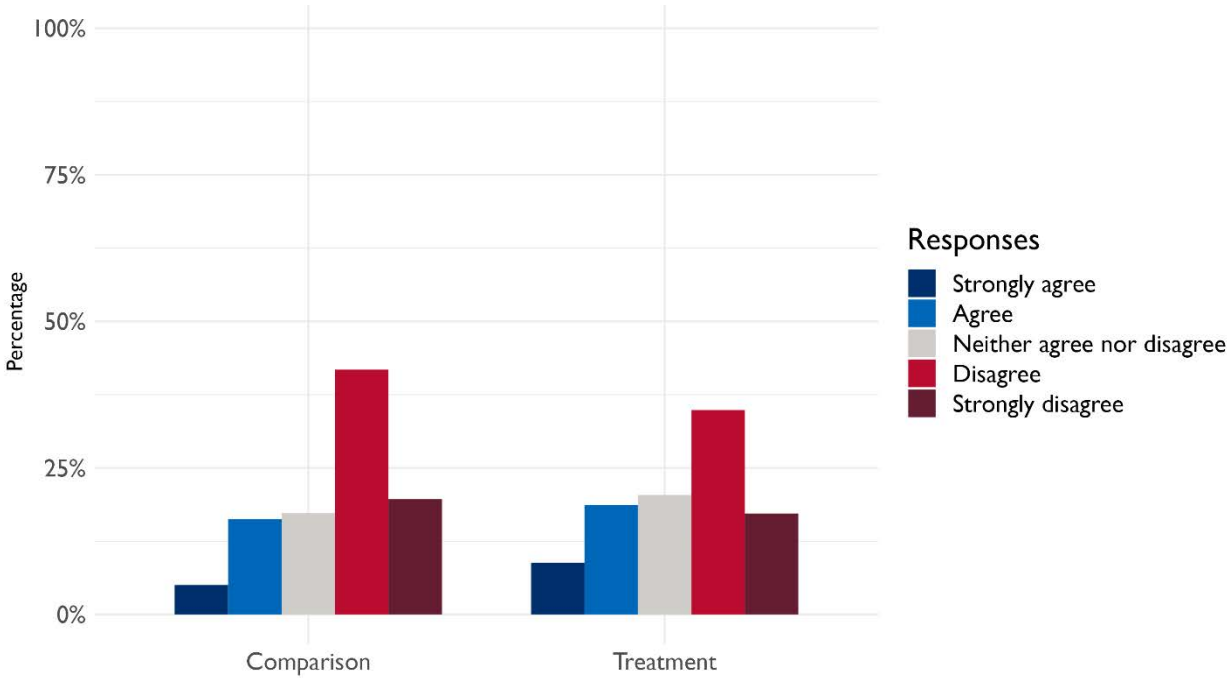


> *"No, they have not been effective, because if that were the case, there would be, for example, in other villages, there would be good forest, too, but since there is not, it is not seen. Once, we went over there to a meeting in the town of Macarena; they said they had no resources, they told us there was no money or anything. So? What we do here, we do it for ourselves—it is not that the government comes to help us, no. They have been ineffective. They have been ineffective, so no, there is no help at all."*

In addition to the failed PNIS program, negative attitudes toward the state are driven by perceived corruption and inequality of treatment for rich versus poor, especially in matters of law and regulations. Reported levels of corruption are high across data sources. Whereas the vast majority of respondents in both areas, around 75 percent, say they have never seen anyone give environmental authorities bribes to

avoid penalties for deforestation,[55] only around 54 percent of respondents in Puerto Rico "agree" that local authorities do **not** take bribes around forest issues, such as those related to forest management, permits, fines, or other forest use (Figure 26). There is a similar distribution of responses in comparison areas. Only 26 percent of respondents in Puerto Rico agreed or strongly agreed with the statement that there is very little corruption among public officials working for the municipal government; at 21 percent, this was slightly lower in control areas (Figure 28).

Figure 28: Percentage of Respondents who Agree there is Very Little Corruption Among Municipal Government by Treatment Status (Puerto Rico and Comparison)



This is also illustrated through a FGD exchange:

> *(R1): "But I tell you one thing, that would be very nice, but it should also be that everything, that is, that a law should be for everyone, not only for us, let us say, peasants, because many times the law is only for the peasant, that is, for those who do not have the resources, let us say, which is the money, the important thing: those who have money can cut down forests, do whatever, and no entity pays attention to that. But while we who do not have, let's say, the raw material that is money, we do go and cut down, we do have the laws."*
>
> *(R2): "Yes, I support what the compañero said there because, in any case, that shows the inequality between the poor and the rich, yes? Because the rich man arrives and buys a farm and arrives and puts in a bulldozer, puts in everything, destroys everything, and they don't say anything to him. But the farmer goes and knocks down a little bit of land and then he gets punished. That is the truth." (PPP FGD, Puerto Rico)*

Overall, an indigenous authority in Puerto Rico provided a good synthesis of the governance problems:

[55] Similarly, around 82 percent in both groups say they have never seen anyone provide environmental authorities with bribes to avoid penalties for illegal cattle grazing, and only about 5 percent say this happens about once a year.

> *"The state is very weak and very absent, that there is really zero fear of logging, clearing, and I say this with a bit of sadness, I feel that FARC were much more effective in controlling than the Colombian State itself and, in fact, part of the deforestation that took off has a lot to do with that at the beginning. After signing the Peace Agreement, theoretically they left certain areas free, and others have been taken over, but nobody has taken that part, there is nobody controlling the resource. So yes, we have a very weak state. Two, we have peasants in very, very precarious conditions in the territories, so they have nothing else to do. Three, we have that line clearly identified by very strong illegal structures already formed, that is, it is a large-scale business managed by some, who already know how to manage, who know how to take things away from them."*

Despite general discontentment with the state, in many instances, FGD respondents report a desire for a greater state presence. This appears to be linked to a perception that the state is strong and has the capacity to be effective in livelihood improvement and forest regulation.

> *"Who are you going to fight with? Fight with the government? Who is going to fight against the government? Nobody." (Women's FGD, Puerto Rico)*

FORMALIZATION AND TENURE

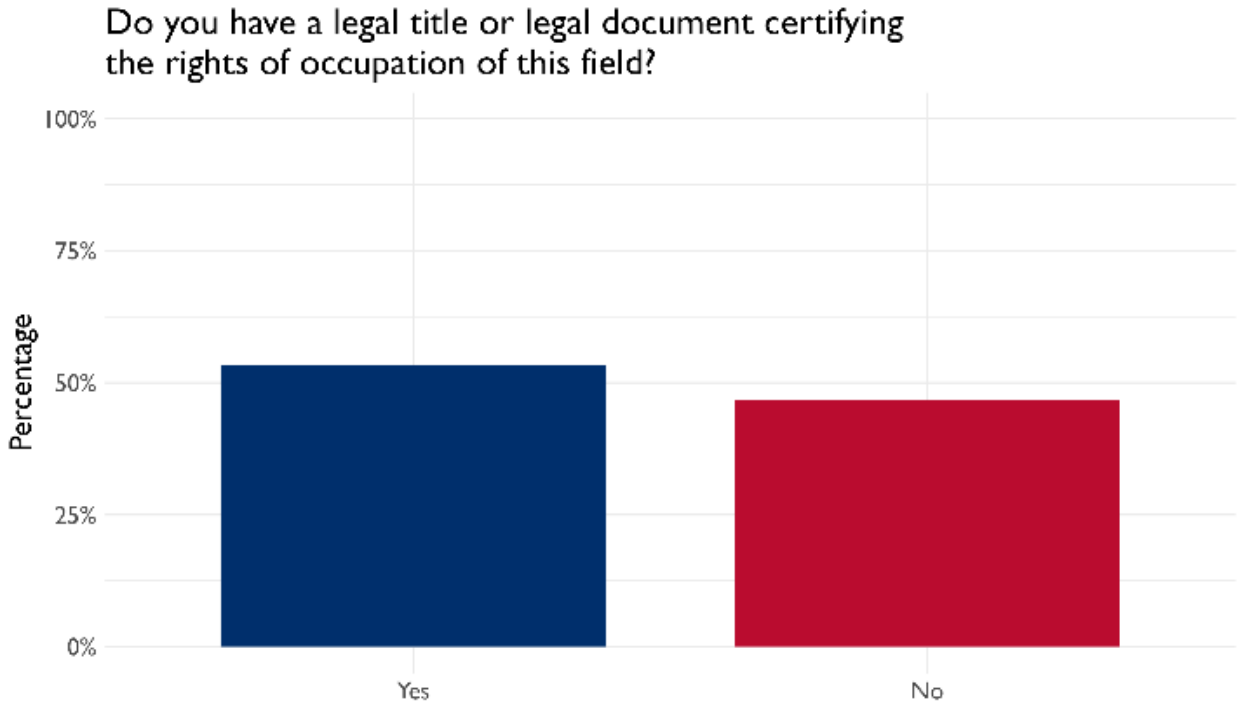
LAND TENURE

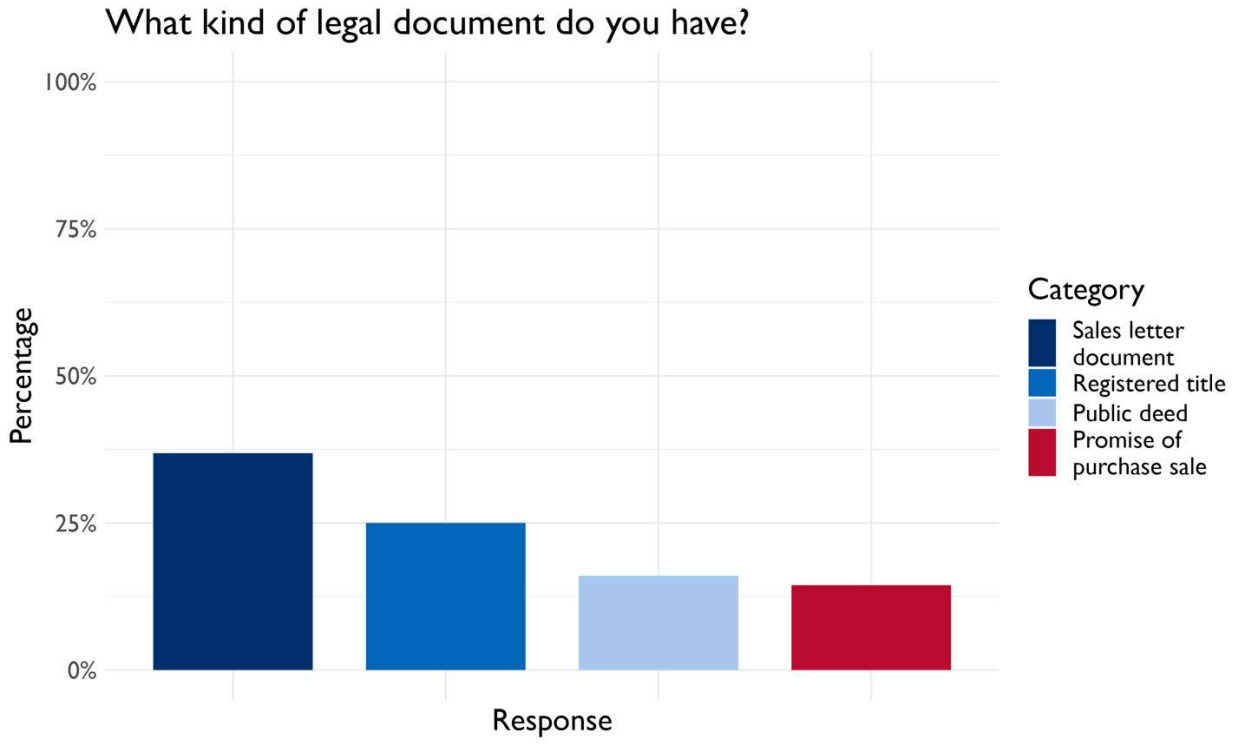
Across Meta, several land tenure problems are associated with the lack of formalization. These relate to large-scale land acquisitions, occupation of vacant lots, and land transfers (sales and inheritance) through sale letters and documents that clearly do not confer the necessary formality to transfer rights.

A total of 53 percent of treatment respondents report that someone in their household has a legal title or legal document certifying their rights of occupation of their fields (Figure 29). This figure is higher in comparison areas (66 percent). However, when asked about the specific documentation, many individuals misinterpret the legal nature of their documentation. **Out of the 53 percent in Puerto Rico, 35 percent have sales letter documents, 24 percent have registered titles, 15 percent have public deeds (either registered or unregistered), and 14 percent have promises of purchase sales** (Figure 29).[56] In cases where there was a cost for documentation, the mean amount paid was 626,333 COP, with the median being 22,500 COP. Twenty-two percent of respondents paid nothing for the "legal documents" for their fields.

[56] In comparison areas, 41 percent have sales letter documents, 17 percent have promises of purchase sales, 15 percent have public deeds, and 14 percent have registered titles.

Figure 29: Land Tenure Documentation Status and Type (Puerto Rico and Comparison)



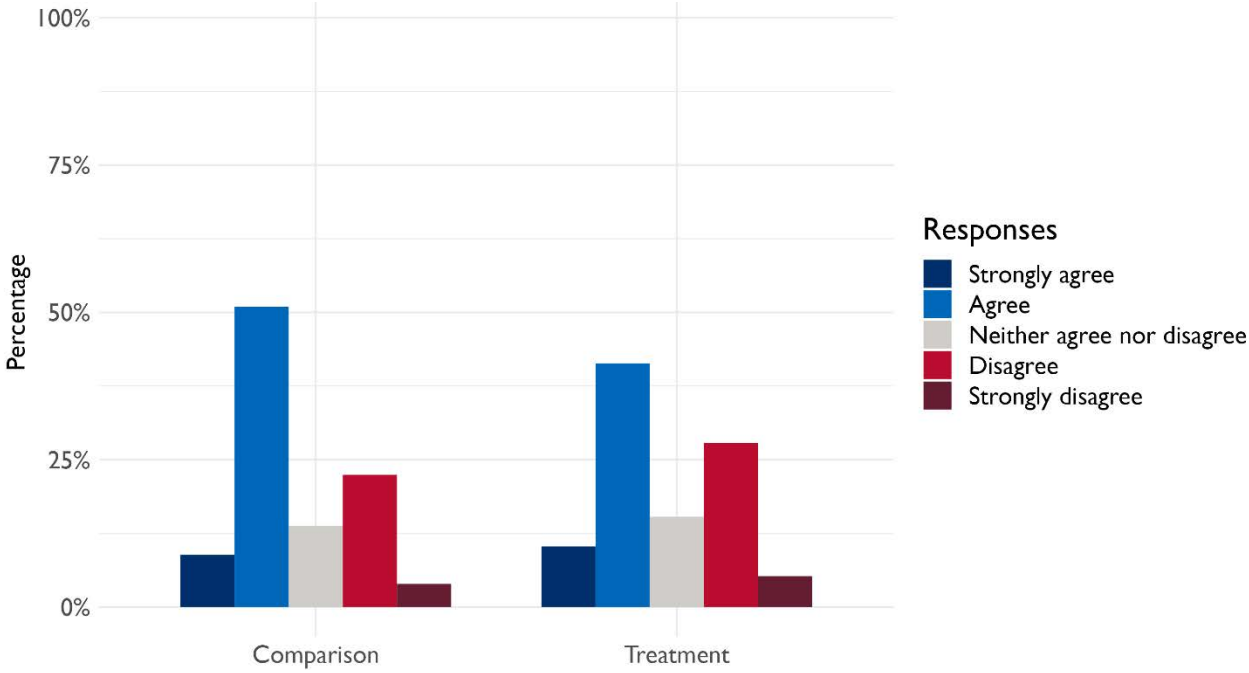


Of those who do not have a formal state-issued document proving ownership of their fields, three-quarters of respondents would be willing to pay for such a document. The top three reported reasons as to why respondents have not formalized or registered ownership of their fields were because of a lack of

resources (23 percent), a lack of information about the required procedures (13 percent), and the fact that the process has not concluded for obtaining the formalized ownership (10 percent).

Only half (50 percent) of respondents in Puerto Rico report that the land rights of citizens are clear and easy to understand (Figure 30) and 46 percent of respondents strongly agree that citizens' rights to land are well protected by Colombian authorities. Baseline findings for the comparison are similar, although a slightly higher percentage report that land rights of citizens are understood.

Figure 30: Land Rights of Citizens are Clear and Easy to Understand by Treatment Status (Puerto Rico and Comparison)



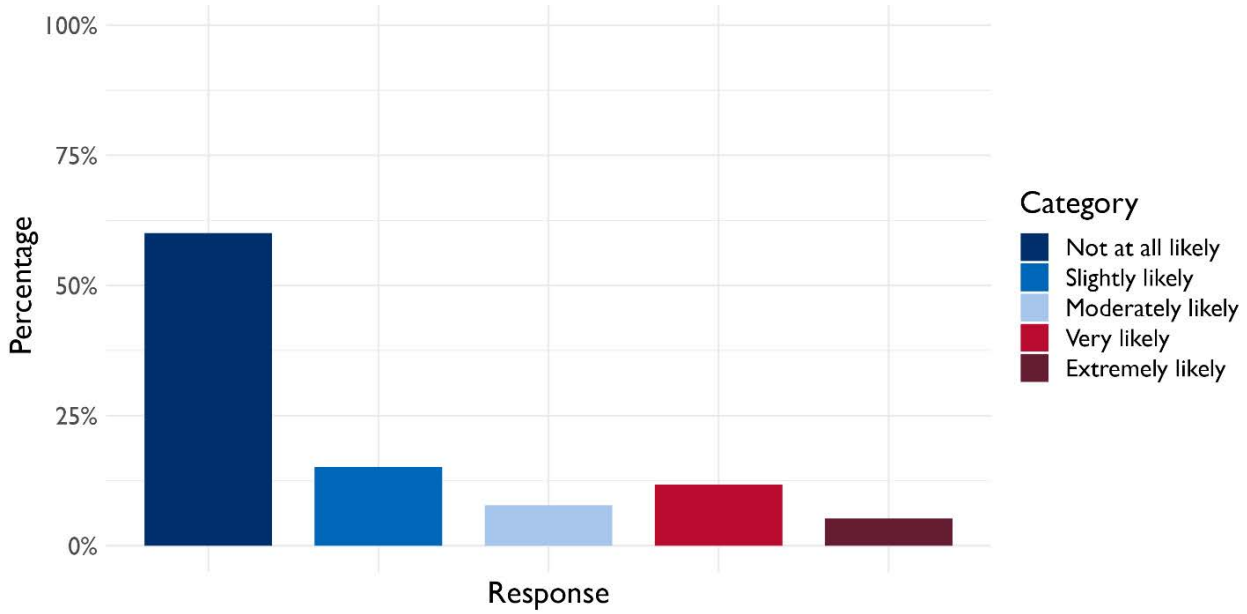
When asked in the SSIs "What are the main challenges to improve land tenure?," a representative from a CSO responded that lack of knowledge was a major constraint:

> *"...transferring this information (on regulations) to a population that has different academic capacities, is quite a big challenge... In other words, there should be more promotion of this information on what to do in the event of… not knowing what to do."*

Regarding household land tenure security, whereas 40 percent of respondents report some degree of perceived tenure insecurity on their household land, 60 percent say it is not at all likely that they or someone else in their household will involuntarily lose ownership or rights to use their fields within the next five years (Figure 31). These results are similar to the Prindex global tenure security findings in Colombia, which found that 65 percent of the adult population feels secure in their tenure rights.[57]

[57] https://www.prindex.net/data/colombia-2/

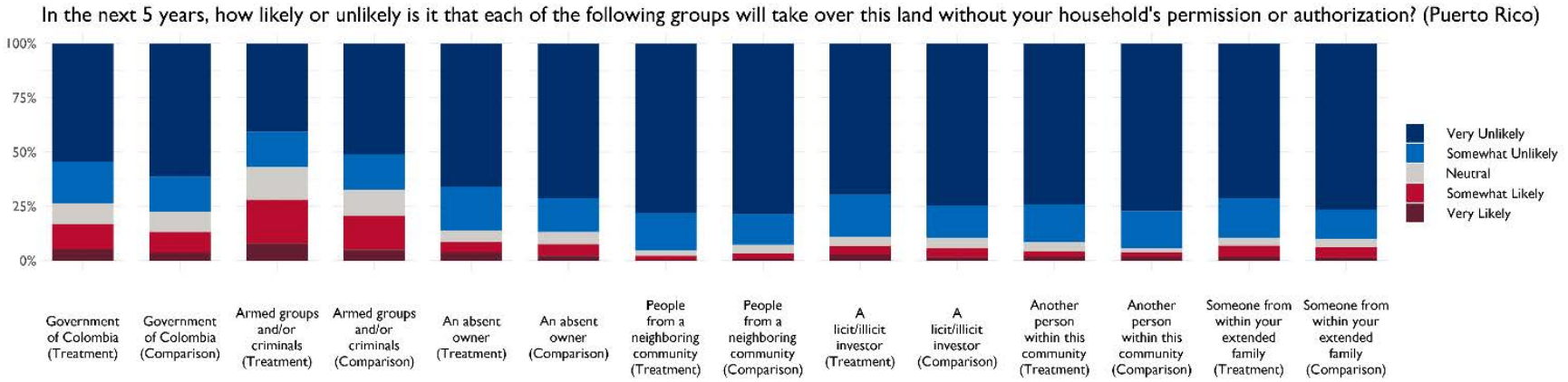
Figure 31: Likelihood of Losing Land Rights in the Next Five Years (Puerto Rico and Comparison)



In terms of sources of tenure insecurity, the greatest perceived source of tenure insecurity is armed groups, followed by the GoC, investors, neighbors, and extended family.[58] In Puerto Rico, approximately 26 percent and 17 percent of respondents said it was either somewhat or very likely that armed groups and the Colombian government (respectively) would take over their land without their household's permission or authorization (Figure 32).

[58] Due to security concerns, the evaluation was not able to ask about the perceived likelihood of land expropriation by armed groups.

Figure 32: Sources of Tenure Insecurity (Puerto Rico and Comparison)



Within the past year, only two percent of respondents in Puerto Rico municipality stated that they had been *threatened* with eviction from their field. For both the treatment and comparison municipalities, almost all respondents (99.8 percent) did not have land that was taken by authorities or external groups to be used for other purposes (Figure 33).

Figure 33: Land Expropriation (Puerto Rico and Comparison)

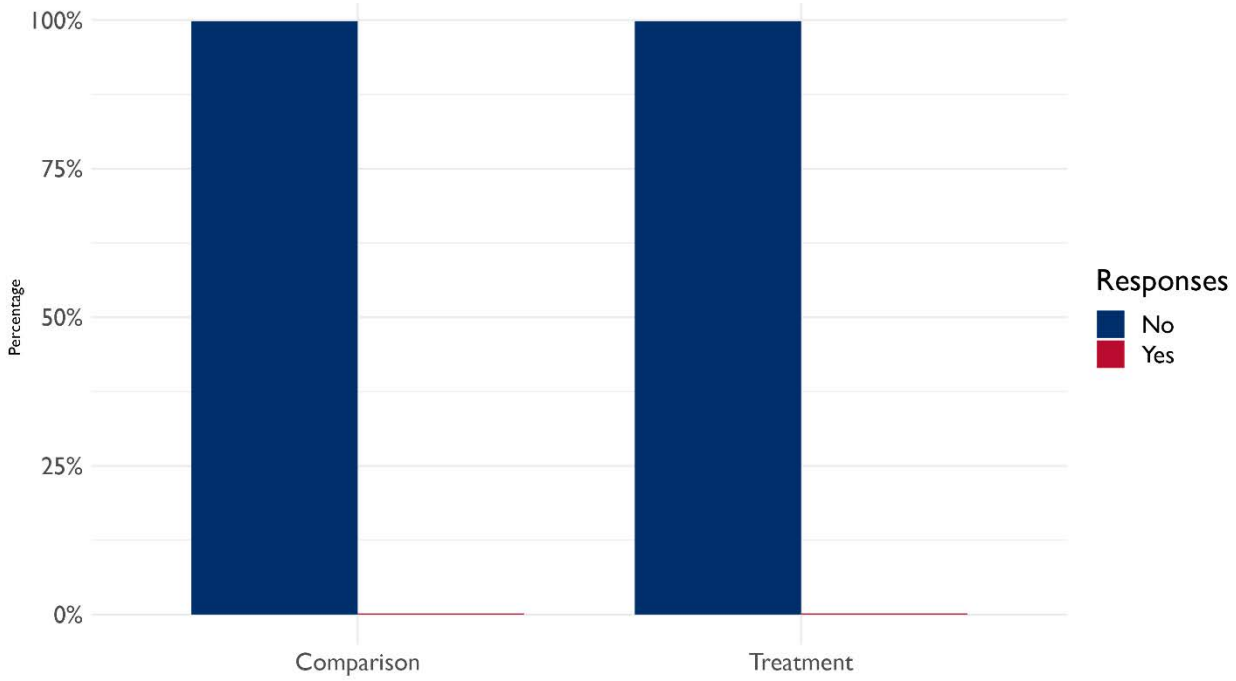


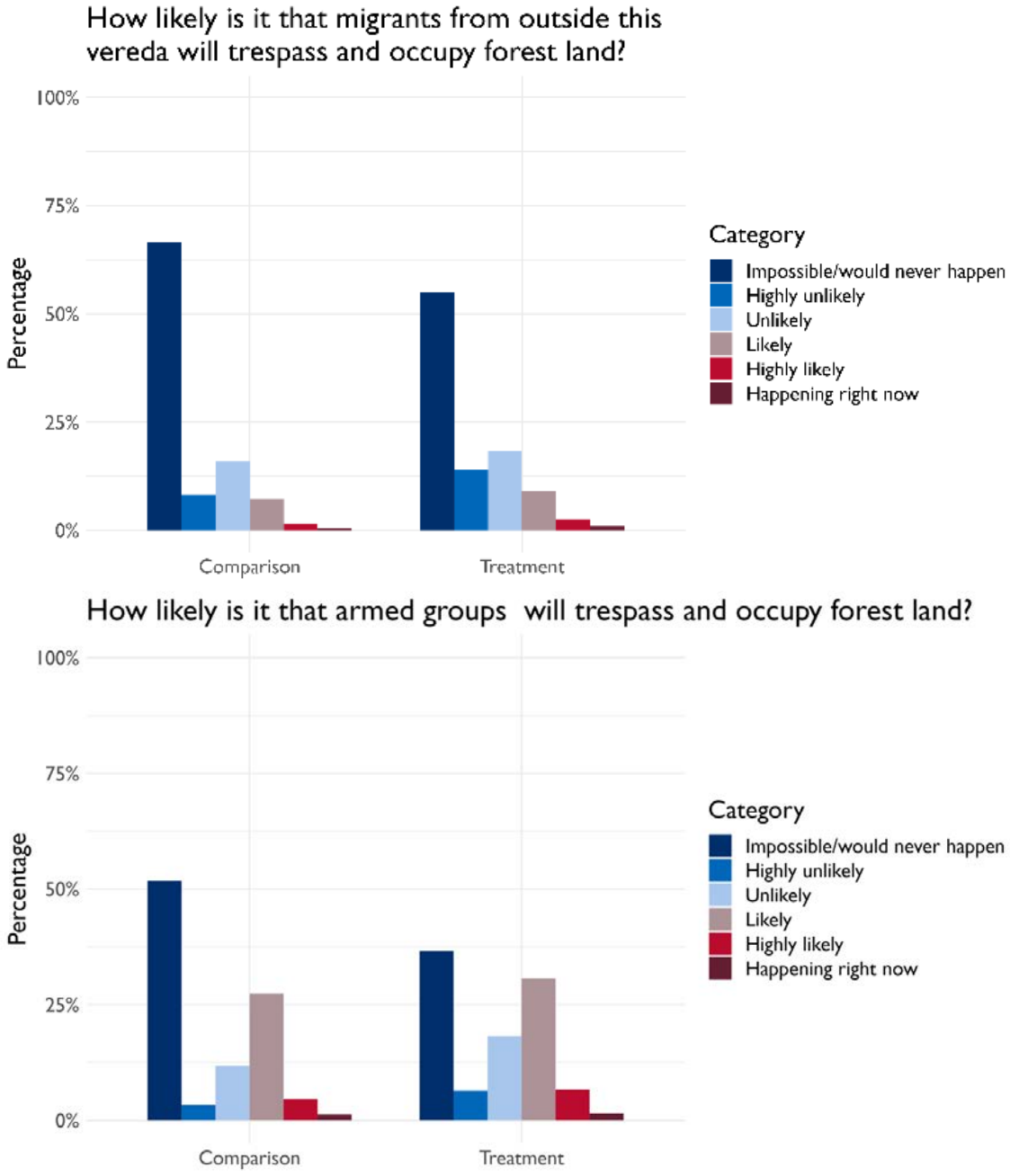
Table 8: Summary Statistics for Overall Land Awareness/Rights Questions, Scale from 1 to 5, Where 1=Strongly Agree and 5=Strongly Disagree (Puerto Rico and Comparison)

	COMPARISON					TREATMENT				
ITEM	N	MEAN	ST. DEV	MIN	MAX	N	MEAN	ST. DEV	MIN	MAX
There is little corruption among public officials working for the municipal government	495	3.545	1.125	1	5	479	3.334	1.216	1	5
The ANT distributes public land fairly	450	2.996	1.103	1	5	445	3.036	1.086	1	5
Land rights are clear and easy to understand	505	2.616	1.050	1	5	499	2.764	1.121	1	5
Citizens' rights to land are well protected by authorities	502	2.793	1.097	1	5	501	2.854	1.125	1	5
I know about my land rights now than I did last year	506	2.281	0.816	1	5	510	2.376	0.908	1	5

FOREST TENURE

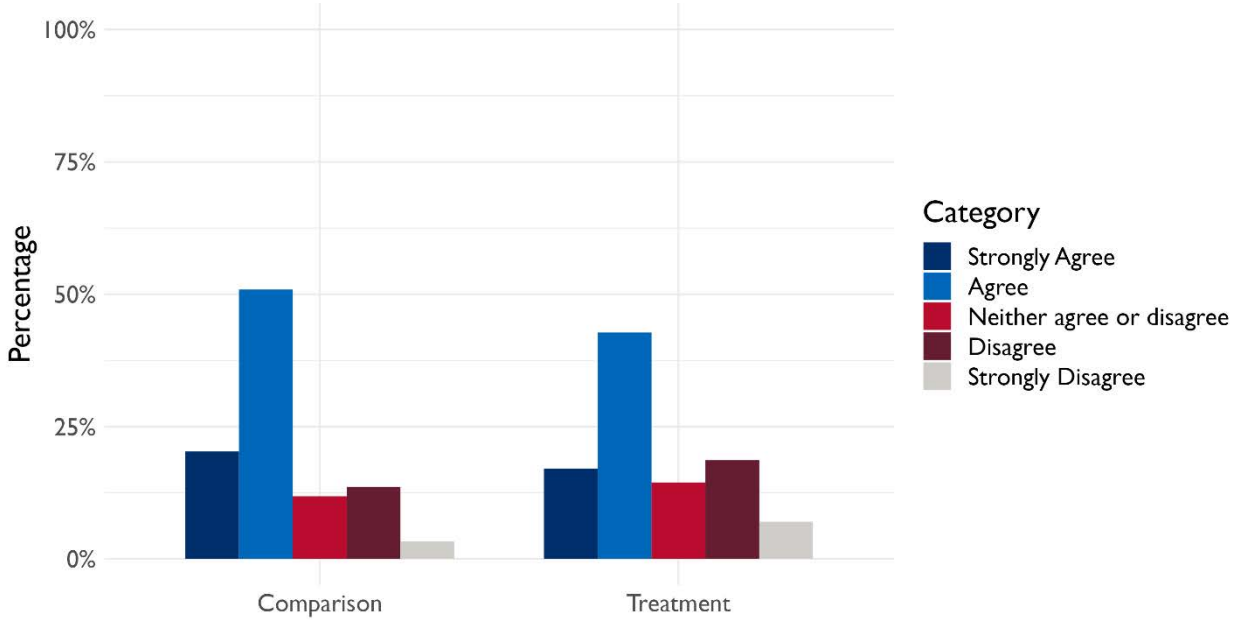
In terms of the tenure security of forest land, while 54 percent of respondents in Puerto Rico said that it was impossible for migrants to trespass and settle on forest land without permission from local authorities in the next 12 months, 13 percent of respondents did report that this was likely, highly likely, or happening right now (Figure 34). Thirty-five percent of respondents in Puerto Rico reported that encroachment on forest lands by armed groups was likely or happening right now (Figure 34). Statistics in comparison areas were generally similar.

Figure 34: Likelihood of Encroachment on Forest Land by Treatment Status (Puerto Rico and Comparison)



With regards to forest encroachment and illegal settlement, 58 percent of respondents from Puerto Rico express agreement with the statement that local authorities protect forests from being taken, invaded, or settled in without permission (Figure 35). This is lower than in comparison areas, where 71 percent of respondents agree that local authorities protect forests.

Figure 35: Local Authorities Protect Forests from Being Taken by Treatment Status (Puerto Rico and Comparison)



CONJOINT ANALYSIS OF FACTORS IMPACTING LAND SAFETY AND PROTECTION[59]

The evaluation used conjoint analysis to assess what variables impacted landowner confidence in their land's safety and protection. Survey respondents were presented with two hypothetical scenarios in which three variables were randomized and were asked to select the scenario in which they would feel the most confident in their land's safety and protection. The three randomized binary variables were "monitor" (whether the land is monitored by state security or armed groups), "interest" (whether the land is of low interest or high interest to agribusiness), and "title" (whether the land owner does or does not have a title for the land). A logistic regression model was used to estimate the log odds for each variable's impact on scenario selection. The detailed analysis and output can be found in Annex IV.

The scenario with the highest level of landowner confidence in their land's safety and protection is: The landowner has a title, state security is the monitoring group, and there is low interest in the land from agribusiness. Conversely, cases where landowners hold no title, armed groups are the monitoring force, and agribusinesses are highly interested in the land are associated with the lowest levels of perceived tenure security. Agribusiness interest in the land does not appear to drastically change the probability of

[59] This and the following sections present conjoint experiment analysis for Puerto Rico treatment and comparison respondents. These questions were asked to household survey respondents in all areas. However, because of the low number of treatment respondents in the polygons currently, results are only presented for Puerto Rico and its comparisons. When the full set of treatment polygons are known the analysis could be repeated on treatment and comparison respondents in the polygons. Refer to Annex IV: Full Survey Experiment Methods and Analysis for additional results.

respondent selections—instead, land tenure security is most associated with the combination of titling and state security monitoring.

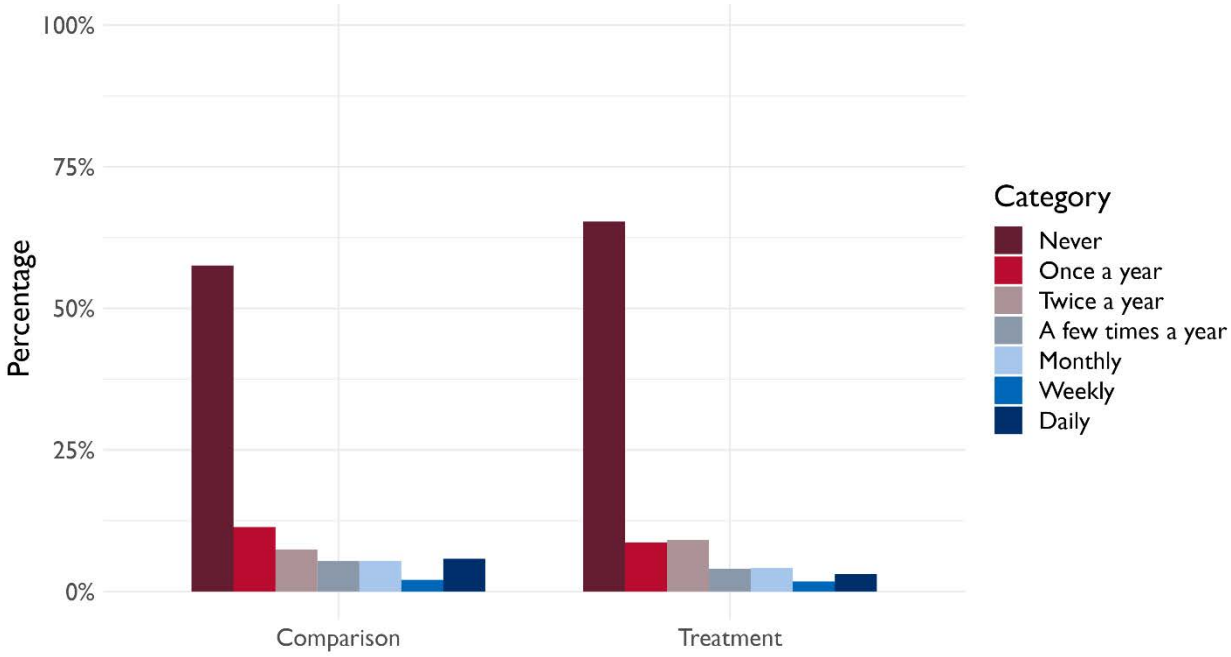
However, the results highlight that state security monitoring versus armed group monitoring is more important to tenure security than titling. Put differently, people will feel more secure if they do not have a title but their land is monitored by state security forces versus cases where they have a title but their land is monitored by armed groups. Based on the analysis, the impact of the variable differences on confidence in land safety and protection is roughly equal between treatment and comparison areas for all scenarios.

COCA PRODUCTION AND ILLEGAL CATTLE GRAZING

Eighty-two percent of respondents in Puerto Rico believe that people should not be allowed to produce coca as a local livelihood. In comparison, only 60 percent of Puerto Rico respondents reported that people should not be allowed to conduct illegal cattle grazing for local income generation.

Similar to responses about other monitoring activities, survey respondents in Puerto Rico reported that most authorities (58 percent) never monitor coca production, and 16 percent monitor once or twice a year (Figure 36). Thirty-five percent of respondents in treatment areas report that there are penalties for coca production in their *vereda*. Statistics are similar in comparison areas.

Figure 36: Frequency of Monitoring for Coca Production by Treatment Status (Puerto Rico and Comparison)



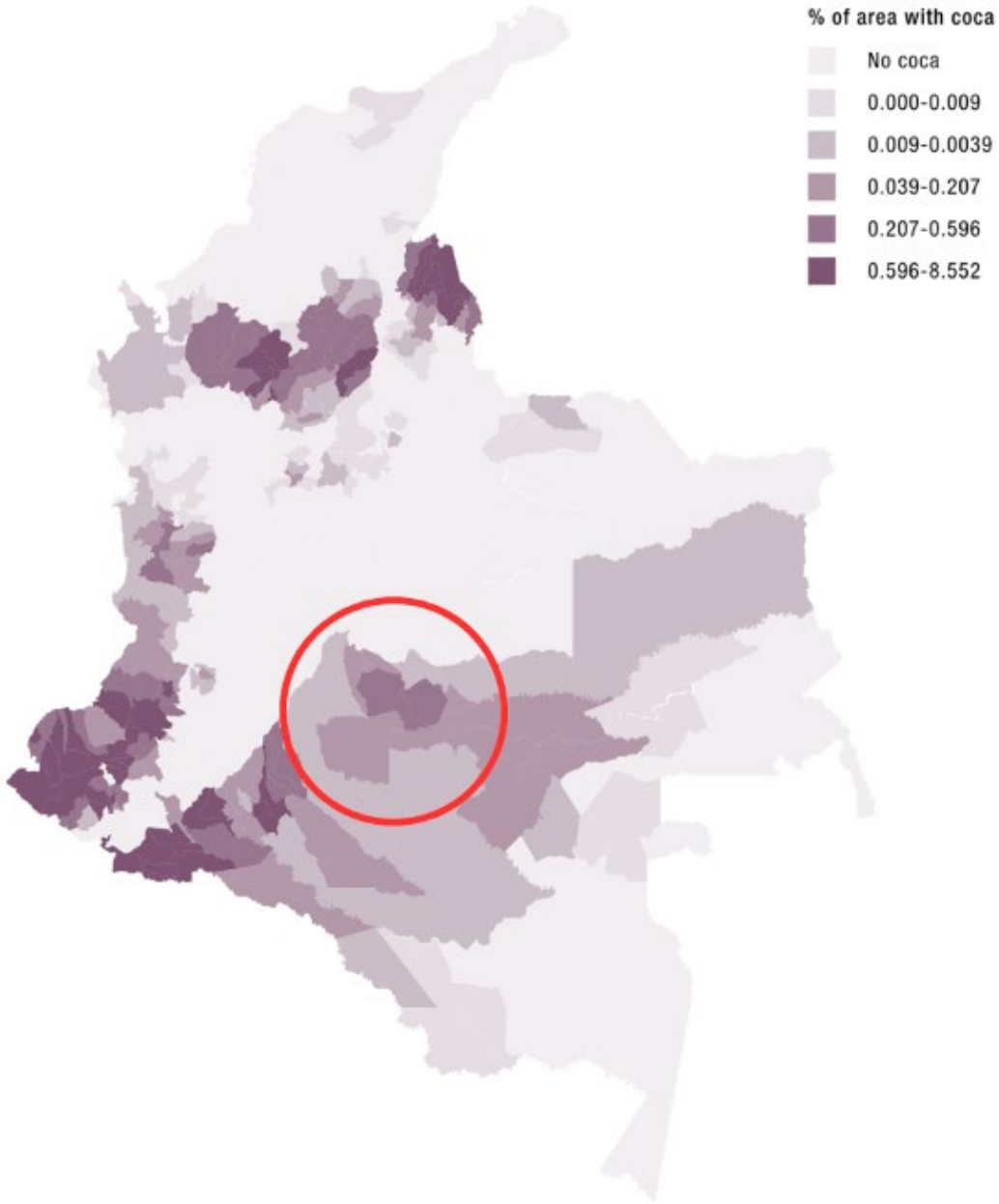
The evaluation conducted a list experiment within the household survey to understand the extent and distribution of coca production in the study area. The list experiment relies on a simple premise that if a sensitive question is asked indirectly, respondents may be more willing to offer a truthful response even when circumstances prompt them to answer otherwise (Blair and Imai, 2012). These experiments invite respondents to say how many things they have done from a list, without disclosing which things. This is a

commonly used technique for identifying the prevalence of behaviors or attitudes that people might be unwilling to openly admit to. In this case, the question in the household survey offered half of the respondents a list of mundane livelihood tasks and the other half the same list, with the addition of the activity "coca production." The prevalence of the activity can then be measured by comparing the mean number of activities that people report that they have participated in to earn money in each group.

The experiment does not find any reported increase in money-earning activities for coca production (the group means are roughly equal), thus indicating either 1) a very low level of coca production in the area, 2) respondents are sensitive to coca questions, even if asked indirectly, or 3) there is a floor effect, in which the incidence of respondents reporting that they engaged in none of the listed activities between both experiments led to a failure in detecting a meaningful indication of coca as an income source. The standard deviations among both the groups who received the list with and without coca production are larger than the average number of activities a respondent reportedly engaged in, indicating a broader spread in the responses, with a high incidence of "0" responses (floor effect), skewing the mean downward.

The results of the list experiment are similar across treatment and comparison respondents. The findings are in opposition to qualitative reports of increases in coca production in the past year, as well as SIMCI data about the extent of coca cultivation in the region (Figure 37). Ultimately, this highlights the difficulties in capturing this indicator in a rigorous way through standard household data collection methods.

Figure 37: Map of Coca Cultivation Regions in Colombia



Source: SIMCI Project (Sistema Integrado de Monitoreo de Cultivos Ilícitos) of UNODC's Colombia Office.

The evaluation also conducted a survey experiment to assess the likelihood of landowners clearing land for cattle grazing outside the limits of their own plots. The team examined this likelihood with a focus on varying three conditions: 1) presence versus absence of a government-issued title to the land, 2) presence of armed groups versus state security forces as monitoring forces, and 3) the possibility that individuals could earn low ($600 USD), medium ($1,200 USD), or high ($2,400 USD) amounts per month from grazing activities.

A linear regression model was used with robust standard errors to identify the effect of the independent variables. The presence of a land title was not significant, whereas the regression shows that "monitoring" and "high earning" are marginally significant. Specifically, the coefficients for "title," "monitor," "medium

earning," and "high earning" were 0.094 (t = 0.78, p = 0.43), -0.226 (t = -1.8, p = 0.06), -0.074 (t = -0.53, p = 0.59), and 0.261(t = 1.68, p = 0.09), respectively. This implies that the presence of armed groups or state security forces monitoring the area and the potential for high earnings from cattle grazing might have some influence on a decreased likelihood of landowners clearing land for cattle grazing, whereas the presence of a land title is not a significant factor. In the context of the 1–5 scale used in the survey question, where 1 represents "not likely" and 5 represents "extremely likely," a value of 1.898 indicates a relatively low likelihood of engaging in land-clearing behavior.[60] However, the low likelihood of land clearing may be due to the survey question's hypothetical nature and the potential social desirability bias, as respondents may have given socially acceptable answers rather than answers reflecting their actual behavior.

WEALTH, LIVELIHOODS, AND ASSETS

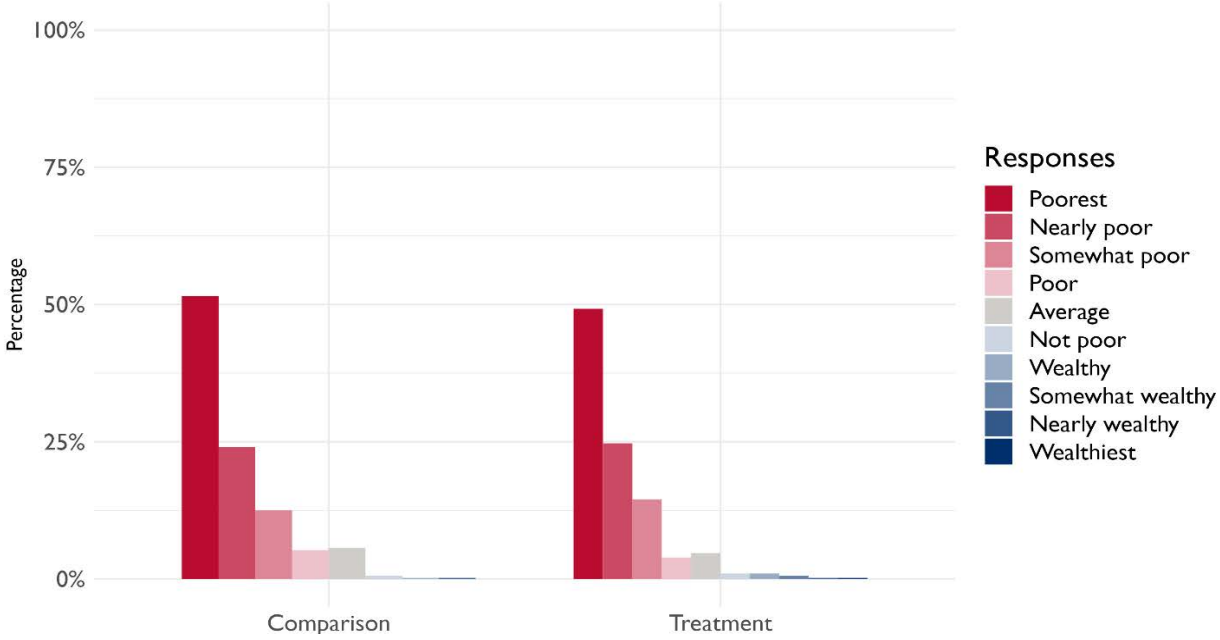
Seventy-two percent of members of households in treatment areas age 18 or older worked in the last 12 months, mostly on agricultural production for sale (26 percent), subsistence farming (16 percent), and agricultural wage labor (11 percent). Employment statistics are similar in control *veredas*, except raising livestock for sale (small-scale) is more common in control *veredas* (15 percent versus 8 percent).

Treatment and comparison respondents generally track together on indicators of wealth and livelihoods. However, there is evidence of slightly higher levels of wealth or improved livelihoods in comparison areas for a few indicators, as described in more detail below.

On a scale from 1 to 10, with 10 representing people at the top who are the wealthiest and live comfortably and 1 representing the people at the very bottom who are the poorest, almost all respondents identified themselves and their households as very poor or poor in comparison to their neighbors. Almost half of the respondents in the treatment municipality (49 percent) selected 1 (poorest), 25 percent chose 2, and 15 percent chose 3. The overall distribution is similar across treatment and comparison areas (Figure 38).

[60] The intercept term of the model was 1.898, which represents the predicted likelihood of engaging in land-clearing behavior when all the independent variables in the model are equal to 0 (i.e., no government-issued title, no monitoring presence, low earnings, and not located in San José or Puerto Concordia).

Figure 38: Self-reported Position on Ladder of Wealth Compared to Other Households (Puerto Rico and Comparison)

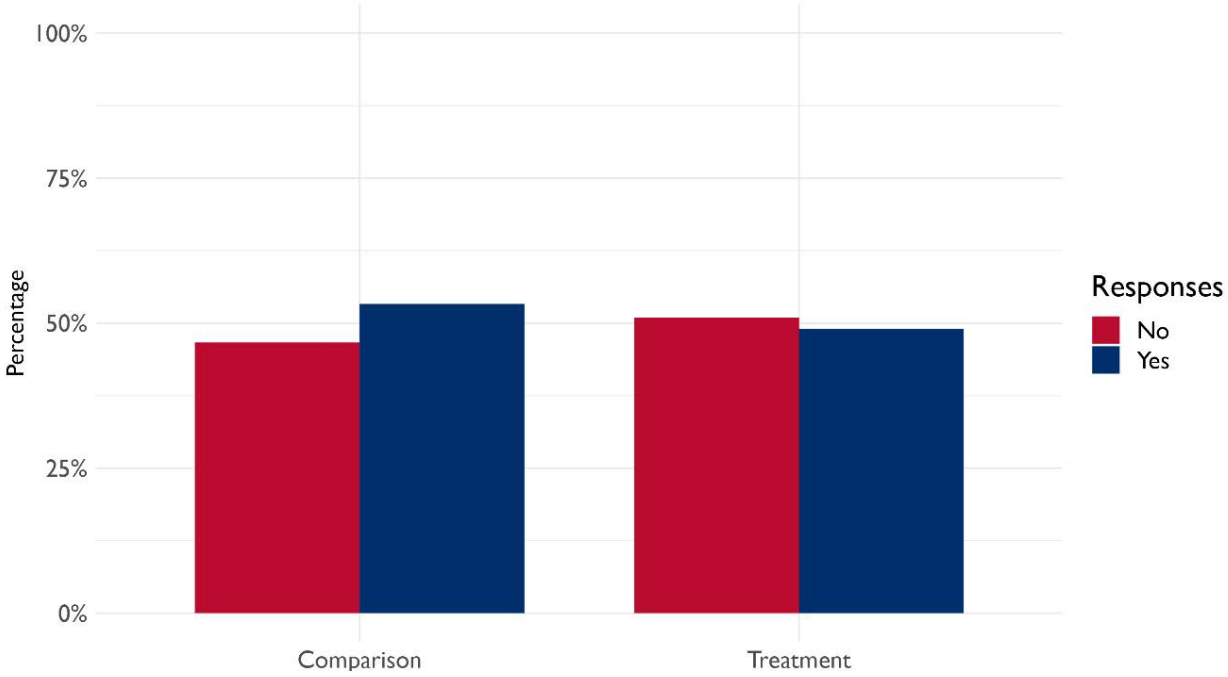


LIVESTOCK ASSETS

About half of respondents in both treatment and comparison areas report owning or working with cows, bulls, calves, or steers (Figure 39). **The estimated average number of livestock that treatment respondents work with is approximately 37, and the number owned is 21.** Results are similar in comparison areas.

Among the approximately half of respondents that reported engagement in livestock as a household livelihood, 14 percent of treatment respondents cited that all of their household income comes from raising/herding livestock, and approximately 12 percent report that half to most of their income comes from these activities—6 percent report less than half and 15 percent report less than a quarter of household income. These distributions were generally equivalent in the comparison areas.

Figure 39: Owned or Worked with Livestock, Last 12 Months (Puerto Rico and Comparison)



Among those who are engaged with livestock, the average amount of land used to support livestock is approximately 36 hectares for treatment respondents and 42 hectares for comparison respondents. There is also a slightly different distribution of uses between treatment and comparison areas, with a larger percentage of treatment respondents using livestock for standing sale versus milk sale and consumption. Specifically, approximately 78 percent of respondents in the treatment group who work with livestock use their livestock for "standing sale," 28 percent use them for "milk sale," and 30 percent use them for "self-consumption milk." In the comparison group, 71 percent of respondents use their livestock for "standing sale," 53 percent use them for "milk sale," and 51 percent use them for "self-consumption milk."

Only 9 percent of treatment respondents report that they graze their livestock in the forest. These results are similar in comparison areas. Given the documented evidence of large amounts of unauthorized grazing in and around these areas, the low levels of reported grazing in the forest could be a result of social desirability bias to sensitive questions.

Table 9: Summary Statistics for Livestock Assets (Puerto Rico and Comparison)

	COMPARISON					TREATMENT				
ITEM	N	MEAN	ST. DEV	MIN	MAX	N	MEAN	ST. DEV	MIN	MAX
Worked with livestock (binary)	509	0.530	0.500	0	1	513	0.493	0.500	0	1
Total use of pasture (ha)	270	41.950	83.341	0	1, 200	252	35.592	37.175	0	320
Total number of livestock own or work with	270	40.611	69.142	0	960	253	37.249	41.949	0	360
Total number of livestock owned	270	22.033	34.734	0	360	253	21.198	25.175	0	160
Value of livestock (CHP)	221	41,088,643,000	59,514,335,000	0	400,000,000	216	36082097000	473110640000	0	356000000
Livestock graze in forest (binary)	270	0.107	0.310	0	1	253	0.091	0.288	0	1
Percentage of household income from livestock raising and herding (scale 0–6, where 0=None and 6=All)	509	1.664	2.261	0	6	511	1.589	2.197	0	6

CREDIT

Slightly less than half of treatment respondents (48 percent) have an account in a bank or financial institution compared with 57 percent of comparison respondents. Despite significant poverty, a high percentage of both treatment and control respondents noted that they would be able to take out a loan or borrow funds if they wanted to, 69 percent and 73 percent respectively. This is due to a reliance on informal loans and local networks for social protection.

Despite a large number of respondents stating that they can take out a loan or borrow funds, only 16 percent of respondents in the treatment municipality received credit or any other financing from outside the household (Figure 40). The average credit value households have received either from credit or other financing sources is 16,930,864 COP. Control values are similar—22 percent have received credit or financing from outside their households at an average value of 18,856,486 COP.

Forty-five percent of respondents in the treatment municipality use their credit to purchase inputs for cultivation (seeds, fertilizers, pesticides, feed for animals) and 13 percent use credit to purchase animals. Respondents in control areas are more likely to use their credit to purchase animals (22 percent versus 13 percent).

Among those receiving credit and outside financing, 39 percent of respondents in the treatment area reported that documents were required as part of the loan process compared to 48 percent for control respondents. Among the documents that were required, 34 percent of those in the treatment municipality cited that a "registered deed" was needed, 16 percent stated "title or certificate of ownership (not a deed)," 13 percent chose "promise of sale," and 9 percent cited "document of possession" as a required document for the loan process, etc. A different set of documentation was used in control municipalities; for example, 17 percent cited that a "registered deed" was needed, 30 percent cited "promise of sale," 21 percent cited "document of possession," 6 percent cited "notarized document," 4 percent cited "award documents," and 8 percent cited "title or certification of ownership." **Overall, deeds and documents of possession are important for loans. Thus, in addition to the expected benefits of tenure security, there is a strong desire for titles to support loan-taking.**

Figure 40: Receipt of Credit and Loans, Last 12 Months by Treatment Status (Puerto Rico and Comparison)

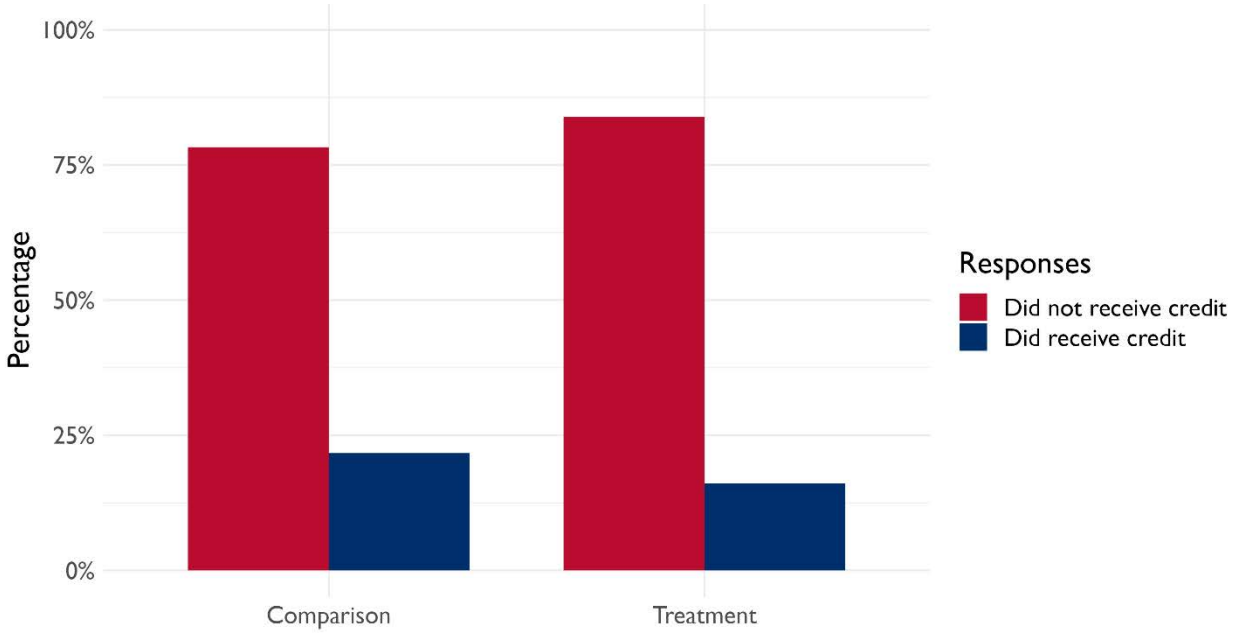


Table 10: Summary Statistics for Credit

	CONTROL					TREATMENT				
ITEM	N	MEAN	ST. DEV	MIN	MAX	N	MEAN	ST. DEV	MIN	MAX
Received credit or financing from outside the household (binary)	508	0.219	0.414	0	1	513	0.160	0.367	0	1
Total credit value (CHP)	111	18, 856, 486.000	38, 914, 868.000	100, 000	350, 000, 000	81	16, 930, 864.000	34, 469, 318.000	0	300, 000, 000
Documents required (binary)	111	0.477	0.502	0	1	82	0.390	0.491	0	1
Can take out a loan (binary)	502	0.735	0.442	0	1	503	0.702	0.458	0	1
Have a bank account (binary)	508	0.567	0.496	0	1	512	0.480	0.500	0	1

FINDINGS—POLYGONS

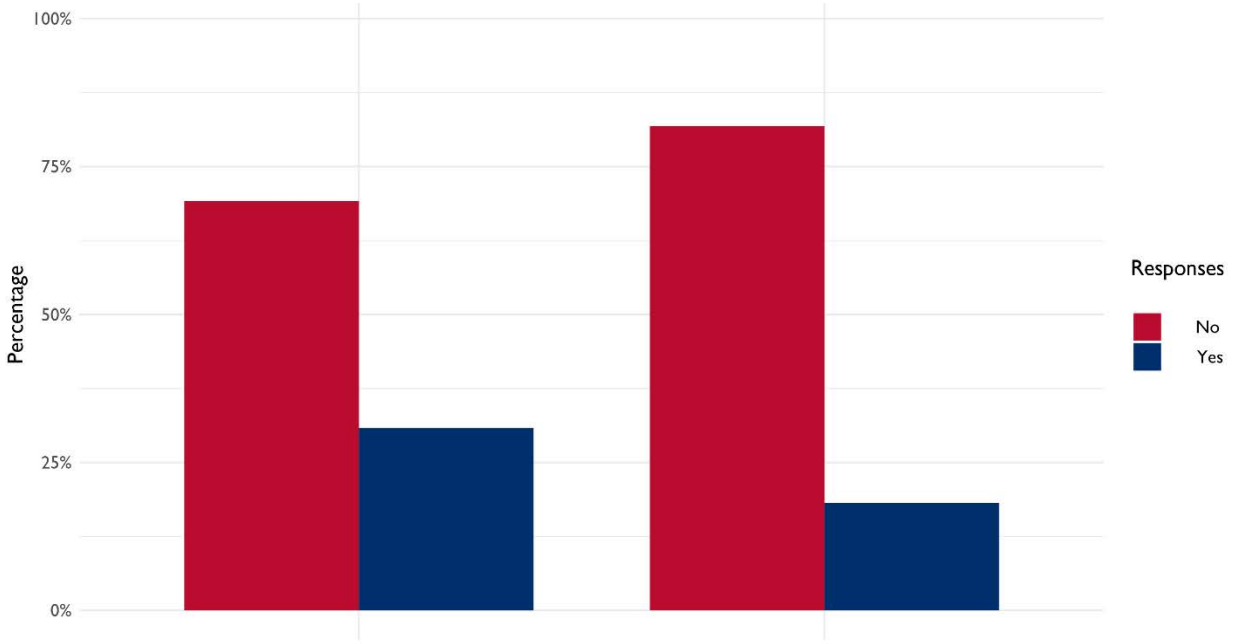
This section presents findings from the two original treatment polygons in San José del Guaviare and San Vincente del Caguán municipalities, as compared to treatment expansion and comparison polygons in Calamar, Miraflores, San José del Guaviare, San Vincente del Caguán, and Solano municipalities.

RESPONDENT HOUSEHOLD AND FIELD INFORMATION

In the treatment area, 38 percent of respondents identified themselves as White, 47 percent selected Mestizo, 3 percent identified themselves as Black or Mulatto, 6 percent chose Afro-descendant or Afro-Colombian, and 6 percent selected Indigenous. The distribution of identities does not differ significantly in comparison polygons.

Approximately 82 percent of respondents in the treatment area were not born in the municipality they currently reside in, compared to 69 percent in comparison polygons (Figure 41). Forty-four percent of respondents in the treatment area moved to the municipality they currently live in due to household decisions, 35 percent of them moved for job and business opportunities, and 21 percent moved because they needed land for agriculture or better yields from more fertile land. This contrasts slightly with the currently designated comparison polygons where a larger percentage of respondents (53 percent) moved because of job and business opportunities versus household decisions (22 percent) or the need for land for agriculture and better yields (12 percent).

Figure 41: Born in the Municipality by Treatment Status (Polygons and Comparison)



Across the polygon study area, there is an average of three habitual residents—with no households that include domestic workers.

Table 11: Summary Statistics from Polygon Respondent Household Information (Polygons and Comparison)

	COMPARISON					TREATMENT				
ITEM	N	MEAN	ST. DEV	MIN	MAX	N	MEAN	ST. DEV	MIN	MAX
Born Locally (binary)	383	0.308	0.462	0	1	33	0.182	0.392	0	1
Years Lived in Municipality	265	24.894	14.130	0	63	27	29.333	16.248	1	61
Number of Habitual Residents	383	3.219	1.732	1	10	33	3.303	1.610	1	8

OVERALL LAND QUESTIONS

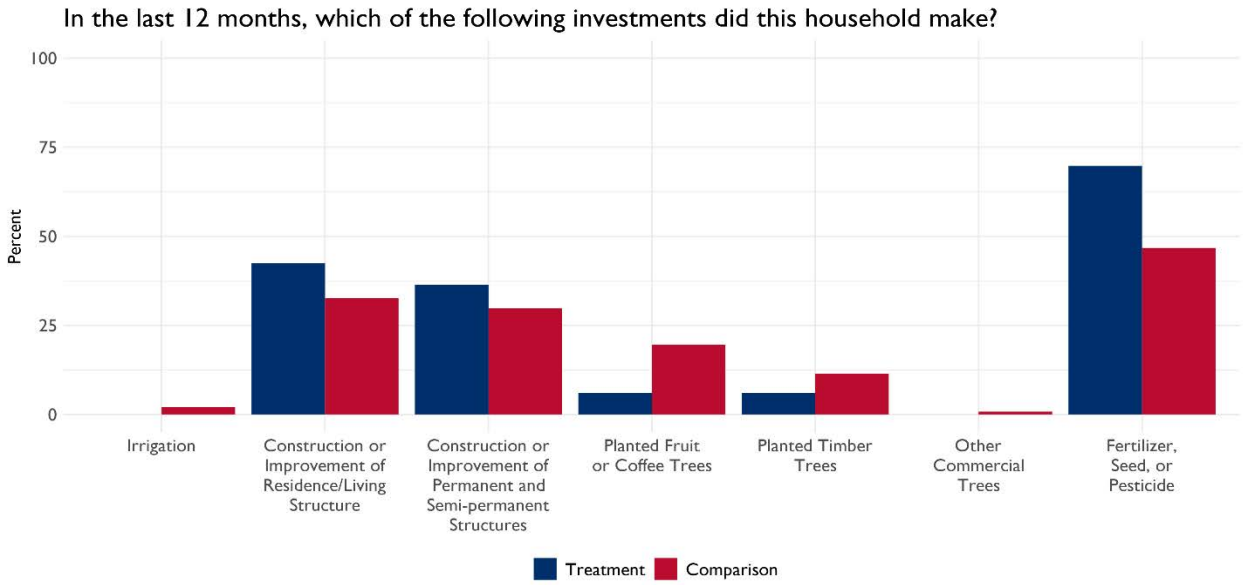
Ninety-four percent of respondents in the treatment area own the land they reside on, while 6 percent rent or borrow.[61] As discussed above, responses to this question may stem from differences in perception of ownership versus what the statutory system would designate as ownership based on actual documentation. The distribution is generally similar in comparison polygons. The total average land area households in the treatment area currently own and use is 74 ha, with a median of 51 ha, compared with 86 hectares in comparison polygons. In the treatment area, when asked how their household acquired this field, the three most common answers were purchased (85 percent), occupied vacant land (5 percent), and usufruct (5 percent). In contrast, the three most common answers in comparison polygons were purchased (59 percent), inherited (13 percent), and usufruct (9 percent).

In the treatment area, the average time it takes to walk to respondents' fields is 18 minutes. **Ninety percent of respondents said that there are natural forests on the field, compared with 68 percent of comparison respondents.**[62] **In the treatment area, 100 percent of respondents said that the field was not in a protected area versus 86 percent of comparison respondents.** In both the treatment and comparison areas, the three most common current uses of the field are forest, livestock and pastures, and residence.

In the last 12 months, respondents in the treatment area made no investments in irrigation, compared with 2 percent of comparison respondents. Beyond irrigation, respondents have made investments in the following areas in the past 12 months: fertilizer, seed, or pesticide (70 percent treatment, 47 percent comparison); roads and road repair (45 percent treatment, 27 percent comparison); construction or improvement of residence/living structures (42 percent treatment, 33 percent comparison); construction or improvement of permanent and semi-permanent structures (non-residence) (36 percent treatment, 30 percent comparison); planting fruit or coffee trees (6 percent treatment, 20 percent comparison); and planting timber trees (6 percent treatment, 11 percent comparison). While there are currently notable differences in field investment between treatment and comparison areas, the team expects that this imbalance will decrease once additional treatment expansion polygons are identified (Figure 42).

[61] The majority of respondents in both the treatment and comparison areas do not lend out their land.
[62] In the treatment area, only 8 percent of respondents said that there were planted forests on the field, compared to 27 percent of comparison respondents.

Figure 42: Land Investments by Treatment Status (Polygons and Comparison)



In the treatment area, 85 percent of respondents indicated that their household cultivated crops (mostly plantains, manioc, and yellow or white corn) on their fields in the last 12 months, and in the comparison area, 81 percent indicated the same. In the two treatment polygons, this is generally for subsistence as only 9 percent indicated that they sold crops from their fields, compared to 30 percent in comparison polygons.

Table 12: Summary Statistics for Polygon Overall Land Questions (Polygons and Comparison)

	COMPARISON					TREATMENT				
ITEM	N	MEAN	ST. DEV	MIN	MAX	N	MEAN	ST. DEV	MIN	MAX
Total land area owned and used (ha)	367	84.330	83.220	0.003	399	31	79.661	43.794	15	204
Total land area rented (ha)	11	53.366	51.619	0.014	135	1	100		100	100
Total land area borrowed (ha)	22	35.206	46.742	0	150	2	80.500	28.991	60	101
Total land area rented out (ha)	3	1.676	2.879	0.12	5	0	-	-	-	-
Total land area lent out (ha)	5	46.050	44.433	0.250	120	0	-	-	-	-
Total land area owned and kept fallow (ha)	2	50.005	70.704	0.010	100	1	150	-	150	150
Land taken by authorities or external groups (binary)	383	0	0	0	0	33	0	0	0	0

FOREST DEPENDENCE AND VALUATION

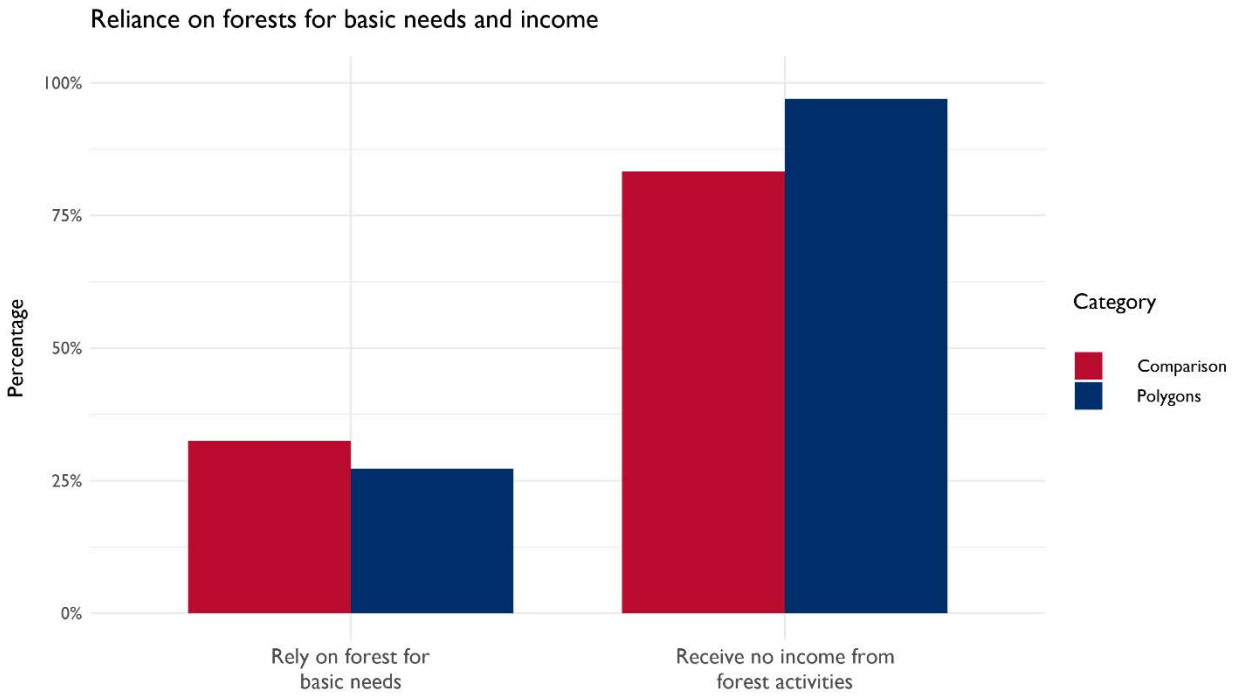
In the treatment area, 27 percent of respondents said their household depends a lot on the forest for basic needs, 42 percent said they depend somewhat, and 30 percent said they do not depend at all. The distribution for forest dependence is relatively similar in comparison areas, especially given the small sample size in treatment polygons. **In the treatment area, 97 percent of respondents report that they did not derive any household income from forest products or activities, compared with 83 percent of respondents from comparison polygons** (Figure 43).

When asked what benefit the nearby forest provides to respondent households besides harvested products, the three most popular answers in both the treatment and comparison areas were fresh air, water conservation, and shade. The most important benefit that the nearby forests provide to their household is water conservation.

When asked in FGDs about the benefits of areas with lots of virgin land, most noted water, oxygen, animals, land, and wood. While some of these benefits were in line with conservation efforts, others were a direct result of clearing the virgin land, with one respondent saying:

> *"We cut [forest] to plant a hectare of plantain, half a hectare of yucca, to plant rice...That is the benefit it gives us. No more." (Woman from Miraflores/Buenos Aires Guaviare)*

Figure 43: Forest Reliance for Basic Needs and Income by Treatment Status (Polygons and Comparison)



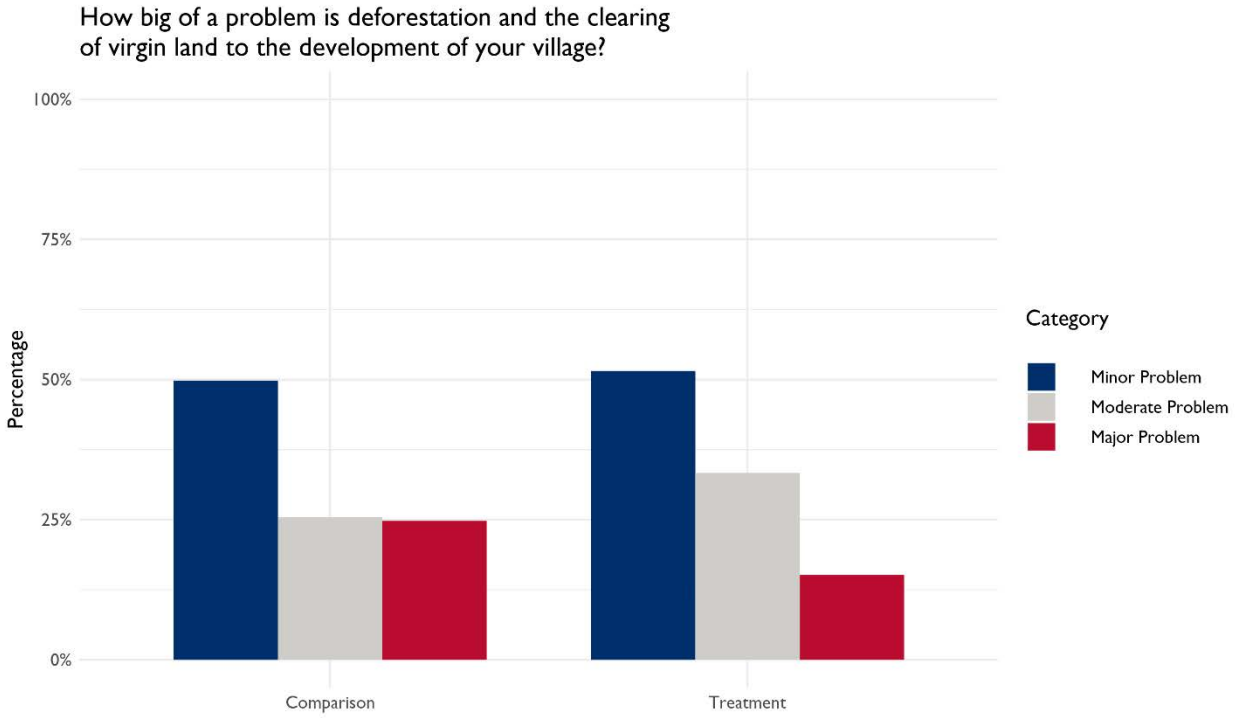
Respondents were given a list of problems often faced by *veredas* in the area and asked to rate on a scale from 1 to 10 how big the following issues are to the development of their village, with 1 being the smallest problem and 10 being the biggest problem. In the treatment area, the top three responses were lack of health services with a mean of 9, lack of jobs or income with a mean of 6.6, and poor yields or lack of

food with a mean of 5.6. In the comparison area, the top three responses were lack of health services with a mean of 8.7, lack of jobs or income with a mean of 6.4, and poor yields or lack of food with a mean of 5.6.

With a mean response of 3.7, deforestation and clearing of virgin land was ranked as the smallest problem. Other development challenges were ranked below a 5, including changes in rainfall (4.67), poor quality of water (4.15), and lack of land for cultivation (4.61).

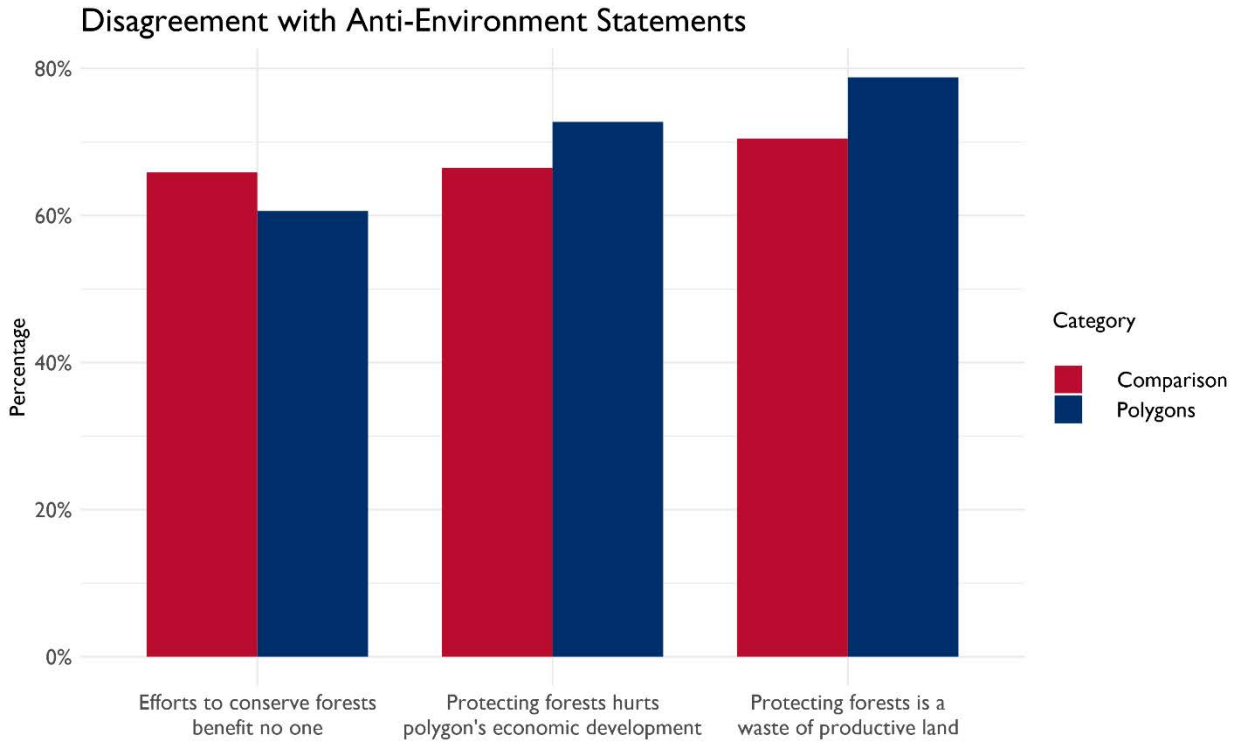
Correspondingly, deforestation is not perceived to be a major challenge or impediment to development in the study area (Figure 44). In the treatment area, 36 percent agreed or strongly agreed that efforts to conserve forests do not benefit anyone in this area, compared with 22 percent of comparison respondents.

Figure 44: Deforestation as a Barrier to Development by Treatment Status (Polygons and Comparison)



Although respondents did not express the opinion that deforestation was a development priority in their area, a majority of respondents indicated support for conservation or the belief that conservation did not need to occur to the detriment of economic development. Respondents in the treatment area disagreed or strongly disagreed with statements that protecting the environment would hurt the *vereda's* economic development (73 percent) and that protecting forests is a waste of productive land (79 percent) (Figure 45). These attitudes were relatively more positive in comparison polygons, with the exception of expected criticism from neighbors for cutting down trees in protected forest areas where 94 percent of treatment respondents expected some form of community sanctioning compared to 75 percent in comparison polygons.

Figure 45: Conservation Norms (Treatment Polygons)



FOREST CONDITION

In the treatment area, approximately 80 percent of respondents described the overall condition of the forest as good or very good and 21 percent were impartial. In comparison polygons 86 percent described it as good or very good, 12 percent were impartial, and 2 percent described it as bad or very bad. Correspondingly, when asked about the condition of forests compared to four years ago, approximately 27 percent of treatment respondents noted that it has worsened, compared with 16 percent in comparison areas.

Overall, the team found that the household survey respondents noted significantly more positive forest conditions and less forest loss than is evident in the geospatial data. In the geospatial data, there was 2.01 kha of tree cover lost in the last five years equivalent to 11 percent of the total treatment area. In the comparison area, there are also higher rates of tree cover loss than indicated by the household survey with 29.48 kha lost, equivalent to 9 percent of the total treatment area in the last five years. There are similar results for forest loss analysis over the last five years in the 5-km buffer areas—12 percent in the treatment buffer areas and 7 percent in the comparison buffer areas (see also Annex V: Geospatial Findings).

That being said, in FGDs and SSIs, individuals had mixed reviews noting different forest conditions in different areas, including logging, animal presence, and coca production.

In particular, when asked about the condition of the forest compared to four years ago in FGDs, responses were varied. While some said the forest was decreasing, others said it was increasing. A man from San José de Guaviare noted the reappearance of animals after a decrease in logging. A woman from San José de Guaviare noted the controlling of hunting by communities in the last two years. On the other hand, a

woman from San Vicente Caquetá noted the decrease of animals as a sign of the forest condition deteriorating. Several other respondents noted that the forest in their area had decreased but that in other areas it had increased.

A number of FGDs highlighted degradation in the area:

> *"[The forest is]…depleting because the truth is that the deterioration has come from the moment when these lands started to be colonized and from then on it started to decrease until what we see nowadays—that nowadays, the deer are very scarce…it has been since when the lands were colonized." (Men's FGD, Caquetá)*

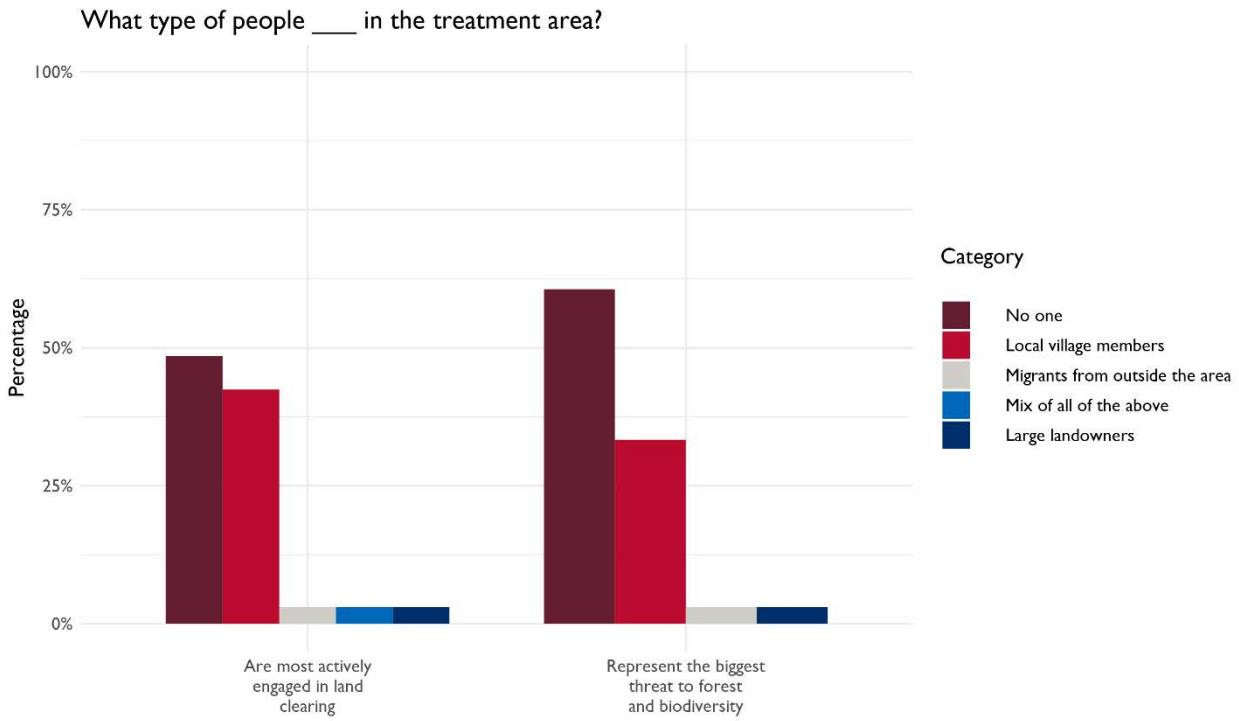
Of those who thought the forest condition had deteriorated, the three most common answers when asked why the forest condition has deteriorated in the treatment area are small-scale clearing for agriculture, bush burning, and increased timber harvesting or tree cutting. In the comparison area, the three most common answers are small-scale clearing for agriculture; increased population or increased building, farming, or herding; and bush burning.

Of those who thought the forest condition has improved, the three most common answers when asked why the forest condition has improved in both the treatment and comparison areas are: (1) land left to regenerate, including secondary forest growth from areas once cultivated by coca, as noted by a man from Miraflores Guaviare: "what was in coca is now practically jungle"; (2) reduced timber harvesting; and (3) conservation activities/sustainable harvest practices.

With regard to the greatest threats to forests and biodiversity, 61 percent of treatment respondents state that "no one" represents the biggest threat to forests and biodiversity in the *vereda*, while 33 percent say that local village members represent the biggest threat (Figure 46). These trends were similar in comparison areas.

However, when asked in SSIs what the biggest threat to conservation was, there were different kinds of answers. These answers included logging, burning, pastures, armed conflict, illegal economies, illegal occupation, population growth, lack of knowledge about regulations, and roads.

Figure 46: Responses to Threats in the Treatment Area (Polygons and Comparison)



Local communities cannot participate safely and effectively in monitoring and reporting deforestation. Although not universal, when asked about fear of denunciations, most respondents indicate that local communities are afraid and cannot be expected to take on that role. Respondents frequently reference reports of local leaders being murdered and individuals being threatened:

> *"Because, as we have seen, when denunciations are made, when protection, claims and denunciations are made, the least that has happened to many of them is death. We have seen in San Vicente del Caguán, for example, that many leaders have died and in other sectors as well, and many of them have been leaders defending water and territory, for example." (Caquetá SSI indigenous authority)*

As such, there is a general hesitancy among local respondents to discuss deforestation. One local authority noted:

> *"People do not feel safe; they are afraid of the reprisals that the person who is doing the damage may have, or often the businessman or the person behind these invasion and deforestation projects." (Caquetá SSI local authority)*

Table 13: Summary Statistics for Forest Condition (Polygons and Comparison)

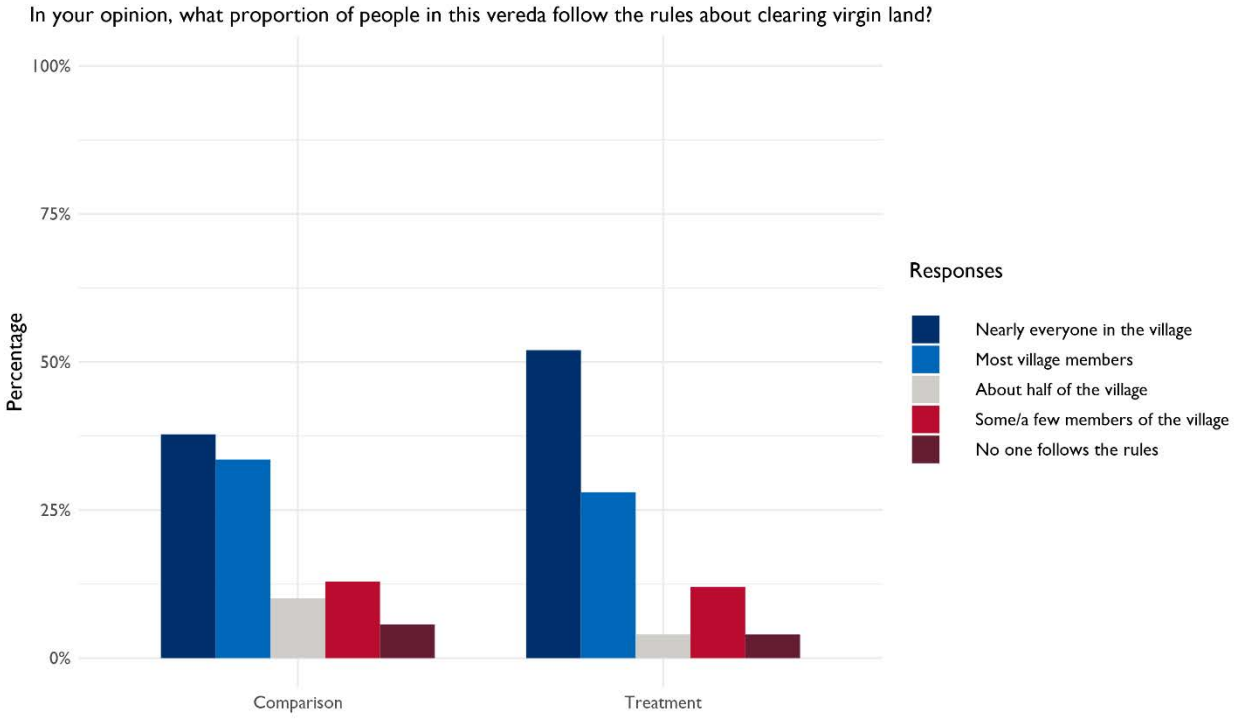
	COMPARISON					TREATMENT				
ITEM	N	MEAN	ST. DEV	MIN	MAX	N	MEAN	ST. DEV	MIN	MAX
Overall Forest Condition (1=Very good, 5=Very bad)	383	1.969	0.650	1	5	33	1.970	0.684	1	3
Change in Forest Condition (1=Significantly worse, 5=Significantly improved)	383	3.457	1.042	1	5	33	3.303	1.159	1	5

LAND CLEARING

In the treatment area, 48 percent of respondents report that "no one" is actively engaged in land clearing in forests in the *vereda*, while 42 percent say that local village members are the most actively engaged. In the comparison area, 54 percent of respondents say "no one" is actively engaged, while 38 percent say that local village members are the most actively engaged. Most respondents report that nearly everyone in the village (52 percent) or most village members (28 percent) follow the rules about clearing virgin land (Figure 47). Similarly, in the treatment area, 67 percent of respondents say they **never** see people who are not authorized to be in this forest cutting trees, logs, or wood. Distributions are similar in comparison polygons.

Nevertheless, 12 percent of respondents in the treatment area reported clearing virgin land in the past year. The mean amount of land cleared was 4.6 ha, and the maximum amount was 15 ha. All treatment respondents who have engaged in land clearing did so to obtain land for subsistence farming. When asked about the frequency of land clearing, most FGD respondents said it was minimal to none. However, they specified that there was no logging in protected areas, meaning the park; outside of that, there was land clearing fairly frequently.

Figure 47: Frequency of Rule-Breaking: Clearing Virgin Land (Polygons and Comparison)



Moreover, among focus group respondents, there were varied responses about the clarity of borders of protected areas. While some said the limits were known, others said that the limits were unclear but they had some idea, and still others said no, as "the entities in charge of this [marking the borders] have failed." (Man from San José de Guaviare).

BUSHMEAT HUNTING

In the treatment area, 36 percent of respondents say that during the past four years, the number of animals in the forest has increased, 33 percent say it stayed the same, and 27 percent say it decreased. Distributions are similar in comparison polygons.

In the treatment area, the jaguar is believed to be rare by 61 percent of respondents, the nutria gigante is believed to be rare by 48 percent of respondents and abundant by 36 percent of respondents, the churuco is believed to be abundant by 91 percent of respondents, and the charapa is believed to be rare by 39 percent of respondents and abundant by 39 percent of respondents.

In the comparison area, the jaguar is believed to be rare by 48 percent of respondents, the nutria gigante is believed to be abundant by 35 percent of respondents, the churuco is believed to be abundant by 88 percent of respondents, and the charapa is believed to be abundant by 46 percent of respondents.

While these differing perceptions of biodiversity could be attributable to differences in land use and land cover in the two areas, they underscore the importance of assessing the actual condition of these species whenever possible and the need for a systematic monitoring scheme for biodiversity, particularly the jaguar population.

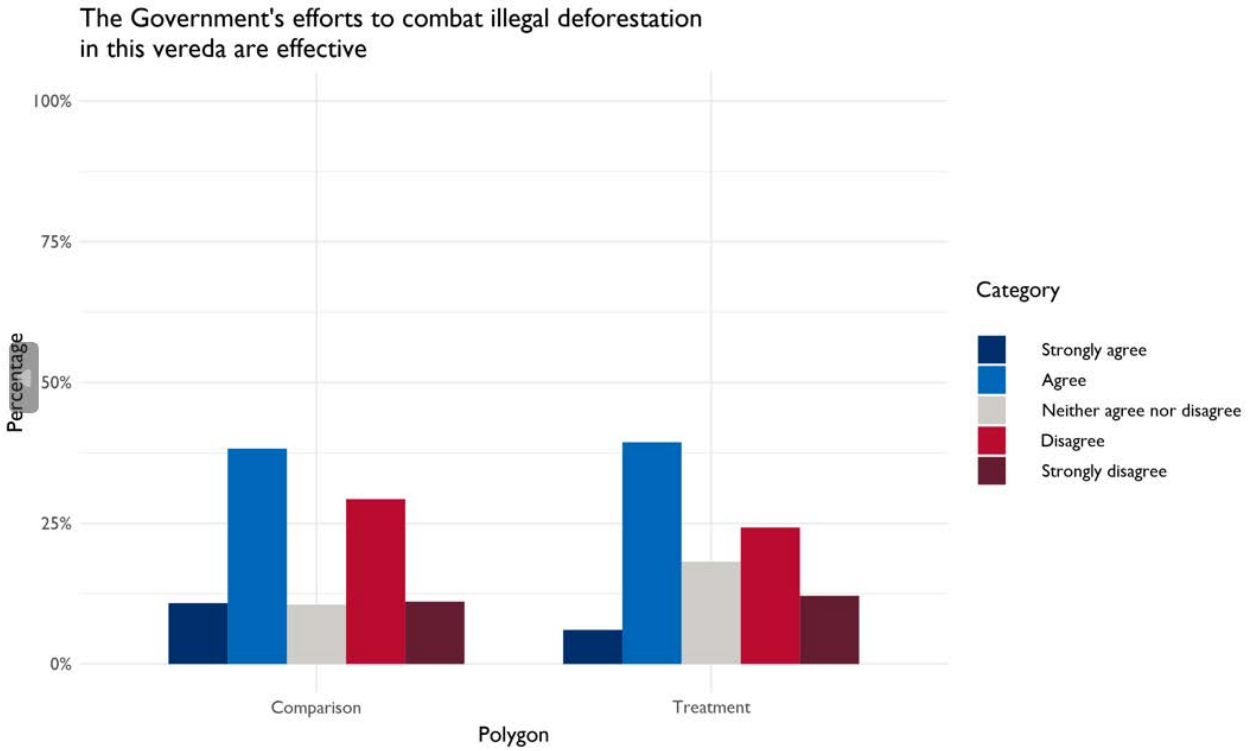
Most respondents note a decrease in bushmeat hunting, which is linked to a decrease in available animals due to reduced habitat. In the treatment area, 72 percent of respondents say there has been a decrease in bushmeat hunting for subsistence consumption compared with 64 percent of respondents in comparison areas. Similarly, in the treatment area, 33 percent of respondents say there was a decrease in bushmeat hunting for sales, markets, or commerce and 67 percent reported that there was 'none.' Findings are similar in comparison areas.

When asked in FGDs about bushmeat hunting, there were several categories of questions. The first was what animals were hunted for bushmeat—many responses included armadillos, deer, and chaquetos. The second was regarding the importance of bushmeat for income/subsistence—almost all of the responses were under the category of self-consumption and food. However, there was one response that said bushmeat was not hunted for food but to prevent the animals from harming other animals; this response also noted the tiger as one of the most common animals in the area. There is no evidence that bushmeat hunting is culturally linked to prestige.

EFFECTIVENESS OF DEFORESTATION INITIATIVES

In the treatment area, only 45 percent of respondents agreed or strongly agreed that the government's efforts to combat illegal deforestation are effective. Correspondingly, 30 percent of respondents agreed that if deforestation activities are reported in this *vereda*, environmental authorities act based on these reports. Distributions for these indicators are relatively similar in comparison areas (Figure 48).

Figure 48: Government Efforts to Combat Illegal Deforestation by Treatment Status (Polygons and Comparison)



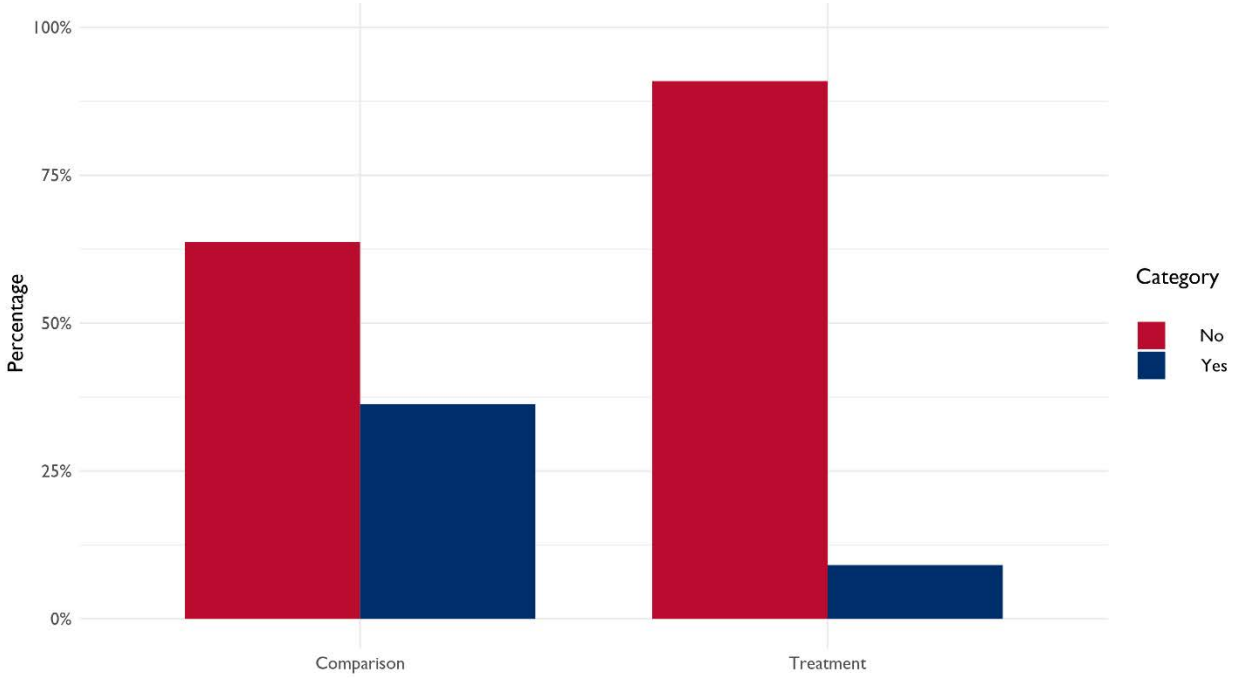
In SSIs, when asked about potential deforestation prevention strategies, respondents cited several general ideas for improvement, including investment in and improved coordination of public forces, clarifying land

policies, stronger political action, and the need for opportunities and alternatives in the countryside, particularly for young people.

ALTERNATIVE DEVELOPMENT PROGRAMS AND NON-FARM INCOME-GENERATING ACTIVITIES

Most respondents in the treatment area (91 percent) did not benefit from alternative livelihoods or sustainable development projects, while three have (Figure 49). Whereas in the comparison area, 64 percent of respondents did not benefit from alternative livelihoods or sustainable development projects, while 36 percent have (Figure 49). **The three programs that respondents in the treatment polygons reported benefitting from are Ranger Families, PNIS, and *Incentivos Forestales*.**

Figure 49: Beneficiaries of Alternative Development Programs by Treatment Status (Polygons and Comparison)



When asked in SSIs about initiatives for coca substitution or sustainable livelihoods, a qualified operator working with the National Parks in Guaviare noted the many non-governmental organizations and labor tourism in the post-conflict period, particularly mentioning the silvopastoral systems, pastoral system, alternative crops, tourism, and non-timber forest products.

Echoing the themes found in Puerto Rico, a Caquetá SSI noted that there were coca substitution programs but many were lost because the government failed to compensate individuals the amounts they were due, causing a net negative impact of the program. In FGDs, respondents had mixed responses to questions about the challenges to coca substitution programs but all responses followed a similar line of thinking. Many FGD responses noted half-hearted implementation and a lack of follow-up, as well as earnings too low to sustain a shift from coca, which have prompted farmers to look for other options or return to coca production:

"Waiting. The challenge of waiting to see what's in store for us because what else? For example, I have three children. And, for example, right now I don't have a job precisely because of that. If there was a farm that was taking some, even 300 arrobas of coca, well, you go and work. And my children's father took them precisely because I don't have a job here; he is giving them things there." (Women's FGD, Guaviare)

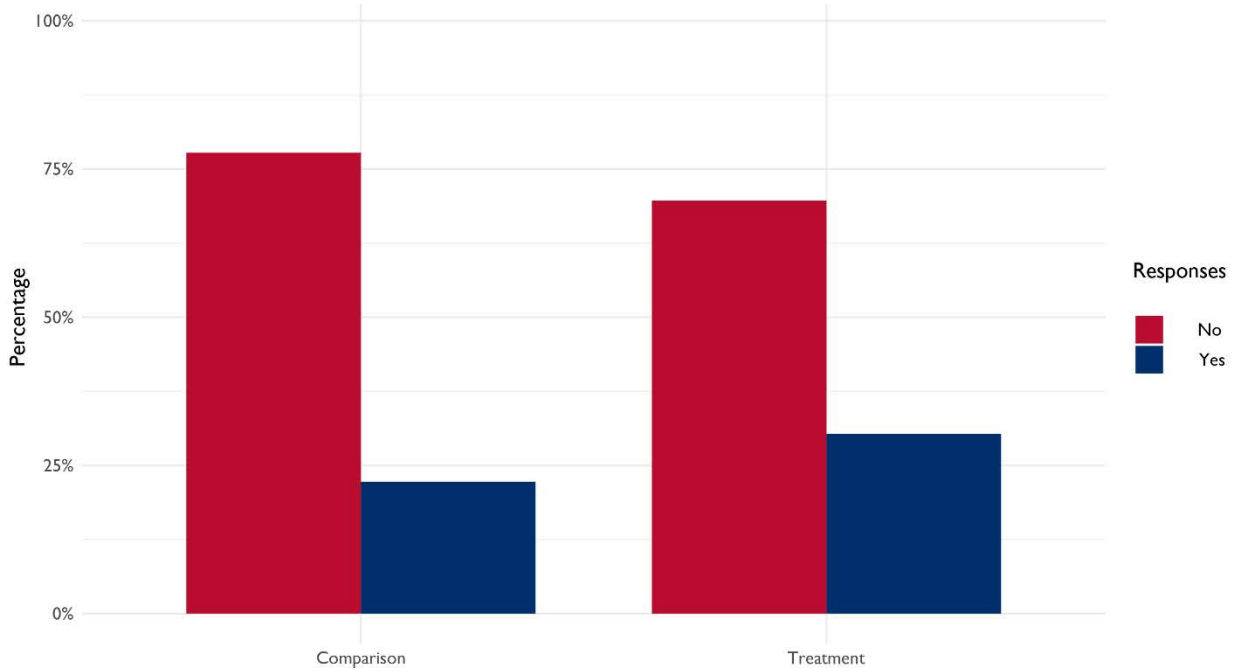
"That is why the farmer is forced to plant coca bushes, because a kilo of coca is taken out in a backpack and it will represent much more economically than a load of banana, a load of cassava, a load of panela, because how much effort they have to make to produce, for example, sugar cane." (SSI Traditional Authority, Caquetá)

CONFLICT

In the treatment area, only one respondent reports having had a (moderately serious) conflict on their land (with a neighbor in the village over an inheritance issue) in the past four years. Approximately 5 percent of respondents in comparison polygons report experiencing a land conflict over the past four years (Figure 50). In the comparison area, the three most common parties in conflicts were neighbors in the village, central or local government, and other family members. In the comparison area, the three most common causes of conflict were boundaries of the plot, government (planning or expropriation), and conflicts over land titling. Respondents were split on the severity of the conflicts and the length of time required for resolution.

Seventy percent of treatment respondents and 78 percent of respondents from comparison polygons said they were not worried about being in a land conflict with someone. For both the treatment and comparison areas, the three most common answers when asked who they could be in conflict with were central or local government, armed groups, and neighbors in the village. These responses track with the sources of tenure insecurity.

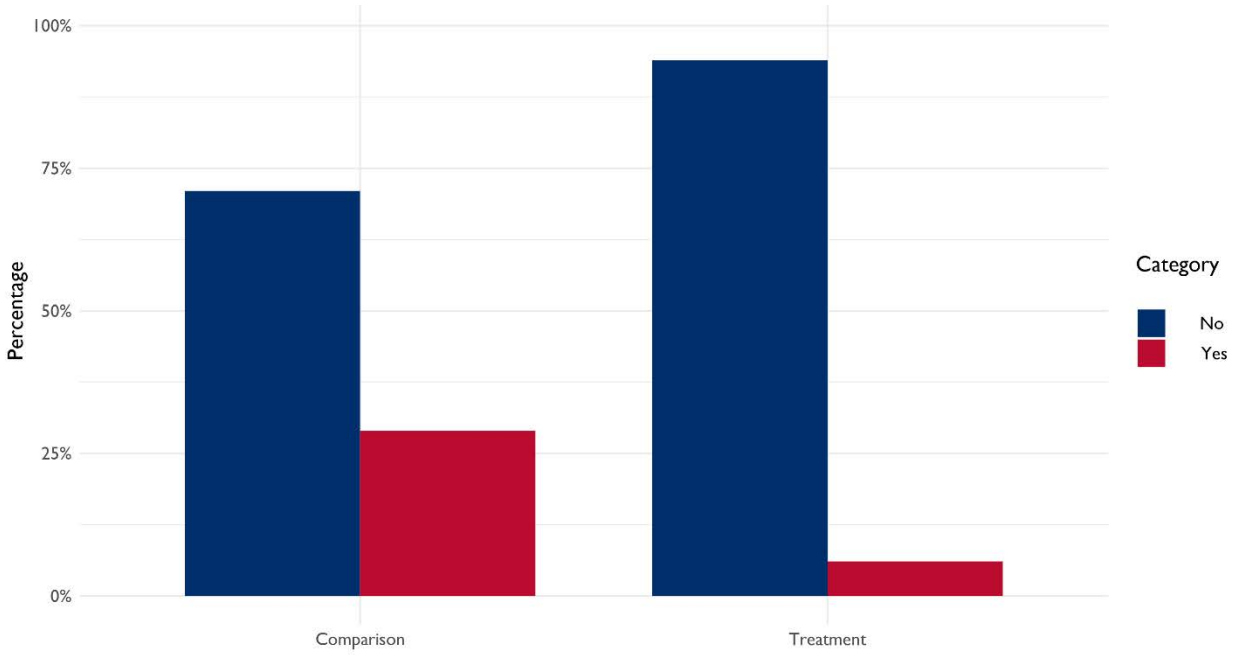
Figure 50: Worried about Future Land Conflict (Polygons and Comparison)



When asked in SSIs about the type of land disputes, the most common responses were drug trafficking and people invading. While SSIs noted drug trafficking as a major source of disputes, this was not rated as a source of disputes among household survey respondents.

Six percent of respondents in the treatment polygons were forced to leave their land or had to leave their land due to armed conflict, compared with 29 percent in comparison polygons (Figure 51). Responses were equally divided in their responses about why they left: it was too dangerous to stay, they were threatened by armed groups, and they had land expropriated by armed groups. Only 3 percent of respondents in the treatment area have been affected by a land restitution case. Twenty-four percent are registered in the National Registry of Victims.

Figure 51: Land Displacement Due to Conflict by Treatment Status (Polygons and Comparison)

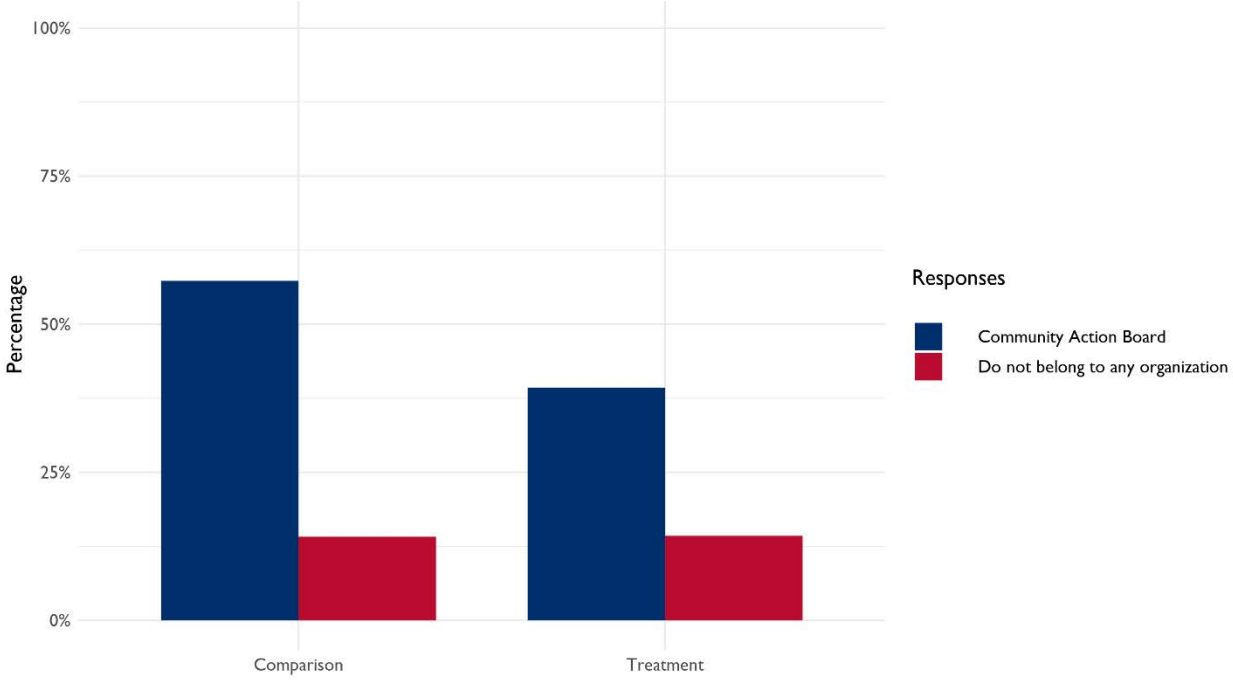


GOVERNANCE

COMMUNITY GOVERNANCE AND COLLECTIVE ACTION

JACs are present in all polygons. **Thirty-nine percent of respondents in treatment polygons belong to the JAC, whereas 14 percent do not belong to any organization** (Figure 52). In contrast, approximately 58 percent of comparison respondents are members of the JAC, whereas about 13 percent do not belong to any organization (Figure 52).

Figure 52: Membership in JAC by Treatment Status (Polygons and Comparison)



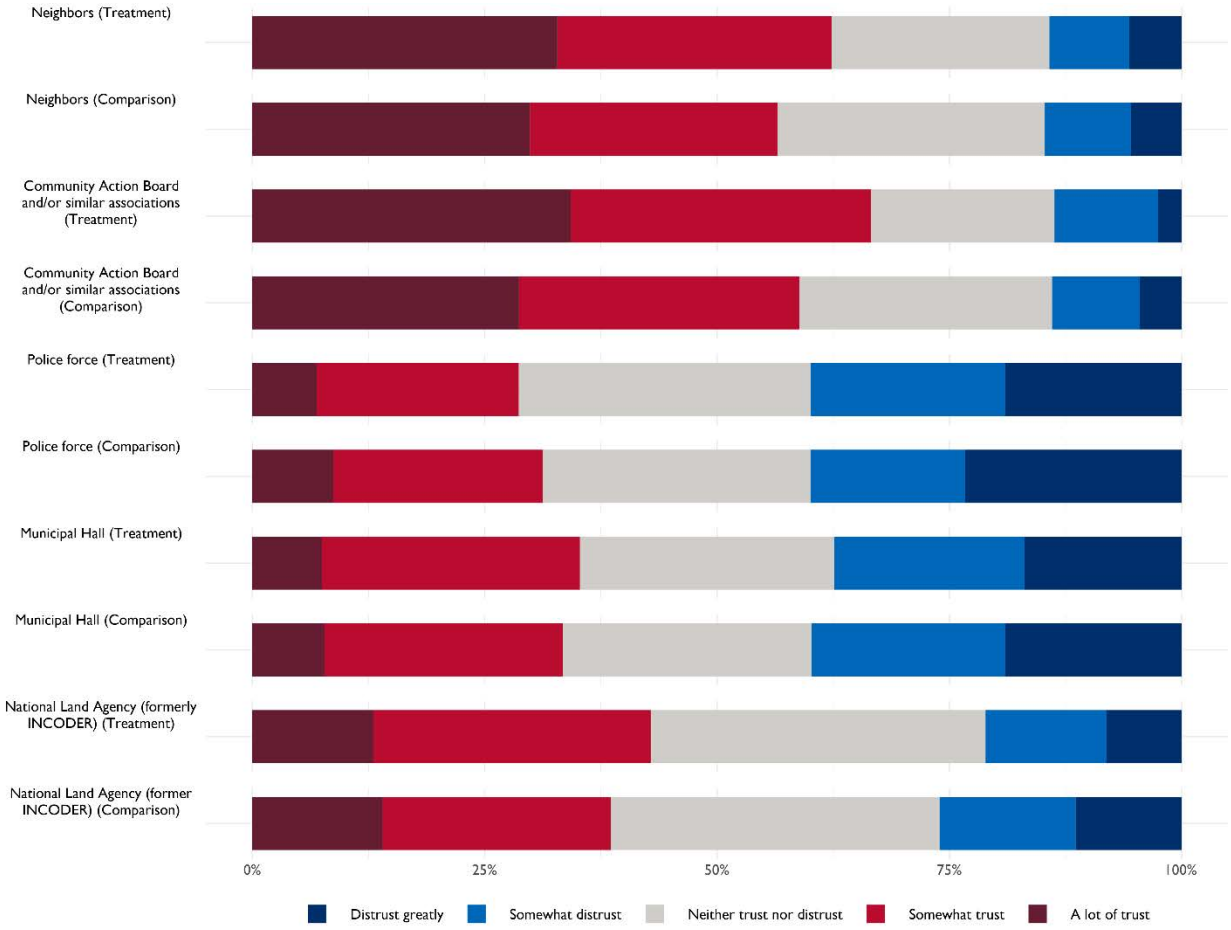
Respondents in both the treatment and comparison areas were asked: If their neighbors had 50,000 COP in their pocket, how many would immediately lend them that amount for emergency medical expenses with the simple promise that they would repay the loan when they could? Only 15 percent of those in the treatment area agreed that the majority of their neighbors would lend them the amount, whereas the majority responded that either very few would (52 percent) or that none would do so (21 percent). This indicator for social capital shows a more positive result in the current set of comparison polygons where about 30 percent of respondents said that the majority of neighbors would provide the necessary funds.

In contrast, almost all treatment respondents (97 percent) reported that when there are problems in the community, people usually organize to solve them, compared with 89 percent of respondents in comparison polygons. And, approximately 60 percent of respondents in both treatment and comparison groups report that they trust their neighbors.

STATE AND OFFICIAL ACTORS

Respondents in both groups were asked to rate the level of trust they feel toward various institutions (Figure 53). **The highest level of trust is directed toward the JAC or similar associations (79 percent treatment, 73 percent comparison). In contrast, trust in state entities is relatively low. Ranked from highest to lowest for treatment polygons, this includes the ANT (40 percent treatment, 28 percent comparison), the Municipal Hall (31 percent treatment, 29 percent comparison), and the police (27 percent treatment, 23 percent comparison).**

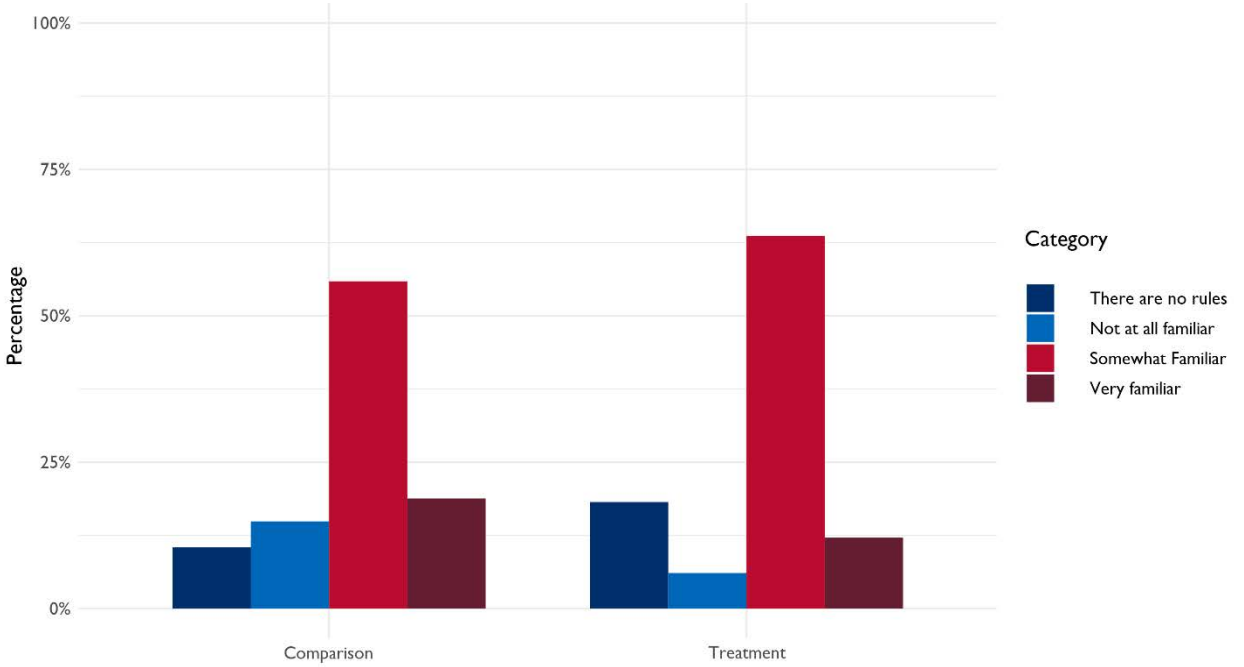
Figure 53: Trust Toward Governance Actors by Treatment Status (Polygons and Comparison)



RULES, MONITORING, AND ENFORCEMENT

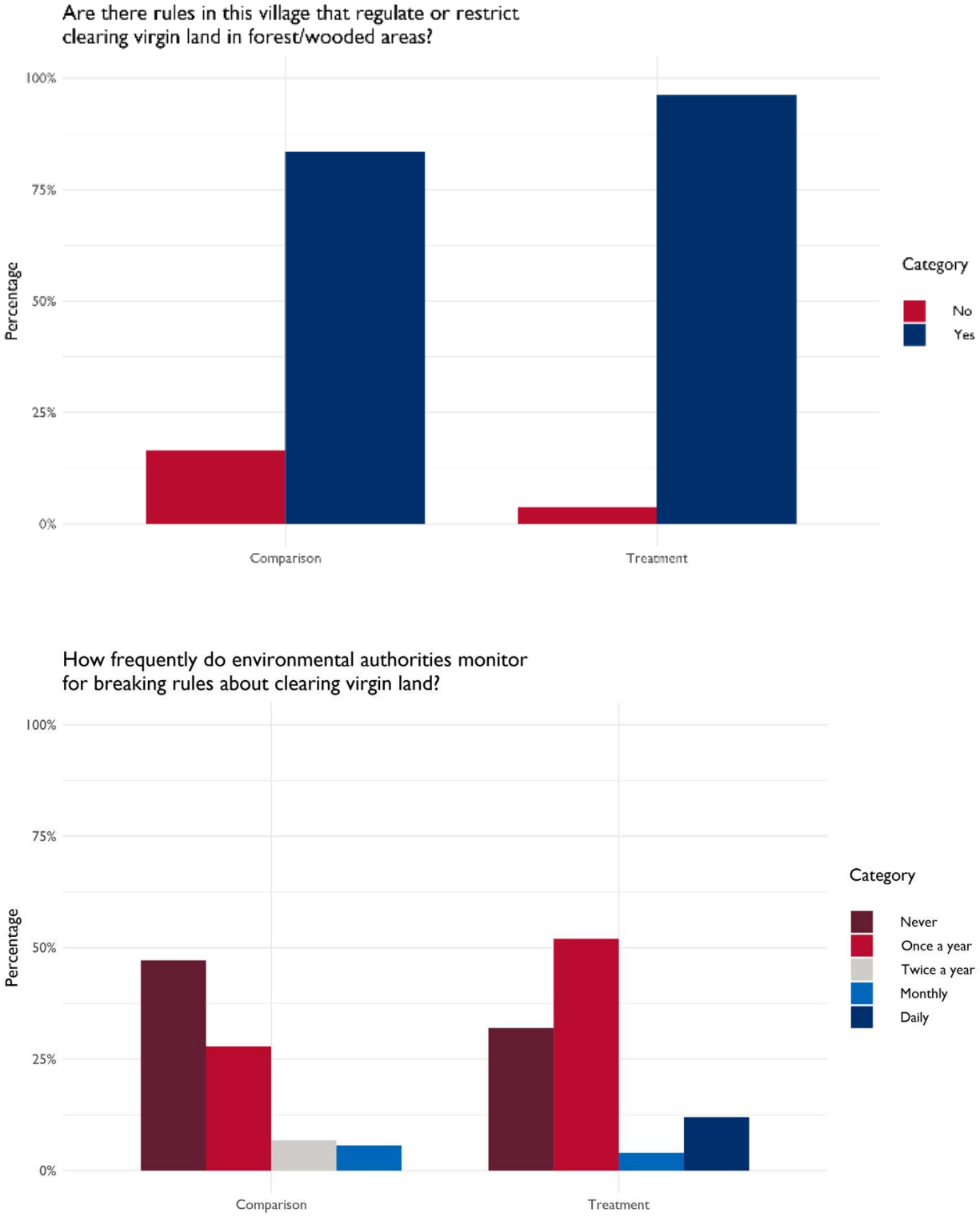
In the treatment area, approximately 76 percent of respondents said they were familiar or very familiar with rules about forest use and access in this *vereda*, whereas 18 percent said there are "no rules" about forest use and access in this area. Given the sample size differential, the distribution in comparison areas is relatively similar, however, slightly fewer comparison respondents report the absence of rules (Figure 54).

Figure 54: Familiarity with Rules About Forest Use and Access by Treatment Status (Polygons and Comparison)



In the treatment area, almost all respondents (96 percent) report the presence of rules in their village that regulate or restrict clearing virgin land in forested or wooded areas (Figure 55), and 84 percent report the presence of penalties for breaking the rules about clearing virgin land. However, according to most households, monitoring for rule-breaking is rare or infrequent. Thirty-two percent of treatment respondents said that environmental authorities never monitor for breaking rules about clearing virgin land, whereas 52 percent said environmental authorities monitor once a year (Figure 55). Monitoring for coca production is even lower, with 88 percent reporting "never."

Figure 55: Land Clearing Rules and Monitoring by Treatment Status (Polygons and Comparison)

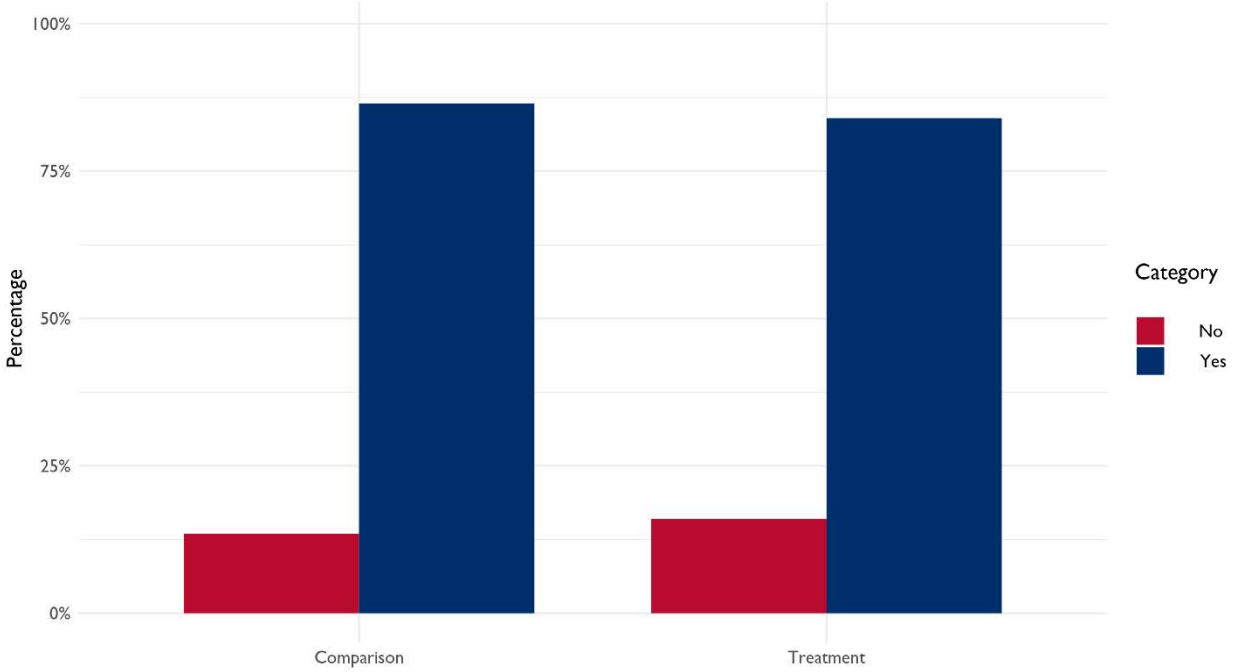


In the comparison area, a slightly lower percentage of respondents report the presence of rules (81 percent). There are similarly low levels of monitoring for land clearing, with 46 percent reporting that they never monitor and 28 percent reporting that they monitor once a year. Reports on the prevalence

of penalties for land clearing are similar between treatment and comparison polygons (84 percent treatment and 87 percent comparison, Figure 56).

In both the treatment and comparison areas, the three most common penalties for breaking the rules about clearing virgin land are (1) paying a monetary fine, (2) being arrested or taken to court, and (3)doing community work. When asked in FGDs what the punishments and penalties were for clearing virgin land, the responses were varied but generally aligned with the quantitative findings, with many noting fines and penalty fees and others noting 4–12 years of jail time. However, other respondents said that the punishments and penalties were minimal, with the government focusing on "awareness raising of us as inhabitants, that we should not destroy" (Woman from Miraflores/Buenos Aires Guaviare).

Figure 56: Existence of Penalties for Land Clearing by Treatment Status (Polygons and Comparison)



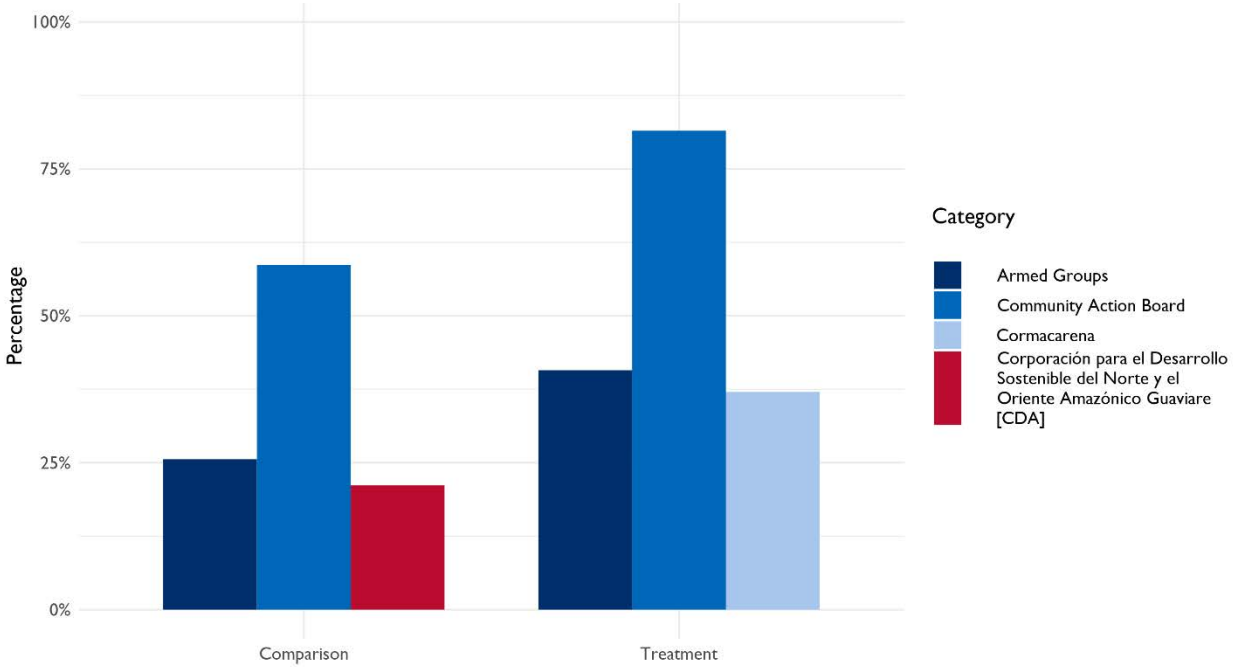
In the treatment area, 80 percent of respondents believe that nearly all or most people in their village comply with rules regarding the clearing of virgin land. This statistic is similar in comparison polygons.

ENVIRONMENTAL AUTHORITIES

When asked to identify the three most important actors for making rules about forest use and access in their *vereda*, respondents from the treatment area replied with the JAC, armed groups, and Cormacarena (Figure 57). Respondents from the comparison area replied similarly.[63] **In both treatment and comparison areas, these are the same three actors (and with equivalent rankings) that are the most important for monitoring and enforcing rules** (Figure 58). Forty-eight percent of respondents in treatment polygons perceived very strong enforcement of rules about forest use and access in their area (Figure 59).

[63] Although they noted the corporation that covers their geography: the *Corporación para el Desarrollo Sostenible del Norte y el Oriente Amazónico Guaviare*.

Figure 57: Primary Rule-Makers about Forest Use and Access by Treatment Status (Polygons and Comparison)



SSIs outlined the various state actors responsible for enforcement and prosecution, including public and military forces (i.e., the Jungle Battalion, the 22nd brigades at the army level, and the Guaviare Police), the Prosecutor's Office, the Natural Parks system, and the Governor's Office.[64] However, SSIs noted the lack of capacity and resources of the government to prosecute. One SSI noted that this is because there are groups outside the law, the government does not have employees, or the node is very far away and they cannot reach it.

[64] In SSIs, when asked about who made efforts to conserve, monitor, or protect the National Park and protected areas, several respondents mentioned IDEAM, a governmental agency in Colombia. Others noted military and police forces, the United Nations, and satellite imaging.

Figure 58: Primary Enforcers of Rules about Forest Use and Access by Treatment Status (Polygons and Comparison)

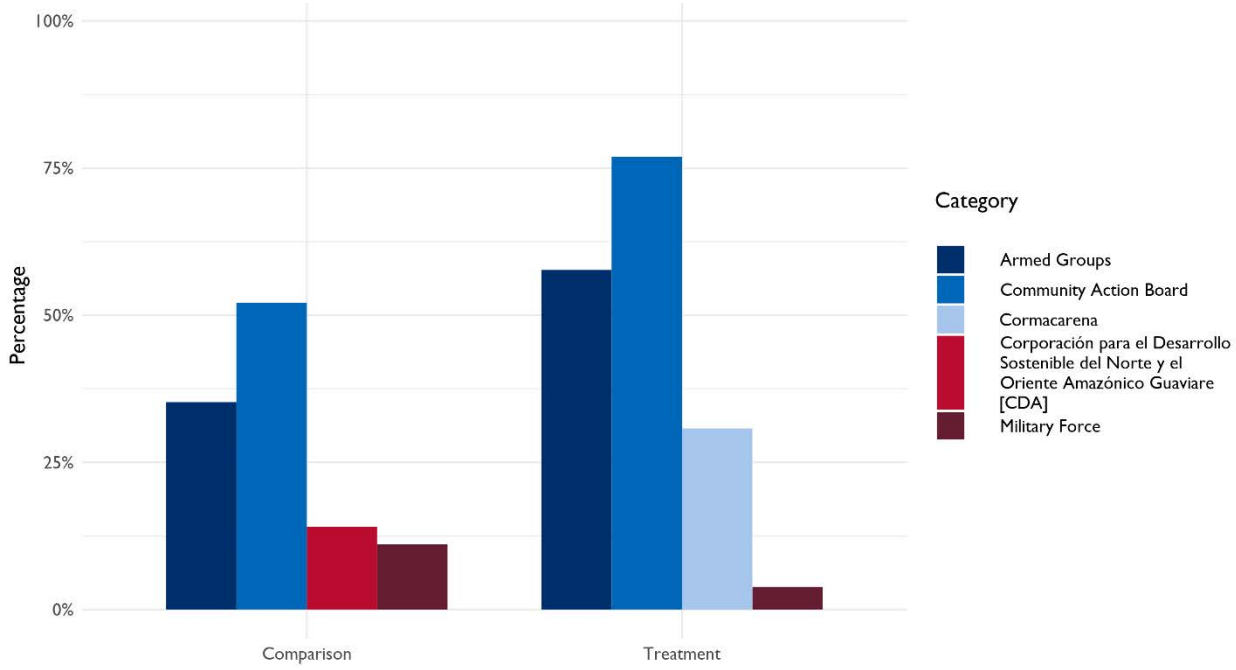
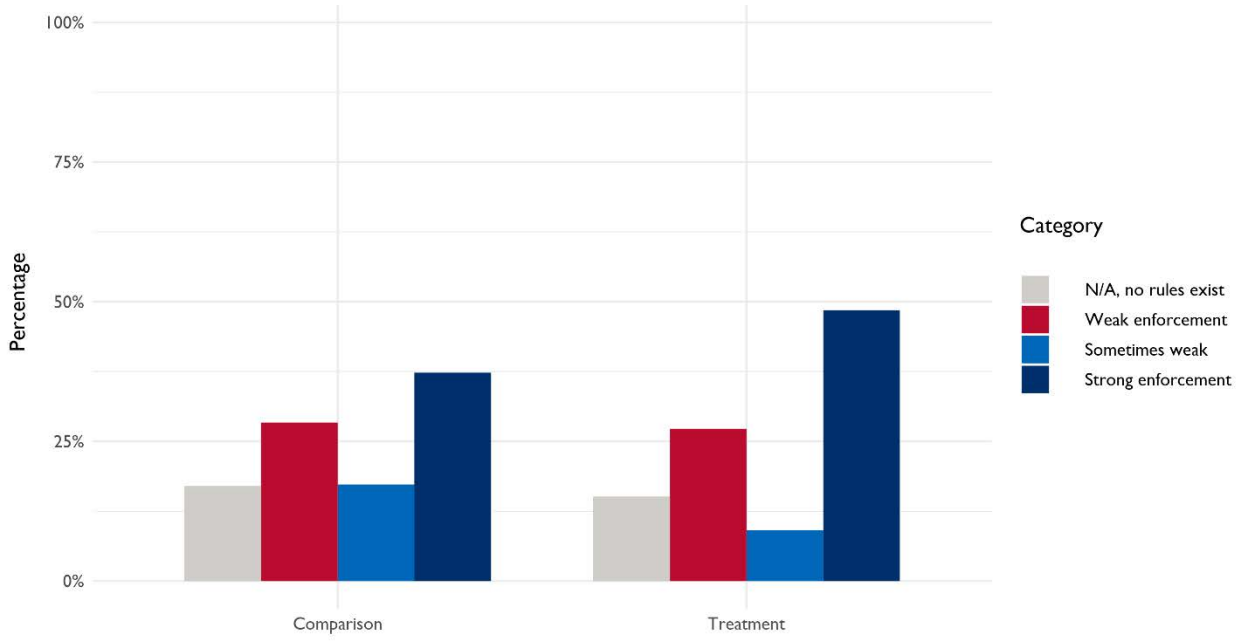


Figure 59: Forest Use Rule Enforcement Strength by Treatment Status (Polygons and Comparison)



When asked in FGDs about community attitudes toward environmental authorities, most responses were indifferent or negative:

> *"Let's say that the farmers almost don't believe in them, they don't believe in the environmental authorities." (Men's FGD, Guaviare)*

> *"From the environmental authorities, that is very bad, very bad, very bad, because the environmental authorities only handle the pen and the laws; they are not mediators, they do not reach the community, well, we are going to talk to bring a solution, they always handle the pen and the desk, they stick to the laws and with that we are going to handle them and that's all they do." (Men's FGD, Guaviare)*

Many FGDs highlighted the belief that environment authorities and the GoC have the capacity to be effective but fail due to a lack of implementation and follow-through in the highest priority areas. Additionally, when asked about why efforts to stop deforestation were ineffective, many FGD responses noted the lack of "social investment" and efforts to involve farmers.

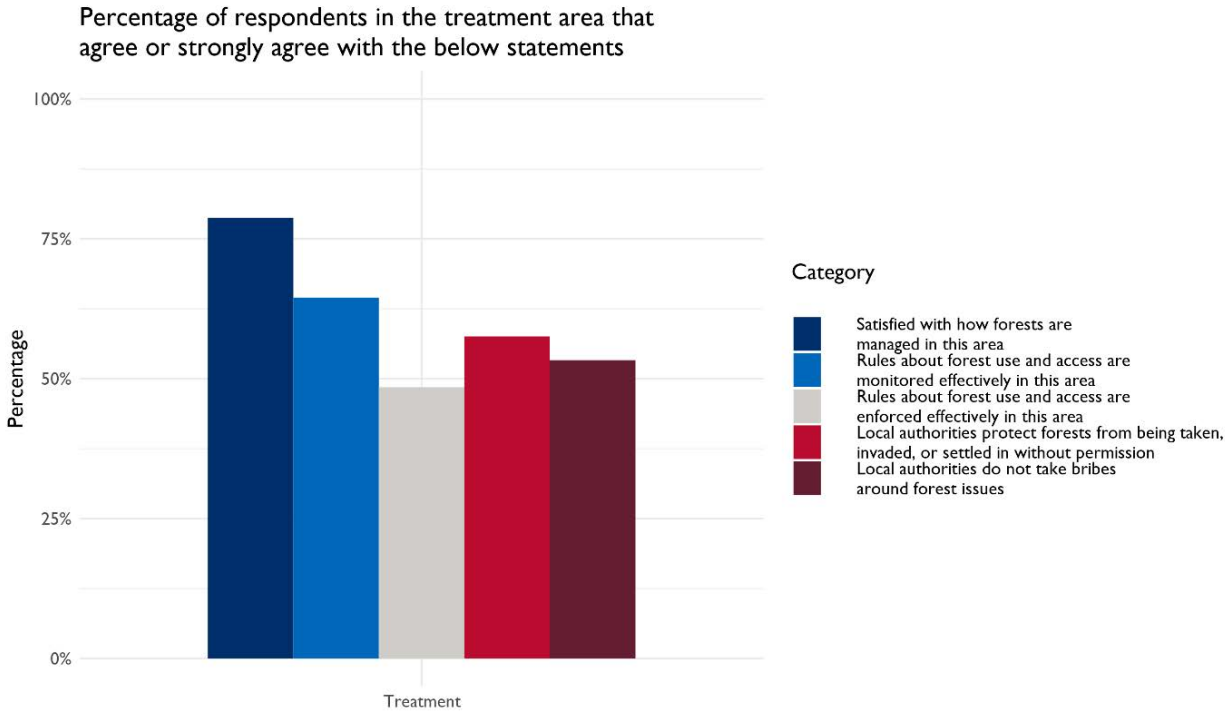
Overall, there is a consistent thread in the qualitative and quantitative data of a governance vacuum left by an absent state. This vacuum is currently filled by JACs and armed groups.

> *"Generally, as a first instance are the JACs, right? There are sectors where the communal action is strengthened and empowered and the community recognizes it and complies with it as an organizational authority, but there are others that do not. And the truth—it hurts to say it, but, for example, in Caquetá, many times the conflicts have resorted to the illegal groups so that they are the ones to mediate and resolve the conflicts because the ordinary justice, the institutional justice, does not reach many places in this country. Look, many...and I am talking about Caquetá—in many places, the only State presence they have is the teacher, that is the only thing." (SSI, Traditional Authority, Caquetá)*

SATISFACTION WITH FOREST MANAGEMENT

In the treatment area, 79 percent of respondents were satisfied with how forests were managed in the area, compared with 66 percent of respondents in comparison polygons (Figure 60).

Figure 60: Satisfaction with Rule Management and Monitoring by Treatment Status (Polygons and Comparison)

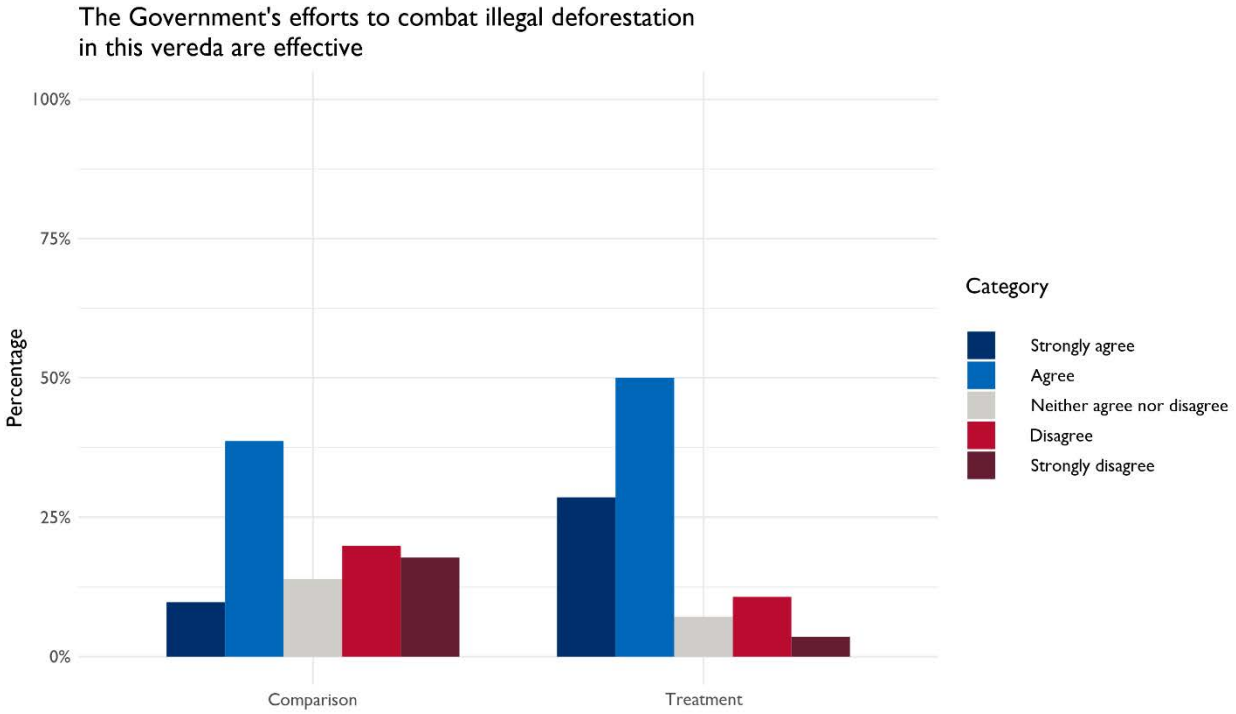


In the treatment area, approximately 65 percent of respondents said that rules about forest use and access are effectively monitored in the area (Figure 60). A significantly lower percentage of respondents in comparison polygons said that use and access rules were effectively monitored. Just under 50 percent of respondents in treatment polygons who report the presence of use and access rules believe that these rules are effectively enforced in the area (Figure 60), compared with 37 percent from comparison polygons.

When asked what actions local authorities are taking to stop unauthorized tree cutting or clearing of virgin land in this *vereda*, the three most common responses in both the treatment and comparison areas were training, knowledge raising, and education. Other popular responses were that "no actions were being taken" or that the question did not apply in the area because there was "no deforestation here."

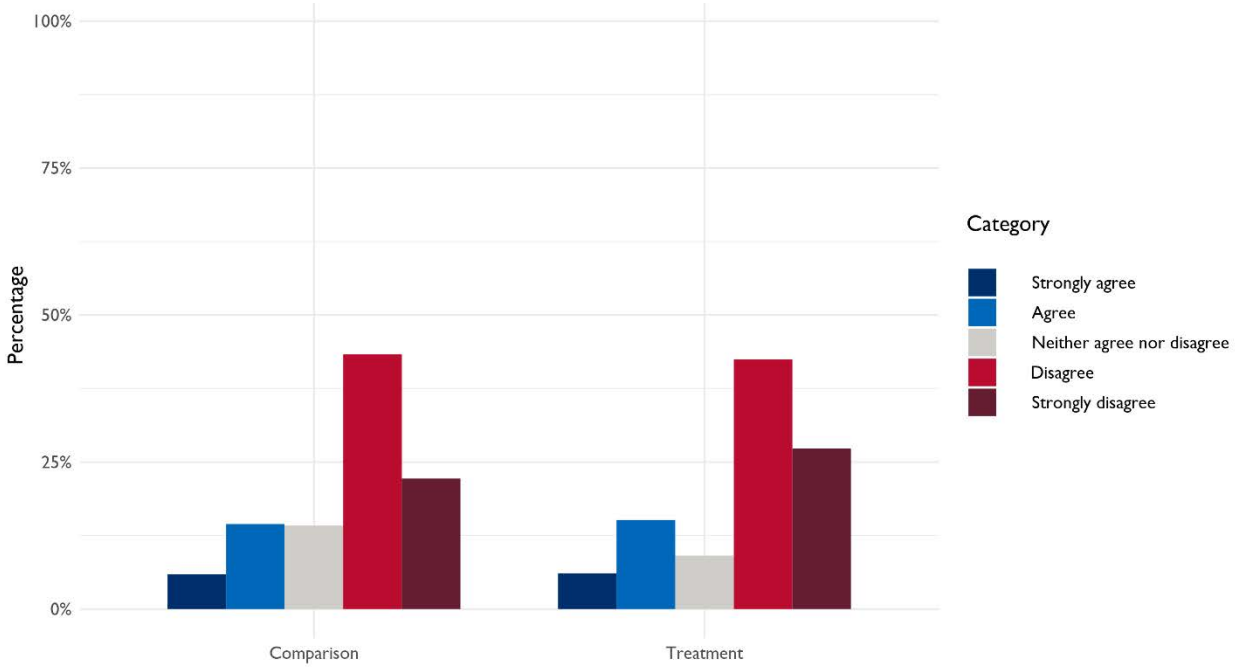
Of those who believe the local authorities are taking action, 76 percent of respondents in the treatment area believe that these actions are effective at stopping unauthorized tree cutting or clearing of virgin land, compared with about 50 percent of respondents in comparison polygons (Figure 61). In the treatment area, approximately 58 percent of respondents strongly agree or agree that local authorities protect forests from being taken, invaded, or settled in without permission (Figure 60). This distribution is relatively similar in comparison polygons.

Figure 61: Effectiveness of Government Efforts to Combat Illegal Deforestation by Treatment Status (Polygons and Comparison)



A high level of corruption is reported in the study area. Respondents in both the treatment and comparison areas were asked if they agree or disagree with the statement that there is very little corruption among public officials working for the municipal government. In the treatment area, a majority of respondents (70 percent) disagreed with the statement that there is very little corruption among public officials working for the municipal government, compared with 65 percent in comparison areas (Figure 62, below). **Only around half of both treatment and comparison respondents agreed that local authorities do not take bribes around forest issues, such as those related to forest management, permits, fines, or other forest use.**

Figure 62: Percentage of Respondents Who Agree There Is Very Little Corruption Among Municipal Government by Treatment Status (Polygons and Comparison)



However, there are low levels of respondents witnessing these events. In the treatment area, 63 percent of respondents claim they have never seen environmental authorities arrest or fine people who engage in illegal deforestation, compared with 72 percent in comparison areas. Approximately 16 percent of treatment respondents and 10 percent of comparison respondents report that they have seen someone give monetary payments to environmental authorities to avoid penalties for deforestation once or twice a year. Similarly, 6 percent of both treatment and comparison respondents report seeing monetary payments to environmental authorities about once or twice per year to avoid penalties for illegal cattle grazing. One Indigenous authority SSI in Caquetá echoes the issue of corruption and inequality between how the law is applied to the rich and the poor:

> *"So the peasants are also forced to cut down some timber trees, some charcoal, but that is also an issue because somehow when the peasant does something like that, the peasant does apply the law, but when they are the big businessmen in the deforestation process, there is no support for them...One sees that here, for example, sometimes they arrive with licenses for fuel and mining exploitation, they come with authorizations from Bogota, the Ministry of Environment, and everything, and then here there is also a lack of knowledge by the authorities—everyone gets to do what they want in the territory, so it is a very complex situation." (Indigenous authority SSI in Caquetá)*

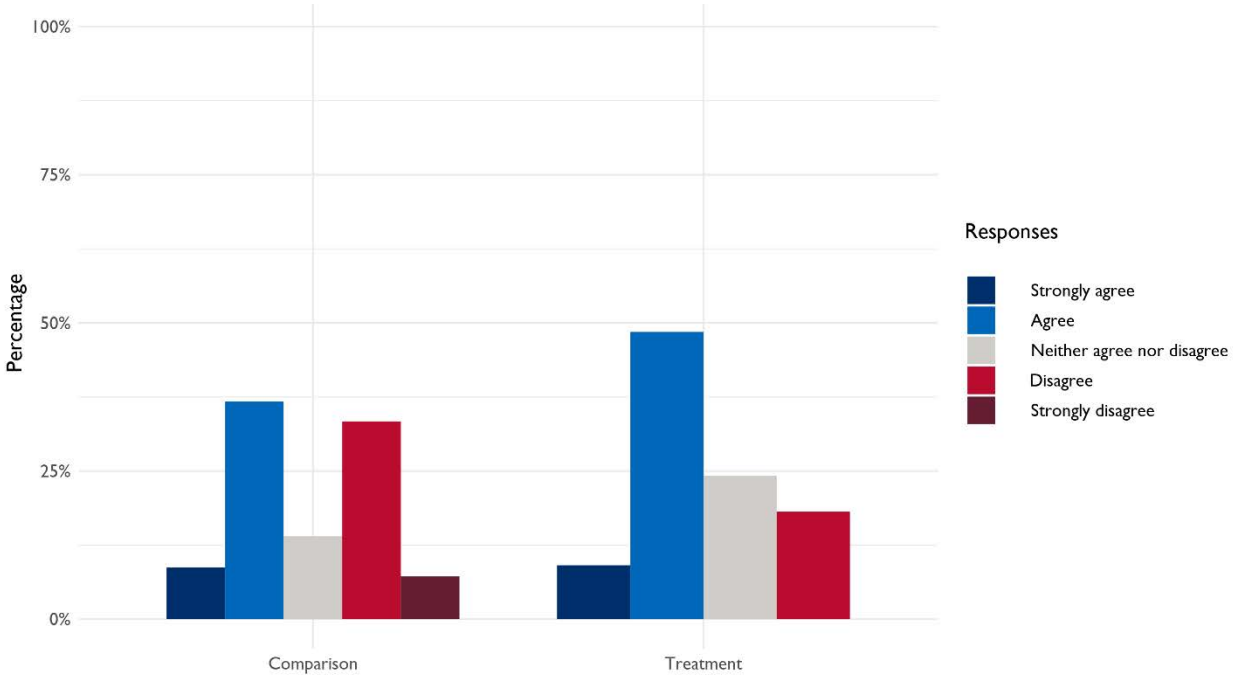
FORMALIZATION AND LAND TENURE

LAND TENURE

For a series of questions about citizen's land rights, treatment respondents reported that land rights are clear and easy to understand (58 percent, Figure 63), citizens' rights are well protected by Colombian authorities (41 percent), and they know more about their land rights this year than they did one year ago

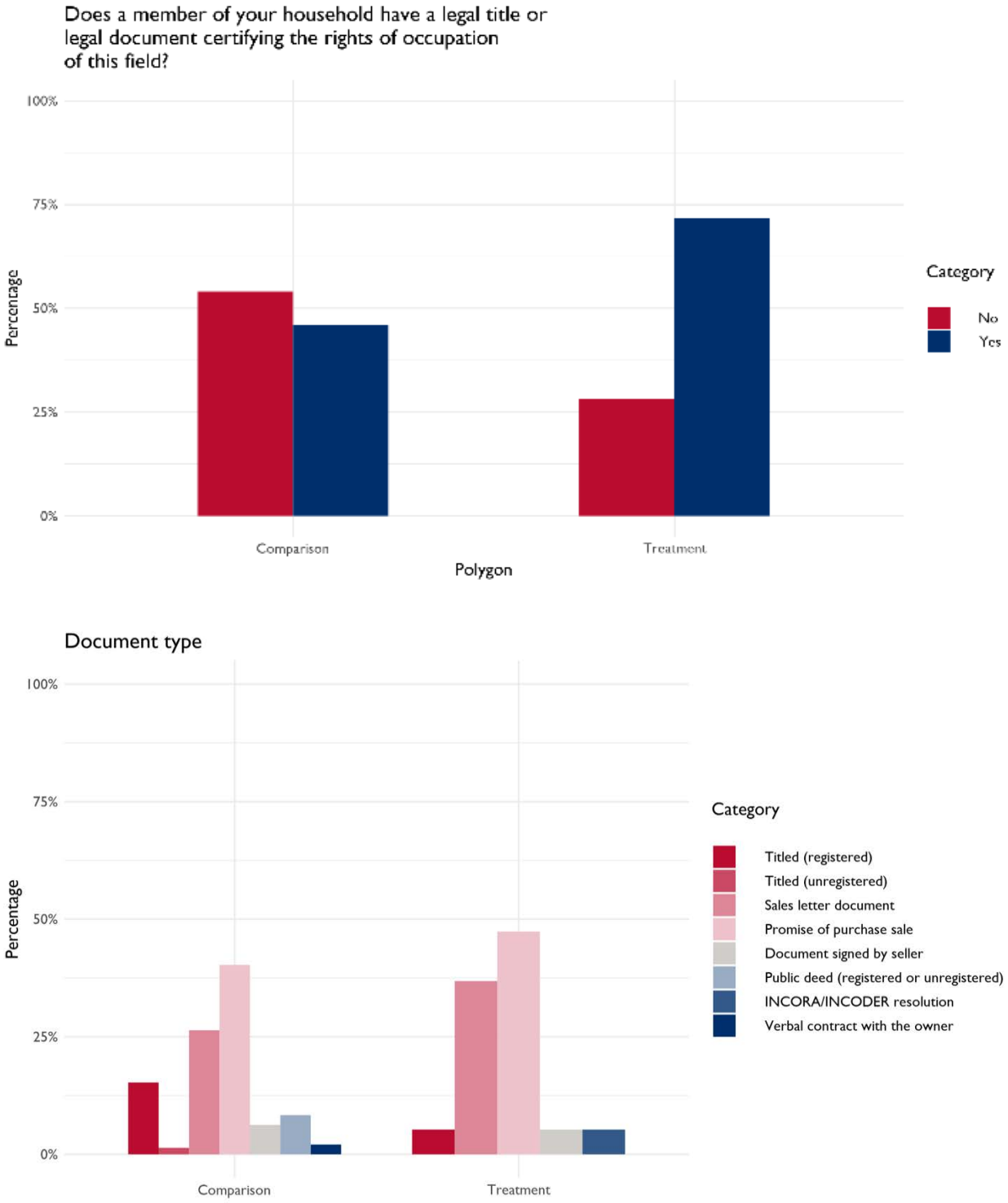
(61 percent). The distributions are relatively similar, although slightly more positive, in polygon comparison areas.

Figure 63: Land Rights of Citizens are Clear and Easy to Understand by Treatment Status (Polygons and Comparison)



In both the treatment and comparison areas, respondents report that the most common ownership status of the land is the untitled owner (purchased but not formalized), titled owner, and usufruct. In the treatment area, all respondents said fields were demarcated by physical signs, including natural fences/cerca, limit signs, and trenches/ditches/chambas. **In the treatment area, 72 percent of respondents report that they have a legal title or legal document certifying the rights of occupation, compared to 46 percent in the comparison area** (Figure 64). As such, these findings likely point to a lack of knowledge and awareness among respondents about what represents formal or "statutory" documentation.

Figure 64: Land Tenure Documentation Status and Type (Polygons and Comparison)



In the treatment area, 82 percent of respondents said they would be willing to pay for a formal state-issued document proving ownership of the field, compared with 75 percent in comparison areas. However, the amount they are willing to pay for a formal state-issued document is extremely low, at an average of 1.8 COP among treatment respondents and 7.04 for treatment respondents.

In both the treatment and comparison areas, the three most common reasons why households report not having formalized or registered documentation are a lack of resources, it is not necessary or there are no benefits, and there is a lack of information about the required procedures.

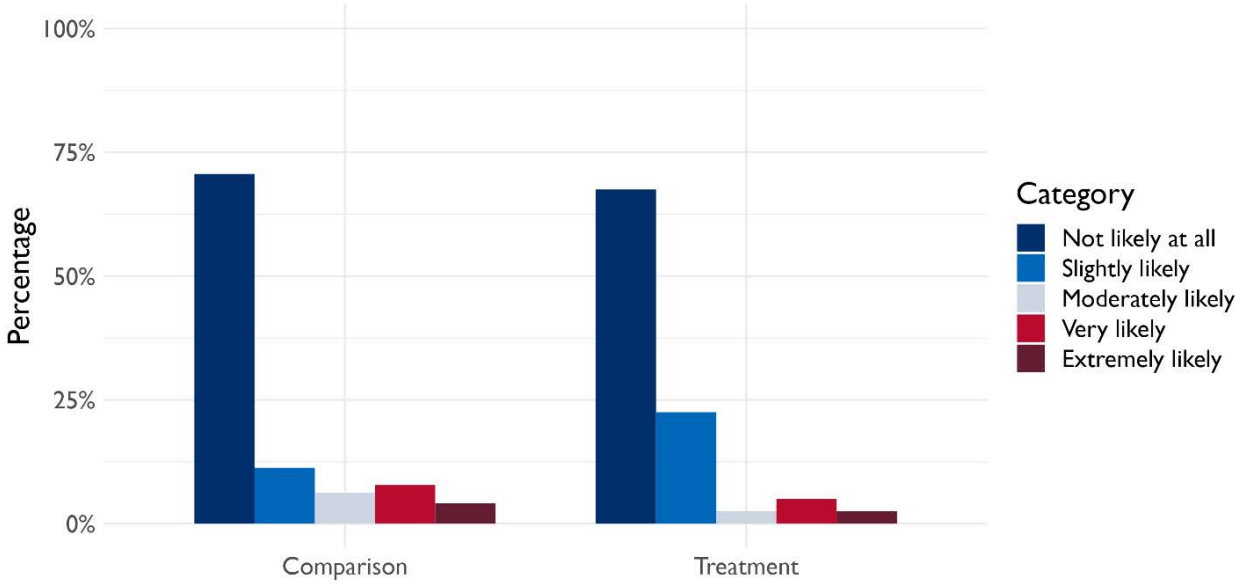
In SSIs, when asked about the prevalence of titles or formal land documentation, a qualified operator working with the National Parks in Guaviare said:

> *"Little by little, [purchase and sale contracts] have been formalized, since the ANT has been delivering titles...but [they] almost never require documents because the only time we have asked for land ownership documents is for civil reserves, and we require that they have a title or deed to enter the program."*

The rest of the responses were similar, with most having contracts of sale but not deeds. One respondent noted that there were only contracts of sale in rural areas, but the closer it got to urban areas, the more common property titles became. Additionally, when asked in SSIs how people secure land rights, a respondent associated with a Livestock Committee noted that they do not provide formal documentation to ranchers because it would "legalize the land where deforestation is taking place."

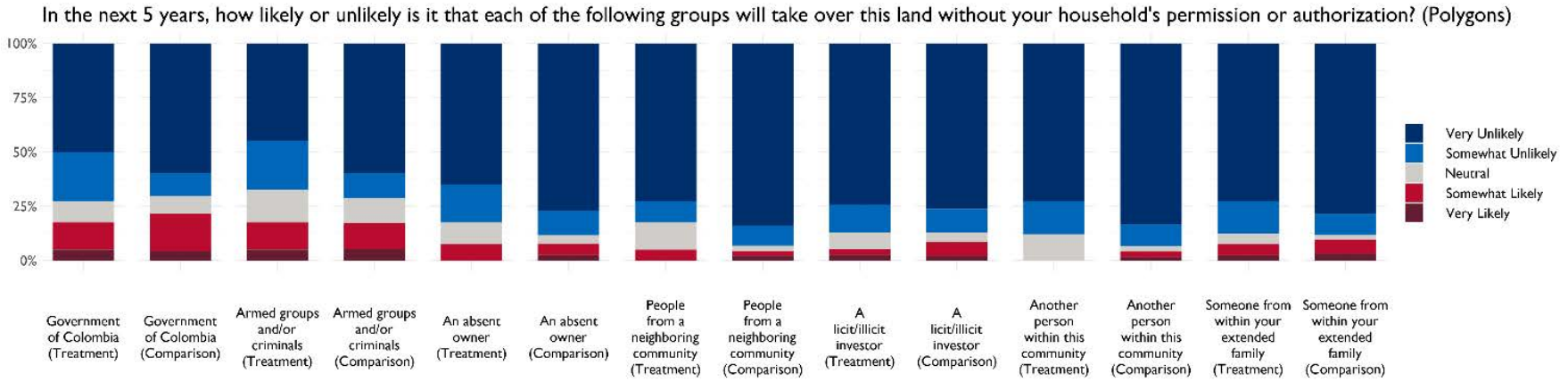
Regarding household land, in the treatment area, 68 percent of treatment and 71 percent of comparison respondents said it was not at all likely that their household will involuntarily lose ownership or rights to use the field in the next five years (Figure 65).

Figure 65: Likelihood of Losing Land Rights in the Next Five Years (Polygons and Comparison)



Absolute levels of perceived tenure security are fairly high across the sources included in the survey module. On a five-point scale, all sources are ranked below 2, with the greatest source of tenure insecurity being the armed groups. In particular, treatment respondents report that it was somewhat or very likely that land could be taken by armed groups (18 percent), the GoC (18 percent), absent owners (8 percent), people from neighboring communities (5 percent), someone from within the extended family (8 percent), licit/illicit investors (5 percent). These distributions were relatively similar across treatment and comparison polygons (Figure 66).

Figure 66: Sources of Tenure Insecurity (Polygons and Comparison)



No respondents indicated that land had been expropriated by authorities or external groups to be used for other purposes. Finally, when asked to agree or disagree with the statement that ANT distributed public land fairly, only 11 percent of respondents in the treatment area agreed, similar to 22 percent in comparison polygons.

Table 14: Summary Statistics for Polygon Overall Land Awareness/Rights Questions, Scale from 1 to 5, Where 1=Strongly Agree and 5=Strongly Disagree (Polygons and Comparison)

	COMPARISON					TREATMENT				
ITEM	N	MEAN	ST. DEV	MIN	MAX	N	MEAN	ST. DEV	MIN	MAX
There is little corruption among public officials working for the municipal government	374	3.615	1.151	1	5	33	3.697	1.212	1	5
ANT distributes public land fairly	336	3.393	1.087	1	5	27	3.519	0.935	1	5
Land rights are clear and easy to understand	371	2.916	1.130	1	5	33	2.515	0.906	1	4
Citizens' rights to land are well protected by authorities	377	3.215	1.127	1	5	32	3.125	1.129	1	5
I know about my land rights now than I did last year	380	2.405	0.913	1	5	33	2.303	0.883	1	4

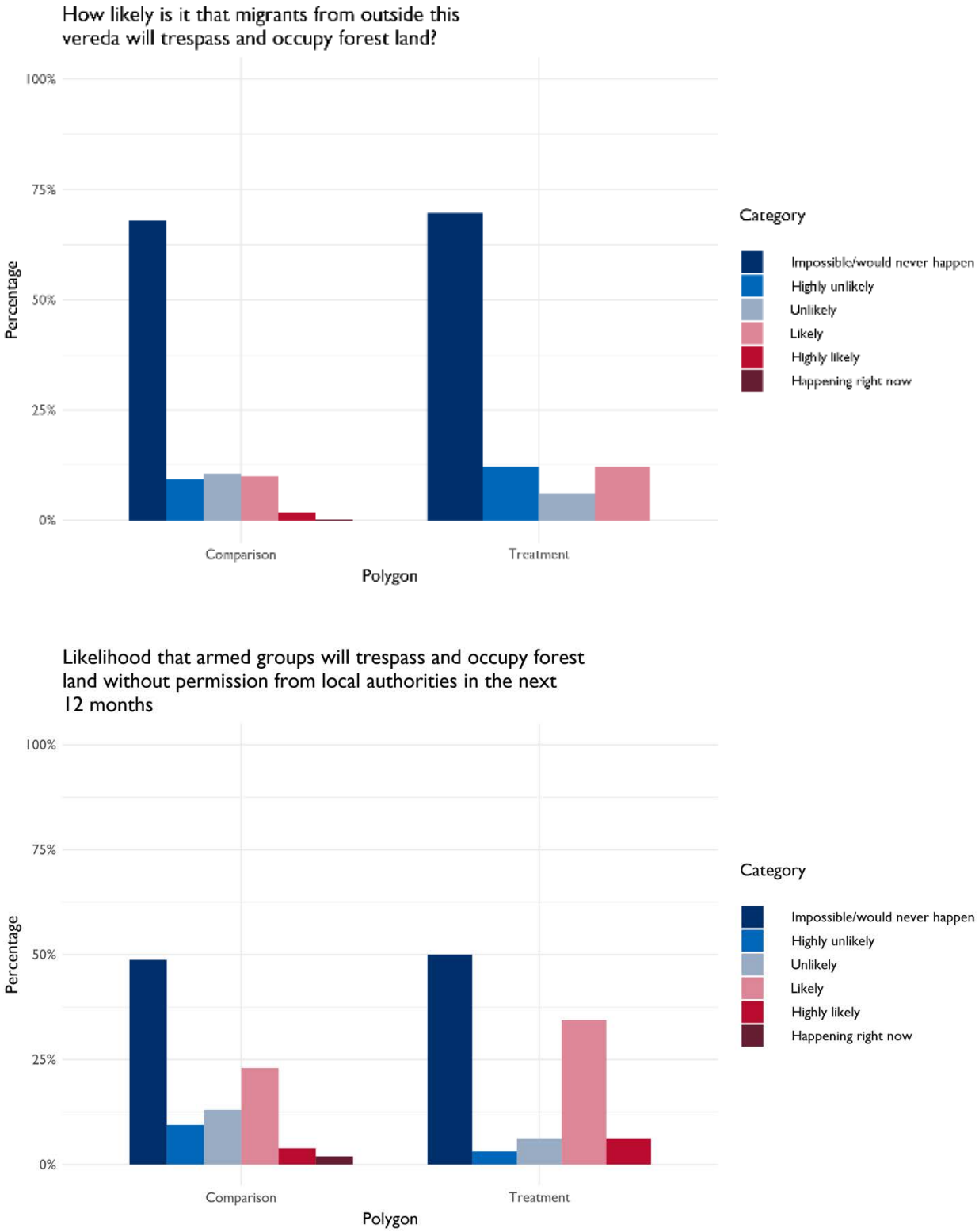
FOREST TENURE

In the treatment area, approximately 12 percent of respondents said there are areas of the forest that their household used to access in the last four years that their household is no longer allowed to access. This is 4 percent in comparison areas.

When asked how their household lost access, the treatment and comparison areas had similar responses with the top two responses being conservation purposes/environmental agencies restricting it and infrastructure developed on land. When asked about the impact of losing access to the forest on their households the top two answers from the treatment respondents were that they started using other forests and lost access to resources for consumption. The top two answers from the comparison respondents were that they started using other forests or that there was no impact.

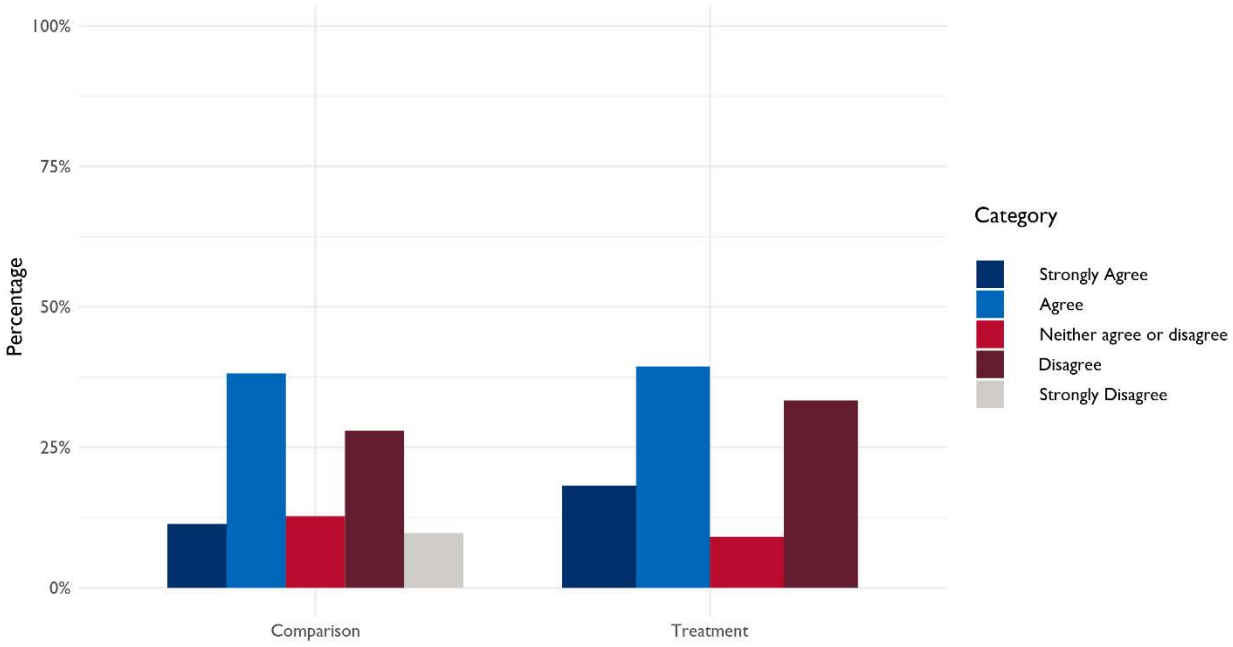
Respondents were asked about various potential sources of forest tenure insecurity. **In the treatment area, 88 percent of respondents believe that it is unlikely, highly unlikely, or impossible that migrants from outside this *vereda* will trespass and settle on forest land without permission from local authorities in the next 12 months** (Figure 67)**, and 94 percent report that it is unlikely or impossible that local people from the *vereda* will trespass or settle. In contrast, 41 percent of respondents in treatment polygons report that it is likely, highly likely, or happening right now that armed groups will trespass and occupy forest land without permission from local authorities in the next 12 months, compared with 29 percent in comparison polygons** (Figure 67). These distributions are similar in comparison areas (Figure 67).

Figure 67: Likelihood of Encroachment on Forest Land by Treatment Status (Polygons and Comparison)



Fifty-nine percent of treatment respondents agree that local authorities protect forests from being taken, invaded, or settled in without permission (Figure 68).

Figure 68: Local Authorities Protect Forests from Being Taken by Treatment Status (Polygons and Comparison)



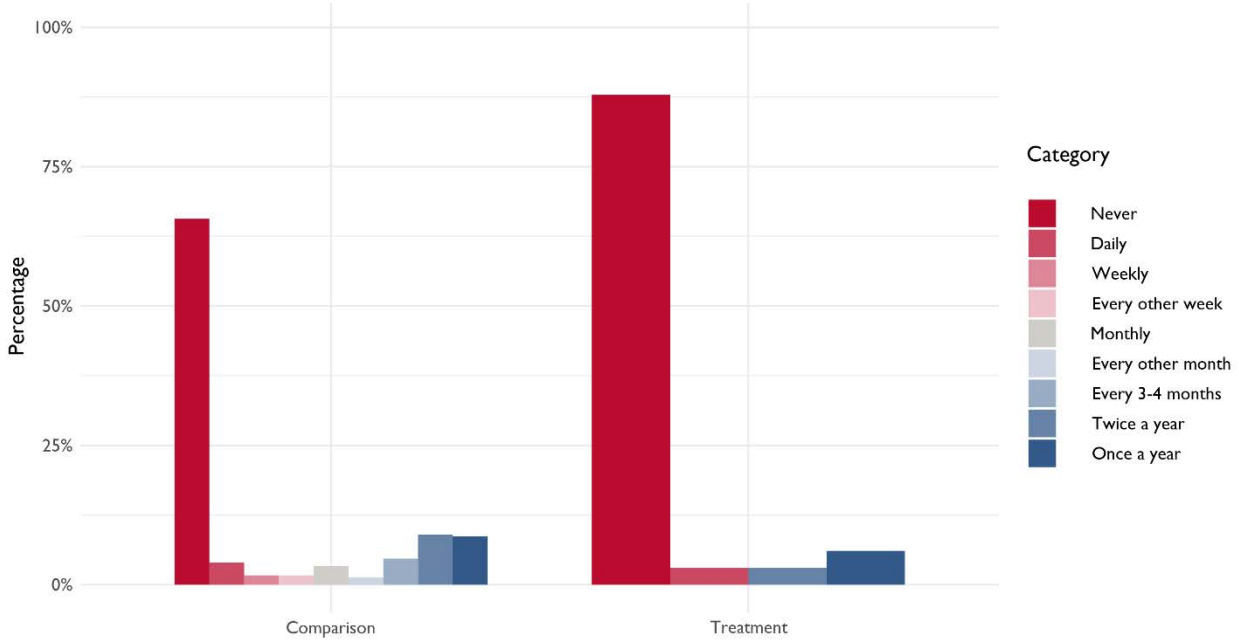
COCA PRODUCTION AND ILLEGAL CATTLE GRAZING

In the treatment area, 79 percent of respondents disagreed or strongly disagreed that people should be allowed to produce coca to provide money to feed their families. In the comparison area, 67 percent disagreed or strongly disagreed that people should be allowed to produce coca to provide money to feed their families. Only 21 percent of treatment respondents disagreed that illegal cattle grazing is part of local income-generating opportunities.

Monitoring for coca production is reportedly higher in comparison areas, with only 66 percent indicating that environmental authorities never monitor for coca production, compared to 88 percent in treatment polygons (Figure 69). **In the treatment area, 85 percent of respondents said that there are no penalties for coca production in their *vereda*.** This statistic is similar in comparison areas. When asked what the penalties are for coca production in this *vereda*, the three most common answers in treatment polygons were that the person would be arrested/taken to court, would have to do community work, and would have to pay a monetary fine.[65]

[65] In the comparison area, the three most common answers were that the person would be arrested or taken to court, would have their land confiscated, and would have to pay a monetary fine.

Figure 69: Frequency of Monitoring for Coca Production by Treatment Status (Polygons and Comparison)



Deforestation linked to livelihoods and coca production was a clear theme in FGDs. For example, a man in Caquetá noted:

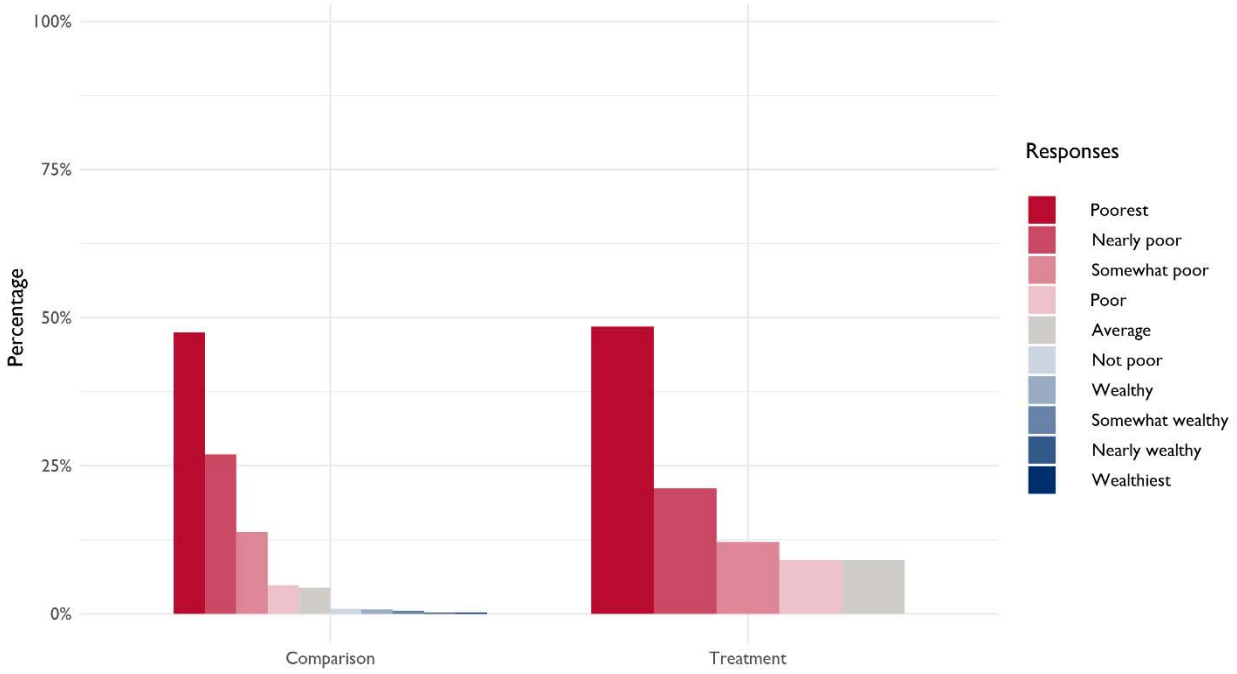
> *"Let's see, there is a need—this is an issue that is a bit complex because, logically, there is a need to cut down, to try to plant, well, food, one thing or another, right? There have also been different interests, because let's not lie to ourselves, sometimes we have also cut down trees to plant coca, let's talk about it, it is not a secret, so in one way or another there has been a generalized issue and for one reason or another it has been carried out, this problem."*

WEALTH, LIVELIHOODS, AND ASSETS

Seventy-three percent of members of households in treatment areas age 18 or older worked in the last 12 months, mostly on raising livestock for sale (small-scale) (43 percent), subsistence farming (12 percent), and various occupations (12 percent). Employment statistics are generally similar in control polygons.

On a scale from 1 to 10, with 10 representing people at the top who are the wealthiest and live comfortably and 1 representing the people at the very bottom who are the poorest, almost half of the respondents (48 percent) in the treatment area selected 1 (poorest), 21 percent chose 2, and 12 percent selected 3 (Figure 70). The distribution is similar in comparison areas (Figure 70).

Figure 70: Self-reported Position on Ladder of Wealth Compared to Other Households (Polygons and Comparison)



LIVESTOCK ASSETS

Ninety-four percent of respondents in the treatment area own and work with cows, bulls, calves, or steers, compared with 64 percent in comparison areas (Figure 71). **The average number of cows, bulls, calves, or steers that respondents in the treatment area currently own is 24 and work with is 45.** As for the comparison area, the average number of owned livestock is 24, while they work with approximately 54. **The total average use of pasture used to support their livestock is estimated at 46.5 hectares for treatment respondents and 49.6 hectares for comparison respondents.** In terms of the top three uses, 28 percent of respondents in the treatment area use their livestock for "self-consumption milk," 38 percent use them for "milk sale," and 22 percent for "standing sale." For the comparison area, 37 percent of respondents use them for "standing sale," 29 percent use them for "milk sale," and 22 percent use them for "self-consumption milk." **Most households note a reliance on livestock raising and herding activities for income; 18 percent of treatment respondents versus 42 percent of comparison respondents noted that they do not rely on livestock activities for any household income.**

Figure 71: Owned or Worked with Livestock, Last 12 Months (Polygons and Comparison)

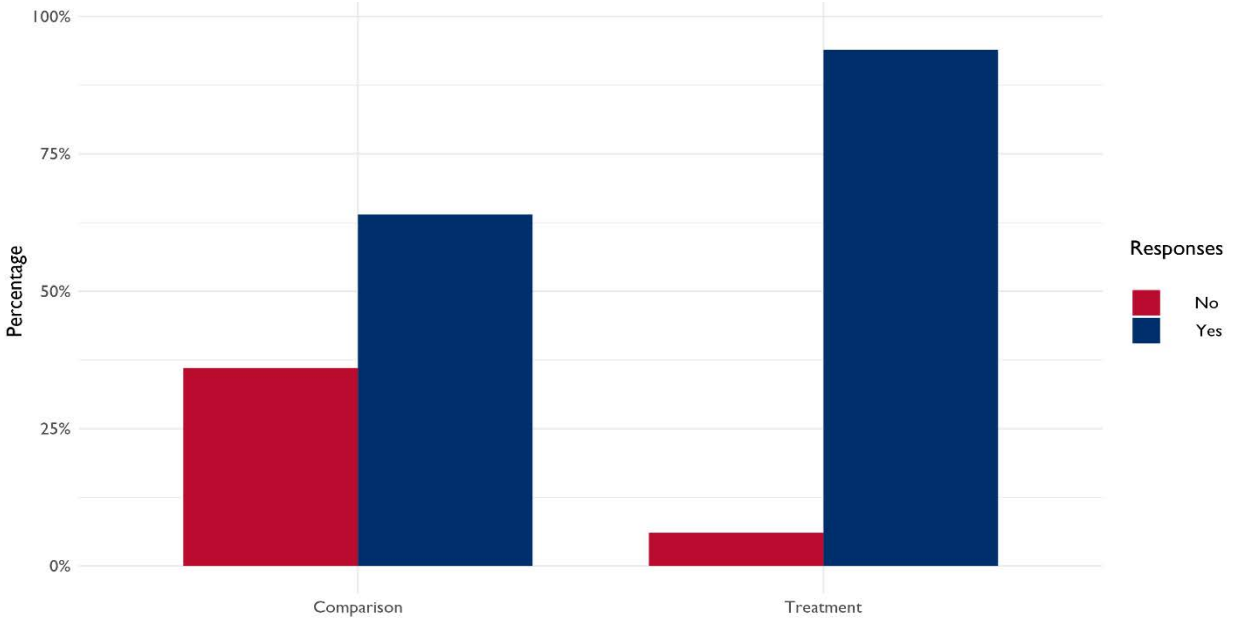


Table 15: Summary Statistics for Polygon Livestock Assets (Polygons and Comparison)

	COMPARISON					TREATMENT				
ITEM	N	MEAN	ST. DEV	MIN	MAX	N	MEAN	ST. DEV	MIN	MAX
Worked with livestock (binary)	383	0.640	0.481	0	1	33	0.939	0.242	0	1
Total use of pasture (ha)	244	49.600	50.783	0	320	31	46.597	23.291	14	116
Total number of livestock own or work with	245	53.539	70.824	0	615	31	45.194	30.064	1	100
Total number of livestock owned	245	23.510	41.200	0	300	31	24	24.062	0	90
Value of livestock (CHP)	192	51, 373, 578.000	84, 477, 982.000	0	600, 000, 000	29	42, 465, 517.000	40, 046, 609.000	0	135, 000, 000
Livestock graze in forest (binary)	245	0.094	0.292	0	1	31	0.032	0.180	0	1
Percentage of household income from livestock raising and herding (scale 0–6, where 0=None and 6=All)	383	2.522	2.627	0	6	33	4.152	2.451	0	6

CREDIT

Approximately 80 percent of respondents in the treatment area reported that they would be able to take out a loan or borrow cash or in-kind if they wanted to, and 64 percent reported that they have an account in a bank or other financial institution. **Despite the possibility of accessing credit/loans, less than a quarter of respondents in the treatment area (24 percent) received credit or other financing from outside the household** (Figure 72). Respondents who did take credit or a loan used the funds for infrastructure maintenance, cultivation facilities, land or animal purchase, and farm structures. The average credit value that households in the treatment area received either from credit or other financing sources is 34,987,500 COP. While the percentage of credit-taking in comparison polygons is similar (18 percent, Figure 72), the average credit value households in the comparison area have received either from credit or other sources is lower, at 15,060,870 COP. This is likely due to the sample size difference between the two areas.

Figure 72: Receipt of Credit and Loans, Last 12 Months by Treatment Status (Polygons and Comparison)

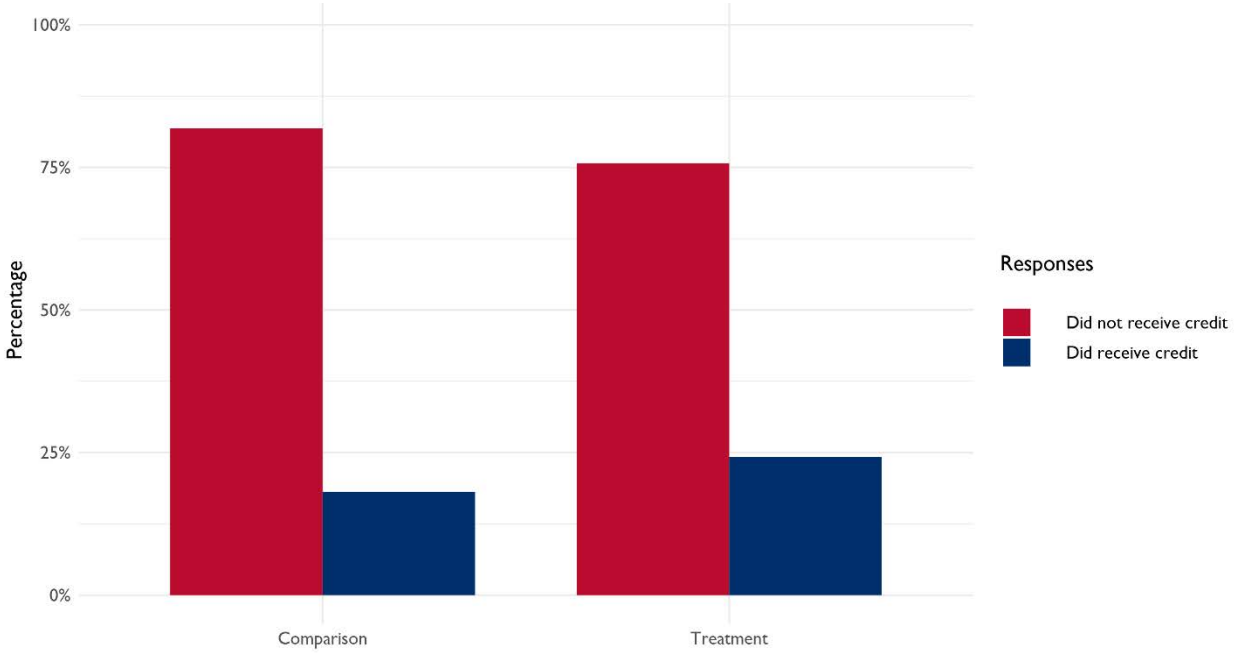


Table 16: Summary Statistics for Credit (Polygons and Comparison)

	COMPARISON					TREATMENT				
ITEM	N	MEAN	ST. DEV	MIN	MAX	N	MEAN	ST. DEV	MIN	MAX
Received credit or financing from outside the household (binary)	380	0.182	0.386	0	1	33	0.242	0.435	0	1
Total credit value (CHP)	69	15, 060, 870	17, 548, 791	1	131, 000, 000	8	34, 987, 500	59, 083, 970	2, 900, 000	180, 000, 000
Documents required (binary)	69	0.435	0.499	0	1	8	0.625	0.518	0	1
Can take out a loan (binary)	378	0.765	0.425	0	1	33	0.818	0.392	0	1
Have a bank account (binary)	383	0.488	0.501	0	1	33	0.636	0.489	0	1

ANNEX I: PROJECT TIMELINE

Table 17, below, presents the anticipated timeline of LfP SMVC activities.

Table 17: Timeline of LFP SMVC Activities

	2022	2023												2024									
		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT
CNP*																							
Community Pilot 1#																							
Community Pilot 2																							
TBD Additional Community Pilots																							
Puerto Rico Parcel Sweep^																							
Puerto Rico PPP																							
Polygons PPP																							

* Cadaster will be complete by Sept. 2023, but it requires six months to be accepted by the state after LfP submits it to the GoC.
# LfP cannot begin formalization pilot operational work until they have legal clarity and buy-in among the community.
^ Parcel sweep will finish by August 2024; GoC will process and deliver titles/contracts after this date.

ANNEX II: EVALUATION TIMELINE

This evaluation was designed to include three rounds of data collection: a baseline prior to the start of the main interventions,[66] an endline at least one year after the completion of project activities, and a follow-up to capture longer-term outcomes at least five years after the completion of project activities.

The recommended rounds of data collection and associated outcomes, instruments, and EQs are listed below in Table 18.

Table 18: LfP SMVC Evaluation Data Collection Timeline Summary[67]

DATA COLLECTION ROUND	TIMING	SOURCE/INSTRUMENT	SAMPLE SIZE	ASSOCIATED EQS
Baseline	February–March 2023	Household survey	2,000	EQ 1, 2, 3
Endline	February–March 2026	Administrative data	TBD	EQ 1, 2, 3
Follow-up	February–March 2030	Satellite data	NA	EQ 1, 3
		SSIs	54	EQ 1, 2, 3
		FGDs	12	EQ 1, 2

[66] As described in the Project Timeline annex, some activities began prior to baseline (namely PPPs in Puerto Rico), but the main interventions to be evaluated such as parcel sweep started after the baseline.
[67] This illustrative timeline assumes that all TBD additional community-level formalization pilots are completed by October 2024.

ANNEX III: MEASURING FOREST CONDITION

DATA SOURCES

Remotely sensed data is the primary data source for exploring the impact of the program on forest condition. This will include two types of available raster satellite imagery:

1. Publicly available spatial data. This data has been used extensively to examine the impact of major deforestation events such as fires, infrastructure, and large-scale land clearing. A number of academic studies employ geospatial IEs that use deforestation raster data to measure the impact of interventions on deforestation.

    - National Aeronautics and Space Administration/Moderate Resolution Imaging Spectroradiometer (MODIS) land cover and related products (Annual data from 2001, 250-500 meter resolution).
    - Global Forest Watch Radar for Detecting Deforestation (near-real-time data from January 2020, 10-meter resolution).
    - University of Maryland Global Forest Change Data: Spatial units of forest loss (Annual data from 2000, 30-meter resolution).

2. Unprocessed imagery that is available to the United States Government through an agreement with Digital Globe.

    - High-resolution satellite data obtained from Maxar's Global Enhanced GEOINT Delivery (G-EGD) via a license provided by the United States Government. These images are at 0.3-meter resolution and are available annually from 2019.

MEASURING FOREST OUTCOMES—PUERTO RICO AND THE POLYGONS

Some of the most used datasets in policy research are based on Landsat images, which have a 30-meter resolution. The Global Forest Change, (Hansen et al., 2013) one of the most popular datasets used in environmental studies, has mapped forest loss since 2000 and has helped understand deforestation in many contexts. The team will use this publicly available data source to investigate annual forest cover trends for 5km buffers around the treatment and comparison *veredas* and polygons—along with assessing forest outcomes in and around CNP. However, a number of studies have highlighted technical issues with this dataset, including:

1. **Accuracy issues:** It does not distinguish tropical forests from plantations and even herbaceous crops, which leads to a substantial underestimate of forest loss (Tropek et al. 2014). In other contexts, depending on precipitation rates, it can underestimate forest cover (Cunningham et al., 2019). Thus, bias moves in both directions.
2. **Inaccuracies in identifying the year of deforestation:** Classification models using datasets such as the Global Forest Change (and similar datasets) may present moderate temporal discrepancies, misclassifying the time of the forest loss (Linke et al., 2017). Considering that methods such as difference-in-differences and staggered entrances are the among the most used identification strategies in applying research, these temporal inaccuracies can have serious consequences for policy research.

In sum, Landsat-based datasets, though useful in many applications, have various limitations in environmental research, especially in deforestation studies. They might misclassify forests both spatially and temporally. These problems compromise their value for research and policy decisions.[68]

To help overcome these data challenges for measuring project outcomes in treatment *veredas* and polygons, in addition to the publicly available datasets, the team will utilize high-resolution satellite imagery from Maxar through a partnership with the National Geospatial Intelligence Agency.[69] The imagery is available globally at a resolution of up to 30 cm, and new images can be as frequent as daily or as infrequent as less than one image per year, although image update frequency is lower for rural areas. Some imagery is multi-spectral, containing data on the colors of light in the imagery, while some imagery only contains light intensity (grayscale).

The ET has examined this data across the study area. Specifically, the ET examined how this data overlapped (spatially and temporarily) with a sample of *veredas* from Puerto Rico municipality and polygons from the Guaviare and Caquetá departments. While the data is higher resolution than many publicly available Landsat and MODIS data sources (30cm versus 30mx30m), there are significant limitations in (1) the temporal frequency and (2) the spatial overlap in images. The temporal and spatial availability of satellite imagery is uneven across locations. For example, for one treatment *vereda*, there is imagery from 2019 and 2022 whereas its matched comparison only includes imagery from 2017 and 2020. This means that the team cannot use this data to consistently examine annual large-scale forest condition trends across each of the treatment and comparison *veredas* and polygons.

Thus, instead of using this data to explore the full study area, the ET will use this data to study a subset of treatment and comparison areas—largely driven by where the data provides good coverage without cloud cover. The ET will attempt to create a matched sample between a baseline and endline set of households. However, since the data provides "spotty" coverage, the ET might need to rely on a cross-sectional (versus panel) baseline and cross-sectional endline measure of forest cover sampled treatment and comparison households. This will enable the research team to match data from the household survey with forest growth and forest loss with precision. Also, similar to the publicly available datasets, this dataset can also be used to assess longer-term trends (5+ years after endline); however, with the same spatial and temporal limitations noted above.

In addition, a growing literature in remote sensing is calling attention to the fact that current datasets and classification methods can identify forest loss (usually, some estimate annual change in forest cover) but cannot indicate changes in forest quality (e.g., Congalton et al. 2014; Bullock et al, 2020). Deforestation tends to be a gradual process wherein individuals degrade the forest before clearing it. In the study, this process is crucial to understanding possible impacts on intermediate levels of forest degradation.

Forest degradation is a serious problem usually overlooked by policy and academic research. The area of disturbed forest in the Amazon is 44 percent to 60 percent more than previously realized. This massive process of forest degradation is an important source of emissions that is usually ignored by researchers

[68] Other publicly available dataset would not solve these issues for they have lower resolution. That is the case of the Moderate Resolution Imaging Spectroradiometer (MODIS), which has three different resolutions (250 m, 500 m, and 1 km). This dataset is useful for various global change research studies including climate change, biodiversity conservation, ecosystem assessment, and environmental modeling. However, it still shows significant inconsistencies with similar dataset and ground-level information. Additionally, It is not very informative to understand the process of forest degradation in specific biomes (Giri et al, 2005).

[69] Imagery use is authorized through the NextView license between the National Geospatial Intelligence Agency and Maxar, which allows access to use the imagery for government purposes. The images cannot be published.

and policymakers (Bullock et al, 2020). The main obstacle preventing more studies of forest degradation is high-quality data.

Thus, forest loss and forest quality are distinct issues. With higher-resolution data, the team will be able to elaborate more precise estimates of forest disturbance and account not only for forest cover loss (deforestation) but also for the intermediate processes that usually lead to future forest clearing.

Finally, high-resolution imagery is also useful to identify proxies of other development outcomes. For instance, with high-resolution data, it is possible to classify spectral signatures related to investments in physical capital, such as (small) construction, pastures, and crops.

The outcomes of interest within administrative boundaries (*veredas* and polygons) and the 5-km buffer include deforestation, forest degradation, land cover type, and burned area. All outcomes except forest degradation will be measured with the pre-processed satellite imagery. The evaluation will present an interrupted time-series design and difference-in-differences analysis for measuring all outcomes except forest quality - which will be measured as a pre-post panel through difference-in-differences analysis without the frequent temporal measures, for the reasons described above.

Key covariates that the team will consider for inclusion in this set of models include forest designations, distance to major road, distance to river, population density, slope (grade), elevation (m), biomass(mg/ha), distance to district capitals, previous levels of deforestation, among others. For general research purposes, beyond the treatment indicator, the team will also explore governance and tenure indicators to the extent that there are variations within treatment areas for these key mechanisms.

MEASURING FOREST OUTCOMES—CNP

In line with the recommended design put forward in the NORC FA, the evaluation will measure the causal impacts of the CNP component on deforestation through a spatial regression discontinuity (SRD) approach using the remotely sensed data on forest conditions described above. The sharp change in spatial coverage of the intervention enables the use of an SRD design. This assumes that land on either side of the border will be similar (on average) across any and all drivers of deforestation.[70] To the extent possible, the team will overlay/integrate an analysis of the administrative data related to the prosecution of environmental crimes

The team will operationalize this design across a number of treatment groups for the Amazon LfP. This will include a forest condition analysis of:

- The full CNP park border.
- Indigenous reserves within CNP.
- Indigenous communities within the park who may have valid claims but are not in formal reserves.
- Other communities with no legal standing to be inside the park.

Several forms of empirical analysis will be applied as part of the SRD approach:

1. Matching each treatment observation to its nearest spatial neighbor on the other side of the CNP border.

[70] These include factors such as topography, elevation, climate, markets, proximity to human settlements, proximity to roads/rivers, forest cover trends, distance to nearest settlement, slope, etc.

2. Normal regression discontinuity—Distance to the CNP boundary (positive for eligible observations, negative for ineligible). Control for distance to the CNP boundary and distance interacted with eligibility.
3. Spatial fixed effects—Viable due to the "sharp discontinuity" of the CNP border and the presence of granular remotely sensed data on/around the boundary.

As part of robustness checks for the analysis, the evaluation will present an interrupted time-series design for measuring deforestation. This design is not as rigorous for assessing causal effects as the SRD design described above. Thus, it will be implemented as a supplement to the SRD. Finally, as a standard practice for conservation IEs, the evaluation will conduct placebo checks and spillover analysis (Kondylis and Loeser, 2019).

OUTCOMES AND COVARIATES

OUTCOMES

- Deforestation (forest loss)/deforestation alerts
- Forest degradation
- Habitat connectivity
- Land Cover Type
- Normalized Difference Vegetation Index (NDVI)
- Burned Area

COVARIATES

- Temperature
- Precipitation
- Protected area
- Distance to city
- Distance to major road
- Distance to river
- Distance to railroad
- Population density

GEOGRAPHICAL AND BIOPHYSICAL

- Slope (grade)
- Elevation (m)
- Precipitation (mm)
- Biomass(mg/ha)
- Distance to rivers (m)

INFRASTRUCTURE

- Distance to roads (m)
- Accessibility index
- Distance to district's capitals (m)

- Distance to population centers within community (m)

LAND USE/LAND COVER

- Distance to deforestation outside communities pre-treatment
- Internal distance to community boundary (m)
- Deforestation in 2010 (ha)
- Distance to protected areas (m)
- Deforestation risk

CHALLENGES

The evaluation will need to account for two methodological changes with the SRD design. The first is testing comparability around the cutoff point. Pre-intervention deforestation levels and trends should be balanced on average. If these trends differ, it will indicate awareness of the boundaries and that the new border is not a new feature (Albornoz et al., 2022). The team will use matching to help mitigate bias.

The second issue is geographic spillover: effective resource protection within CNP leads to increases in deforestation in areas outside of the treatment area. Again, additional matching will be employed to conduct an analysis of spillover (e.g., Andam, 2008). Statistical matching will be used to identify untreated areas outside of the treatment areas to match untreated areas even further away; deforestation trends in these areas will be compared over time.[71]

MEASURING BIODIVERSITY OUTCOMES

The satellite imagery sources listed above for measuring deforestation and forest degradation are not suitable for analyzing key biodiversity outcomes, such as species richness and abundance.

Many of the recommended approaches for measuring biodiversity are not feasible for this evaluation due to a number of factors, including budget limitations, security concerns, and contextual issues. In particular, the team does not have funds to set up and monitor camera traps or conduct direct observation, and there are also security concerns with the camera trap approach. This evaluation explored the costs and benefits of applying a predictive approach, such as the method used by (Heilmayr, 2020) to model the biodiversity impacts of forest gains and improved habitat connectivity.

Our assessment—based on budget constraints and research priorities—is to focus the biodiversity assessment on proxy measurements of species diversity based on forest loss after calculating expected changes in forest loss, land use patterns, and habitat connectivity. This will be based on assumptions that reduced deforestation and improved habitat connectivity will translate to improved biodiversity. Proxy measurements of species diversity and abundance will then be applied based on forest loss. Global Forest Watch maintains and reports two measures at 1 km resolution for global biodiversity intactness and global biodiversity significance. Also, the PREDICTS database (Hudson, 2017) represents a potential method to model the impacts of land use change and human population density on biodiversity in forested areas.

[71] Another best practice for exploring spillover is field-based qualitative work to help identify the extent of spillover effects and other positive/negative externalities. Unfortunately this evaluation is not funded to conducted this additional qualitative analysis.

ANNEX IV: BALANCE AND POWER CALCULATION SUMMARY[72]

BALANCE ANALYSIS

The team looked at balance across more than 50 indicators between Puerto Rico municipality and its comparisons. **Overall, the team found balance between treatment and comparison groups on just under 70 percent of indicators.** Indicator balance is mixed between Puerto Rico municipality and its comparisons. While many indicators are similar, they also differ in some fundamental ways: livelihoods, displacement, born locally, documentation, reported familiarity with forest rules, and income from forests. Please refer to Table 19 for the full results of the balance analysis.

There are no significant differences between treatment and comparison households in terms of gender, economic or employment status, land area owned (ha), heads of livestock owned, ownership of residence, forest clearing behavior, and land conflict experience. While the proportion of households with formal education is the same across treatment and comparison areas (92 percent), the number of household members with formal education and the maximum level of formal education is slightly lower in treatment areas.

Treatment households have slightly, but significantly, fewer members as compared to comparisons (3.1 members in treatment households compared to 3.4 members in comparisons). Significantly more household heads in treatment areas were born in the municipality where they reside as compared to comparisons (25 percent of treatment household heads versus 17 percent of comparisons). Relatedly, fewer treatment households have ever been forced to leave their land (36 percent of treatment households versus 42 percent of comparisons) and are members of an organization for displaced persons (two percent of treatment households versus four percent of comparisons).

Treatment households report a slightly higher proportion of their income coming from the forest (0.35 versus 0.22 on a scale where 0=None and 6=100 percent) and slightly more familiarity with forest use rules (1.7 versus 1.6 on a scale where 1=Not at all familiar and 3=Very familiar). This is likely due to the ecological differences between treatment and comparison areas discussed in the Puerto Rico forest conditions findings section. The percentage of households reporting employment in small-market livestock is lower in treatment areas (12 percent of treatment households versus 18 percent comparison) and in small-market farming is higher in treatment areas (32 percent of treatment households versus 20 percent of comparisons). Finally, the proportion (51 percent of fields with documentation in treatment areas versus 63 percent of comparisons) and average number (0.65 in treatment versus 0.81 in comparisons) of fields with documentation is lower in treatment areas as compared to comparisons.

[72] Note that because the set of treatment polygons has not yet been finalized (only two treatment polygons have been selected to-date), this report presents only balance and power calculations for Puerto Rico municipality and its comparison veredas. These analyses can be updated to include the polygons when the full set of treatment areas is finalized. In general, for the polygon area, the evaluation finds good initial balance on indicators and ecological condition in the treatment and treatment expansion/comparison areas, and genetic matching helps to improve the 'already good balance' between treatment and comparison polygons.

Table 19. Illustrative Indicator Balance

ITEM	COMPARISON MEAN	TREATMENT DIFFERENCE	P-VALUE
Respondent female	0.402	-0.038	0.216
	(0.021)	(0.03)	
Born locally	0.191	0.063	0.015**
	(0.018)	(0.026)	
HH head born locally	0.166	0.083	0.001***
	(0.018)	(0.025)	
Economic status (10 = highest)	1.932	0.094	0.267
	(0.06)	(0.085)	
Members in HH	3.361	-0.222	0.041**
	(0.077)	(0.109)	
Dependence on forest (3 = highest)	1.951	0.065	0.19
	(0.035)	(0.049)	
Income from forest (6 = highest)	0.217	0.134	0.035**
	(0.045)	(0.064)	
Familiar w forest use rules (3 = highest)	1.6	0.122	0.021**
	(0.037)	(0.053)	
Satisfaction w forest management (5 = lowest)	2.454	0.031	0.608
	(0.043)	(0.061)	
Has cleared forest, past year	0.098	0.016	0.404
	(0.014)	(0.019)	
Amount of forest cleared, past year	1.568	21.222	0.134

ITEM	COMPARISON MEAN	TREATMENT DIFFERENCE	P-VALUE
	(9.987)	(14.138)	
Land area owned (ha)	44.582	-5.883	0.106
	(2.566)	(3.632)	
Conflict Over Land, Past 4 Years	0.047	0	0.984
	(0.009)	(0.013)	
Ever Forced to Leave Land	0.422	-0.067	0.028**
	(0.022)	(0.03)	
Benefitted from Projects	0.339	0.016	0.582
	(0.021)	(0.03)	
Heads of Livestock Owned	21.516	-3.137	0.271
	(2.013)	(2.85)	
Income Level (5 = lowest)	3.589	0.002	0.968
	(0.041)	(0.058)	
Not Enough Food at Any Time, Past Year	0.519	-0.015	0.641
	(0.022)	(0.031)	
HH Owns Residence	1.315	0.013	0.761
	(0.03)	(0.043)	
JAC in Village	0.996	0	0.979
	(0.003)	(0.004)	
Asset wealth index	-0.032	0.152	0.002***
	(0.035)	(0.049)	
Member: JAC	0.603	0.049	0.102

ITEM	COMPARISON MEAN	TREATMENT DIFFERENCE	P-VALUE
	(0.021)	(0.03)	
Member: community dev. council	0.059	0.026	0.111
	(0.011)	(0.016)	
Member: indigenous reservations	0.006	0	0.996
	(0.003)	(0.005)	
Member: productive orgs	0.067	0.006	0.7
	(0.011)	(0.016)	
Member: peasant orgs	0.023	0	0.992
	(0.007)	(0.009)	
Member: women's orgs	0.022	-0.002	0.833
	(0.006)	(0.009)	
Member: orgs for displaced/victims	0.043	-0.021	0.053*
	(0.008)	(0.011)	
Member: parents' assoc.	0.049	0.006	0.662
	(0.01)	(0.014)	
Member: other	0.01	0.016	0.056*
	(0.006)	(0.008)	
No members of any org	0.325	-0.056	0.052*
	(0.02)	(0.029)	
Mean HH birth year	1982.72	-1.258	0.239
	(0.755)	(1.069)	
Min HH birth year	1968.338	0.235	0.792

ITEM	COMPARISON MEAN	TREATMENT DIFFERENCE	P-VALUE
	(0.628)	(0.889)	
Max HH birth year	1996.68	-2.301	0.122
	(1.049)	(1.486)	
Prop. of HH w formal education	0.926	0.002	0.9
	(0.009)	(0.012)	
Num of HH members w formal education	2.896	-0.169	0.084*
	(0.069)	(0.098)	
Maximum level of formal education in HH	6.348	-0.493	0.01**
	(0.136)	(0.192)	
Prop. of working-age HH employed in past year	0.677	0.007	0.679
	(0.013)	(0.018)	
Num of HH members employed in past year	1.734	-0.05	0.423
	(0.044)	(0.062)	
Job in HH: subsistence farmer	0.266	-0.04	0.136
	(0.019)	(0.027)	
Job in HH: small-market livestock	0.187	-0.064	0.005***
	(0.016)	(0.023)	
Job in HH: small-market farming	0.203	0.12	0***
	(0.019)	(0.027)	
Job in HH: farm laborer	0.119	0.03	0.161
	(0.015)	(0.021)	
Job in HH: various jobs	0.141	-0.088	0***

ITEM	COMPARISON MEAN	TREATMENT DIFFERENCE	P-VALUE
	(0.013)	(0.018)	
Job in HH: livestock laborer	0.076	0.02	0.257
	(0.012)	(0.018)	
Job in HH: salaried laborer	0.07	0.022	0.202
	(0.012)	(0.017)	
Job in HH: businessperson	0.07	-0.023	0.114
	(0.01)	(0.015)	
Job in HH: construction worker	0.051	-0.006	0.671
	(0.009)	(0.013)	
Job in HH: subsistence livestock	0.033	0.002	0.854
	(0.008)	(0.011)	
Prop. of fields w documentation	0.628	-0.118	0***
	(0.021)	(0.029)	
Num of fields w documentation	0.814	-0.169	0***
	(0.03)	(0.042)	

The ET explored several matching techniques (propensity score matching, genetic matching, and entropy balancing) to improve balance. Entropy balancing performed best (see Figures 73–75) and will be used in endline regression analysis. For forest condition analysis, the evaluation will restrict analysis to the treatment and comparison *veredas* that are (a) closer to forests and/or (b) contain enough forest within the *vereda* to justify analysis of forest cover trends.

Figure 73: Propensity Score Matching Results

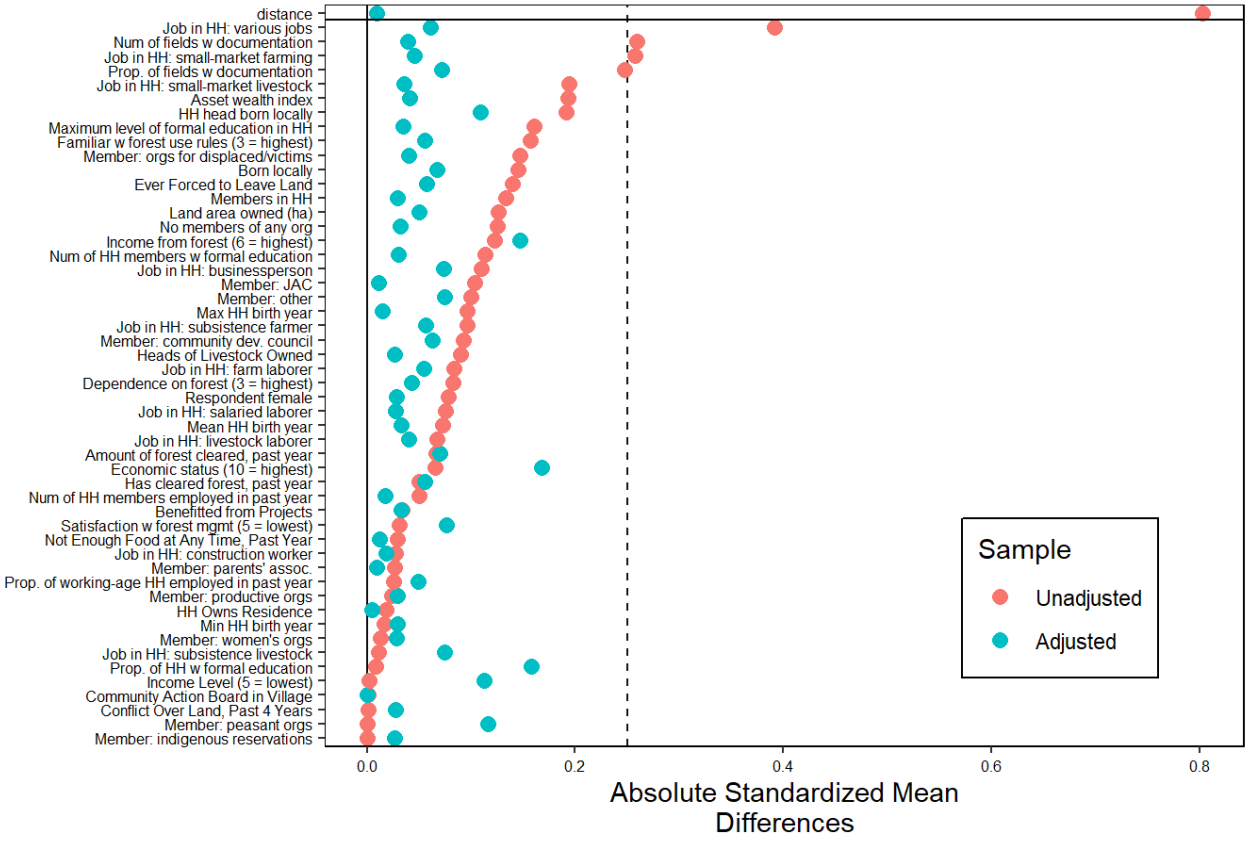


Figure 74: Genetic Matching Results

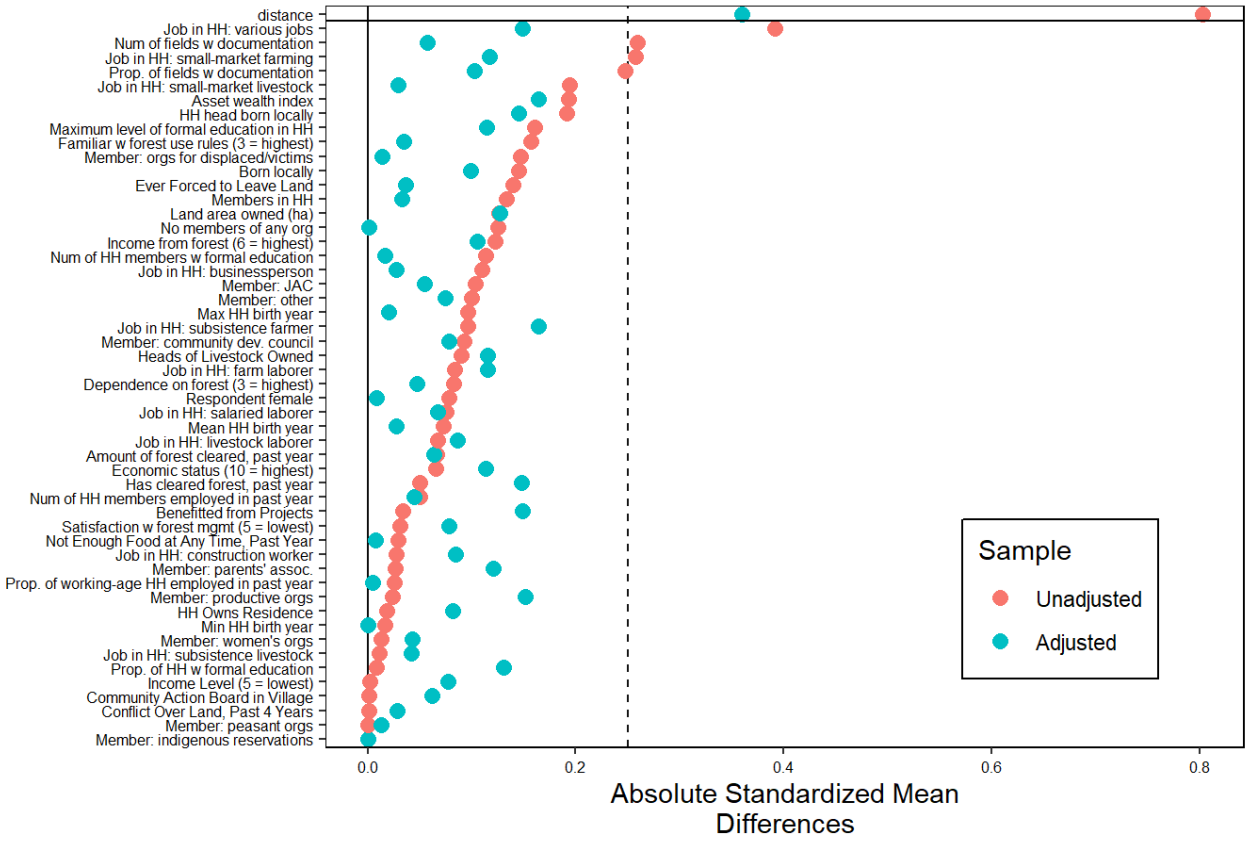
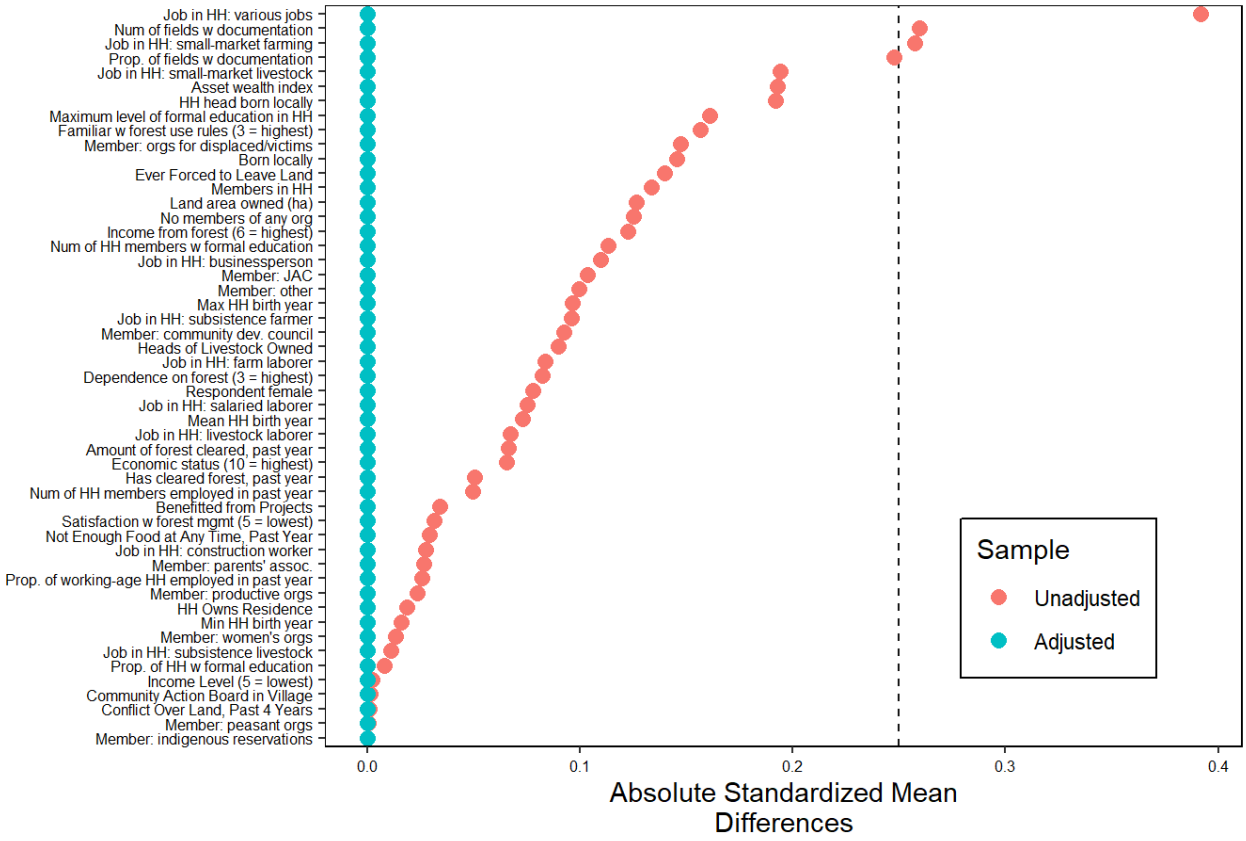


Figure 75: Entropy Balancing Results



POWER ANALYSIS

The team conducted power calculations to determine the MDI measurable given the baseline mean, standard deviation, and sample sizes for each indicator.[73] The team used a clustered design, to account for the level of treatment at the community level.

At the household level, the study is powered to detect medium to large changes—the necessary MDI is between 18 to 34 percent from the baseline mean across all indicators. The only indicator that would require an effect size greater than 30 percent is the total area owned and used by the household. See Table 20 for illustrative indicator power analysis, with details on the MDI for each indicator.

[73] The team conducted power calculations in R. Parameters: power = 0.80; alpha = 0.05.

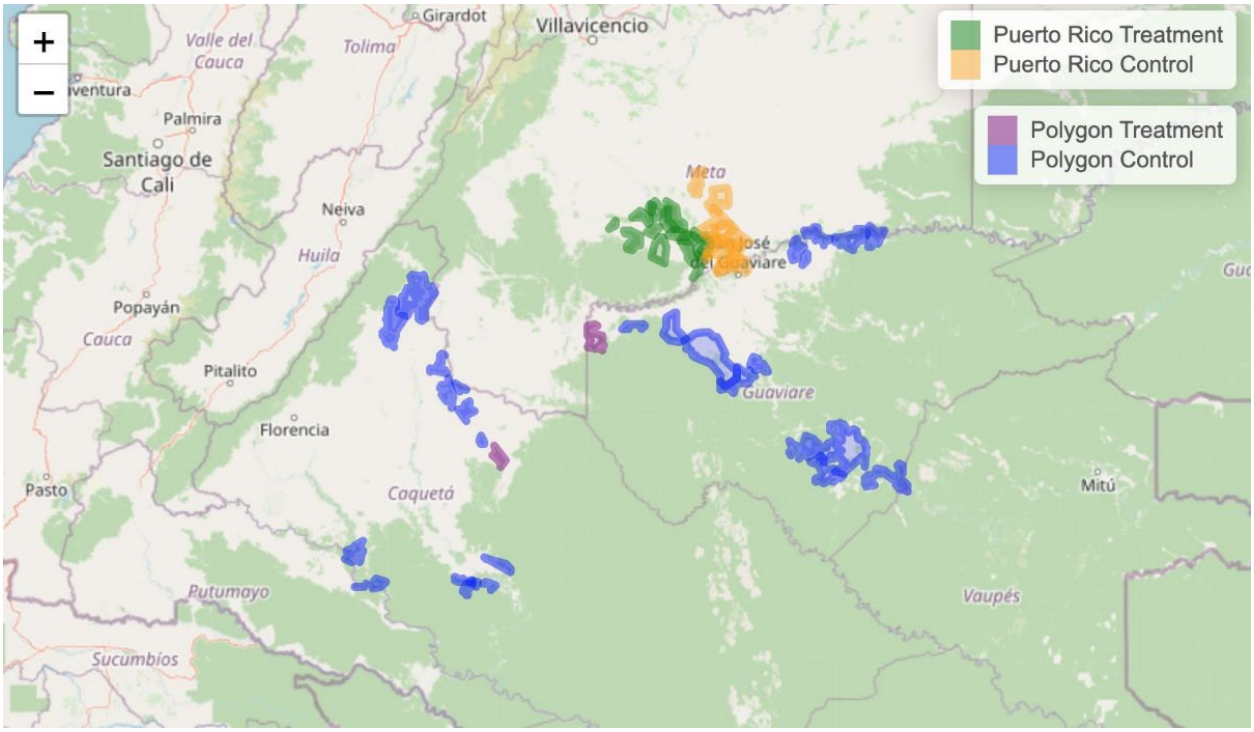
Table 20: Illustrative Indicator Power

OUTCOME	BASELINE VALUES		SAMPLE SIZE	MDI	%
	MEAN	SD			
Household depends on the forest for BASIC needs	0.68	0.47	1012	0.23	23%
Household has income comes from forest products or activities	0.11	0.32	1012	0.23	23%
Familiar with rules about forest use and access	0.65	0.48	1012	0.23	23%
Satisfied with how forests are managed	0.65	0.48	1012	0.18	18%
Household cleared virgin land in the past 12 months	0.1	0.31	1012	0.24	24%
Total virgin land household cleared (ha)	12.09	225.58	1012	0.18	18%
Total land area that household currently owns and uses (ha)	52.7	66.56	920	22.63	34%
Household has a legal title or legal document certifying the rights of occupation	0.61	0.49	1012	0.29	29%
Household had conflict on land in past 4 years	0.05	0.21	1012	0.21	21%
Household ever forced to leave land or had to leave your land as a result of the armed conflict	0.39	0.49	1012	0.29	29%
Household benefited from alternative livelihoods or sustainable development projects, illicit crop substitution projects, or forest conservation or reforestation projects	0.35	0.48	1012	0.26	26%
Number of cows, bulls, calves, or steers household currently works with or owns	19.83	45.47	1012	12.28	27%
Household does not have enough income to cover expenses	0.42	0.49	1012	0.2	20%
During the past 12 months, household did not have enough food because of a lack of money or other resources	0.51	0.5	1012	0.24	24%
Household owns residence	0.79	0.41	1012	0.24	24%
Presence of JAC	1	0.06	1012	0.18	18%
Member—JAC	0.62	0.48	1012	0.2	20%
Member—Productive organization	0.07	0.25	1012	0.27	27%

ANNEX V: GEOSPATIAL FINDINGS

This section presents estimated tree cover, as well as a five- and 10-year description of the tree cover loss of the treatment and comparison areas in Puerto Rico and the polygons (Figure 76) as well as a 5 km buffer around each area.

Figure 76: Puerto Rico and Polygon Treatment and Comparison Areas[74]



Each of the eight maps (one for each of the four geographies without the buffer and one with the 5-km buffer around study *veredas*/polygons) were loaded into Global Forest Watch (GFW). Using the data and analysis from GFW, the team estimated the tree cover in 2022 (the most current data in GFW), the percent tree cover loss over the five years prior to 2022, and the percent tree cover loss over the 10 years prior to 2022. The analysis only covers tree cover loss in each area and does not include any potential tree cover gain across the study area. Tree cover is defined as the stand level of vegetation greater than five meters and with a canopy density greater than 30 percent. It is mapped at 30x30 resolution and includes changes in both natural and planted forests. The unit of forest loss is kilo-hectare (kha).

Each of these eight areas is shown in the figures section below, first using the 2022 data on tree cover loss since 2018 (the five-year range), then using the 2022 data on tree cover loss since 2013 (the 10-year range). Finally, the same statistics are presented about tree cover loss in the 5-km buffer areas. In all figures, green is tree cover, pink is tree cover loss, blue is tree cover gain, and white is other land use. Note for the Polygon comparison areas the file size was too large to upload into GFW without losing boundary specificity. The geography was separated into 3 parts, which were analyzed together after being

[74] This figure was created by loading the study area boundaries into R using the Leaflet() function, where green represents tree cover.

weighted by area, but they are separated into the groups of Figures 82, 83, and 84 and Figures 86, 87, and 88 below.

PUERTO RICO

In 2022 the estimated tree cover in the treatment areas of Puerto Rico was 46 percent, compared to an estimated tree cover of 33 percent in the comparison areas of Puerto Rico. In the last five years (2018-2022) there has been a 5.48 kha loss in tree cover in the treatment areas of Puerto Rico, totaling six percent of the total area (Figure 77), compared to a 1.75 kha loss in tree cover in the comparison areas, totaling two percent of the total area, in the same time period (Figure 77). In the last 10 years (2013–2022), there has been a 9.68 kha loss in tree cover in the treatment areas of Puerto Rico, totaling to eleven percent of the total area (Figure 78), compared to a 3.93 kha loss in tree cover in the comparison areas of Puerto Rico, totaling to four percent of the total area, in the same time period (Figure 78).

Figure 77: Puerto Rico Treatment (left) and Comparison (right) Areas, 2018–2022

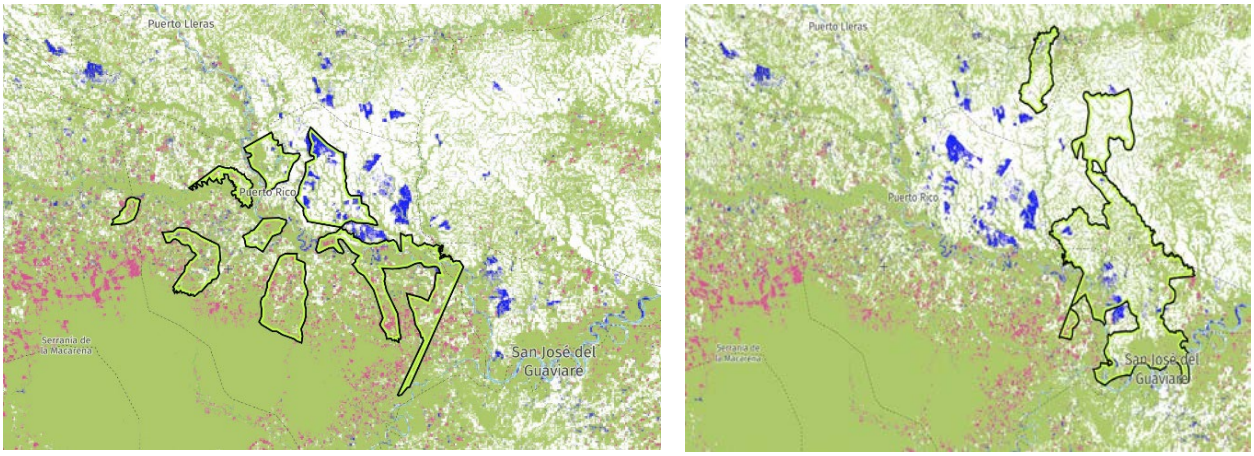
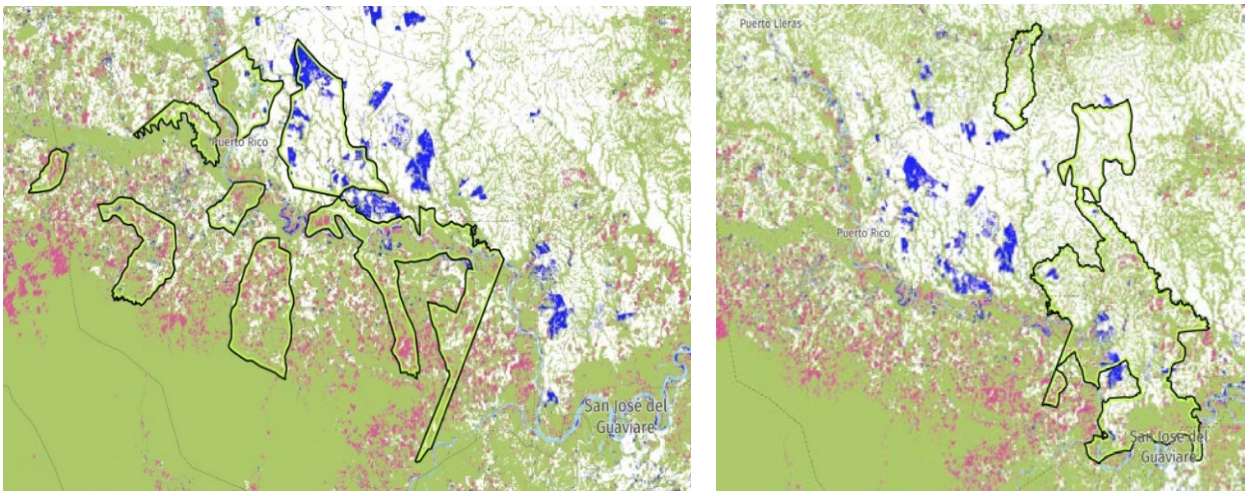


Figure 78: Puerto Rico Treatment (left) and Comparison (right) Areas, 2013–2022



Looking now at the buffer areas of Puerto Rico treatment and comparison, these buffer areas are each of the initial areas with an added 5 km buffer around them to include the forest activity in the surrounding area. In 2022 the estimated tree cover in the Puerto Rico treatment buffer area was 49 percent compared

to an estimated tree cover of 30 percent in the comparison buffer area. In the last five years (2018–2022) there has been a 17.24 kha loss in tree cover in the Puerto Rico treatment buffer area, totaling six percent of the total area (Figure 79), compared to a 5.56 kha loss in tree cover in the comparison buffer area, totaling two percent of the total area, in the same time period (Figure 79). In the last 10 years (2013–2022) there has been a 29.83 kha loss in tree cover in the Puerto Rico treatment buffer area, totaling ten percent of the total area (Figure 80), compared to an 11.34 kha loss in tree cover in the comparison buffer area, totaling four percent of the total area, in the same time period (Figure 80).

Figure 79: Puerto Rico Treatment (left) and Comparison (right) Buffer Areas, 2018–2022

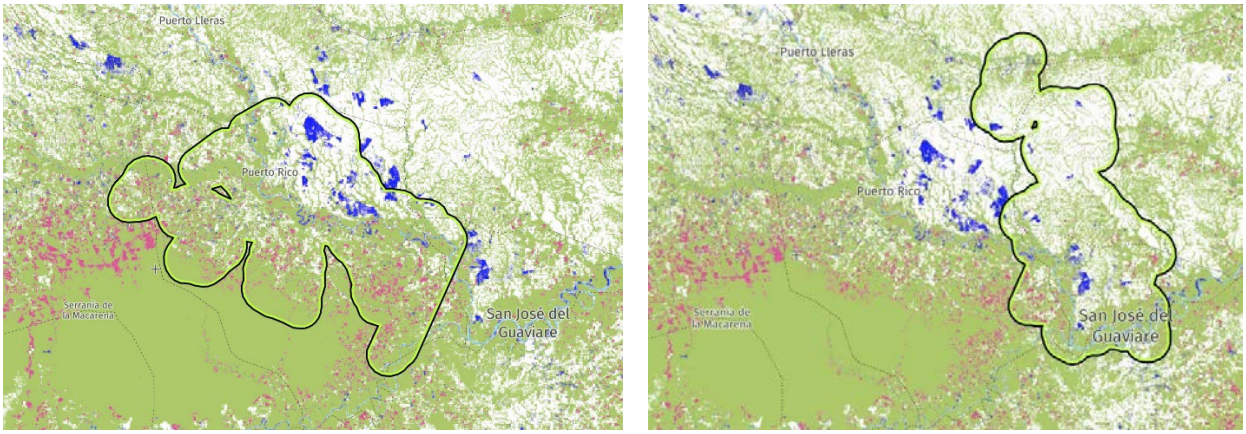
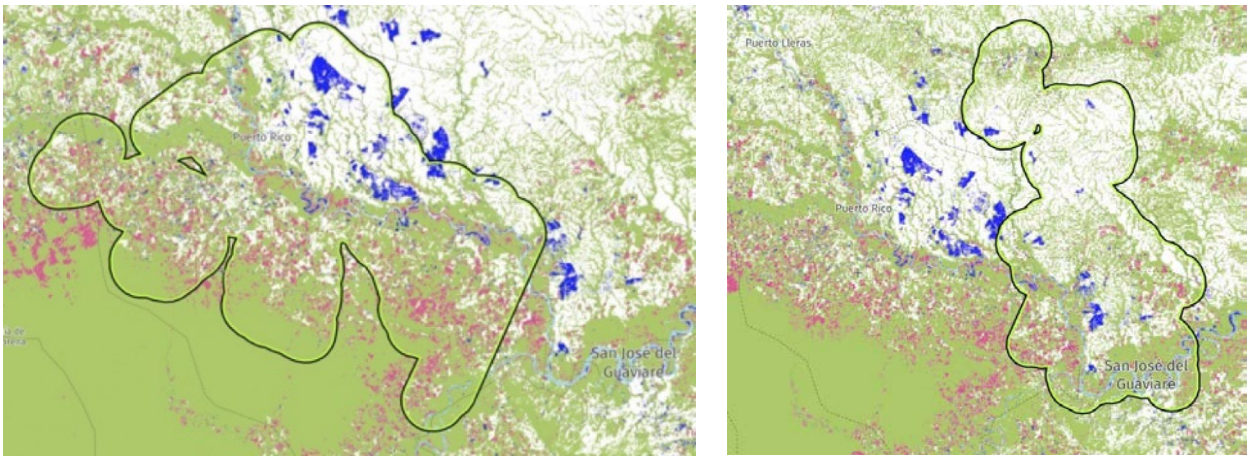


Figure 80: Puerto Rico Treatment (left) and Comparison Buffer Areas, 2013–2022



Comparing these results to general trends in the Meta department where the Puerto Rico treatment areas, comparison areas, and their buffer areas are located, from 2010 to 2022, Meta lost 647 kha of tree cover, equivalent to a 15 percent decrease in tree cover since 2010.

POLYGONS

In 2022 the estimated tree cover in the treatment areas of the Polygons was 43 percent, compared to an estimated tree cover of 68 percent in the comparison areas of the Polygons. In the last five years (2018–2022) there has been a 2.01 kha loss in tree cover in the treatment areas of the Polygons, totaling eleven percent of the total area (Figure 81), compared to a 29.48 kha loss in tree cover in the comparison areas

of the Polygons, totaling nine percent of the total area in the same time period (Figures 82, 83, and 84). In the last 10 years (2013-2022) the team sees a 3.58 kha loss in tree cover in the treatment areas of the Polygons, totaling 20 percent of the total area (Figure 85), compared to a 48.55 kha loss in tree cover in the comparison areas of the Polygons, totaling 14 percent of the total area, in the same time period (Figures 86, 87, and 88).

Figure 81: Polygon Treatment Areas, 2018–2022

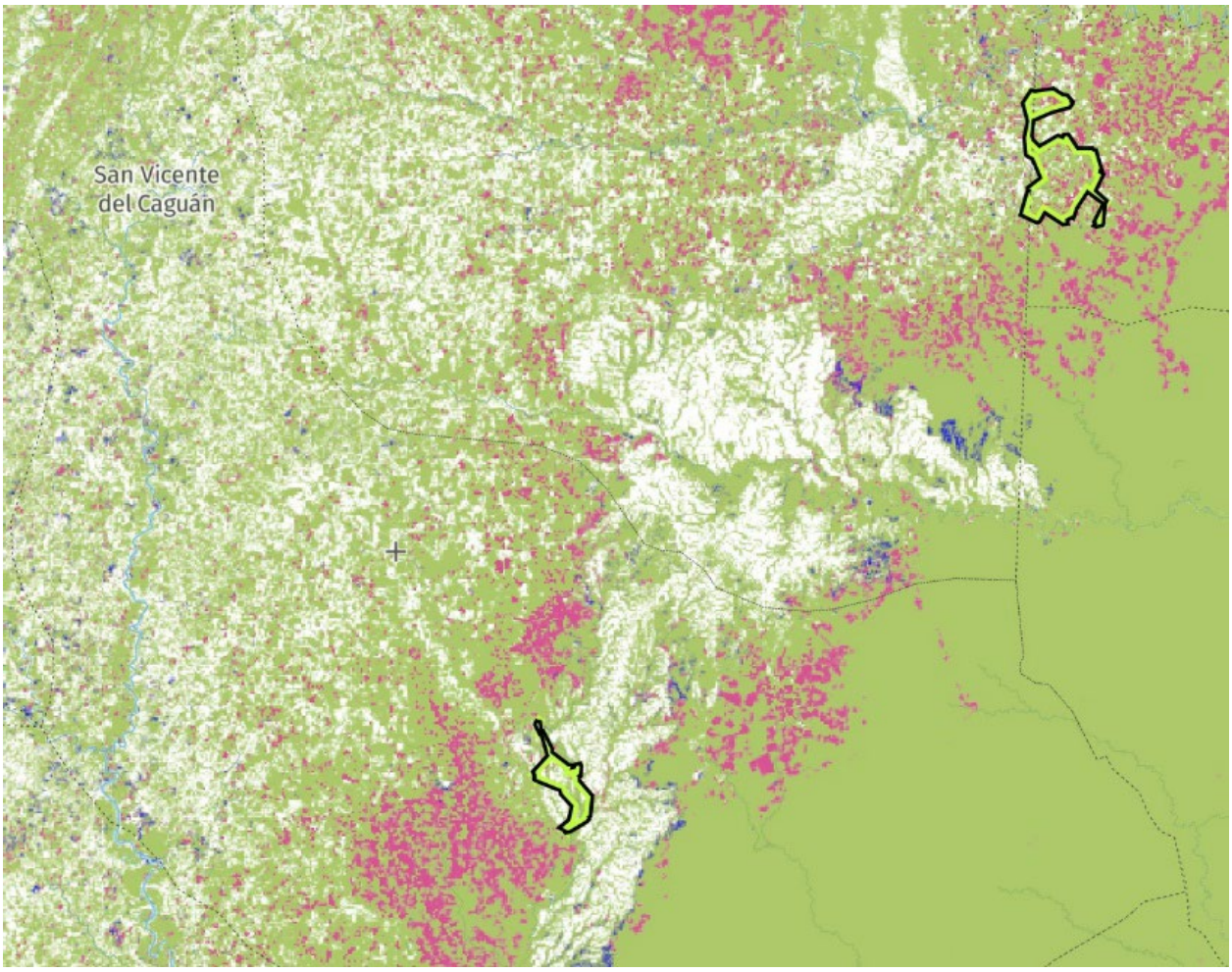


Figure 82: Polygon Comparison Areas (1/3), 2018–2022

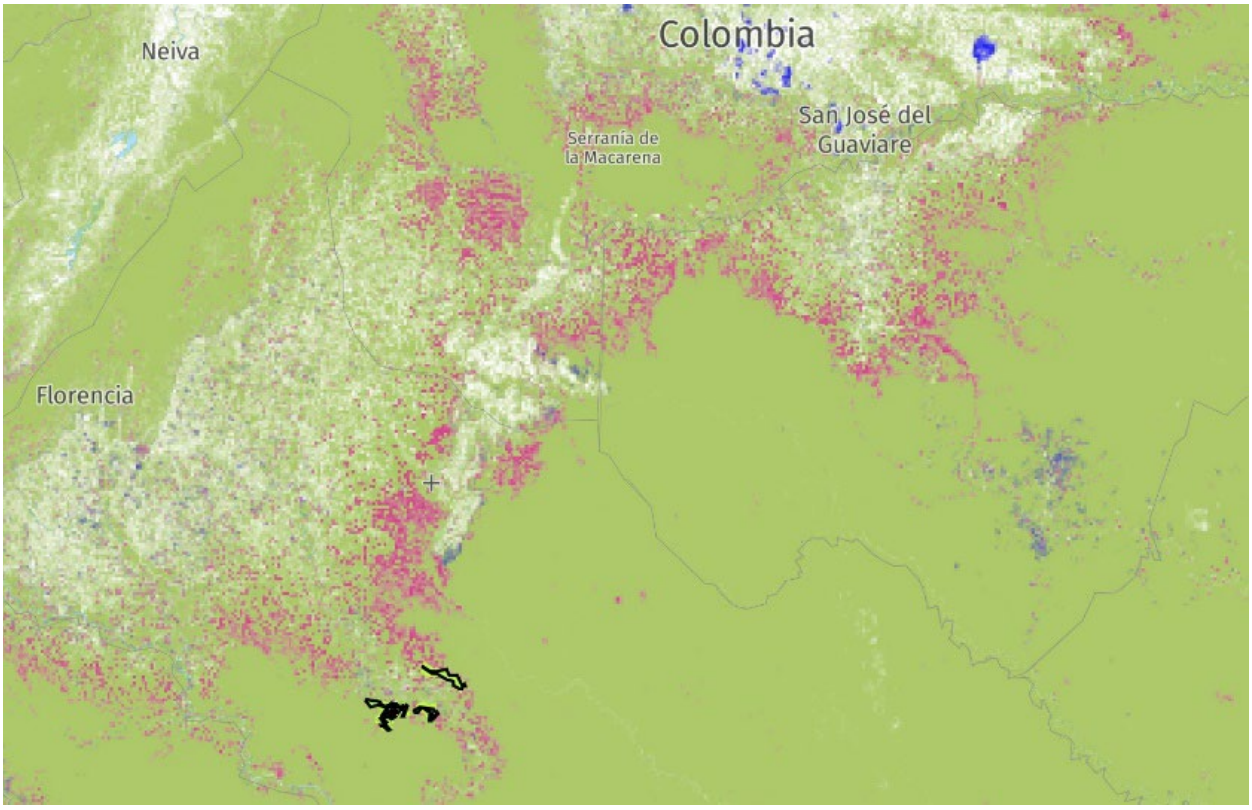


Figure 83: Polygon Comparison Areas (2/3), 2018–2022

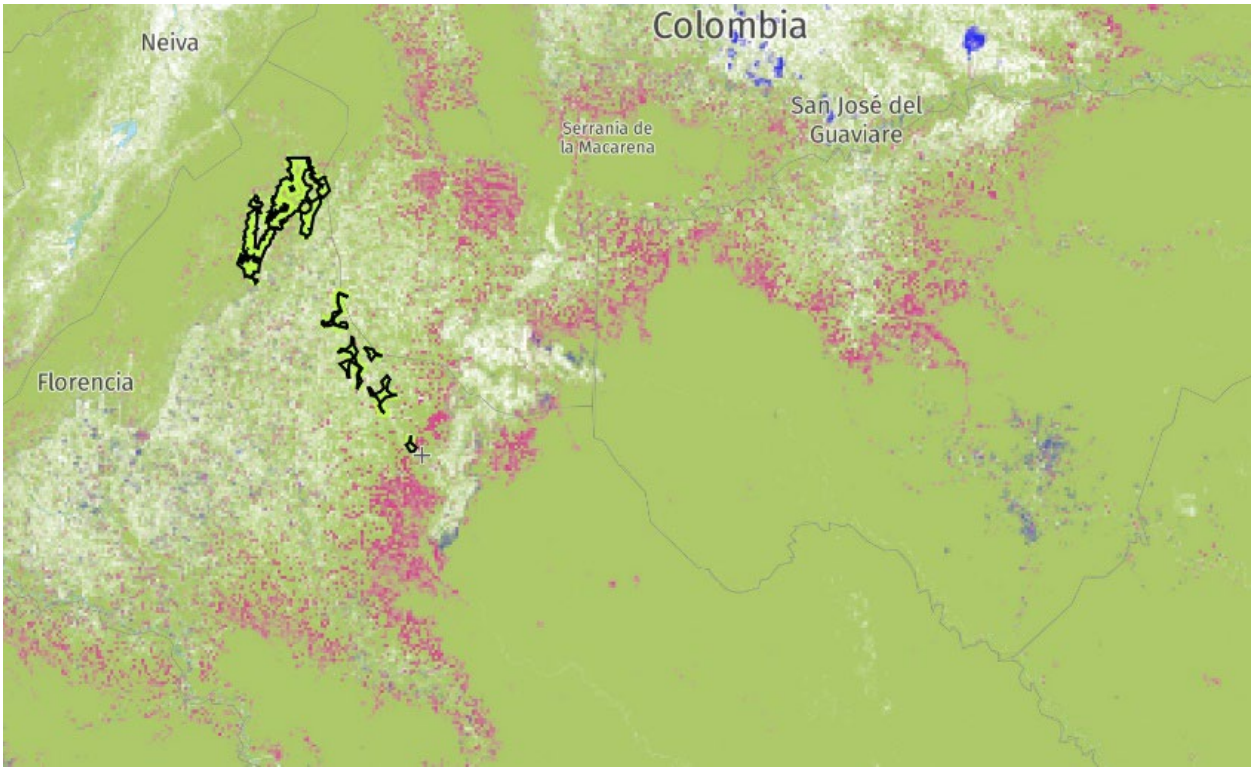


Figure 84: Polygon Comparison Areas (3/3), 2018–2022

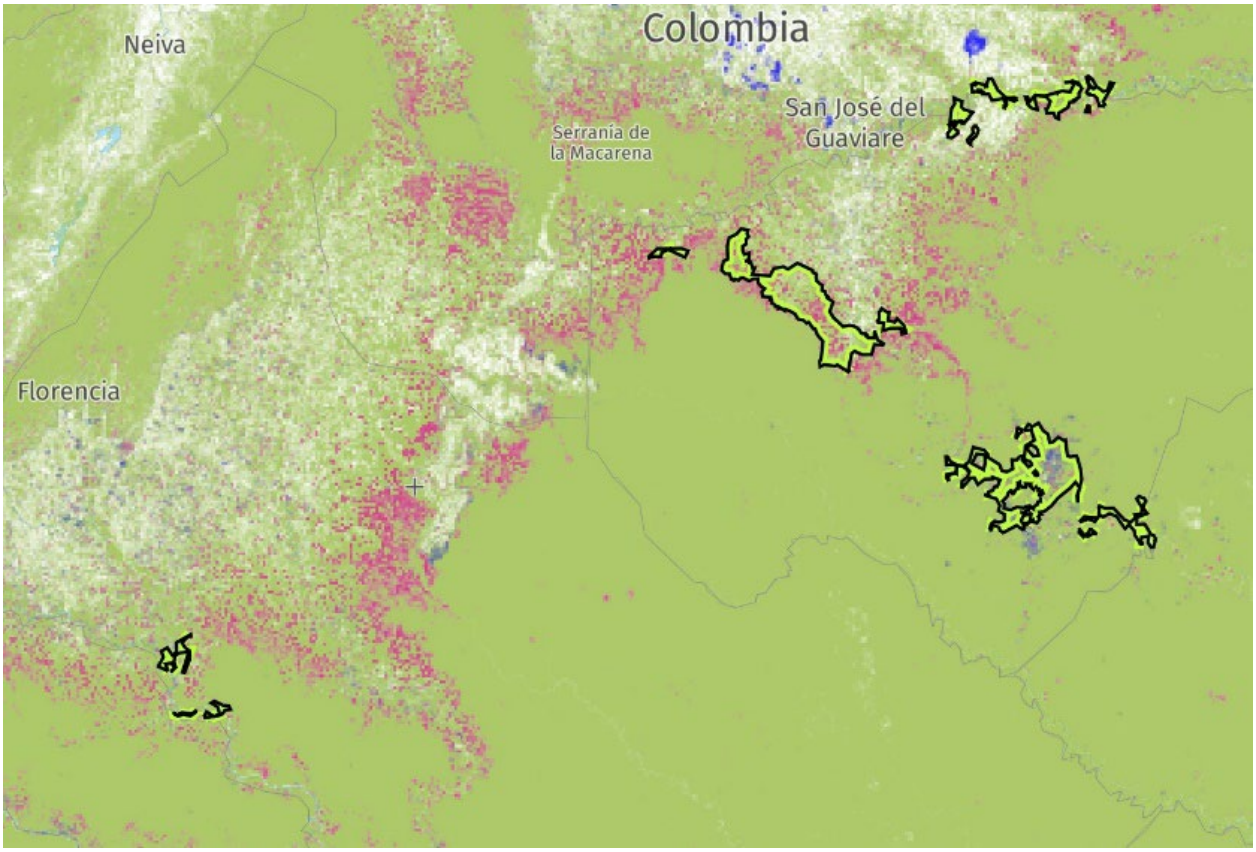


Figure 85: Polygon Treatment Areas, 2013–2022

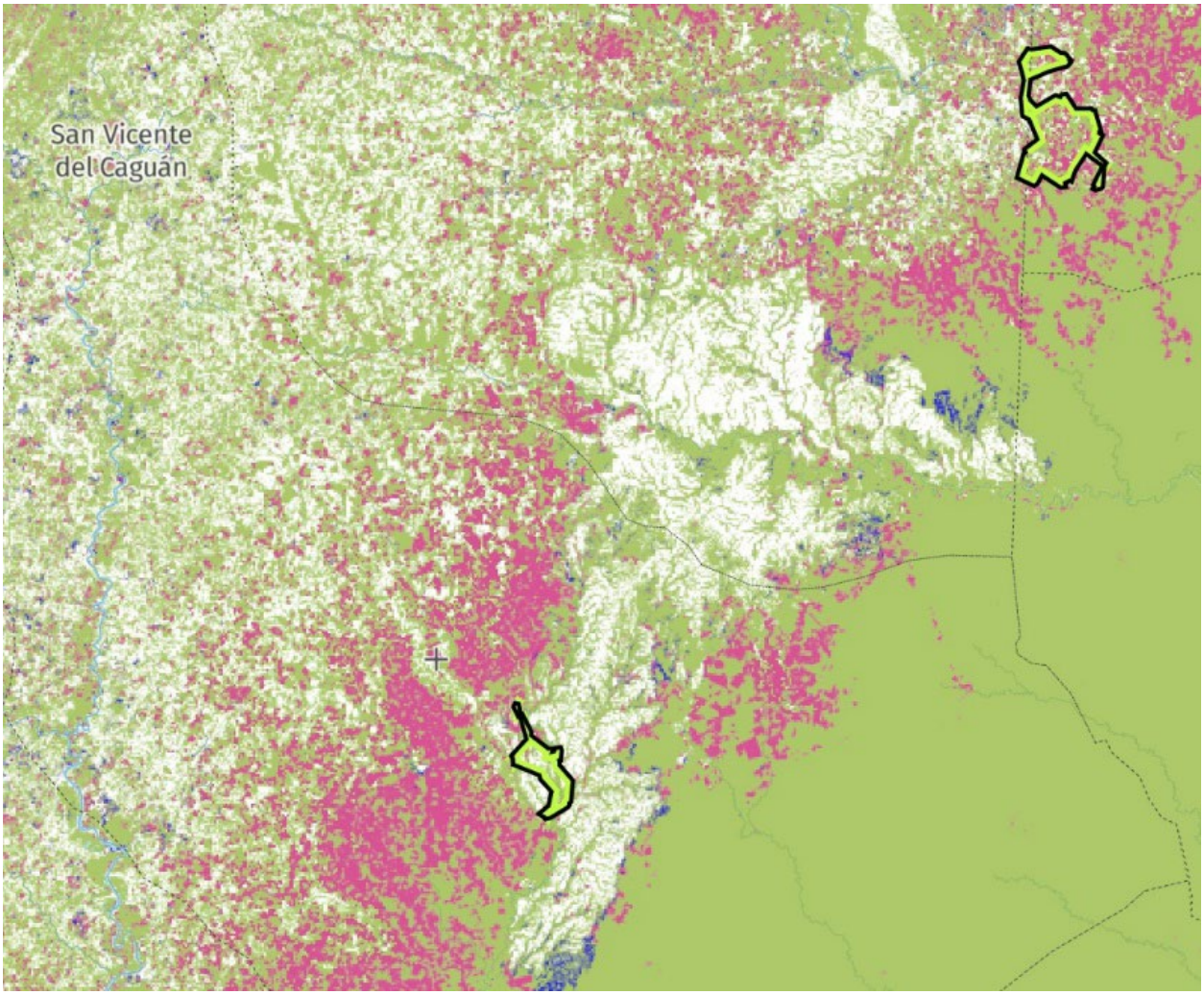


Figure 86: Polygon Comparison Areas (1/3), 2013–2022

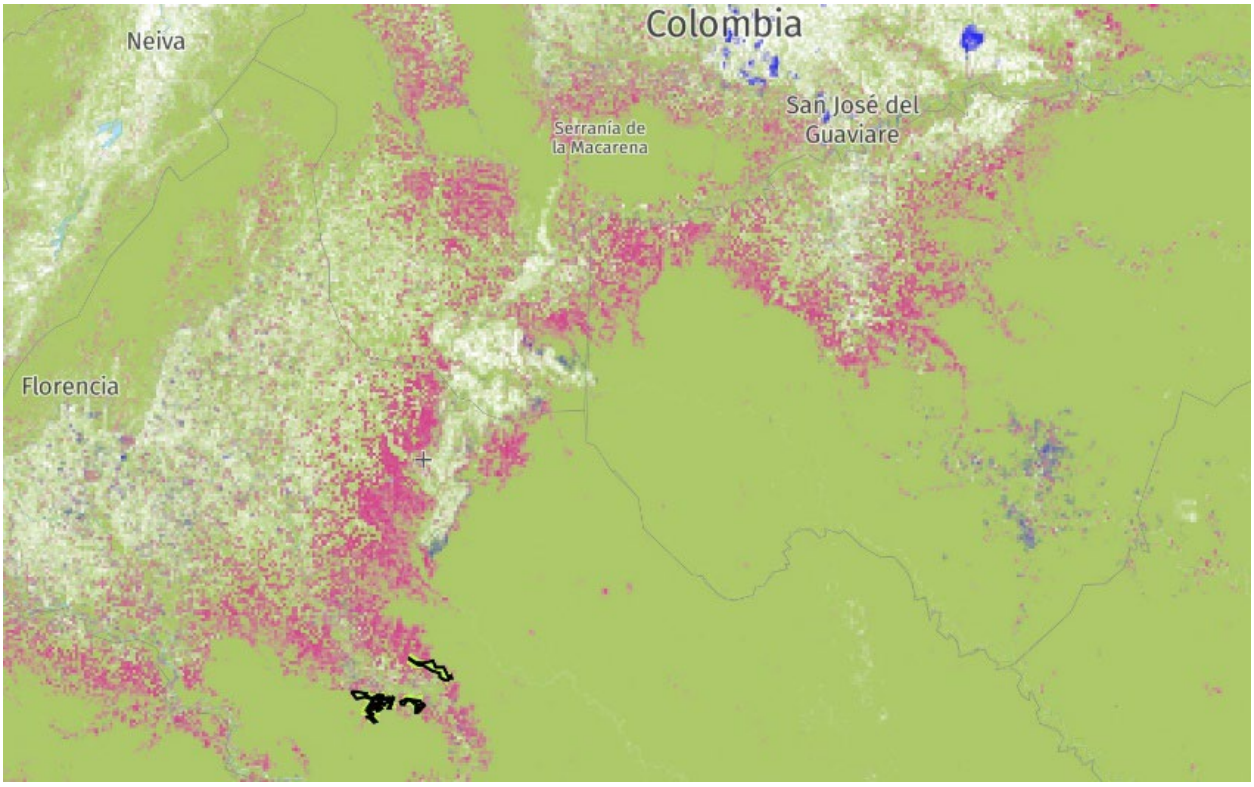


Figure 87: Polygon Comparison Areas (2/3), 2013–2022

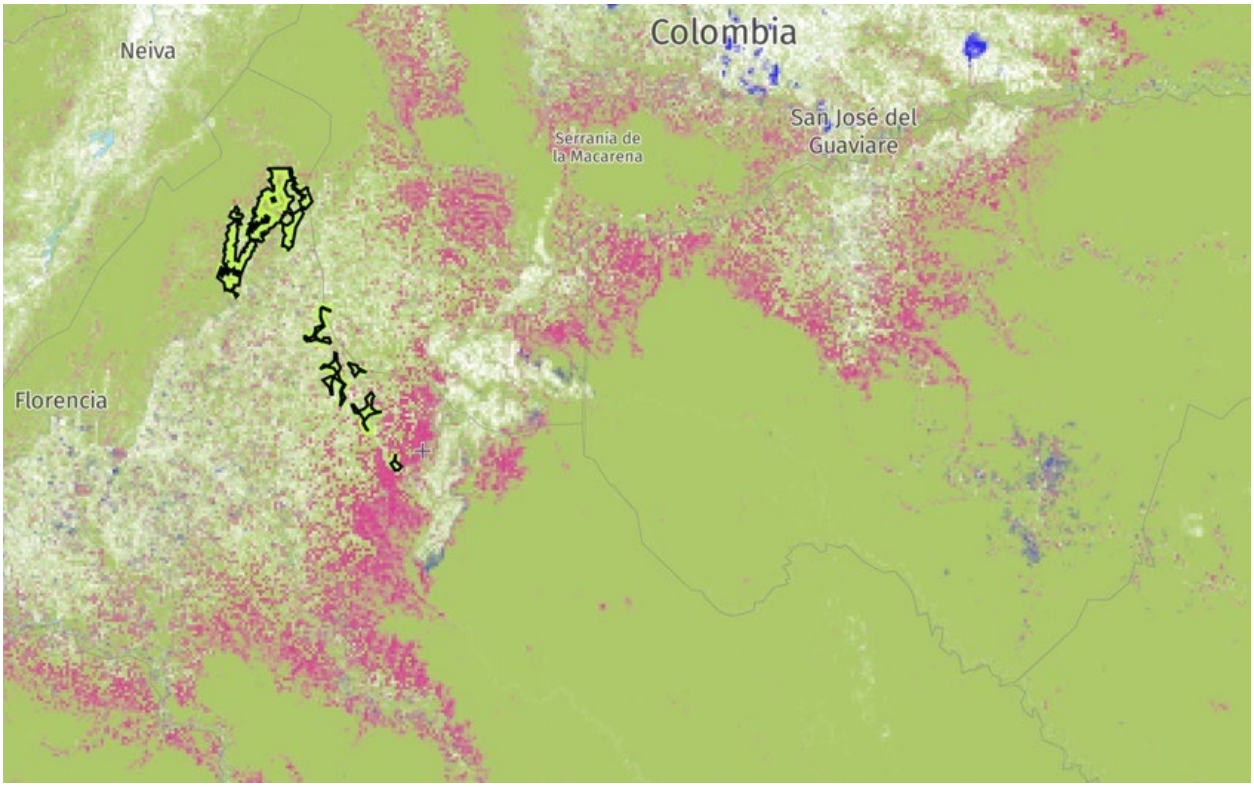
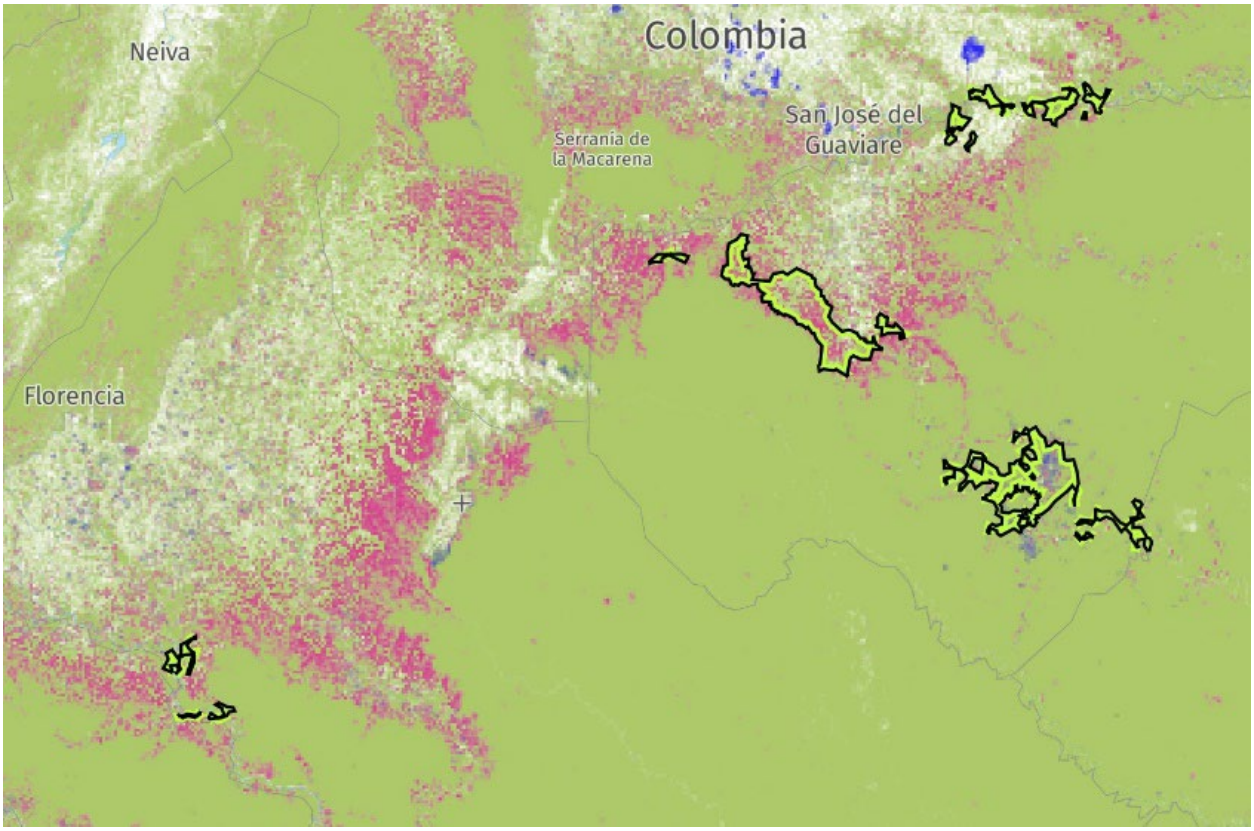


Figure 88: Polygon Comparison Areas (3/3), 2013–2022



Looking now at the buffer areas of the polygons' treatment and comparison, in 2022 the estimated tree cover in the polygon treatment buffer area was 39 percent. Compared to an estimated tree cover of 67 percent in the polygon comparison buffer area. In the last five years (2018–2022) there has been a 10.40 kha loss in tree cover in the polygon treatment buffer area, totaling eleven percent of the total area (Figure 89), compared to a 88.70 kha loss in tree cover in the polygon comparison buffer area, totaling 7 percent of the total area, in the same time period (Figure 90). In the last 10 years (2013–2022) there has been an 18.36 kha loss in tree cover in the polygon treatment buffer area, totaling 21 percent of the total area (Figure 91), compared to a 151.85 kha loss in tree cover in the polygon comparison buffer area, totaling twelve percent of the total area, in the same time period (Figure 92).

Figure 89: Polygon Treatment Buffer Areas, 2018–2022

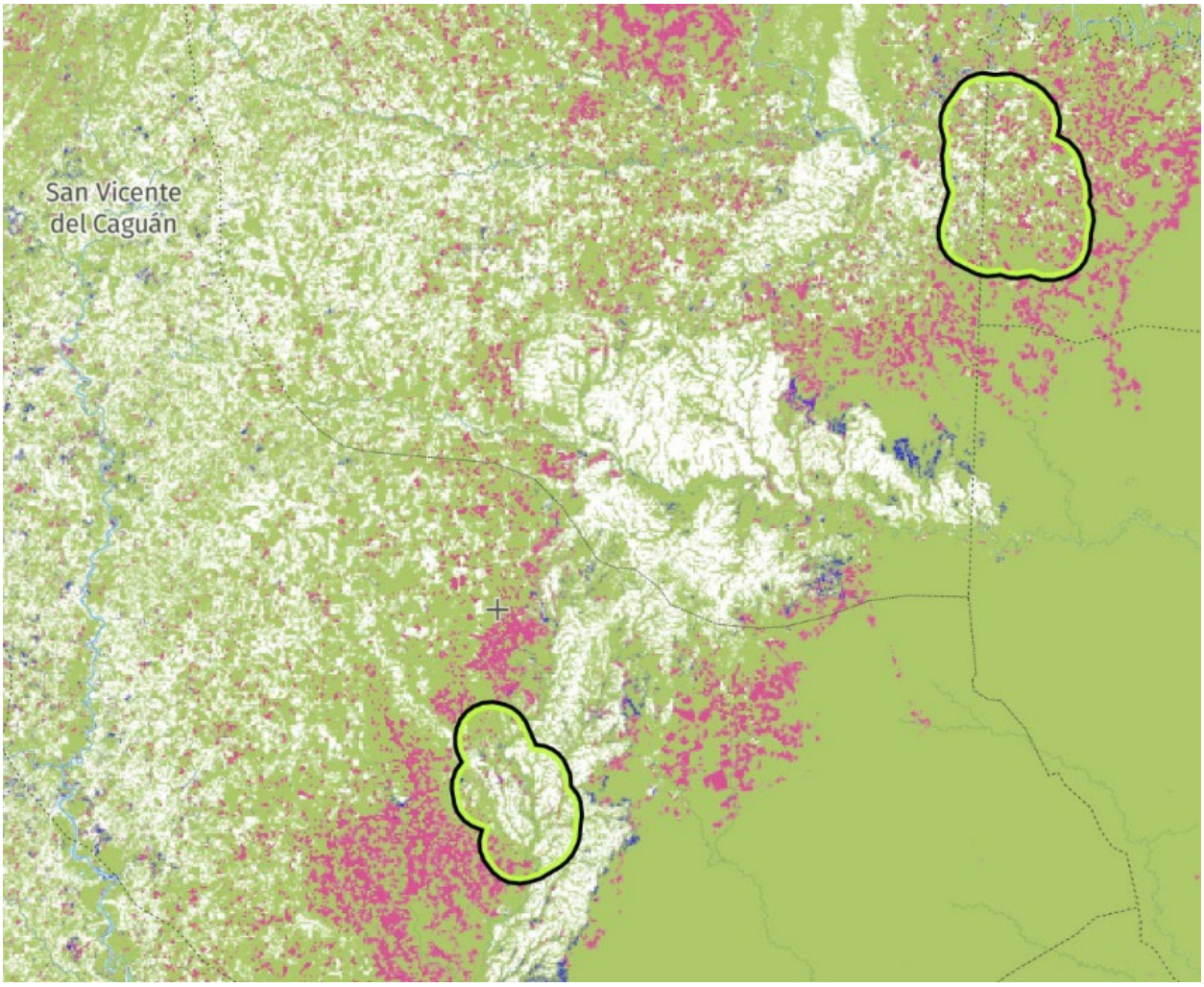


Figure 90: Polygon Comparison Buffer Areas, 2018–2022

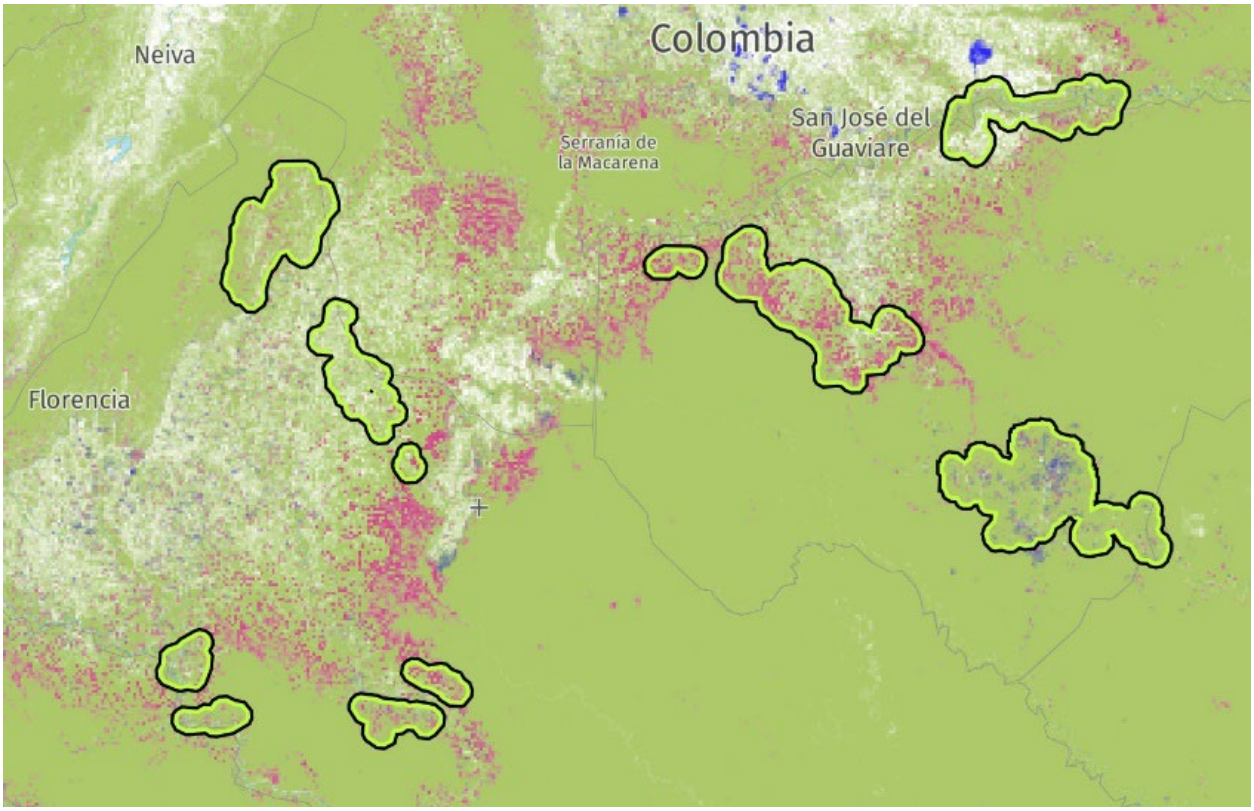


Figure 91: Polygon Treatment Buffer Areas, 2013–2022

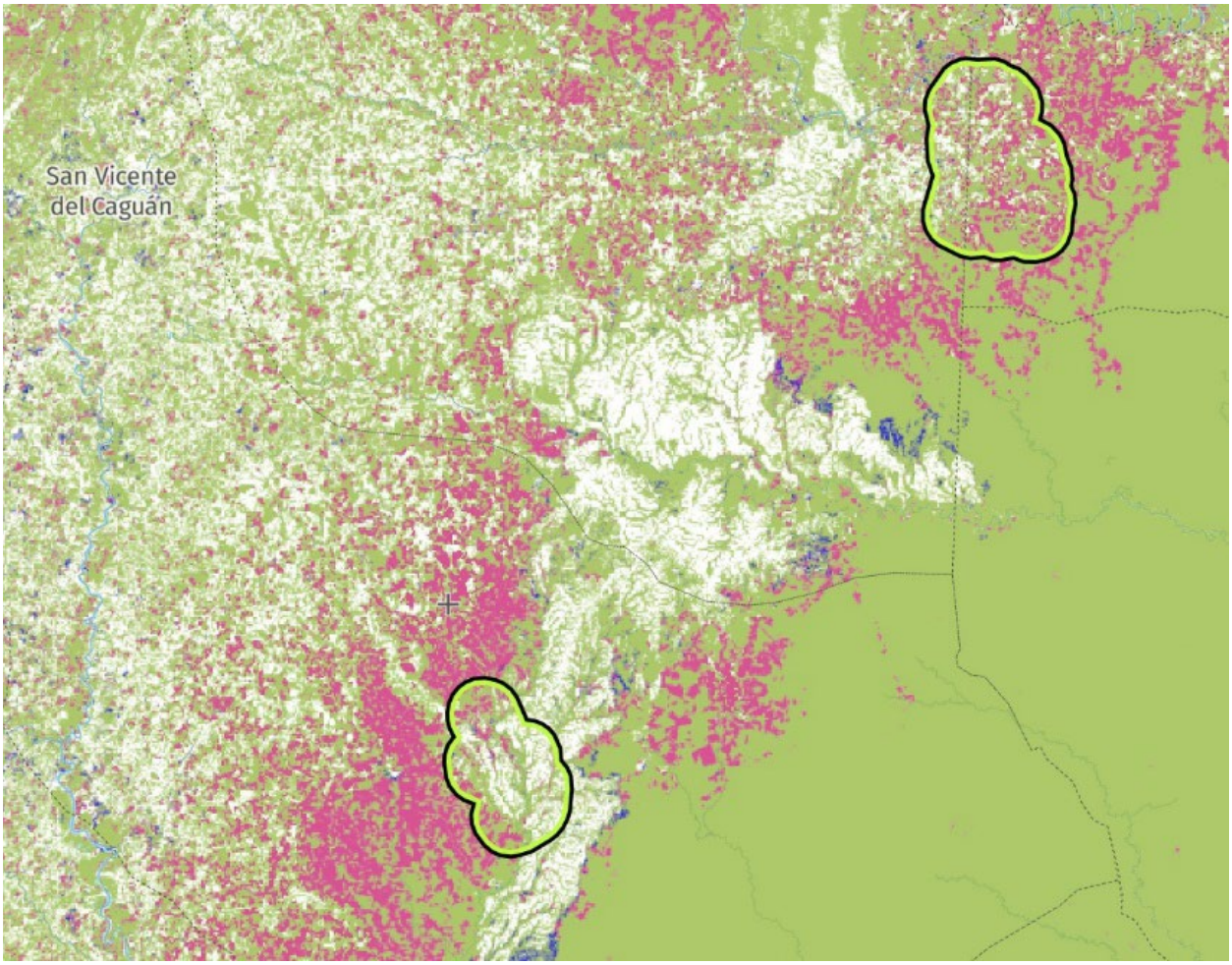
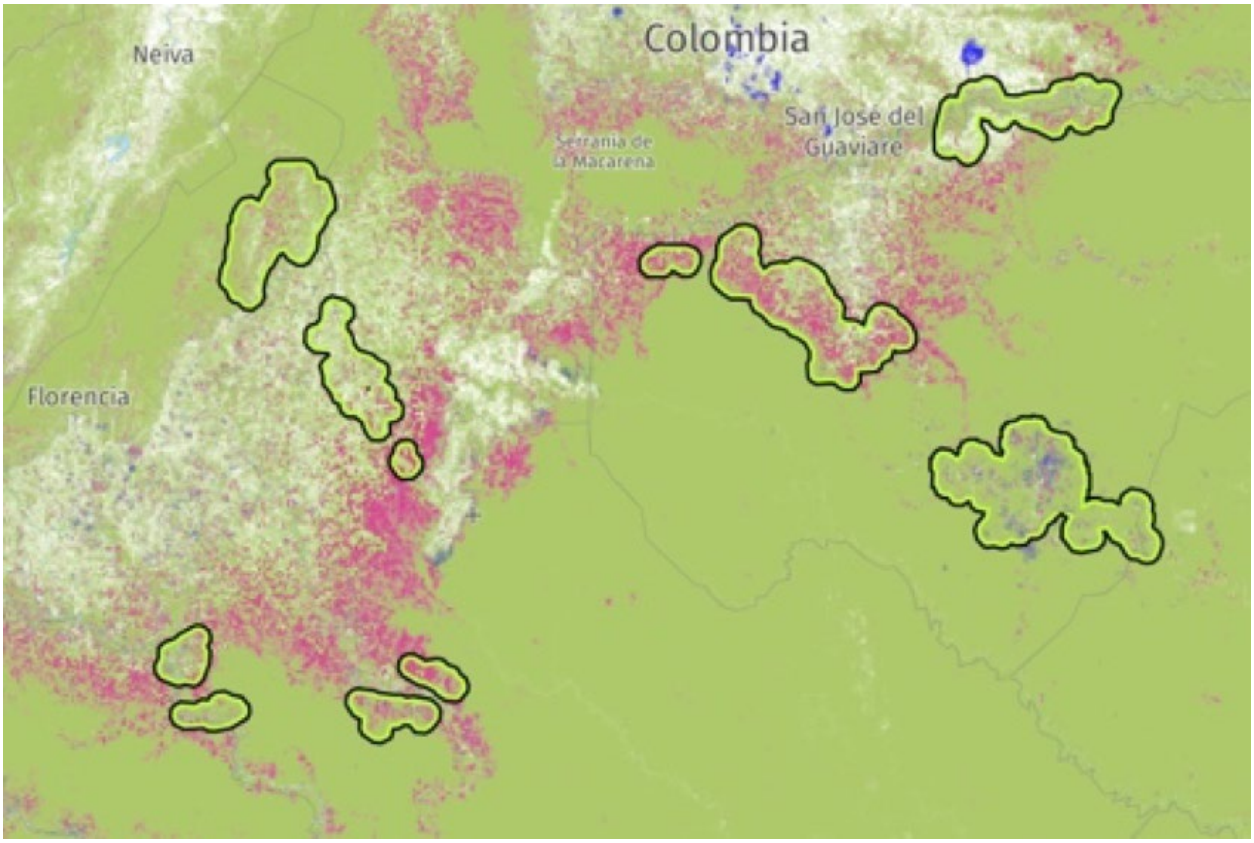


Figure 92: Polygon Comparison Buffer Areas, 2013–2022



Comparing this to the general trends in Guaviare and Caquetá departments, where the treatment and comparison areas of the polygons and their buffer areas are located, from 2001 to 2022, Guaviare, lost 409 kha of tree cover, equivalent to an eight percent decrease in tree cover since 2010. From 2001 to 2022, Caquetá lost 773 kha of tree cover, equivalent to a ten percent decrease in tree cover since 2010.

ANNEX VI: FULL SURVEY EXPERIMENT METHODS AND ANALYSIS

This section presents analysis of the collected baseline survey experiments from three municipalities: 1) Puerto Rico, 2) San José, and 3) Puerto Concordia. The baseline data includes list experiment and conjoint analysis experimental designs to extract truthful responses from survey participants. The findings for Experiment I, which used a list experiment design to analyze the income sources of respondents and if coca production was one of them, suggest a lack of statistical significance of coca in income activities. Experiment II, which used a conjoint analysis experimental design to assess the probability of landowners clearing land for cattle grazing using specific variables, also demonstrates a lack of statistical significance on the probability of landowners clearing land for cattle grazing. Experiment III, which also used a conjoint analysis experimental design to assess the factors that impact land safety and protection by presenting randomized hypothetical scenarios to participants, suggests statistical significance in having state security monitoring forces, land-titles, and land of low interest to agribusiness.

ANALYSIS OF INCOME SOURCES OF PARTICIPANTS (LIST EXPERIMENT)

EXPERIMENTAL DESIGN

In this experiment, researchers sought to understand the extent and distribution of coca production in the regions of interest. A list experiment design was used to elicit truthful responses from respondents around the subject of coca production. Though coca farming is illegal in Colombia, it remains a prevalent and lucrative option for farmers, despite its cultivation practices contributing to widespread deforestation. The list experiment relies on a simple premise described by Blair and Imai (2012):

> *"The premise of list experiments is that if a sensitive question is asked in an indirect fashion, respondents may be more willing to offer a truthful response even when social norms encourage them to answer the question in a certain way."*[75]

Evaluators embedded a list experiment within the baseline survey to assess coca production prevalence among the surveyed regions. Respondents were asked to report how many activities their household had participated in to earn money in the past 12 months without reporting which activities they were. Respondents were randomly assigned to view either a list of four or five potential activities:

Table 21: List Experiment Responses

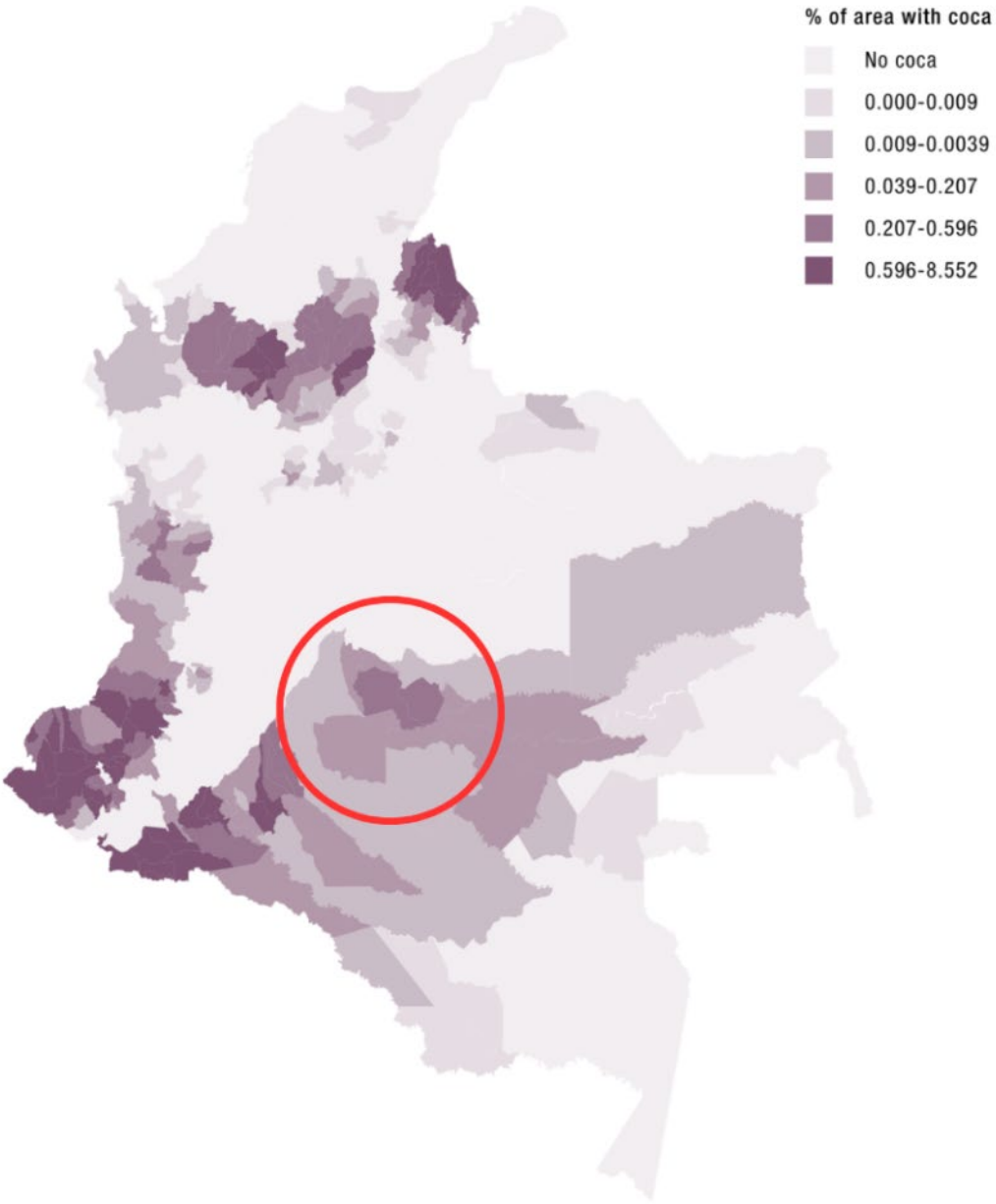
ACTIVITIES (EXPERIMENT 2A)	ACTIVITIES (EXPERIMENT 2B)
Carpentry	Carpentry
Basketry/Manufacturing of Mats	Basketry/Manufacturing of Mats
Brickwork/Construction	Brickwork/Construction

[75] Blair, G. J., & Imai, K. (2012). Statistical Analysis of List Experiments. *Political Analysis*, *20*(1), 47–77. https://doi.org/10.1093/pan/mpr048

ACTIVITIES (EXPERIMENT 2A)	ACTIVITIES (EXPERIMENT 2B)
Auto Mechanics	Auto Mechanics
	Coca Production (Sensitive Item)

In this context, the theory is that respondents may be unwilling to state outright if they engage in coca practices due to their illegality. Any differences in responses between Experiment 2a and Experiment 2b can be attributed to coca production. This approach allows researchers to elicit the prevalence of coca production without directly asking whether a respondent engages in coca production, since the experiments are otherwise identical. If respondents answer the list experiment question truthfully, the team should see a statistically significant difference in average response numbers between 2A and 2B, indicating that some respondents are engaging in coca production. Participants assigned to the control group received a list of four options of how their household earned money and participants assigned to the treatment groups received the same four options plus an additional option of coca production. Figure 93 below represents the surveyed regions known for coca cultivation.

Figure 93: Map of Coca Cultivation Regions



Source: SIMCI Project (Sistema Integrado de Monitoreo de Cultivos Ilícitos) of UNODC's Colombia Office.

EXPERIMENT RESULTS

Survey respondents did not exhibit any reported differences in money-earning activities between Experiment 2a and Experiment 2b. Between Experiment 2a and 2b, the average number of activities respondents reported engaging in were not significantly different. The lack of a statistically significant difference contradicts the known coca production occurring in the surveyed areas but may be attributed to the floor effect, in which the incidence of respondents reporting engaged in none of the listed activities between both experiments leads to a failure in detecting a meaningful difference.[76] The standard deviations

[76] Imai, K. and Blair, G. (2010) Statistical Analysis of List Experiments - Harvard University. NJIT Mathematics. Available at: https://imai.fas.harvard.edu/talk/files/NJIT10.pdf (Accessed: April 12, 2023).

among all of the municipalities for both Experiment 2a and Experiment 2b are larger than the average number of activities a respondent reportedly engaged in, indicating a broader spread in the responses, with a high incidence of "0" responses (floor effect), skewing the mean downward. Table 21 and Table 22 show the analysis from the list experiment.

Table 22: Mean Number of Items Selected by Municipality (List Experiment)

Experiment 2 Descriptive Statistics Table

Municipality	N	Mean	Std. Deviation	Std. Error	Conf. Interval	Group
Puerto Concordia	92	0.26	0.53	0.06	0.11	Control
Puerto Rico	252	0.24	0.52	0.03	0.06	Control
San Jose	61	0.16	0.58	0.07	0.15	Control
Puerto Concordia	99	0.26	0.53	0.05	0.11	Treatment
Puerto Rico	261	0.25	0.51	0.03	0.06	Treatment
San Jose	59	0.36	0.58	0.08	0.15	Treatment

To test for the experiment design effects, the team conducted a Bonferroni post-hoc analysis, a series of t-tests performed on each pair of groups. This compared the difference between the number of selected items in the control group with the number of selected items in the treatment group. The p-value of 0.71 (Figure 98 in the Appendix) indicates that the team failed to reject the null hypothesis that there is no design effect based on participant responses across all three municipalities.

Additionally, the team used linear regressions to determine if there were differences in the responses based on the participant's municipality for both the control and treatment groups. The results show that there were no statistical differences in either condition (Tables 27 and 28 in the Appendix).

CONJOINT ANALYSIS OF FACTORS IMPACTING LAND CLEARING FOR CATTLE GRAZING (EXPERIMENT 7A)

EXPERIMENTAL DESIGN

This survey experiment was conducted to assess the likelihood of landowners clearing land for cattle grazing outside the limits of their own plots in the absence of a government-issued title to the land, with the presence of armed groups as monitoring forces protecting the area. This was designed as a 2x2x3 conjoint experiment using vignettes. The dependent variable measured is the likelihood of a participant to clear the land for cattle grazing. The independent variables are "title1" (whether the land owner has a **government-issued title** to the land, or **no government-issued title** to the land), "monitor1" (whether the land is monitored by **state security** or **armed groups**), and "earn1" (the possibility that participants could earn **$600, $1,200**, or **$2,400** USD per month).

Each participant was assigned a single vignette where the independent variables were randomized within it. Below is an example of this vignette:

> *"Imagine the following scenario. You have a piece of primary or secondary forest of 1 (one) hectare in this municipality. You do **not have a title** to the land issued by the government.*

*Additionally, the deforestation where this land is located is **monitored by armed groups**, however, grazing cattle can generate a monthly income of **$2,400**."*

After reading the vignette, the participants were then asked to rate how likely they would be to clear land for cattle grazing on a 5-point Likert scale with 1 being "Not Likely" and 5 being "Extremely Likely." They were also given the options of "don't know" and "prefer not to respond."

EXPERIMENTAL RESULTS

A linear regression model was used with robust standard errors to identify the effect of the independent variables. Prior to running the regression, the data for those who responded with "don't know" and "prefer not to respond" were dropped from the sample. Based on the regression results presented in Table 26 in the Appendix, the variables "monitor" and "High_Earning" are (marginally) significant at the 10% level. Specifically, the "monitor" variable is just above the 5% level ($p = 0.061$), while the "High_Earning" variable is just below the 10% level ($p = 0.094$). This implies that the presence of armed groups or state security forces monitoring the area and the potential for high earnings from cattle grazing might have some influence on the likelihood of landowners clearing land for cattle grazing. However, it is essential to interpret these results cautiously due to the large standard errors and small sample sizes observed. Further research with larger sample sizes and additional explanatory variables may be necessary to better understand the impact of these factors on land-use decisions in these contexts.

The coefficients for "Title", "Monitor", "Medium_Earning", and "High_Earning" were 0.09371 ($t = 0.78$, $p = 0.437$), -0.22616 ($t = -1.8$, $p = 0.061$), -0.07415 ($t = -0.53$, $p = 0.594$), and 0.26083 ($t = 1.68$, $p = 0.094$), respectively. The intercept term of the model was 1.898, which represents the predicted likelihood of engaging in land-clearing behavior when all the independent variables in the model are equal to 0. (i.e., no government-issued title, no monitoring presence, low earnings, and not located in San José or Puerto Concordia). In the context of the 1-5 scale used in the survey question, where 1 represents "Not Likely" and 5 represents "Extremely Likely," a value of 1.898 indicates a relatively low likelihood of engaging in land-clearing behavior.

However, the low likelihood of land clearing may be due to the survey question's hypothetical nature and the potential social desirability bias, as respondents may have given socially acceptable answers rather than answers reflecting their actual behavior.

The results of the regression analysis suggest that other factors not captured by the variables in the model might be driving land-clearing decisions in these contexts or that the sample size was not large enough to detect significant effects. Further analysis with larger sample sizes and additional explanatory variables may be needed to understand these factors and their potential impact on the success of the LfP program.

CONJOINT ANALYSIS OF FACTORS IMPACTING LAND SAFETY AND PROTECTION (EXPERIMENT 7B)

EXPERIMENTAL DESIGN

This survey experiment used a conjoint analysis to assess what variables impacted landowner confidence in their land's safety and protection. Survey respondents were presented with two hypothetical scenarios in which three variables were randomized and were asked to select the scenario in which they would feel the most confident in their land's safety and protection. The three randomized binary variables were "monitor" (whether the land is monitored by state security or armed groups), "interest" (whether the

land is of low interest or high interest to agribusiness), and "title" (whether the land owner does have a title or does not have a title for the land). The question below, along with scenarios 1 and 2, exemplify the choice structure presented to respondents.

(EXP2_CHOICE): IN SOME COMMUNITIES, PEOPLE'S LAND IS SAFE AND CLEARLY RESPECTED BY OTHERS, WHILE IN OTHER COMMUNITIES, PEOPLE'S LAND IS UNSAFE AND OTHERS MAY DISRESPECT IT. IMAGINE THE FOLLOWING TWO HYPOTHETICAL SCENARIOS AND TELL ME IN WHICH CASE YOU WOULD FEEL MORE CONFIDENT THAT YOUR PROPERTY IS SAFE AND RESPECTED?

- **Scenario 1:** Your plot is in an area that is of **[low / high]** interest to agribusiness from outside the community. You **[do / do not]** have formal papers showing you own this land. In addition, **[armed groups / state security forces]** have promised to protect the property rights of citizens in this area.
- **Scenario 2:** Your plot is in an area that is of **[low / high]** interest to agribusiness from outside the community. You **[do / do not]** have formal papers showing you own this land. In addition, **[armed groups / state security forces]** have promised to protect the property rights of citizens in this area.

Note: Table 24 displays the entire list of the possible two scenarios (2x2x2 choice structure). Instances where respondents were presented with two identical scenarios were removed from the analysis.

EXPERIMENTAL RESULTS—REGRESSION

A logistic regression model was used to estimate the log odds for each variable's impact on scenario selection. The coefficient estimate in the output indicates the average change in the log odds of the dependent variable, scenario selection, associated with a one-unit increase (binary change) in the predictor variable. The log of the odds was then transformed into a probability of scenario selection using the function:

Table 23: Logistic Regression Probability Estimates By Variable

Experiment 7b Model 2 Regression Table

Variable	Log Odds Estimate	Std. Error	Log Odds P Value	Probability Estimate
(Constant)	0.26	0.12	0.0259*	1.30
Interest	-0.30	0.12	0.0110*	0.74
Title	-1.52	0.12	<0.00000000000002***	0.22
Monitor	1.19	0.12	<0.00000000000002***	3.29

[1] *** P<.001
[2] ** P<.05
[3] * P<.1

A linear model could also estimate the probability; however, the team chose a logistic regression in order to estimate probabilities within the [0,1] range.

Probability=eβ
Interest = 1 when land is of high interest to agribusiness, 0 if low interest
Title = 1 when owner has title for land, 0 if no title
Monitor = 1 when land is monitored by armed groups, 0 if state security

When the land is of low interest, the owner does not have a title for the land, and the land is monitored by state security, the probability estimate of 1.30 tells us that there is a 30 percent relative likelihood that a respondent selects this as the scenario in which they feel most confident in their land's safety and protection. When the land is of high interest to agribusiness, the probability estimate of .74 tells us that there is a 26 percent ($(1-e^{\beta})*100$) decrease in the relative likelihood that a respondent answers that their land is safe and respected. When the land is being monitored by armed groups, the probability estimate of .22 tells us that there is a 78 percent decrease in the relative likelihood that a respondent answers that their land is safe and respected. When the landowner has a title, the probability estimate of 3.29 tells us that there is a 229 percent increase In the relative likelihood that a respondent answers that their land is safe and respected. All of these results are statistically significant at the .05 significance level.

Table 24 shows the eight possible scenarios a respondent could be presented with, given the 2x2x2 choice structure.

Table 24: List Possible Scenarios for Experiment 7B

SCENARIO	INTEREST	MONITOR	TITLE	N (# OF ASSIGNED OBS)
Scenario A	High	State Security	Have Title	189
Scenario B	High	Armed Groups	Have Title	180
Scenario C	High	State Security	No Title	177
Scenario D	High	Armed Groups	No Title	164
Scenario E	Low	State Security	Have Title	186
Scenario F	Low	Armed Groups	Have Title	170
Scenario G	Low	State Security	No Title	152
Scenario H	Low	Armed Groups	No Title	150

A logistic regression model was used to understand the impact of each individual scenario on the likelihood of respondent selection.

Table 25: Logistic Regression Probability Estimates by Scenario

Experiment 7b Model 1a Regression Table

Scenario	Log Odds Estimate	Std. Error	Log Odds P Value	Probability Estimate
Option A	1.02	0.16	0.000000000564***	2.77
Option B	-1.38	0.22	0.000000000679***	0.25
Option C	-1.01	0.22	0.000005860513***	0.36
Option D	-2.52	0.26	<0.000000000002***	0.08
Option E	0.55	0.25	0.031282*	1.73
Option F	-1.07	0.23	0.000002052528***	0.34
Option G	-0.78	0.23	0.000726***	0.46
Option H	-2.41	0.26	<0.000000000002***	0.09

[1] *** P<.001

[2] ** P<.05

[3] * P<.1

Our intercept estimate in this regression corresponds to scenario A, in which a respondent sees an option with land of high interest to agribusiness, state security as the monitor, and they have a title for the land. The probability estimate coefficient of 2.77 here tells us the base probability of scenario A being selected.

Scenario B, which differs from scenario A in that armed groups are now the monitor, has a probability estimate of 0.25, which tells us that there is a 75% ($(1-e^{\beta})*100$) reduction in the relative likelihood that a respondent selects that scenario compared to scenario A. Since the difference here is just in the monitoring force, this reduction can be attributed to respondents feeling less confident in their land safety when armed forces are the monitoring group as opposed to state security.

Scenario C, which differs from scenario A in that the land owner now no longer has a title for the land, but the land is of high interest to agribusiness and state security is the monitor, has a probability estimate of 0.36. This estimate indicates that respondents presented with scenario C have a 64 percent reduction in the relative likelihood of selecting this comparison to scenario A. Since the only difference here is whether or not the landowner holds a title for the land, this reduction can be attributed to respondents feeling less confident in their land's safety in scenarios in which the landowner does not have a title for the land.

Scenario D, in which respondents are presented with an option in which the land is of high interest to agribusiness, but the monitoring force is armed groups and the landowner does not have a title for the land, has a probability estimate of 0.08. This estimate tells us that, when presented with this scenario, respondents exhibit a 92 percent reduction in the relative likelihood that they select this option as compared to scenario A. This supports trends exhibited in scenarios B and C, where respondents reported feeling less confident in their land's safety and protection when the monitoring force was armed groups and the landowner had no title for their land. In other words, state security as the monitoring force and holding a title for the land increase respondents' reported feelings of confidence in their land's safety.

Scenario E, in which respondents see an option in which land is of low interest to agribusiness, state security is the monitoring force, and the landowner has a title for the land, has a probability estimate of 1.73. This tells us that there is a 73 percent greater relative likelihood that a respondent selects this scenario as opposed to scenario A. The difference in these scenarios is that in scenario E, the land is of low interest to agribusiness, as compared to high interest in scenario A, therefore the difference in the likelihood of scenario selection can be attributed to the impact of the land's interest level to agribusiness.

Scenario F, in which respondents see an option in which land is of low interest to agribusiness, armed groups are the monitoring force, and the landowner has a title for the land, has a probability estimate of 0.34. This indicates that there is a 66 percent reduction in the relative likelihood that a respondent selects scenario F in comparison to scenario A. Since, all other things held equal, land being of low interest to agribusiness increased the relative likelihood of respondent selection, this reduction can be attributed to the impact that armed groups (or alternatively, lack of state security as the monitoring force) have on respondent feelings of confidence that their land is safe and protected.

Scenario G, in which respondents see an option in which land is of low interest to agribusiness, state security is the monitoring force, and the landowner does not have a title for the land, has a probability estimate of 0.46. This tells us that respondents presented with this scenario exhibit a 54 percent decrease in the relative likelihood that they will select this option compared to scenario A. Scenario E, in which land was of low interest, state security was the monitoring group, but the landowner had a title for the land, produced an increase in the relative likelihood of respondent selection compared to scenario A. The only difference between scenarios E and G is whether or not the landowner has a title to the land, therefore the reduction in relative likelihood of respondent selection for scenario G can be attributed to the negative impact not having a title has on respondents' reported feelings of confidence in land safety.

Scenario H, which differs from scenario A in all three variables; here, land is of low interest to agribusiness, armed groups are the monitoring force, and the landowner does not have a title for the land. This scenario has a probability estimate of 0.09, meaning that respondents presented with this scenario have a 91% reduction in the relative likelihood of selecting this option when compared to scenario A. This can be attributed to the reduction in respondents' reported confidence as a result of armed groups rather than state security as the monitoring force as well as the landowner not having a title for the land. In other words, not having a title and having armed forces for the title and monitor variables decreases the likelihood of respondent selection, while the landowner having a title for the land and state security as the monitoring force increases the likelihood of respondent selection. Additionally, land being of low interest to agribusiness, all other things held equal, increases the likelihood of respondent selection, indicating respondents feel more confident in their land's safety and protection when their land is not of high interest to agribusiness.

EXPERIMENTAL RESULTS—FIGURE

Figure 94: Likelihood of Scenario Selection Across Municipalities

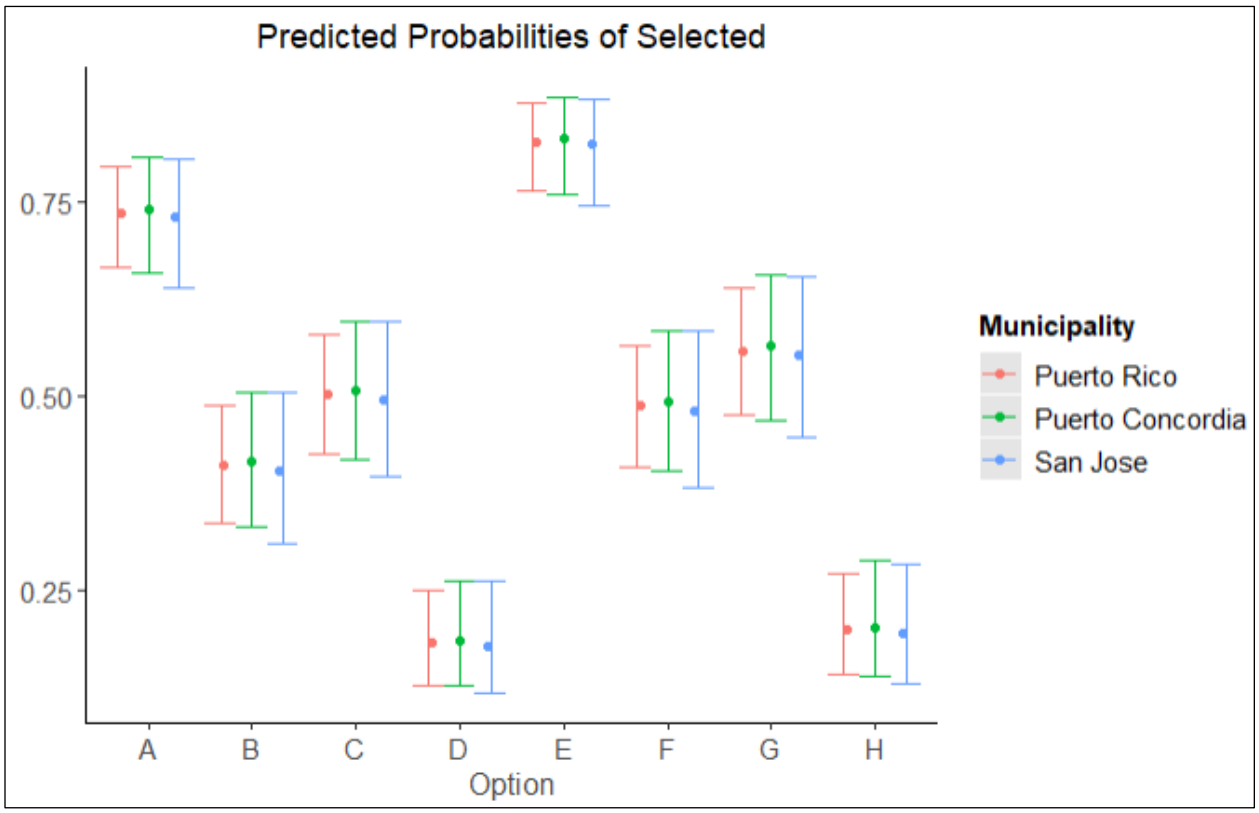


Figure 94 displays the probability of respondents selecting each scenario, regardless of the other option they are presented with, and mirrors the regression in Table 28 in the Appendix. This model includes fixed effects for each municipality. Scenarios A and E, in which a landowner has a title for the land and state security is the monitoring group, show a high probability of respondent selection. This is indicative of respondents perceiving those scenarios, and specifically those variable options, as affording them a higher level of safety and protection than other scenarios. Conversely, scenarios D and H, in which landowners hold no title and armed groups are the monitoring force, are associated with a lower probability of selection. This is indicative of respondents perceiving those scenarios as affording them lower levels of safety and protection than other scenarios. The impact of the land's interest to agribusiness does not appear to drastically change the probability of respondent selections. Based on the estimates, the team can also conclude that the impact of the variable differences on confidence in land safety and protection is roughly equal between the three surveyed municipalities (Table 28 in the appendix).

APPENDIX

Figure 95: Evidence of List Experiment Design Effects

```
Test for List Experiment Design Effects

Estimated population proportions
                              est.   s.e.
pi(Y_i(0) = 0, Z_i = 1)  0.0414 0.0284
pi(Y_i(0) = 1, Z_i = 1) -0.0012 0.0126
pi(Y_i(0) = 2, Z_i = 1) -0.0026 0.0042
pi(Y_i(0) = 3, Z_i = 1) -0.0025 0.0025
pi(Y_i(0) = 4, Z_i = 1)  0.0000 0.0000
pi(Y_i(0) = 0, Z_i = 0)  0.7685 0.0206
pi(Y_i(0) = 1, Z_i = 0)  0.1567 0.0214
pi(Y_i(0) = 2, Z_i = 0)  0.0322 0.0094
pi(Y_i(0) = 3, Z_i = 0)  0.0049 0.0035
pi(Y_i(0) = 4, Z_i = 0)  0.0025 0.0025

 Y_i(0) is the (latent) count of 'yes' responses to the control items.
Z_i is the (latent) binary response to the sensitive item.

Bonferroni-corrected p-value
If this value is below alpha, you reject the null hypothesis of no
design effect. If it is above alpha, you fail to reject the null.

Sensitive Item 1
       0.7147787
```

Table 26: List Experiment Regressions for Control & Sensitive Items Across Municipalities

Control Items Regression Table

Municipality	Estimate	Std. Error
(Constant)	0.26087	0.05575
Puerto Rico	-0.02277	0.06468
San Jose	-0.09694	0.09362

[1] *** P<.001
[2] ** P<.05
[3] * P<.1

Sensitive Item Regression Table

Municipality	Estimate	Std. Error
(Constant)	0.00176	0.07705
Puerto Rico	0.00919	0.08945
San Jose	0.19024	0.13190

[1] *** P<.001
[2] ** P<.05
[3] * P<.1

Table 27: Linear Regression With Municipality Fixed Effects

Experiment 7a Regression Results

	Dependent variable:	
	Likert Choice 1-5	
	(1)	(2)
Title	0.09	0.10
	(0.12)	(0.12)
Monitor	-0.23*	-0.23*
	(0.12)	(0.12)
Medium Earning	-0.07	-0.08
	(0.15)	(0.15)
High Earning	0.26*	0.26*
	(0.15)	(0.15)
Puerto Concordia		-0.32
		(0.62)
San Jose		-0.68
		(0.73)
Constant	1.90***	2.23***
	(0.13)	(0.63)
Observations	408	408
R2	0.02	0.02
Adjusted R2	0.01	0.01
Residual Std. Error	1.23 (df = 403)	1.23 (df = 401)
F Statistic	2.13* (df = 4; 403)	1.61 (df = 6; 401)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 28: Logistic Regression Probability Estimates with Municipality Fixed Effects

Experiment 7b Regression Results

	Dependent variable:	
	Selected (Log Odds Estimate)	
	(1)	(2)
Option B	-1.38***	-1.38***
	(0.22)	(0.22)
Option C	-1.01***	-1.01***
	(0.22)	(0.22)
Option D	-2.52***	-2.52***
	(0.26)	(0.26)
Option E	0.55**	0.55**
	(0.25)	(0.25)
Option F	-1.07***	-1.07***
	(0.23)	(0.23)
Option G	-0.78***	-0.79***
	(0.23)	(0.23)
Option H	-2.41***	-2.41***
	(0.26)	(0.26)
Puerto Rico		-0.02
		(0.15)
San Jose		-0.05
		(0.20)
Constant	1.02***	1.05***
	(0.16)	(0.20)
Observations	1,368	1,368
Log Likelihood	-814.35	-814.32
Akaike Inf. Crit.	1,644.71	1,648.65
Note:	*p<0.1; **p<0.05; ***p<0.01	

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