ecoagriculturepartners

September 2016
Ecoagriculture Discussion Paper
No. 15

Connecting farm to landscape for biodiversity conservation

The CAMBio project in Central America

Lee Gross, EcoAgriculture Partners
Sebastian Castro-Tanzi, Antioch University New England
Sara J. Scherr, EcoAgriculture Partners

Metadata

Gross, L., Castro-Tanzi, S., and Scherr, S.J. 2016. Connecting farm-to-landscape for biodiversity conservation: The CAMBio project in Central America. Ecoagriculture Discussion Paper, No. 15. Washington, DC: Ecoagriculture Partners.

Cover photo: Farmer in Apaneca, El Salvador explains the affect of leaf rust on his coffee production.

All photos by Lee Gross/EcoAgriculture Partners.

About the Series

The Ecoagriculture Discussion Paper Series is an initiative of EcoAgriculture Partners, a nonprofit organization dedicated to supporting innovators from the agriculture, conservation, and rural development sectors to strengthen and scale up integrated landscape management.

The Ecoagriculture Discussion Paper series presents results of research and policy analysis on important aspects of integrated landscape management theory and practice. The series seeks to stimulate dialogue among specialists and practitioners in agriculture, conservation, and rural development.

For inquiries about publishing a paper in the Ecoagriculture Discussion Paper Series, please email info@ecoagriculture.org.

GLOBAL ENVIRONMENT FACILITY
INVESTING IN OUR PLANET

UNDP

Acknowledgments

This Discussion Paper presents the research highlights from a study commissioned by the United Nations Development Programme (UNDP) to evaluate the Central American Markets for Biodiversity project (CAMBio). We are grateful for the financial support for this research provided by the UNDP, the Central American Bank for Economic Integration (BCIE), and the Global Environment Facility (GEF).

Yuri Zenteno and Carlos Canales of BCIE and Dr. José Manuel Mora at the University of Costa Rica reviewed the evaluation's methodology and assisted with pilot testing in Honduras and Guatemala. Rob Cahill of Community Cloud Forest Conservation and independent consultant Rodrigo Morales assisted with interviews and translation in Guatemala. Field-work in Costa Rica was undertaken by Dr. José Manuel Mora.

Thanks to Andrew Bovarnick of UNDP, Yuri Zenteno, José Manuel Mora, Carlos Canales and Louise Buck of EcoAgriculture Partners and Cornell University for their careful review of the full report.

Abigail Hart, formerly with EcoAgriculture Partners, helped with methodology development. Louis Wertz of EcoAgriculture Partners formatted this report.

Abstract

Conserving and sustaining biodiversity while promoting agricultural production is a challenge worldwide, and particularly acute in the highly populated landscape mosaics of Central America. Shifting financial incentives toward biodiversity-friendly agriculture is a key strategy in addressing this challenge. Over the past decade a number of international projects have focused on best management practice adoption by farmers as a tool for biodiversity conservation in the tropics, and market transformation for sustainable agri-commodity supply chains more broadly.

From 2008-2014 one of the most prominent of these was the Central American Markets for Biodiversity project (CAMBio, or Mercados Centroamericanos para la Biodiversidad in Spanish) financed by the Global Environment Facility, designed and implemented by the United Nations Development Programme, and executed by the Central American Bank for Economic Integration. This discussion brief presents the results of a study undertaken by EcoAgriculture Partners in late 2015 focused on evaluating the CAMBio project's biodiversity impacts, at field and landscape levels, across five Central American countries.

The evaluation's methods included in-depth interviews with farm owners, rapid biodiversity assessments on farms and GIS modeling, with an emphasis on the spatial targeting of investments in seven clusters. Findings suggest that the CAMBio project was successful in improving the adoption of best practice management practices on farms, including increased tree cover (through agroforestry) and the reduction of agrochemical usage (through organic production). Further, by focusing on agroforestry-based commodity producing farming systems, CAMBio was able to effectively target areas in need of increased landscape connectivity or protection of high conservation values. However, our research pointed to an inability of CAMBio loans to enhance the protection of existing on-farm forests. However, our analysis was limited by a dearth of baseline data on which to assess forest status change.

Overall the project's public-private partnership structure demonstrates that facilitating loans through banking institutions can be an effective tool in protecting biodiversity. These findings and the ex-post evaluation methodologies applied yield a number of important lessons for the design of future projects and programs attempting to support farm and landscape level biodiversity conservation in Central America and across the tropics.

Contents

1 Introduction 7

2 CAMBio project overview 9

3 Objectives and methodology 11

3.1 Defining the study questions 11

3.2 Selecting production systems and focal clusters for evaluation 12

3.3 Study limitations 13

3.4 Data collection and analysis 13

4 Findings 15

4.1 Tree cover within SMEs 15

4.2 Conservation of forest resources 17

4.3 Spatial biodiversity at the cluster level 19

4.4 Proximity of CAMBio sites to protected areas and conservation corridors 20

5 Lessons learned 25

5.1 CAMBio-type loan projects can have significant impacts 25

5.2 Focus on agroforestry effectively targeted HCV areas 25

5.3 CAMBio supported critical agroecosystems 26

5.4 Allowed coffee farmers to reinvest in their plantations 27

5.5 Promoted afforestation but not on-farm tree protection 27

5.6 Technical assistance was seen as very valuable 28

5.7 Invest more resources to create a baseline dataset 28

References 30

Figures

Figure 1.
CAMBio geo-referenced sites in Central America and selected clusters for evaluation ... *12*

Figure 2.
Investment in agroforestry practices by CAMBio participants and production system ... *15*

Figure 3.
Trends in forest change within selected farms ... *17*

Figure 4.
Spatial biodiversity pattern analysis, La Apeneca cluster in El Salvador ... *21*

Figure 5.
Level of CAMBio investment across five countries in relation to protected area ... *22*

Figure 6.
Proximity of CAMBio sites to protected areas relative to random set of sites, by cluster ... *23*

1 Introduction

The adoption of natural resource-intensive agricultural production methods, particularly for agricultural commodities, is exerting a substantial strain on the world's biological diversity, including high conservation value habitat. Conserving and sustaining biodiversity while promoting agricultural production is a challenge worldwide, and particularly acute in the highly populated landscape mosaics of Central America (Harvey et al. 2008).

Especially outside protected areas, deforestation and destruction of natural habitats continue at very high rates in most Central American countries, with huge impact on the biodiversity sustained by forest ecosystems in the region (Jha et. al 2014). In addition, many rural lands are being converted rapidly into highly productive agricultural landscapes in order to meet the demand for food commodities. This simplification of the structure and functioning of ecosystems indirectly affects ecological processes, ecosystem services, and population dynamics of endangered species at the landscape level (DeClerck et al. 2010). In many situations, agriculture intensification relies heavily on the use of pesticides and the unsustainable use of soil resources, further damaging neighboring natural ecosystems (Zhang et al. 2007).

Shifting financial incentives toward biodiversity-friendly agriculture is a key strategy in addressing this challenge. Over the past decade a number of international projects have focused on best management practice adoption as a tool for biodiversity conservation in the tropics and market transformation for sustainable agri-commodity supply chains more broadly (Mankad et al. 2014; Mallet et al. 2016). In 2015 EcoAgriculture Partners evaluated the biodiversity impacts of one of the most important efforts to promote public-private financing for such purposes, the CAMBio (Central American Markets for Biodiversity, or Mercados Centroamericanos para la Biodiversidad in Spanish) project. Following a previous positive evaluation of the project's overall effectiveness, the objective of this evaluation was to identify biodiversity benefits at farm and landscape levels as a result of changes in site-level interventions (i.e. best management practices) conducted by small and medium-sized enterprises (SMEs).

This Discussion Paper presents the main highlights from a larger commissioned study (Gross et al. 2016). The paper first provides an overview of the CAMBio project, then describes the study questions and methodology, summarizes the findings on biodiversity impacts; and finally draws lessons learned for design of financial instruments intended to support biodiversity and for future research.

Steep slopes characterize much of the terrain in the CAMBio program area.

2 CAMBio project overview

Financed by the Global Environment Facility (GEF), the CAMBio project was designed and implemented by the United Nations Development Programme (UNDP) and executed by the Central American Bank for Economic Integration (BCIE) from 2008-2014. The purpose of the project was to mainstream biodiversity conservation and sustainable use in production landscapes in five Central American countries (Guatemala, Honduras, El Salvador, Costa Rica, and Nicaragua).

The project sought to develop financial mechanisms, delivered through national financial institutions, to encourage adoption of biodiversity-friendly practices by farmers, livestock producers, tourism operators, and other small and medium-sized enterprises. The project's specific objective was to remove barriers in banking, business, and enabling environments to catalyze biodiversity-friendly investments in SMEs in Central America. In practice, most of the funds accessed were used for working capital. From the US $10.25 million in project funding from GEF, $18 million was co-financed by government and commercial sources for a total project financing of almost $28 million. This was used to leverage more than $64 million in project resources. Overall, the CAMBio project provided 12,107 loans in five Central American countries. These loans benefited 26,078 SMEs, 8,738 indirect beneficiaries in households, and 11,394 direct beneficiaries, directly affecting 140,000 hectares of land.

Several characteristics made the loans offered through CAMBio attractive to SMEs. First, the loans had reasonable interest rates between 15-20 percent. Second, the lender or a partner organization – such as a coffee cooperative – provided technical assistance throughout the process. Third, by complying with farm improvement plans and meeting the set of indicators agreed upon as a strategy to improve habitat quality at the farm/site level, SMEs could compete for the biopremio award. The biopremio consisted of a cash award amounting to ten percent of the total loan, up to $10,000. From this award, SMEs kept seven percent (three percent went to the local financial institution) and were able to make unrestricted use of it.

The analysis presented in this discussion paper is intended to provide BCIE, UNDP, GEF and co-financing partners, as well as other researchers and practitioners, with more in-depth insights on the biodiversity impacts of the CAMBio program's interventions. The results presented in this study are intended also to offer important insights for the design of future programming focused on biodiversity conservation in agricultural production landscapes through small-and-medium-sized enterprises operating in agri-commodity value chains.

Surveying coffee farmer in El Salvador with electronic tablets using Fulcrum software.

3 Objectives and methodology

3.1 Defining the study questions

We sought to assess two broad hypotheses about CAMBio impacts. Firstly, that the loans granted by CAMBio were received by participants living and working in agroecosystems of high value for biodiversity conservation, in terms of their geographic location and/or agroecology. Secondly, that loans obtained through CAMBio enabled entrepreneurs to incorporate best management practices that had a positive impact on the conservation of biodiversity and its supporting ecological system. We focused on the following indicators of biodiversity impact: impact analysis on land cover quality (e.g. habitat suitability for sustaining biodiversity), reduction of potential negative impacts on biodiversity (e.g. agrochemical pollution and sedimentation), landscape connectivity, and spatial relationship to high conservation value areas (e.g. protected areas).

The evaluation aimed to answer the following specific questions:

1. Did the CAMBio loans end up in areas of greater importance to biodiversity conservation?
2. Did CAMBio lend to land managers who were already implementing at least some biodiversity best management practices?
3. Did CAMBio prevent/reduce deforestation and/or promote forest and natural ecosystem restoration in farms and landscapes?
4. Did CAMBio prevent/reduce deterioration and/or promote restoration of freshwater ecosystems in farms and landscapes?
5. Did CAMBio improve agroecosystem structure and ecological processes contributing to biodiversity and landscape connectivity?
6. Did CAMBio decrease environmental impacts on biodiversity, specifically by reducing pesticide use, erosion, and fresh water sedimentation?
7. By participating in CAMBio, were farmers able to reduce their unsustainable use of forest resources and threats to wildlife?
8. Did participating in CAMBio open up opportunities for farmers to obtain environmental certifications and/or sell their commodities through environment friendly markets?

3.2 Selecting production systems and focal clusters for evaluation

Given the magnitude of the CAMBio project, it was critical to define carefully the scope and focus of the biodiversity assessment. Based on the level of investment (both total amount invested and number of loan recipients from CAMBio), it was determined that three production systems would be the focus of analysis; 1) organic agriculture, 2) agro-forestry systems for coffee, cocoa and cardamom, and 3) silvopastoral systems. These three systems together represent nearly 75 percent

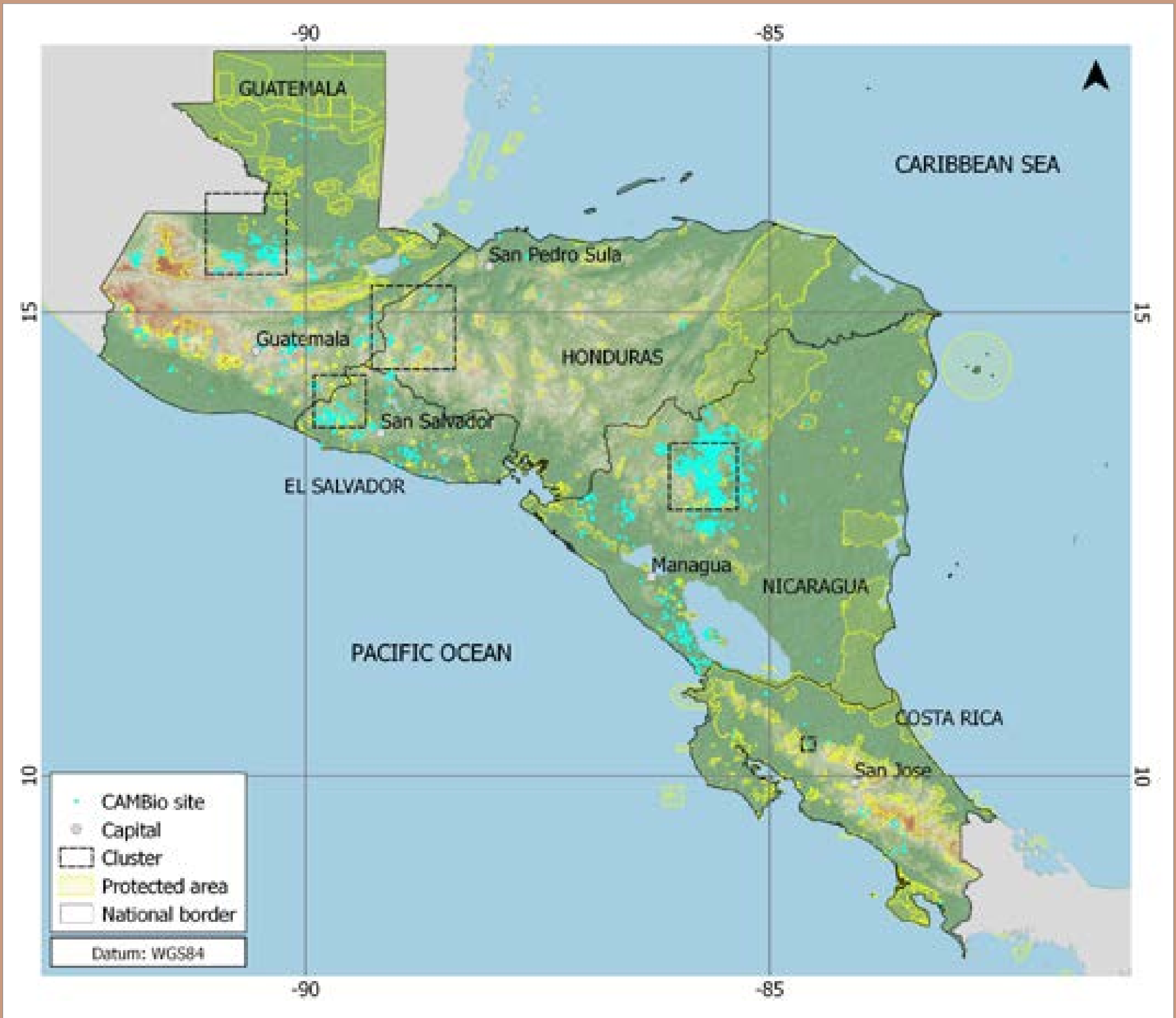

Figure 1.
CAMBio geo-referenced sites in Central America and selected clusters for evaluation

of all loans. Analysis was first made to determine whether loans were actually given based on the applicants' eligibility, which included compliance with some of the best management practice criteria for their production systems.

A cluster approach was used to evaluate impacts in geographic areas with a relatively high density of CAMBio investments, and thus with plausible impacts on biodiversity at landscape levels. Selection of focal clusters was based on three criteria: 1) the number of loans (or loan beneficiaries) given in a particular region (e.g. density of loan recipients) 2) the level of financial investment made in the landscape; 3) the presence of the evaluation's focal production system. Within each cluster's broader political department, an initial spatial analysis of loan distribution was conducted by mapping recipients according to GPS location. From this process, seven potential cluster areas were identified for farm-level analysis. Figure 1 shows the final list of selected cluster sites.

3.3 Study limitations

A comprehensive database of loan recipient information was provided to the evaluation team about the project's beneficiaries. Unfortunately, fewer than half of these loans were geo-referenced. Additionally, information in the loan database offered insights on farm size, crop type, beneficiary, department, and state. No information was provided, though, about the types of best practices adopted or other relevant environmental or biodiversity-related aspects. Therefore, no rigorous baseline could be established for cross-comparison or control in this evaluation relative to the initial state before CAMBio interventions took place. Given the lack of a biodiversity baseline and the incomplete geo-referenced data points, a rigorous impact assessment across the entire project was not possible. The evaluation's limitations are not uncommon for international development and biodiversity programming, particularly those seeking to measure the impact of best practice adoption on environmental outcomes (Milder et. al 2012). This evaluation aimed instead for a thoughtful qualitative analysis, supported by statistical and spatial analyses to the extent that existing data provided by CAMBio staff and data collected by the project team in the field would allow.

3.4 Data collection and analysis

The evaluation utilized three methods for field data collection.

1. In-depth interviews with farm managers and/or owners.
2. Qualitative estimations of canopy cover (in percent) and species richness on farms
3. Open-ended semi-structured group interviews with cooperatives and local financial intermediaries.

A digital data entry form was prepared in the mobile data collection service *Fulcrum* containing the selected modules and questions identified for each farming system. This digital application runs in a Samsung Tab 3 tablet hardware and was used to collect data in the field. Field data collection tools were first piloted in two cluster areas in Honduras before the tools were revised and applied to the remaining clusters.

To assess whether the land management changes mobilized by CAMBio enhanced habitat quality for biodiversity at a landscape scale, the evaluation included a spatial analysis component using a geographical information system (GIS). This analysis provided an overview of the effectiveness of the project in reducing habitat fragmentation/increasing connectivity; targeting high value biodiversity areas; targeting locations near protected areas and conservation corridors, and contributing to on-farm habitat quality. To undertake this analysis required identifying and mapping the CAMBio investment hotspots across the Central American region, especially in the clusters selected for the analysis. To do so, the spatial analysis relied on two databases created by the CAMBio project, specifically the biopremio geo-referenced database and the loan database. The "biopremio" data set provides geographical coordinates for a subset of SMEs (about 2,200) that received the award. The loan database details all loans provided by the CAMBio project. Although the loan database does not include geographical coordinates, it does provide information of the province/department were the SME is located. We used these databases to map the geographical location of part of the CAMBio sites, particularly the seven selected cluster areas. The spatial analysis was then linked with the field data collection conducted in seventy-one (71) sites across the seven clusters.

To analyze the contribution of CAMBio project sites to reducing habitat fragmentation and increasing connectivity we adapted LEFT, the "local ecological foot printing tool," a remote biodiversity assessment web based tool.[1] This tool uses readily available biodiversity databases to produce spatially explicit and continuous maps detailing differences in biodiversity levels with minimal user input parameters. For example, to produce outputs, users only need to provide geographical location (latitude/longitude). By combining species distribution and land cover data, we produced maps detailing habitat quality. We used this tool specifically to map habitat fragmentation and connectivity, by comparing the location of CAMBio sites with neighboring geographic points in the system.

1 Assessing Ecological Value of Landscapes Beyond Protected Areas (LEFT) http://www.biodiversity.ox.ac.uk/researchthemes/biodiversity-technologies/assessing-ecological-value-of-landscapes-beyond-protected-areas-left/

4 Findings

The key types of biodiversity impacts evaluated were: tree cover within the SMEs, conservation of forest resources, spatial diversity at cluster level, and proximity of CAMBio sites to protected areas and conservation corridors.

4.1 Tree cover within SMEs

Among many specific findings, our analysis revealed that one of the major achievements of the CAMBio project was increasing tree cover within the SMEs. More than 75 percent of coffee and cardamom producers interviewed for this evaluation across all countries indicated that participating in the CAMBio project allowed them to invest in their agroforestry systems. Although lower in comparison, investment rates in agroforestry activities were also high in silvopasture livestock systems (Figure 2).

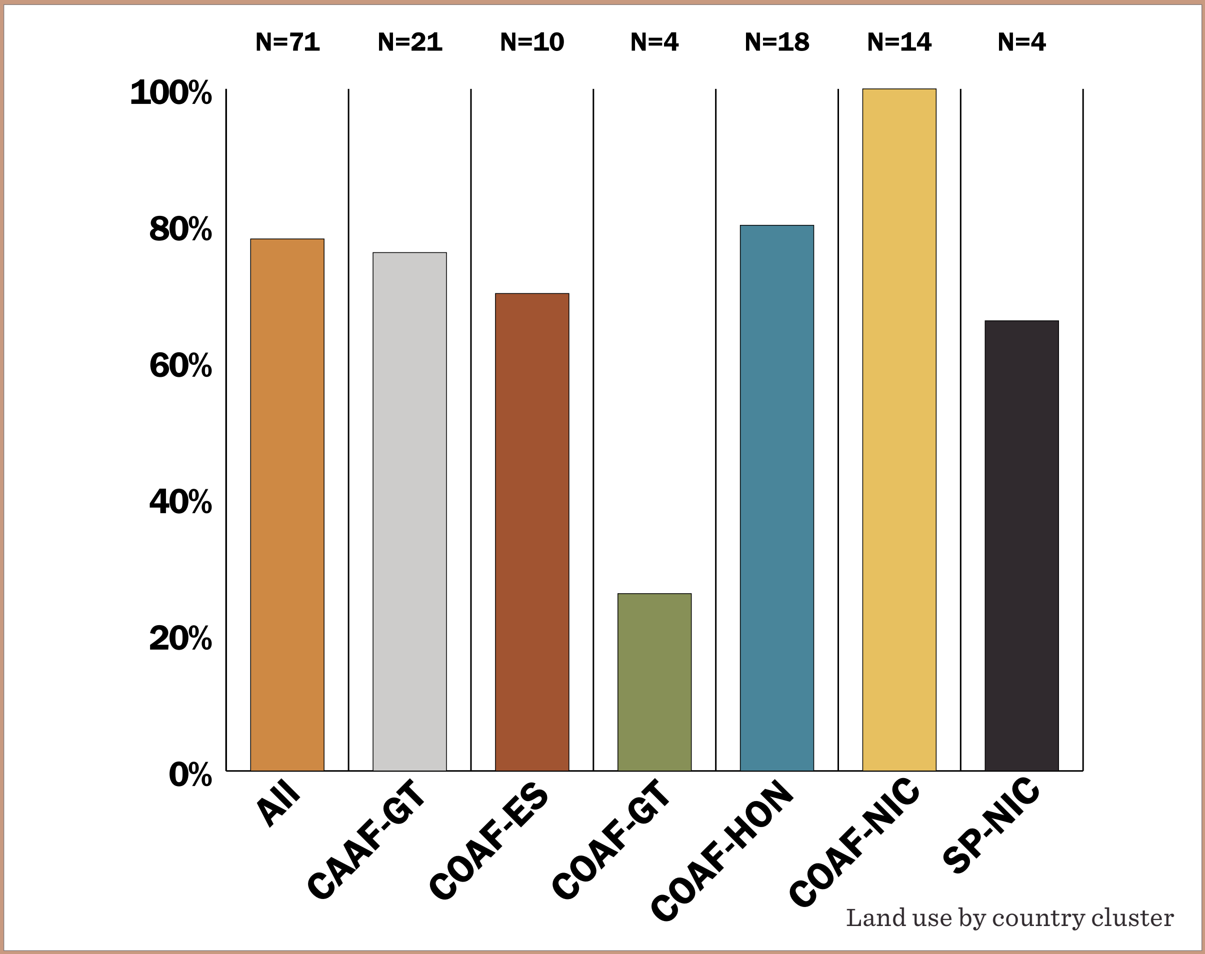

Figure 2. Investment in agroforestry practices by CAMBio participants and production system

CAAF= Cardamom agroforestry

COAF= Coffee agroforestry

SP= Silvopasture systems

GT = Guatemala

ES = El Salvador

HON= Honduras

NIC = Nicaragua

In El Salvador, tree planting was distributed in long corridors of windbreak plots in agroforestry coffee. In Honduras and Nicaragua, farmers focused in smaller stretches of agroforestry plots. In these two countries, farmers also increased the number of trees in small areas of coffee that were fully exposed to the sun. In Nicaragua, farmers transformed an average of 1.7 ha of other land uses (pastures and corn/bean plots) into agroforestry coffee systems using the CAMBio funds.

CAMBio also increased live fences and other tree containing features across the landscape. Around half of the CAMBio participants interviewed for this analysis reported incorporating the cultivation of hedges, hedgerows and/or live fences as a farming practice in their production units as a result of participating in the program. In coffee agroforestry systems in El Salvador and livestock operations in Nicaragua, 100 percent of farmers reported applying this practice. In Guatemala, however, almost none of the farmers employed this strategy. The two water board organizations interviewed in Costa Rica also reported increasing the number of trees inside the perimeter of the properties.

The type of investment (e.g., live barriers, live fences, trees in pastures and windbreaks) in tree containing features varied across the region. In

Shade coffee farm near Parque Nacional El Imposible, El Salvador.

Nicaragua cattle production systems, all interviewed farmers incorporated live fences into their farms. These same farmers also tended to incorporate trees in working pastures. Live fences are also popular in coffee agroforestry systems in this same country. In coffee agroforestry systems of El Salvador, windbreaks are very popular. These same coffee agroforestry systems in Honduras also did a good job of incorporating live barriers, primarily for erosion control. In the other countries across all farming systems, live fences were not popular and were rarely cultivated.

4.2 Conservation of forest resources

In the subset of 48 interviewees who reported owning forest areas as part of their properties, the perception of the project varied between clusters and land uses. For example, a high proportion of participants farming cardamom in Guatemala indicated that the loans and/or biopremio award allowed them to invest in forest conservation. In contrast, no forest owning coffee farmer in El Salvador or Nicaragua reported being able to invest in forest protection. Most farmers did not report the strategies that facilitated this forest protection process. In the case of Costa Rica, the Water Management Boards reported using the CAMBio loan to purchase

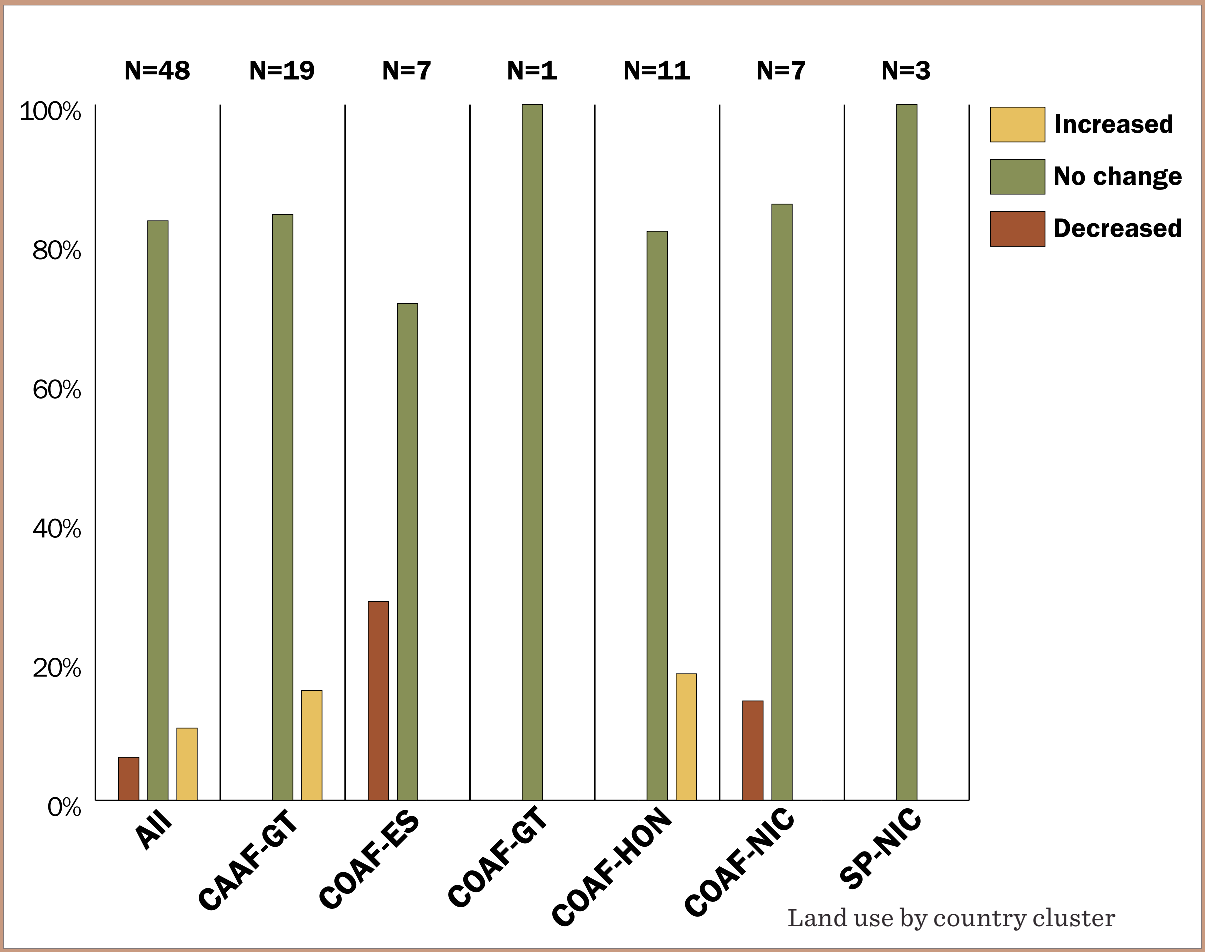

Figure 3. Trends in forest change within selected farms

CAAF= Cardamom agroforestry,

COAF= Coffee agroforestry

SP= Silvopasture systems

GT = Guatemala

ES = El Salvador

HON= Honduras

NIC = Nicaragua

forested land. They noted that under the new purpose of the land - ensuring the prevalence of water recharge areas - the forest will effectively be protected from the threat of land use change in the near future.

Agroecosystems in Central America tend to be mosaics of land uses, some of which provide high-quality habitat to animal and plant biodiversity. Given the loss of forest ecosystems and natural habitats across the region, forest remnants are of special importance. Across the region, 67 percent of the interviewed CAMBio participants reported owning areas under forest in their properties. The presence of forest remnants within the farms varied considerably. For example, in Guatemala, around 90 percent of cardamom farmers reported managing forests within their properties while only a quarter of coffee farmers in this country reported owning remnants of this land use. The size of these forest areas within the productive unit varied between countries. For example, forest areas within coffee farming systems in El Salvador were quite large. Cardamom farmers in Guatemala also reported owning considerable areas of land under forest. In coffee farms of Nicaragua, Honduras and Guatemala, forest areas were rather small. These forest patches typically corresponded to areas of the terrain with reduced access and that are marginal for intensive agriculture production. Although having important ecological value in landscapes characterized by an intensive agriculture production matrix, the few forests directly observed during the field assessment showed signs of intensive human intervention and use.

Almost half of the interviewees who reported owning forest patches within their properties indicated that these were under some type of legal conservation. In El Salvador, more than 80 percent of respondents who reported owning forest ecosystems within their farms indicated that these were included within the national protected area network. In a country where most forest ecosystems have been severely altered, these fragmented and small forest remnants most likely play a key role in the connectivity between different national parks and provide refuge for valuable biodiversity. On the other hand, in Nicaragua, Guatemala, Honduras and Costa Rica, most of the forest fragments contained in the SMEs were outside the jurisdiction of the national conservation networks.

Building upon the forest tenure information provided by farmers, we were able to estimate that in just a few of the farms funded by CAMBio, forest area increased or declined. The few farmers reporting a decline indicated that they transformed previously semi-natural forest by cultivating coffee under the existing tree canopy. They argued that these new coffee plots were managed as "natural coffee," meaning that it resides under the existing tree canopy cover, thus creating only a small impact. These changes, however, were not triggered by the participation in CAMBio nor funded through this project. In most of the farms across the region, forest was maintained (Figure 3).

It is important to note that most farmers interviewed in this evaluation (about 75 percent) reported making use of forested areas within their properties. This was particularly notable in Guatemalan cardamom agroforestry systems and Nicaraguan livestock production. Analysis identified at least six uses of the forest by farmers. Nearly 30 percent of farmers reported extracting timber and firewood; use by cardamom farmers in Guatemala and cattle farmers in Nicaragua was almost 100 percent. In Honduras, half of the forest owning farmers reported obtaining water from springs within the forest.

4.3 Spatial biodiversity at the cluster level

The LEFT™ tool generated spatially explicit analyses of beta diversity (ratio between regional and local species diversity), connectivity, fragmentation and resilience. These were used to develop a single spatially explicit "summary ecological index" value that was mapped for the seven clusters studied. The biodiversity value of the actual CAMBio sites was compared to the biodiversity value of a random set of points within the cluster.

Cardamom agroforestry system in la Zona Reina, Guatemala.

The cluster in El Salvador used in this analysis covers part of the Ahuachapan, Sonsonate, La Libertad, Santa Ana and Chalatenango municipalities, and stretches across into eastern corner of Guatemala. Three ecoregions are found inside this focus area: Central American pine-oak, dry forests, and montane forests. Without anthropic disturbance, closed canopy forest ecosystems would dominate. In El Salvador, forests are widely fragmented and very little continuous area of this ecosystem exists. Yet currently, the Ahuachapan municipality contains the largest area under tree cover in the regions covered in this analysis. Mapping indicates that high ecological value (i.e. high LEFT summary ecological index) CAMBio sites are found in this area.

In El Salvador, as a result of widespread human-induced disturbance of the original forest ecosystems, coffee agroforestry landscapes play a particularly important ecological role. Coffee agroecosystems in this country have traditionally incorporated agroforestry practices. Many farms are covered by a considerable tree canopy, creating high-quality refugia for many organisms in these territories. Furthermore, most coffee landscapes in El Salvador share their geographic space with high value biodiversity sites. Mountain ridges in this country contain important remnants of semi-natural and natural vegetation. These same mountains hold the majority of the high quality coffee producing landscapes.

Since an important number of CAMBio investments were directed to coffee growing and processing SMEs, the CAMBio project allocated funds in sites with higher than expected biodiversity conservation value. This geographical overlap likely explains why, with little selection effort, the CAMBio project was able to better target high biodiversity value areas.

Further analysis indicates that that the CAMBio sites had consistently higher LEFT ecological summary value index values when compared to a random allocation process. CAMBio sites in El Salvador had LEFT ecological summary index values 20 percent higher (Figure 4).

Additional analyses for Guatemala, Honduras and Nicaragua are available in the full evaluation report.

4.4 Proximity of CAMBio sites to protected areas and conservation corridors

During the selection phase, the CAMBio project sought to target SMEs found near protected areas and conservation corridors. We tested whether the project was able to target sites located closer to protected areas. The analysis first presents a map detailing the distribution of funds across administrative units and compares it to the regional distribution of protected areas. Then further spatial analysis was performed on the

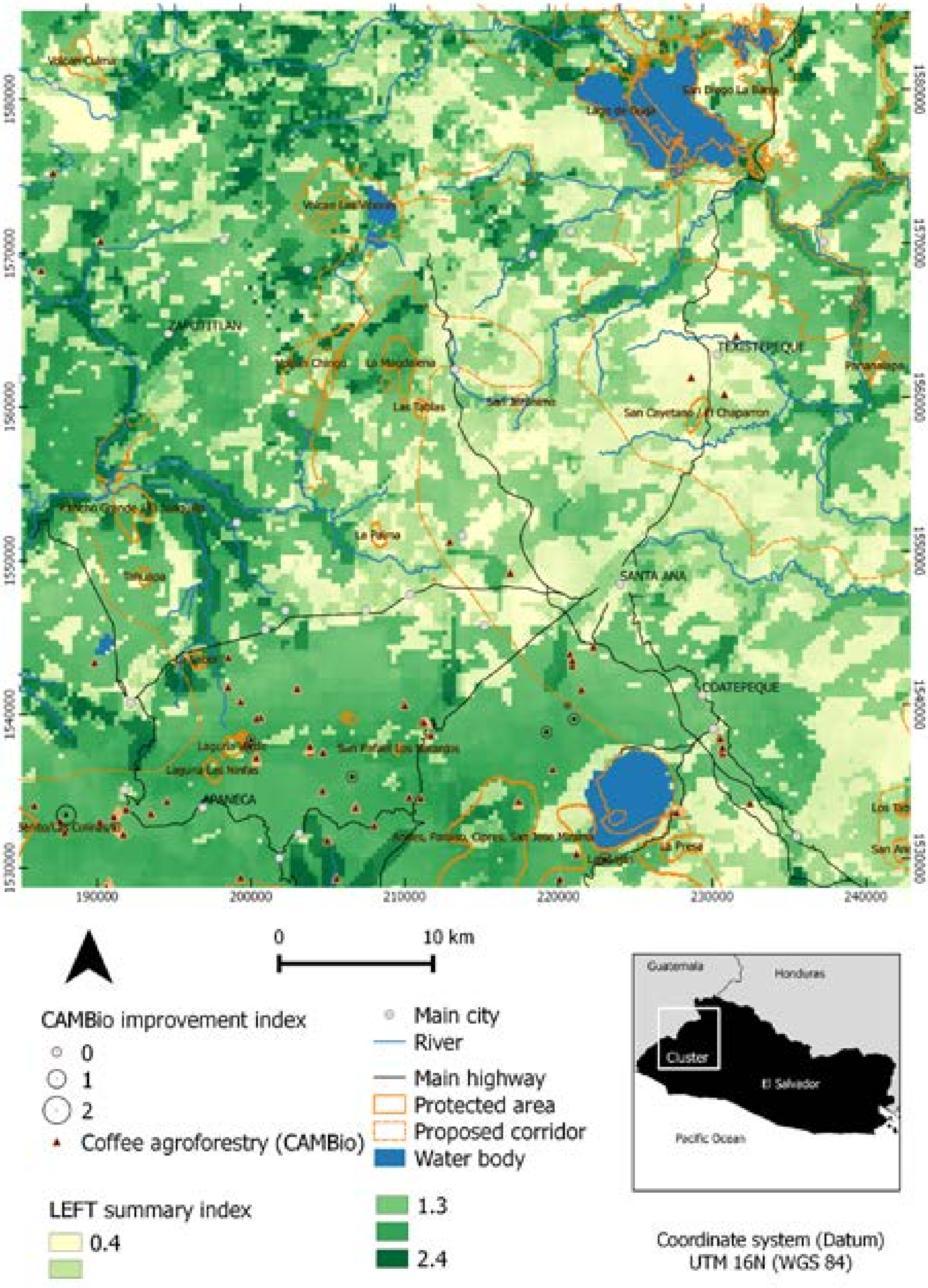

Figure 4.
Spatial biodiversity pattern analysis, La Apeneca cluster in El Salvador

analytical clusters of El Salvador, Guatemala and Nicaragua. Data was not available for analysis of the Costa Rica and Honduras clusters.

Figure 5 shows the level of investment contributed by CAMBio across the five participating countries in relationship to the geography of protected areas in Central America. In El Salvador, Honduras, and Guatemala there seems to be a clear but weak association between investment level aggregated per administrative unit and the density of protected areas. In the case of Costa Rica and Nicaragua the association is less clear.

One thing to note in Costa Rica and Honduras and part of Nicaragua is that territories along the Caribbean shore were neglected by credit allocation despite containing some of the highest densities of protected areas. This neglect was because the CAMBio crop production system selection.

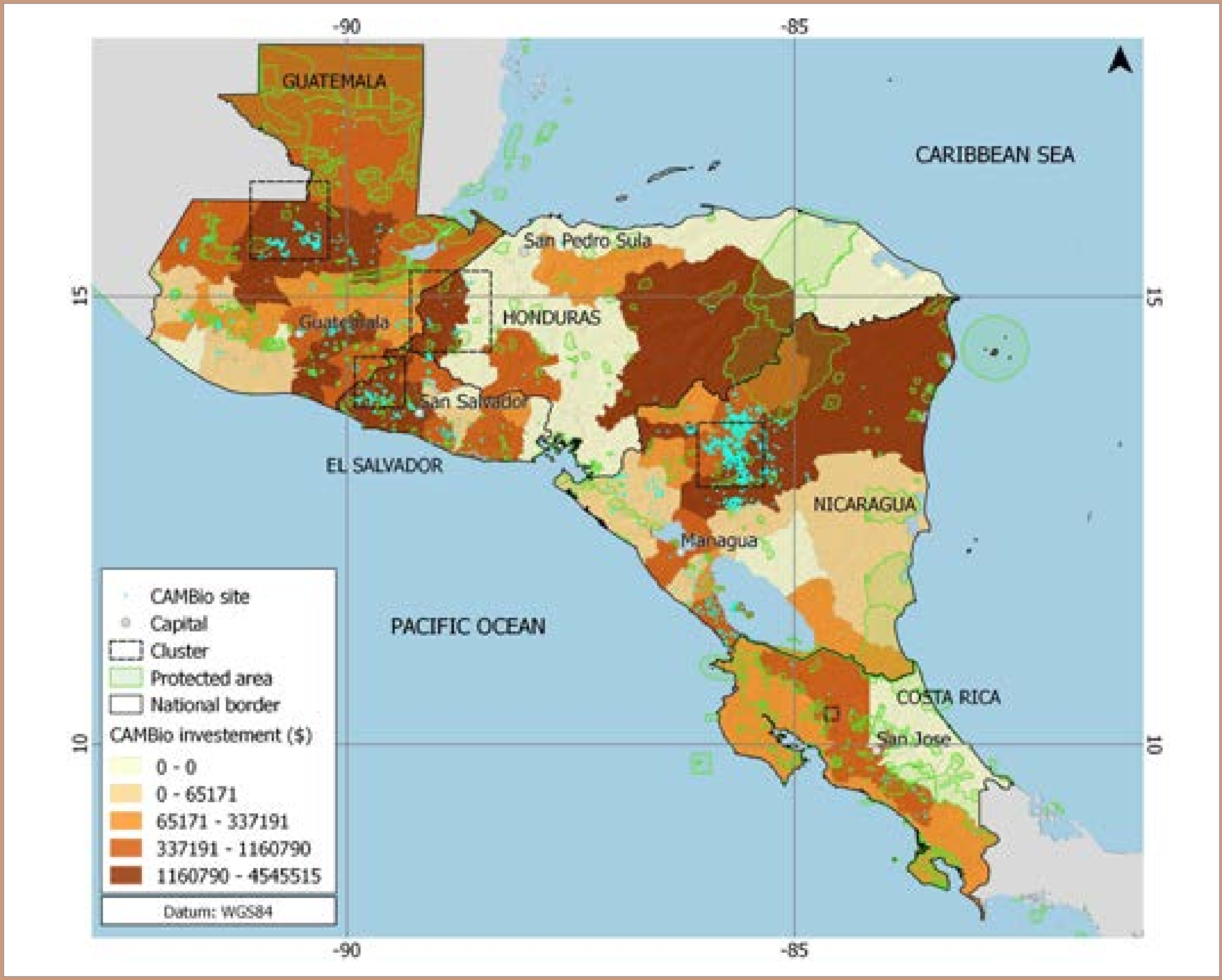

Figure 5.
Level of CAMBio investment across five countries in relation to protected area

In two of the regions analyzed – El Salvador and Nicaragua – CAMBio sites were much closer to protected sites than what would be expected from a random distribution in this landscape. In El Salvador, almost 20 percent of the sites reported by CAMBio are located inside protected areas and 50 percent of them were at distances of less than 2.5 km from a protected area. In the case of Nicaragua, there was not much difference between the actual and random distribution; at least 50 percent of farms in Nicaragua were 8 km from a protected area (Figure 6).

In Guatemala, the CAMBio project did not seem to do a good job of targeting SMEs operating near protected areas, at least within the cluster under scrutiny. In this case, the proximity to protected areas of a set of random points outperformed that of the CAMBio sites. It is interesting to contrast this result – the relative high distance of CAMBio sites from protected

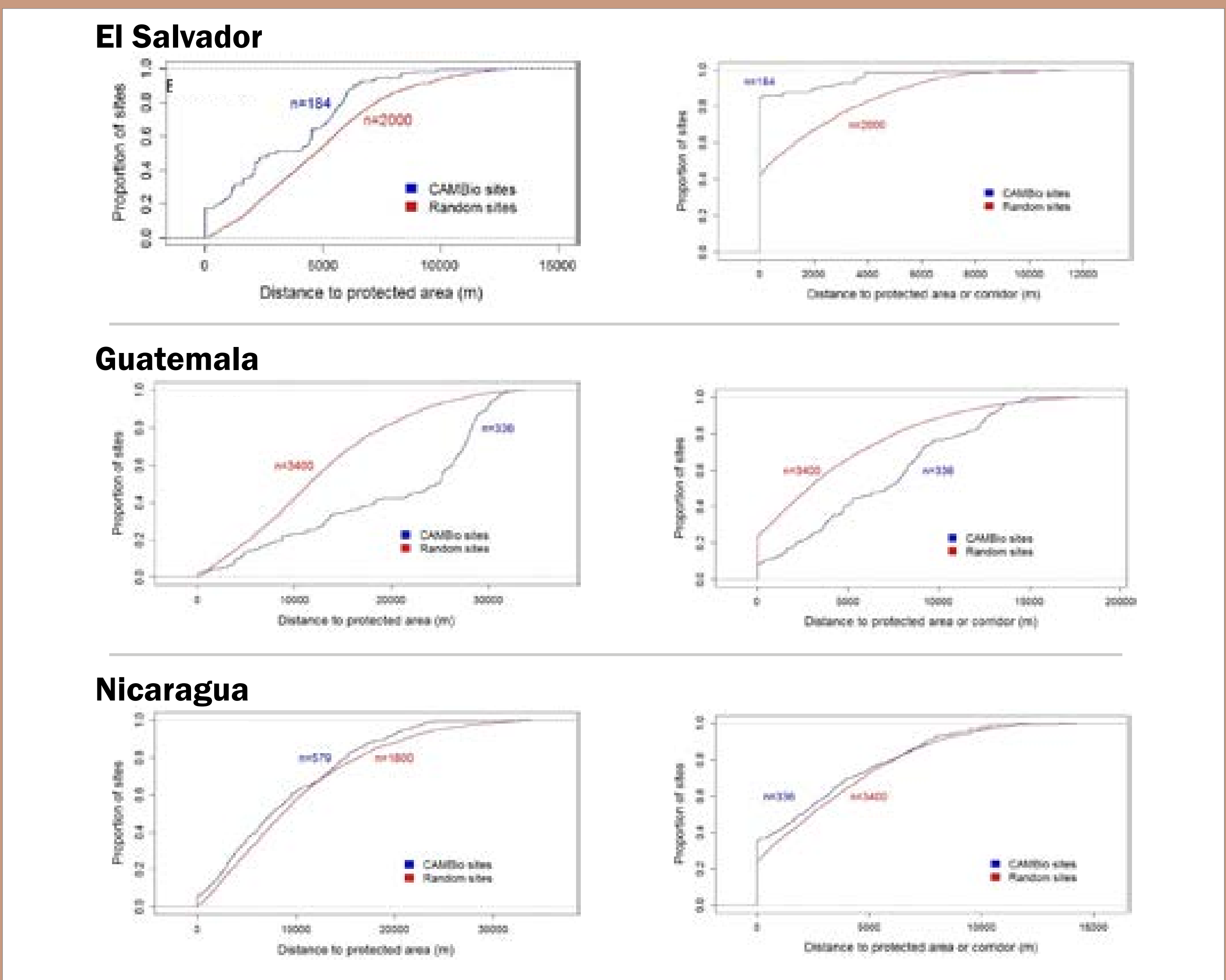

Figure 6.
Proximity of CAMBio sites to protected areas relative to random set of sites, by cluster

areas--with the fact that by selecting those sites, CAMBio selected high value to diversity locations. This might be an indication of the value to conservation of sites outside of protected areas in Guatemala.

In the case of the El Salvador and Nicaragua sites, our results suggest that the CAMBio project complied with its requirement of targeting SMEs located in the near proximity of protected areas. In El Salvador, agroforestry coffee landscapes have been integrated into the protected area network for many years. Therefore, targeting coffee producing and processing SMEs most likely facilitated meeting this criterion. In Nicaragua, protected areas inside the analytical cluster are located in mountaintops and steep slopes. Mountainous landscapes in Central America are conducive to coffee cultivation. In the Jinotega and Matagalpa region, coffee farming systems are located at elevations above 800 meters. Therefore, by working with this sector, CAMBio was able to allocate to sites nearer protected areas than expected. However, the effect was not much better than the random process.

During the beginning, the CAMBio project had a clear mandate to target SMEs operating near protected areas or conservation corridors. However, in order to boost the performance of the project and to satisfy the emergent demand, this selection criterium was relaxed to include SMEs outside of targeted areas, but in the priority value chains or production systems. Most likely, many areas and sectors that were not near protected areas were given a green light to participate.

5 Lessons learned

Synthesizing from our results enables us to draw several conclusions regarding the effectiveness of CAMBio that should be used to shape future loan projects.

5.1 CAMBio-type loan projects can have significant impacts

Facilitating loans for good management practices through banking institutions can be an effective tool in protecting biodiversity. Summarizing our analysis of the eight central study questions, we conclude that CAMBio-type loan projects can have significant positive impacts on biodiversity in agricultural landscapes. For example, one of the major impacts of the program included increasing the number of trees in the landscape. Further, a large proportion of surveyed farms reduced pesticide use through new practices and involvement in certification; and through expansion of other best practices such as organic production.

The overall selection criteria administered as part of the loan processes provided a rigorous selection process to identify SME loan recipients implementing or committing to biodiversity-friendly production practices as evidenced from the farmer surveys results (n=71) where all farmers were implementing some form of biodiversity-friendly production practice. In addition to loans devoted primarily to working capital, CAMBio successfully executed different mechanisms to facilitate or provide technical support to SMEs participating in the project. This comprehensive support package to SMEs in biodiversity-friendly production was made possible by the unique combination of technical and financial resources afforded by the project's public private partnership of the BCIE, UNDP and GEF.

5.2 Focus on agroforestry effectively targeted HCV areas

By focusing on agroforestry-oriented, commodity-producing farming systems, CAMBio effectively targeted areas in need of increased landscape connectivity or protection of high conservation value. By targeting and favoring agroforestry crops and farming systems with high demand of credit, CAMBio did a slightly better job of selecting areas in the landscape with high conservation value than what would be

Summary of Lessons Learned

1. Facilitating loans for good management practices through banking institutions can be an effective tool in protecting biodiversity

2. By focusing on agroforestry oriented, commodity producing farming systems, CAMBio effectively targeted areas in need of increased landscape connectivity or protection of high conservation values.

3. CAMBio supported critical agroecosystems for biodiversity, livelihoods and ecosystem services, such as coffee agroforestry across Mesoamerica.

4. CAMBio allowed coffee farmers to reinvest in their plantations, increasing the productive potential of these agroecosystems.

5. CAMBio promoted the afforestation of farming systems in many respects through improved agroforestry, but was not observed to provide sufficient mechanisms to enhance the protection of existing on-farm forests.

6. Technical assistance, farm management plans, and incentive strategies were greatly appreciated by farmers in combination with financial loans directed towards adoption and maintenance of best management practice.

7. Future projects following similar guidelines should invest more time in acquiring baseline information and developing more robust databases.

expected from a random selection process. For example, the relative ecological value in CAMBio sites was 5 to 20 percent when comparing to a null hypothesis of location selection.

These results suggest a geographic association between the location of agroforestry oriented farming systems and high value habitat across landscapes in Central America. Regarding the effectiveness of CAMBio to target SMEs situated in the vicinity of protected areas, this analysis provides similar results. In Nicaragua and El Salvador, by working with the specific farming systems promoted by the program, CAMBio effectively targeted sites located near protected areas and corridors. In El Salvador, up to 20 percent of CAMBio sites were located inside the network of protected areas. In the case of Guatemala, however, loans went to areas of the landscape where agriculture production demanded it, with an increasing cardamom boom, and not where they would have the best impact on landscape connectivity.

This can be attributed to the fact that local financial intermediaries did not conduct their investments in relation to the broader strategy developed by the CAMBio team and/or were not working in close relation with the CAMBio team on the allocation of resources according to other biodiversity-related parameters and mapping systems such as GIS. Additionally, CAMBio loans were driven by demand from clients. Nevertheless, it is important to mention that despite not always being able to target locations near protected areas, the CAMBio program efficiently allocated credits in high value biodiversity sites.

5.3 CAMBio supported critical agroecosystems

CAMBio supported agroecosystems crtical for biodiversity, livelihoods and ecosystem services, such as coffee agroforestry, across Mesoamerica. During 2012 and 2013, coffee rust (i.e. la roya) had a severe effect on coffee yields and plot health. CAMBio's investments/loans during this period were essential for replanting, compensating for lost wages/product, and combatting the spread of the roya. In addition, CAMBio's selection process provided support to farmers utilizing or expanding biodiversity-friendly practices (e.g. agroforestry) and offered them an incentive to continue these ecologically important production systems rather than adopt environmentally harmful monoculture crops such as maize, sugarcane, or cattle. With the exception of coffee agroforestry systems in the Coban region of Guatemala, all of the agroforestry systems included in this analysis presented diverse agroforestry canopies.

In some cases, such as the Apaneca region of El Salvador and certain farms in the El Cua region of Nicaragua, the agroforestry canopy was composed of complex strata containing well-established tree canopies. Less complex coffee agroforestry systems still contained multiple species, mostly trees that benefit the crop (i.e. legume trees) or fruit bearing species. Following the structural classification put forward by Moguel and Toledo (1999), these systems would be classified as commercial polycultures. Support for these agroecosystems throughout Latin American and the Caribbean will continue to play a critical role in biodiversity and ecosystem services conservation (Gross et. al 2014).

5.4 Allowed coffee farmers to reinvest in their plantations

CAMBio allowed coffee farmers to reinvest in their plantations, increasing the productive potential of these agroecosystems. This had a positive impact on the livelihoods of smallholder farmers, their cooperatives and communities. However, this also poses a number of questions for future investigation related to the biodiversity impact of these production practices, as farmers chose high yielding, lower quality coffee varieties that are resistant to the rust.

Also, it is important to point out that reforestation processes put in motion by CAMBio across the region tended to rely on a very narrow set of tree species. It is understandable that given their functionality and opportunity to fetch revenue in the near future, rapid-growth trees (i.e. Inga spp) were preferred by beneficiaries. However, this limited selection of species might have detrimental consequences on the structure and biodiversity of agroecosystems, effectively homogenizing the shade canopy tree assemblage across the agroforestry agroecosystems in Central America. To avoid this, future programs should not only work with experts capable of identifying desirable, multipurpose tree species that are attractive to potential beneficiaries, but also promote tree nursery initiatives prepared to facilitate this material.

5.5 Promoted afforestation but not on-farm tree protection

CAMBio promoted the afforestation of farming systems in many respects through improved agroforestry, but was not observed to provide sufficient mechanisms to enhance the protection of existing on-farm forests. This report suggests that future projects should keep the focus on promoting afforestation strategies, but should expand programs to include mechanisms that safeguard and improve forest remnants scattered within the production systems managed by the beneficiaries. Results presented in this evaluation indicate that in the last five years, within farm forest remnants in the different regions experienced limited transformation, likely resulting in decreased deforestation rates in the landscapes under evaluation.

However, in Central America, forest ecosystems continue to be under intense anthropogenic pressure. This is reflected in the fact that, despite being committed to conserving the remaining forest patches, farmers included in these samples continued to make ample use of the resources contained in these ecosystems. Unfortunately, this analysis does not indicate the magnitude of this impact.

5.6 Technical assistance was seen as very valuable

Technical assistance, farm management plans, and incentive strategies were greatly appreciated by farmers in combination with financial loans directed towards adoption and maintenance of best management practices. In some cases, by partnering with capable financial institutions and coffee cooperatives across the different countries the project made available to farmers a set of technical and professional assets to which they might otherwise not have access.

For example, working alongside the extension personnel of Nitlapan allowed Nicaraguan farmers to develop plans to improve environmental sustainability and achieve target biodiversity indicators previously identified. The use of individual management plans with loan recipients was particularly useful in advancing producers through a “step-wise approach” to achieve best management practices (BMP) adoption in compliance with the parameters of their agreement.

5.7 Invest more resources to create a baseline dataset

This study demonstrates that ex-post methodologies can be used to assess some biodiversity impacts by combining field interviews and GIS modeling. This approach can be adapted and improved for use in the many development contexts where baseline data are missing.

However, the CAMBio experience suggests that future initiatives should allocate more resources to compiling adequate baseline information. This baseline information could be limited to easy-to-measure agroecosystem properties, such as extent of different land use systems, canopy cover, species richness and planting density. This information would allow monitoring changes in the structure and compositions of the agroecosystem to be linked to the best management practices implemented through the project. Furthermore, with creativity, proper facilitation, and adequate technology, participatory biodiversity monitoring processes could be established, opening the possibility of integrating farm owners in the assessment phase.

“Organic agriculture is life.”

References

DeClerck, F., A. J., et al. Biodiversity Conservation in Human-modified Landscapes of Mesoamerica: Past, Present and Future. *Biological Conservation* 143, no. 10 (2010): 2301-313. doi:10.1016/j.biocon.2010.03.026.

Gross, L., S. Castro and S.J. Scherr. 2015. Biodiversity Impacts of Project CAMBio (Centro American Markets for Conservation). A final program evaluation report prepared for the Central American Bank for Economic Integration, the United Nations Development Programme and Global Environment Facility.

Gross, L., Erickson J., and Mendez, V.E. 2014. Supporting Rural Livelihoods and Ecosystem Services Conservation in the Pico Duarte Coffee Region of the Dominican Republic. *Agroecology and Sustainable Food Systems*. 38(9): 1078-1107

Harvey, C. A., et al. "Integrating Agricultural Landscapes with Biodiversity Conservation in the Mesoamerican Hotspot." *Conservation Biology* 22, no. 1 (2008): 8-15. doi:10.1111/j.1523-1739.2007.00863.x.

Jha, S., C. M. Bacon, S. M. Philpott, V. Ernesto Mendez, P. Laderach, and R. A. Rice. "Shade Coffee: Update on a Disappearing Refuge for Biodiversity." *BioScience* 64, no. 5 (2014): 416-28. doi:10.1093/biosci/biu038.

Mankad, K., Negra, K., and L. Gross. 2014. Transforming Markets for Conservation: Insights from the Biodiversity and Agricultural Commodities Program. Washington, DC: EcoAgriculture Partners.

Mallet, et al. 2016. ISEAL Report: How sustainability standards can contribute to landscape approaches and zero deforestation commitments.

Milder. J., Gross, L., Class, A. 2012. Assessing the Ecological Impacts of Agricultural Eco-certifications and standards. Report prepared for International Finance Corporation. Washington, DC: EcoAgriculture Partners.

Moguel, Patricia, and Victor M. Toledo. "Biodiversity Conservation in Traditional Coffee Systems of Mexico." *Conservation Biology* 13, no. 1 (1999): 11-21. doi:10.1046/j.1523-1739.1999.97153.x.

Zhang, W. Ricketts, T.H. Kremen, C. Carney, K and Swinton, S.M. "Ecosystem Services and Dis-services to Agriculture." *Ecological Economics* 64, no. 2 (2007): 253-60. doi:10.1016/j.ecolecon.2007.02.024.

Copan, Honduras

ecoagriculturepartners

1100 17th Street NW Suite 600
Washington, DC 20036 USA

Telephone: +1 202 393 5315
Email: info@ecoagriculture.org
www.ecoagriculture.org

September 2016

Ecoagriculture Discussion Paper No. 15