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Early REDD+ Implementation: The Journey of an Indigenous Community in Eastern Panama

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Abstract: Reducing Emissions from Deforestation and Forest Degradation (REDD+) offers developing countries an opportunity to engage in global climate change mitigation through the sale of carbon credits for reforestation, avoided deforestation and forest conservation projects. Funding for REDD+ projects has increased in recent years and REDD+ projects have proliferated, but relatively few studies have, as yet, examined their implementation. Here, we present a synthesis of the challenges and lessons learned while implementing a REDD+ project in an Emberá community in Panama. Our case study, documented in four cycles of collaborative action research over 11 years, examines how local communities sought to reduce emissions from deforestation and benefit from carbon offset trading while improving local livelihoods. Through semi-structured interviews and participatory methods, we found that success with REDD+ hinges on broader issues than those widely discussed in the literature and in policy circles. Though economic incentives for participants and the equitable distribution of benefits remain important to project participants, our study finds that, in adapting REDD+ strategies to best suit community needs, the role of a support system for implementation ("bridging institutions") and REDD+'s potential as a conflict resolution mechanism for tenure issues deserve more attention as key factors that contribute to meaningful participation in REDD+.

Keywords: REDD+; community REDD+; carbon-offset projects; land tenure; deforestation; climate change mitigation

1. Introduction

Reducing Emissions from Deforestation and Forest Degradation (REDD+) is now an accepted climate change mechanism under the United Nations Framework Convention on Climate Change (UNFCCC). It allows developing countries to contribute to mitigation by undertaking one or more of five activities: reducing emissions from deforestation, reducing emissions from degradation, conserving carbon stocks, managing forest sustainably and enhancing forest carbon stocks [1]. REDD+ is mobilizing significant financial resources from the international community as well as the private sector [2]. To date, funding from public sources dominates contributions, including bilateral agreements (i.e., the Norway–Indonesia REDD+, US$1 billion), and multilateral funds such as the Forest Carbon Partnership Facility (FCPF, US$385 million) [3] and the United Nations REDD Programme (UN-REDD, US$227.28 million) [4]. Much of such funding is aimed at REDD+ readiness, assisting countries in preparing to develop and implement carbon mitigation measures. In contrast, funding for early pilot initiatives comes mostly from the private sector through voluntary carbon

funds [5,6]. Investment in REDD+ greatly exceeds historical spending in conservation. The total budget for protected areas in developing countries during the 1990s was estimated at US$ 0.70 billion [7], a fraction of REDD+ investment. Such high levels of investment have raised hopes for enhanced forest conservation in parallel with effective carbon management [8].

REDD+ provides an opportunity for developing countries to engage in a process of change regarding forest resources, to address the causes of deforestation [6] and to create incentives for farmers and communities that influence local land use [9]. Many countries are currently hosting REDD+ pilot projects and their numbers are growing rapidly. In 2013, 300 REDD+ pilot projects were reported around the world [10], most of which were in the development phase and for which experience with implementation was relatively limited [11]. In 2012, we found information on only 20 REDD+ projects under implementation in Latin America [12], while Panfil and Harvey [13] in 2013 analysed 80 Project Design Documents for REDD+ projects worldwide under the Climate Community Biodiversity Alliance (CCBA) standards, only 15 of which filed an Interim progress report. The CCBA data however currently report 142 verified projects for Latin America [14].

REDD+ faces both opportunities and challenges that are contingent on local contexts and actors [12,15,16]. CIFOR's Global Comparative Study on REDD+ [17] recently yielded a number of important analyses of early REDD+ implementation in Brazil, Cameroon, Tanzania, Indonesia and Vietnam [18,19], recognizing that challenges were rooted deep in history and likely to require landscape-wide reforms. Their conclusion was echoed by Corbera et al. [20], who analysed tenure rights in Brazil, Mexico and Costa Rica, highlighting different 'bundles of rights' amongst countries. The authors stressed the importance of effective, equitable and legitimate policies and measures addressing not only tenure insecurity but also the ability of communities to exercise their rights to manage the forests. In fact, Chhatre et al. [21] identified tenure security and effective participation as the principal safeguards for REDD+ implementation. In Latin America, community forest management is particularly advanced, emerging as a solution from grassroots pressures to retain control over forests [22]. If REDD+ is implemented centrally, however, some authors fear a reversal of the "democratization" of forest governance that evolved over the last 20 years [23]. Although nested approaches to REDD+ implementation offer, in theory, the possibility for jurisdictional- or project-level REDD+ initiatives to inform national policy, a review of multilevel governance in Brazil, Peru, Indonesia, Tanzania, Cameroon and Vietnam suggest that positive feedback between levels is the exception rather than the norm [18].

The literature on early REDD+ implementation suggests that strategies for implementation of community-based REDD+ projects tend to be similar around the globe as rural and indigenous communities try to address common challenges they face [24,25]. For example, the majority (91%) of the projects reviewed in the literature address small-scale drivers of land-use change mostly related to agriculture and cropping systems [24,25]. Most of the projects (80%) include afforestation/reforestation strategies with both timber and agroforestry. As noted by Lawlor [24], the incentives most commonly used in projects are payments for ecosystem services (39%) and integrated conservation and development (29%). Securing land tenure is also an important motivation for community participation; Sills et al. [25] found that most projects support communities in their claims to secure tenure. The need to obtain land tenure also holds true for a project with 14 communities in Colombia [26]. Several projects have focused on land invasions and supporting communities in enforcing their land demarcations [27].

The present study contributes to this growing literature by providing empirical insights from a long-term REDD+ participatory action research initiative in an indigenous Emberá community in eastern Panama. The initiative, which spanned 11 years (2002–2013), was originally conceived in the context of the voluntary carbon market that developed in parallel with the Clean Development Mechanism. The initiative evolved to include avoided deforestation, livelihood enhancement and conflict resolution as part of a voluntary REDD+ pilot project. We present here the lessons learned from the project, identifying successes and barriers, and providing recommendations for future REDD+ implementation, while adopting a people-centred approach. We position the villagers' reality as

a starting point and examine the options offered by REDD+ for capability, equity and sustainability as necessary conditions to enhance livelihoods.

2. Methods

2.1. Introducing the Case Study

The long-term participatory action research initiative reported here took place in an indigenous Emberá community of eastern Panama. The region receives an annual average of 2500 mm of rainfall, with a marked dry season between December and April; the mean annual temperature is 26 °C [28] and the primary vegetation is tropical moist forest (Holdridge Life Zones system). Migration and settlement patterns of the Emberá population in eastern Panama's Bayano region are well-described in the literature [29,30]. The Emberá people first settled in the area during the 1950s when they migrated from the Darien, Panama's easternmost province. In the mid-1970s, a hydroelectric dam was constructed in the Bayano River, creating Lake Bayano and displacing some 400 Emberá, 1500 Guna and 2500 colonist farmers [30]. The Majecito Agreement signed between President Omar Torrijos and the Emberá community in 1975 entitled the Emberá to new land without granting full legal land rights. Forty years after the resettlement, in 2015, the Panamanian government officially recognized the territory as a Collective Land under Law 72 following ruling of the Inter-American Court of Human Rights in favor of the Indigenous groups of the Bayano watershed [31].

The community is governed by a political body, the *dirigencia*, led by a community chief (*noko*) chosen by a community assembly. The community is also home to a community-based non-governmental organization (NGO) established in 1998. Its mission is to promote conservation and sustainable development as well as to preserve the culture and traditions of the Emberá people. In 2004, when interest in a carbon project first emerged, the community consisted of 550 people with most of the 71 families residing in a nucleated settlement [32]. The community's territory encompasses 3145 ha, with the land divided into plots ranging in size from 1 ha to 100 ha. Plots are allocated by the chief to individual households and decisions on land-use management are made at the household level. Community regulations prohibit households from selling their plots. Land cover in 2004 included forest (46%), pasture (18%), tall fallow fields (19%), short fallow fields (8%) and cropland (9%) [33]. Households rely, for their livelihoods, on subsistence cultivation, cattle ranching, day labour and handicraft production. Timber, beef and manioc (*Manihot esculenta* Crantz) are the principal market goods.

The community initiated a long-term collaboration with the Neotropical Ecology Laboratory of McGill University in 1996. Since the onset, an action research approach was employed, in which research is conducted jointly between researchers and local participants to empower villagers in identifying issues that affect their lives and promote social change [34]. Action research is undertaken in cycles initiated by implementing an action and reflecting upon the experience to develop a new research cycle, enabling both participants and researchers to "learn by doing" [34]. Lessons from the earlier phase allow the formulation of new research questions and actions for the next cycle, in a progressive learning path [35,36]. Multiple methods are used in action research, and the participatory nature and full involvement of local participants are of central importance.

The first studies in the community, in the late 1990s, examined the conservation status of traditional plant resources [37,38]. Research showed that about a third of the studied species were considered by villagers to be threatened or potentially threatened [38]. These results stimulated community interest in exploring land-use alternatives that would allow for forest restoration and conservation, particularly reforestation. A former community chief mentioned that: "*Through this study, we realized that if we continued cutting trees we were going to end up with no forest; we needed to do something about it.*" (*Former community chief in the 1990s, interview conducted in 2009*).

In 2002, the community began exploring the feasibility of implementing a reforestation/afforestation initiative for carbon storage, species conservation and enhancing local livelihoods [33]. Earlier studies suggested that carbon stocks in the community were likely to decline by more than 50% between 2004

and 2024 (from 301,859 t C to 155,730 t C) due to a projected increase in pasture area and an expected reduction in fallow cycle duration on established croplands [33]. This led the community to engage, in 2008, in a voluntary carbon-offset project with a Panama-based research institute (hereafter the client) that engaged to purchase a total of 6900 t CO_2e over 25 years. The contract aimed at enhancing forest carbon stocks through reforestation (3600 t CO_2e equivalent to 10 ha) and avoiding deforestation (3300 t CO_2e equivalent to 24 ha in three years, 8 ha per year). The client committed to providing the seedlings for the first planting season (2008) and to assisting the community-based NGO in establishing a local nursery for future plantations. In this paper, we describe the research cycles that unfolded during this carbon-offset project implementation and draw the lessons learned from the community's experience with REDD+.

The overarching research question that guided the participatory action research between 2009 and 2013 was "How can forest carbon offset initiatives benefit local communities, reconciling emission reduction and local livelihoods?" To answer this question, the project engaged in three cycles of research action. The first research cycle documented here addresses climate change mitigation, focusing on the carbon contract's participatory design, including the internal process undertaken by community leaders to engage local villagers, find a carbon buyer and negotiate the carbon price. The specific question asked during this research cycle was "From participants' viewpoints, what are the best combinations of land-use alternatives to increase carbon stocks and what is an appropriate benefit-sharing design?" The second research cycle focused on early implementation of the carbon contract, asking "What barriers were faced during implementation on the ground?"; "How were they overcome?"; and "What is the participants' perception of the project?" The third research cycle broadened the scope of analysis, aiming to understand interactions with other stakeholders, in particular *colonos* (non-indigenous farmers of Latino origin) living adjacent to Emberá land. This research cycle explored possible ways forward.

2.2. Participatory Design and Implementation of a Carbon Project

In 2004, villagers developed a participatory map of current land uses on their territory that served as a basis to determine a carbon baseline [33]. Members of the community then began discussing what future high-carbon landscapes could look like. They crystallized their desire to implement a carbon project by developing a Project Design Document (PDD) for submission to ANAM, Panama's National Authority for the Environment, which was acting then as the clearing-house for carbon projects in Panama. Interviews conducted in 2005 with 60 of the 70 community landowners helped them determine (1) how much land could be allocated to a carbon project; and (2) which new land uses would be preferred [33].

Between 2009 and 2013, 108 semi-structured interviews were conducted with community leaders, project participants and other stakeholders (Table 1). Interviews were designed to answer questions from each research cycle and to shed light on diverse aspects of project design and implementation. Interviews were conducted with the help of McGill's Panama Field Study Semester (PFSS) students and community research assistants; the latter ensured full comprehension of questions and answers and translated between Spanish and Emberá as needed. The semi-structured interviews were coded qualitatively and key concepts were identified and categorized into interview themes [39]. Multiple coding was used to cross-check the data and interpretation by different members of the research team [40]. For example, data gathered and analyzed by students were always validated in supervisory meetings with I.H. and C.P. Further, member checking—a qualitative validation method for verifying research findings with participants [41]—was used to validate and modify preliminary interpretations as needed. Participant observation, using field notes, was used throughout the research cycles to record community meetings [42,43]. The study followed McGill University's Policy on the Ethical Conduct of Research Involving Human Subjects, the Neotropical Environment Option Protocol for conducting research with Indigenous Peoples in Panama as well as the agreement and rules set forth in Resolution 2 of 16 March 2008 by the *Congreso Local de la Comunidad.* For more details about

interviews, including type of interviewees and interview guides and initial coding and analysis of interviews, see [44–47].

Table 1. Total number of interviews conducted throughout the research cycles (2008–2012).

Interviewee	2008	2009	2010	2011	2012	Total
Former community chiefs	1	1				2
Local NGO * representative	1	1	1	2	2	7
National NGO representative		1				1
Representative of the client	1	1				2
ANAM ** representatives		1				1
Project participants						
Participants in avoided deforestation ***		3	3			6
Participants in reforestation ***			7	8	20	35
Interested potential participants					54	54
Total	3	8	11	10	76	108

* Non-Government Organization (NGO); ** National Authority for the Environment (ANAM); *** Some participants were interviewed in multiple years; total participants in avoided deforestation 3 and in reforestation 22.

2.3. Land Invasion and REDD+ Implementation

One year into implementation, in 2009, participants reported that the land set aside for REDD+ was invaded by *colonos*. To document what was happening and determine the rate of deforestation in this area due to *colono* invasion, the area dedicated to REDD+ was visited on three separate occasions—4–14 February and 28 March 2009 (see details in [47]). During each visit, GPS coordinates were systematically taken at points of interest and at minimum intervals of every 200 m (using both Garmin GPS III Plus™ and Legend HCx to improve the precision of locations). At each point, the land use type was noted and points of interests, including houses and working huts, were recorded. The land uses noted followed those used in the 2004 map that served to develop the carbon baseline [33]: pasture, short fallow (1–4 year), tall fallow (>5 year), primary forest, secondary forest and new deforestation. The latter category included freshly cut trees, burned fields and sites in which the understory was entirely cut. As necessary, 360-degree pictures were taken to give a sense of surroundings. Sketches relying on estimating relative distances walked and orientation with a compass were drawn in the field to help subsequent mapping. GPS coordinates and field notes were imported into ArcGIS. A satellite image from Google Earth was then overlaid in ArcGIS using landmarks, such as rivers, mountain ridges and roads. After developing the map, notes for each GPS point were reviewed along with its corresponding photographs to delineate the current land-use areas on the map. Polygons were created to represent the distribution of each land use in the area. The exact extent of the polygons relied heavily on photographs and field sketches. Pictures from different field days from the same area were also compared to verify accuracy; however, distances were often estimated in the field or from photographs. ArcGIS was used to determine polygon areas using geographic coordinates [47].

3. Results

3.1. Research Cycle 1: Participatory Design of a Forest-Carbon Project: What Are the Best Combinations of Land-Use Alternatives to Increase Carbon Stocks and What Is an Appropriate Benefit-Sharing Design?

As the community began to discuss a carbon-offset initiative, there was much interest expressed by local leadership and households. Coffee plantation under forest trees, silvopastoral systems and living fences were identified as attractive novel land uses to increase carbon stocks. Only eight of the 60 land owners initially interviewed in 2005 were not interested in investing part of their land in a carbon project. The vast majority of landowners proposed to convert half of their lands into tree plantations, due to the high market value of timber, while the other half showed interest in fruit tree plantations for their market and subsistence value. In addition, some villagers showed interest in silvipastoral practices (the combination of livestock and trees in the same land); others were interested

in putting living fences around their land. The 2005 Project Design Document indicated that 52 owners would participate, dedicating 180 ha of pasture, 66 ha of low fallow, 268 ha of tall fallow and 65 ha of mechanized rice for a total of 579 ha of land. The novel land uses would consist of 290 ha of native timber plantations, 155 ha of agroforestry, 140 ha of silvopastoral and ~7500 m of living fences.

Despite initial enthusiasm, it took four years for community members to initiate the carbon project. In 2006, a working group established by the *cacique* (regional chief) assessed options to go forward with the project and decided to begin the project as a pilot initiative. Recruiting community members to participate in the carbon project took considerable time. The project started in 2008 with seven participants. After three years of implementation, there were 22 participating households. During a community meeting undertaken in 2012, four years after project implementation, 54 people expressed an interest in engaging in a second carbon-offset project, suggesting that they were less reticent to participate after seeing results of others that engaged first. Still, the 22 participating households were more cautious when it came to project establishment then they had been in the PDD development. Their initial pledge in 2005 during the PDD development was on average 30% of their total land. In reality, participants allocated an aggregate of 19 ha to the carbon project, representing 1.3% of their total land. Allocation to novel land uses was consistent with their initial intentions but at a much-reduced scale, and participants' interest shifted over time from timber to agroforestry (Figure 1).

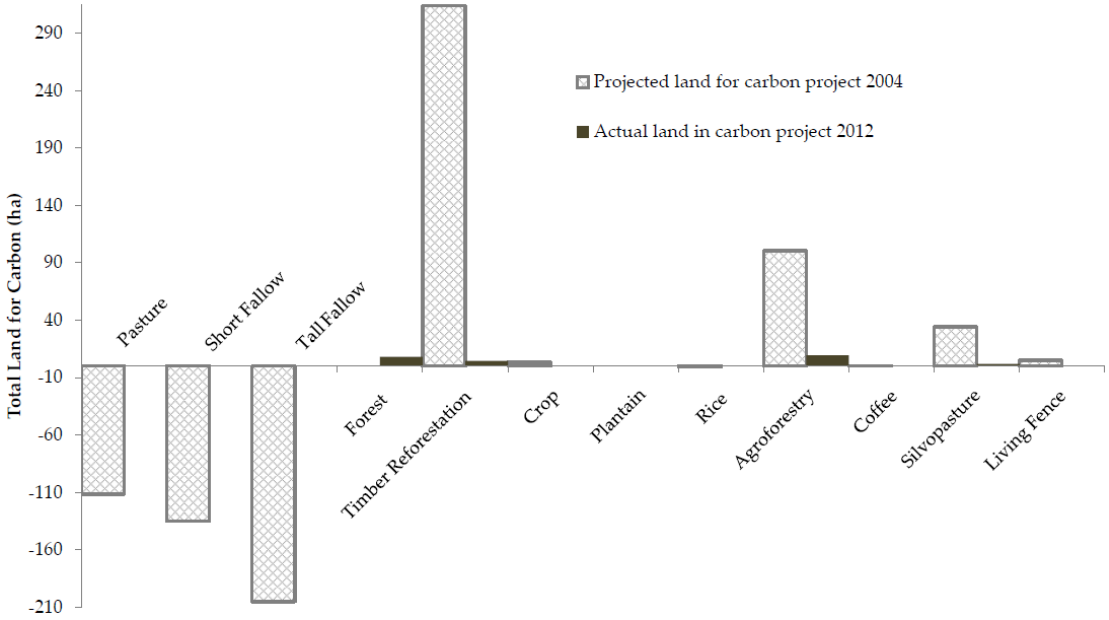

Figure 1. Initial projection and actual land (in hectares) allocated by participants to the carbon-offset project in 2004 and in 2012.

Interviews with both local leaders and participants revealed tensions within the community regarding the notion and design of a benefit-sharing mechanism, suggesting that this tension might have been holding back participation. There was friction particularly over whether the revenues should be for community development or for participating households. The former *cacique* mentioned that, in her view, a carbon project should aim towards the collective development of the community, an opinion shared by the President of the community-based NGO. The local authority wanted to establish a community development fund for improving local infrastructure and access to services such as education and health.

> *Families who wanted to participate sought to receive the entire portion of the carbon funds; while our vision (as leaders) was that part of the money should be for a collective fund to benefit the entire community—for us, this is development—and another portion to families so they could*

> *buy their personal stuff. This internal difference blocked the idea of a carbon project until 2007. (Former community chief between 2002 and 2004, interview conducted in 2008)*

This view, however, was not shared among interested community members and potential participants.

> *I am the one that works all day under the sun weeding my plot, so why should the carbon project renovate and buy seats for the communal meeting house? I prefer that this money is in my pocket. (Project participant (male), reforestation with agroforestry, interview conducted in 2012)*

In the end, 80% of payments were to be made directly to participants and 20% pooled into a community development fund managed by the community-based organization [45]. Per the contract, direct payments would be made bi-annually to participants if they complied with their contract obligation. These commitments included ensuring the preservation of standing forest (avoiding deforestation) and, for the reforestation component of the carbon project, weeding and replacing dead trees.

Results of semi-structured interviews, carried out in 2012, revealed different views as to how financial incentives for participation in a carbon project should be calculated [46]. Some landowners thought the project should compensate participants for the potential gains they would have made in the various land uses that they instead chose to allocate to the project; to this end, villagers estimated land use opportunity costs. Others were comfortable with evidence-based payments, i.e., payments based on carbon sequestered. Finally, some felt that the project should ensure participants' costs of living, providing them with desired social benefits in exchange for their role in maintaining an important ecosystem service. The proponents of this "quality of life approach" estimated that a family income of US$700 per ha per year per family was needed to ensure access to education and community development. Ultimately, the carbon contract used both reforestation and avoided deforestation. The contract allocated US$4500/ha (US$10.22/t CO_2e) for reforestation, with funds to be disbursed over the first eight years. For avoiding deforestation, the client agreed to pay US$100/ha per year based on estimated net returns for cattle ranching over a 25-year period [48].

Interviews held in 2012 with 54 potential new participants revealed that receiving monetary compensation was the main attraction for participating in REDD+ (72% of interviewees) [46]. Thirteen percent of interviewees stated a better quality of life as a reason for participating in a future REDD+ project. Facilitating access to education was the second most common reason (61% of interviewees), with 42.6% of interviewees specifying that they wanted money to send their children to school. Community development was cited by 39% of interviewees. Of these, 57% mentioned improving community infrastructure, while 28.5% specified community development through capacity-building. Further, 26% of interviewees listed improving the environment—in particular, forest preservation and climate change mitigation—as their reason for wanting to participate. Insufficient monetary incentive was a concern for 24% of interviewees. Price volatility and the general increase in cost of living were emphasized, leading interviewees to stress the need for monetary incentives being flexible over time and adjustable according to the rising cost of living [46].

3.2. Research Cycle 2: Early Implementation of the Forest-Carbon Contract: What Barriers Were Faced during Implementation on the Ground? How Were These Overcome? What Is the Participants' Perception of the Project Strategy?

The initial carbon-offset contract included reforestation of existing pasture and short fallow areas. Although reforestation was initially planned with native timber species only (on 10 ha), in 2009, project participants explained that they did not have enough land to devote exclusively to timber and asked to include agroforestry systems that combine fruit and native timber trees as a reforestation option. Project participants argued that exclusive allocation of land to timber could compromise household food security and livelihoods, and they were concerned about the long maturation time and lag for receiving benefits from timber. An interviewee noted that:

> "*It is important to have options so reforestation could ensure that I could continue using my land to grow cassava, plantains and the products I need to feed my family*". (*Project participant, reforestation with agroforestry, interview conducted in 2009*)

The client agreed to adjust the reforestation strategy, and agroforestry became a reforestation option in 2009. This change was accepted because the client's interest lay in the total amount of carbon sequestered, regardless of the manner by which it was achieved. The client's representative mentioned that: "*This is not different from buying pineapples; you buy a number of them and want to have them in hand when you pay*". Agroforestry systems were chosen as the reforestation strategy by 55% of project participants (12 households), and only one new project participant chose to reforest exclusively with timber species [45].

Interviews conducted with project participants in 2012 reveal concern regarding the disbursement mechanism of the project. Participants and community leaders alike expressed reservations, specifically regarding the Communal Fund. The idea behind the Communal Fund was to support community development initiatives so project benefits could be broadly shared. However, there was a lack of agreement on the fund's objectives as most project participants (62.5%) did not agree that they should "donate" money for community development from the money they generate through individual efforts on the carbon project. Project participants and community leaders so far have been unable to agree on how the money should be disbursed. Consequently, the Communal Fund has accumulated as clarity on how it should be spent is pending [46].

The interviews in 2012 highlight another concern about the disbursement mechanism, namely lack of cash flow. In all participating families, men—who are mostly in charge of agricultural work—receive daily or monthly payment for daily labour (i.e., as agricultural worker-peons, loggers, teak plantation workers, security guards, etc.). Seventy-five percent (15/20) of participants mentioned hiring agricultural workers (*peones*) for weeding and planting on their reforestation plots [45]. These project participants asked the client to pay them a bi-annual upfront payment rather than paying them after plantations were cleaned, to allow them to hire labour. This, however, has not been accepted by the client, who indicated that such a payment method would entail an investment risk (Field notes from meeting, December 2010).

The initial interviews held in 2010 to inform project design revealed leadership and fund management as an *a priori* concern for 24% of interviewees, who noted the lack of transparency in fund management by existing leaders [44]. This concern emerged as a central theme in the interviews carried out in 2012 after years of implementation [46]. Project participants (reforestation) overwhelmingly (88%) felt that the project lacked the leadership needed to support, motivate and galvanize the project. A key factor that might explain the lack of strong local leadership throughout the project life is that, in 2008, a generational change of leaders occurred and the capacities of elder leaders were not passed on to the new generation. For the new, young leaders of the community who faced the demands of having young children and of building an economic future for their families, time committed to project coordinating activities without compensation was costly and sometimes counterproductive. The carbon-offset contract contemplated the need to support project implementation and develop leadership capacity. A national NGO was invited by the client to monitor the reforestation plots (verification) and assist participants and the community-based NGO in building project implementation capacity. The national NGO initially played a very positive role in the community, bringing additional corporate social responsibility funds from a national enterprise. In the end, the national NGO could not fulfil its role because of lack of funding to support its continued engagement. Its lack of experience in supporting carbon sequestration projects in indigenous communities might have also played a role, since the project was the first of its kind in Panama. "*This is the first experience we have [as organization] with projects related to carbon sequestration and so far we are finding the implementation process slower than expected*" (*National NGO representative, interview conducted in 2009*).

3.3. Research Cycle 3: Unresolved Foreseen Complications

Land tenure was a concern voiced by 16.7% of interviewees during the project design phase in 2008. Community members feared that *colonos* might invade areas dedicated to the carbon project, threatening the success of REDD+. Furthermore, some mentioned that Panama's Constitution indicates that if land is not used, it is not considered as being owned. They were thus concerned that the Panamanian Government could take back their land if they were to "stop using" it in order to conserve the forest under REDD+. At the project onset, only three landowners chose to engage in the avoided deforestation component of the project. These landowners held parcels far away from the village and without direct access by road. As the project unfolded, it became evident that these parcels had historically faced intense land conflicts between the community and local *colonos*, and that the landowners saw in REDD+ an opportunity to resolve the situation. Since 1992, *colono* families that lived on land near the community began clearing forest for agriculture on Emberá community land. To enforce REDD+ on their land, the participants' action plan included: (i) posting signs to delineate the avoided deforestation parcels; (ii) training a community-based patrol to ensure compliance; and (iii) establishing a reforestation border in the conflict area.

Within six months of action plan implementation, it became clear that the land conflict between *colonos* and the community was deeper and more complex than originally feared. Despite sign postage, colonists continued to invade community land. Site visits showed that 36 ha of community land had been cleared by colonists between February and March 2009, including short fallow fields (31 ha), tall fallow fields (4 ha) and primary forest (1 ha) [47]. Tensions increased as clearing continued and threats of violence by colonists rose. Mapping revealed the presence of *colono* houses established for over a decade both along the river and deep inside the Emberá territory. We also documented the presence of pastures used either by *colono* farmers living outside of or *colonos* established within the Emberá land [49].

Interviews with a representative from ANAM indicated that, in theory, *colono* farmers could be forced to pay a fine between $1000 and $1500, and cease any "environmentally detrimental" activities. The official, however, noted that this would not be easy as the *colono* farmers have lived in the area for some time, and it is therefore unclear whether the Emberá have legal title to their land [49]. To do this investigation, they would need to review laws and legal documents to verify that the land is indeed Emberá-owned. ANAM's representative also noted that ANAM alone cannot solve this problem, as other authorities—such as those responsible for ownership rights or the agricultural sector—also must be involved in inherently complex cases of land invasions [49].

Community leaders decided to initiate political actions aimed at resolving the land conflict through dialogue and state representation. Their complaints, however, were lost in the bureaucracy; none of the formal notes sent were acknowledged nor could they be found in the government record or archives. Interviews held in 2009 with representatives of two key agencies—ANAM and Política Indigenista—suggest that the unresolved land tenure status of the community prevented the agencies from enforcing any action on the ground to resolve the land conflict. Further, the agencies lacked clarity in their mandate to address land and land-use conflicts where tenure status was unclear; interviewees argued that their agencies had no legal mandate per se to resolve conflicts.

To support dialogue between local stakeholders with competing interests for the land and the government and identify possible ways forward, researchers from the Neotropical Ecology Laboratory invited local and national stakeholders to form a working group, The Advisory Council on Conflict Resolution and REDD+ (hereafter The Council). Between May and December 2011, The Council brought together 68 participants representing 34 organizations including representatives from government agencies (14), indigenous peoples (5), colonists (5) and NGOs (4) to establish a successful intercultural collaborative dialogue on the contentious issue of territorial conflicts among different sectors [50].

The Council developed a series of recommendations shedding light on the considerable confusion about the roles and responsibilities of government agencies in land tenure and invasion law

enforcement (Table 2) [50]. Nonetheless, despite the efforts to build capacity for land conflict resolution and new government laws since The Council meetings, much confusion remains about the roles and responsibilities of government agencies in land law enforcement.

Table 2. Recomendations issued by The Advisory Council on Conflict Resolution and REDD+ to the National Land Council Panamanian Government [50]. ANATI: National Authority for Land, the government agency responsible for land titling.

1.	The National Land Council should lead territorial conflict resolution following ANATI's advice.
2.	It is essential to precisely define territorial limits as proof of judicial processes that will determine relocation and/or eviction decisions. The national Geographic Institute should be responsible for field analyses relying on geographical information, in coordination with the national Limits Commission.
3.	Where they do not exist, Municipal Courts should be created to manage territorial conflicts and mandate executions in coordination with responsible authorities.
4.	It is imperative to harmonize the work of different government entities and clarify the legal context. Legal gaps and overlapping/conflicting legislation need to be identified and corrected; clear rules defining institutional responsibilities that apply to land conflicts are a must.
5.	ANATI should implement an extensive and in-depth divulgation campaign to present and clearly explain hierarchical order and institutional Government mandates pertaining to territorial conflict resolution, as well as the corresponding processes to be followed.
6.	The National Land Council should create a Follow-up Agreement Commission.
7.	The Advisory Council offers that its members be integrated into the Follow-up Agreement Commission as they are personally acquainted with territorial conflicts, have received training and tools for their resolution through dialogue and have demonstrated genuine interest in reaching consensual and beneficial solutions for all parties involved.

4. Discussion

The socio-economic and cultural features of communities in which REDD+ is being implemented vary widely around the world. Lawlor et al. [24] reviewed 41 projects across 22 countries—from Latin America, Asia and Africa—and Sills et al. [25] reviewed another 23 projects in six countries. These projects take place in a variety of ecosystems, from drylands to tropical rainforests, with project size ranging from 42 to 642,184 ha and local populations varying from 1025 to 250,000 people [24,25]. The Panamanian project analyzed here, with 19 ha of reforestation and 22 participants, is smaller than most other REDD+ case studies reviewed. However, it began in 2002 when the community sought financial support to estimate the carbon stocks of its territory and is therefore one of the longest ongoing such initiatives in Latin America, together with Noel Kempf Mercado in Bolivia and Scolel-Té in Mexico, initiated in 1996 and 1997, respectively.

Overall, the community's efforts to engage in REDD+ documented here show that implementing REDD+ may be particularly challenging for poor communities. REDD+ was initially proposed as a "cost-effective strategy" for climate change mitigation [51]. Attention has since been drawn to the fact that cost-effectiveness is context-dependent and conditional on the remoteness of areas, the nature of social, cultural and environmental landscapes, governance and tenure regimes, and more [52]. Indeed, the general claim of cost-effectiveness has been called into question [9,53]. In addition, REDD+, as an initial "carbon-market" vision, was conceived as a financial rather than governance mechanism [54] but implementation of a people-centred approach requires that REDD+ be understood as a new environmental governance structure [55].

Our long-term study showed that, to embrace livelihood enhancement in rural communities, REDD+ design and implementation must consider the underpinning complex of social, cultural, political and economic factors operating at different levels (Figure 2). The journey we described in this article is rich in lessons learned and we use them to guide the discussion of key observed implementation barriers and attempts to overcome them.

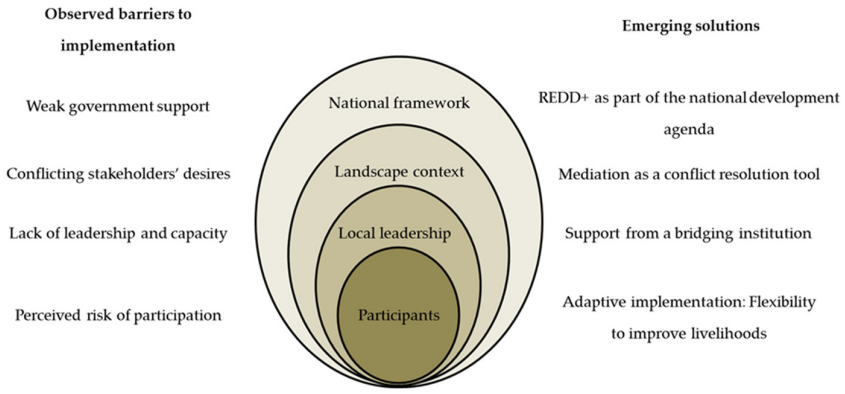

Figure 2. Concept map showing REDD+ implementation considering a landscape approach and summary of observed barriers to REDD+ implementation and emerging solutions.

4.1. Lesson 1: REDD+ Participation Entails a Slow Process of Engagement

A key lesson learned is that engagement in REDD+, in the context of poor communities, is a slow process. The concept of carbon credits or selling carbon is apparently not easily understood by local communities and there is considerable uncertainty about how REDD+ will affect existing tenure and use rights (i.e., changes in carbon tenure) [52]. For REDD+ to be fully appreciated by communities, sufficient time must be available to negotiate conditions under which communities will feel motivated to participate [52,56]. Consent must be understood as a process and negotiated between affected parties throughout all stages of a project, which inevitably takes time [57]. Three years into project implementation, we felt that residents were still risk-averse but willing to take a chance after seeing the benefit/risk ratio of early participants. This "demonstration effect" is consistent with reports that pilot initiatives can act as a catalyst for others to engage and scale up [15,58]. Local willingness to participate and engage in new strategies can require long timeframes which need to be considered in the project design phase [59]. Cronkleton et al. [22] forewarned REDD+ planners that they should expect a long period of learning and adaptations and therefore find "patient" investors.

Previous studies have emphasized the need to provide a suite of activities from which participants can choose to ensure broad participation and shape the project strategy to local livelihood needs [8,33,60]. A review of 40 Payment for Ecosystem Service projects noted that initiatives that improved livelihoods and community development were more successful than those that did not [61]. In the present case study, the flexibility of the client who accepted a modification in the original plantation design to allow the establishment of agroforestry systems played a key role. The tangible livelihood benefits incurred by establishing agroforestry plots facilitated adoption by reducing the perceived risk of engaging in REDD+. We therefore call for adaptive implementation allowing to reorganize project activities during implementation to align with the evolving needs and constraints of participants.

4.2. Lesson 2: Strong Sustained Local Leadership and Nested Bridging Institutions Are Critical for Successful REDD+ Implementation

A second lesson drawn from the community's journey is that the "willingness" to manage the forest sustainably is insufficient, alone, to ensure success. REDD+ is a complex mechanism and implementation in indigenous and small rural communities poses particular challenges. The effectiveness of REDD+ projects rests largely on the ability and interest of local communities to manage their forests sustainably while enhancing forest carbon stocks [55]. Participants in the project identified project leadership as a major barrier in implementation. Evaluating the use of payment for ecosystem services to foster community development and forest conservation in Latin America,

Couto Pereira [62] noted that discussions around capability, equity and sustainability were often absent from ongoing dialogues.

The framework developed by Cerbu et al. [5] to understand the capacity barriers of communities seeking to implement REDD+ is highly useful. The authors considered four categories of capacity: (1) technical; (2) managerial; (3) organizational; and (4) related to dealing with risk and potential REDD+/livelihood development conflicts. In the Panama project, we noted strong capacity for both the technical and managerial aspects of resource use [33,45]. The leadership issues noted as a major impediment were organizational in nature.

We propose that, for small communities, REDD+ projects should be considered as emerging sustainable social-ecological systems, *sensu* Ostrom [63]. In such a context, bridging institutions could assist communities in building their capacity for successful REDD+ implementation [12]. Bridging institutions, a key element in Ostrom's [63] framework, as Berkes ([64], p. 1692) notes, "bridging organizations provide a forum for the interaction of these different kinds of knowledge, and the coordination of other tasks that enable co-operation: accessing resources, bringing together different actors, building trust, resolving conflict, and networking". Recognition of the need for capacity-building and the role of bridging institutions should be considered in designing payments. Payment designed to foster stewardship or to compensate for lost opportunities might be more appropriate for grassroots communities than payments targeting ecosystem services [55]. The Juma Sustainable Development Reserve in Brazil, with its four components of supporting families—sustainable income generation, local organization strengthening and participation and social development—provides an interesting example of payments to support forest stewardship [65].

4.3. Lesson 3: Multi-Actor Land Conflicts Can Undermine REDD+

A third lesson is that inability to engage with multiple agents responsible for deforestation can imperil communities' efforts to implement REDD+. This study was carried out in an intercultural context where interest groups collide forcefully over the fate of the forest. Land allocation policies in developing countries often consider intact forests as "unproductive" resources [66]. One way of "improving" land is through deforestation [66,67] as cleared land is more valuable than standing forest [68,69] and, in countries such as Panama, the Constitution and Agrarian Code indicate that deforestation signals land ownership. As pressure on land resources becomes more acute, pressure on forests can mount and excluding outsiders becomes even more challenging [19]. It has long been recognized that uncertain tenure can facilitate deforestation [67,70]. Corbera et al. [20], however, cautioned against using REDD+ as an instrument for gaining land title and tenure security over their lands, suggesting that income would be insufficient to enable the full enforcement of forest rights.

Recently, a landscape approach that integrates agriculture, conservation and other land uses is gaining momentum in REDD+ implementation [71]. This approach acknowledges the decisions made by multiple actors and cultures at the landscape level [72] and enables the search for solutions that broadly address conservation and development challenges [71]. Undertaking REDD+ implementation based on a landscape approach would allow us to look beyond the forest, acknowledging competing land uses as well as the complete array of actors and institutions that shape land use beyond local communities [21].

In the Panama project, the community chose to engage in a process involving conflict resolution methods such as mediation [73] to try to find a way forward. The Council that served as a multi-stakeholder platform for discussing the challenges of REDD+ implementation was successful in that its analysis shed clarity on the responsibilities of the many institutions involved in land tenure and management. However, The Council failed to attract the attention of higher levels of government, despite being composed of representatives from five governmental agencies.

4.4. Lesson 4: The Self-Interest of the State

Possibly the greatest impediment faced during the Panama carbon project's development was the lack of support from the State. This was first evident in 2005 when the community sent their PDD to ANAM. Despite numerous efforts to follow-up, the community never heard back from the government. This absence of interest prevented the community from garnering support to identify potential carbon buyers internationally. A similar failure to support the community was observed when government authorities were presented with both the evidence of *colono* invasion of the communal land and The Council's proposal for mediation. The lack of cooperation and assistance from the State is consistent with reports of poor communication between the government and indigenous peoples [74].

Policy options that could allow for reducing deforestation in Latin America include the need to stop illegal expansion of the agricultural frontier [75]. An essential question therefore is "Why would this be in the interest of the State?" Forests have long been perceived as a supply of land in Latin America [23]. In this context, "predatory forest exploitation" is often financially more attractive than careful management [75]. As noted by Chhatre et al. [21], some of the most forested regions in the world are characterized by weak rule of law and a low level of public accountability. In a comparison of REDD+ policies in Brazil, Cameroon, Tanzania, Indonesia and Vietnam, Ravikumar et al. [18] pointed to the absence of harmonization between national and local jurisdictional policies. Brazil is apparently the only country in which land tenure regularization by proponents is more closely aligned with national policies and in which a series of measures adopted by the State have allowed successful reduction of deforestation in the Amazon [19,23].

In a review of 23 REDD+ projects at the jurisdiction and project level, Nasi et al. [75] trace the willingness of States to manage forest as emerging from social and political values influenced by the positioning of extractive industries and society. Scholars have emphasized the need to trigger a values shift in response to climate change—a task that requires action on the part of governments, private sector leaders, and civil society—and to create a vision of the future that is both desirable and feasible [76]. Imaginative, novel values could possibly emerge from a national REDD+ agenda that proposes another way to "improve" land, such as partnering with conservation organizations [77]. As noted by Sjaastad and Bromley ([78], p. 553) "although insecurity of tenure is a disincentive to invest, it is—paradoxically—often also an incentive because investment will itself increase security". REDD+ could therefore offer a way for local communities to prove that the land is being used "productively" (i.e., with respect to carbon), showing investment in and improvements to their land and increasing the value of standing forests.

At the time of our case study, combating deforestation has not been a national priority for Panama. Indeed, current as well as past priorities centered around poverty elimination, security and health [79]. At the Conference of Parties of the UN Framework Convention on Climate Change in Paris in 2015, Panama's President launched a national reforestation campaign pledging to reforest one million hectares over 20 years [80]. It will be interesting to see if this new initiative will finally provide the community with the support needed to advance their goal to maintain forest cover in their territory.

5. Conclusions

Whether the Panama project was a success or failure depends on which objectives are taken as paramount. From the strict viewpoint of carbon sequestration, the Panama project could be interpreted as a failure. Project participants were unable to implement the avoided deforestation component of the original carbon contract, equivalent to 3300 t CO_2e, and the reforestation component fell short of reaching its carbon sequestration objective. It was estimated that agroforestry systems would sequester 71 $\pm$ 2.5 t C ha^{-1} but projections showed that, due to tree mortality, carbon sequestration would reach only 59 ($\pm$ 16) t C ha^{-1} [45]. This outcome contrasts strongly with the trajectory of the Scolel-Té project of Chiapas Mexico [81], a project that started with 43 participants who reforested 77.5 ha and 10 years later, in 2015, reached 2437 participants for 9645 ha. A possible explanation for the marked difference in trajectory between the two projects is that, while both were initiated as "ways

to advance community development and provide environmental services" [82], Scolel-Té evolved in response to new possibilities offered by the carbon market whereas the Emberá project remained a community-development strategy.

From the perspective of community development, the Panama project was a success. Three years following project implementation, half of the project participants were receiving income from sales of early-maturing fruit, and project participant interviews indicated that they felt their livelihoods had improved [45]. Furthermore, indigenous authorities and villagers from nearby Emberá territories strive to emulate the community in which the carbon project took place, perceiving it as successful in avoiding environmental degradation [83]. Thus, from a people-centered approach or from a community development viewpoint, the Panama carbon project did achieve favorable outcomes.

We propose that successful implementation of REDD+ projects in small rural or indigenous communities demands a shift in paradigm, away from "evidence-based payment" and towards an integrated development approach. The key lesson we learned is that REDD+ takes much time to implement because it involves redefining livelihood strategies. It is indeed unlikely that, at the current market price for carbon, evidence-based payments could support the transformative change that is required at the community level, e.g., development of enhanced leadership capacity of local organizations or of bridging institutions. Alternate models of support for community-based REDD+ initiatives are needed, such as the Juma project in Brazil [65] or the N'hambita community carbon project in Mozambique [15] that are combining evidence-based payments with development and poverty reduction, and apparently are better suited to support community development needs and challenges in the context of REDD+.

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