DATA COLLECTION IN THE FIELD

Lessons from Two Case Studies Conducted in Belize

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ORIGINAL ARTICLE

The carbon sequestration potential of tree crop plantations

Rio Kongsager · Jonas Napier · Ole Mertz

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Abstract Carbon (C) conservation and sequestration in many developing countries needs to be accompanied by socio-economic improvements. Tree crop plantations can be a potential path for coupling climate change mitigation and economic development by providing C sequestration and supplying wood and non-wood products to meet domestic and international market requirements at the same time. Financial compensation for such plantations could potentially be covered by the Clean Development Mechanism under the United Nations Framework Convention on Climate Change (FCCC) Kyoto Protocol, but its suitability has also been suggested for integration into REDD+ (reducing emissions from deforestation, forest degradation and enhancement of forest C stocks) currently being negotiated under the United Nations FCCC. We assess the aboveground C sequestration potential of four major plantation crops – cocoa (*Theobroma cacao*), oil palm (*Elaeis guineensis*), rubber (*Hevea brasiliensis*), and orange (*Citrus sinensis*) – cultivated in the tropics. Measurements were conducted in Ghana and allometric equations were applied to estimate biomass. The largest C potential was found in the rubber plantations (214 tC/ha). Cocoa (65 tC/ha) and orange (76 tC/ha) plantations have a much lower C content and oil palm (45 tC/ha) has the lowest C potential, assuming that the yield is not used as biofuel. There is considerable C sequestration potential in plantations if they are established on land with modest C content such as degraded forest or agricultural land, and not on land with old-growth forest. We also show that simple C assessment methods can give reliable results, which makes it easier for developing countries to partake in REDD+ or other payment schemes.

Keywords Aboveground biomass · Allometric equations · Carbon estimations · Carbon sequestration · Ghana · Kuofie · Land-use change · Tree crop plantation

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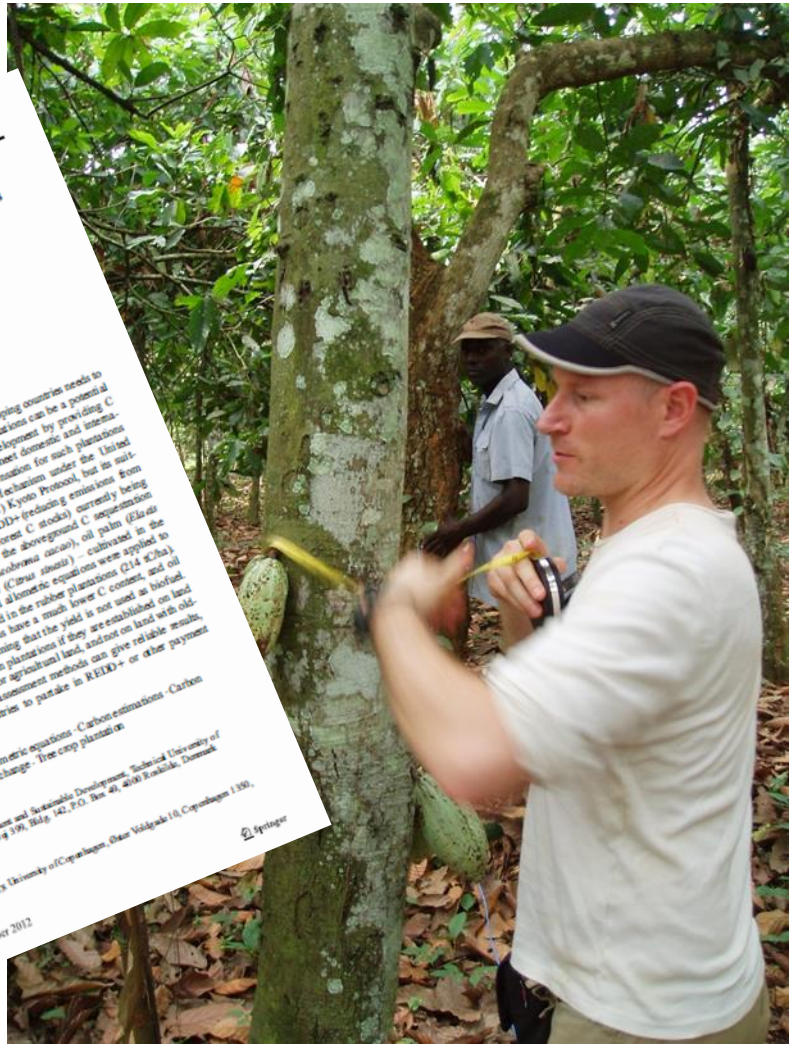


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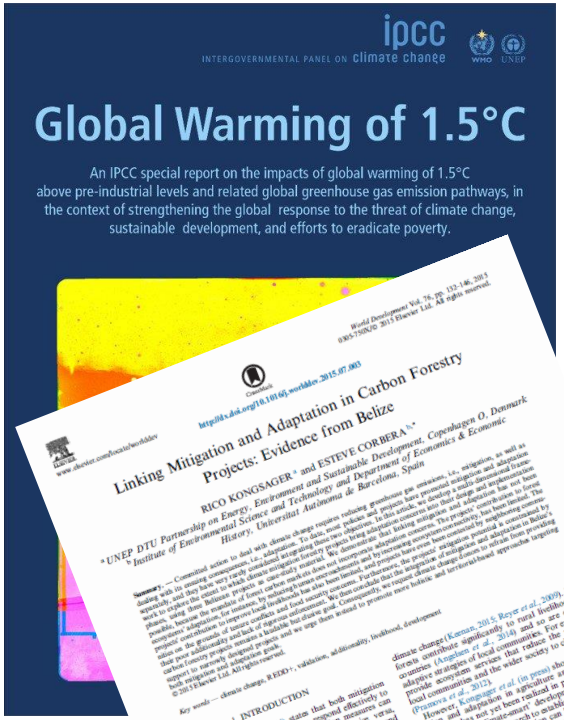

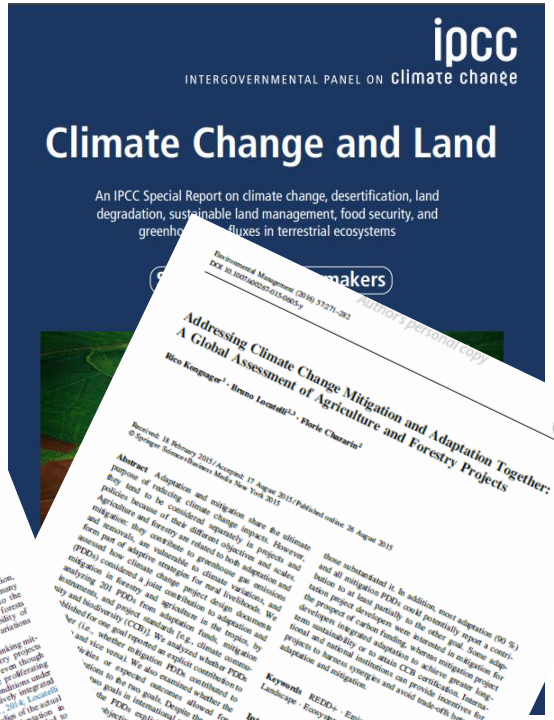

Linking Mitigation and Adaptation in Carbon Forestry Projects: Evidence from Belize

RICO KONGSAGER and ESTEVE CORBERA

Addressing Climate Change Mitigation and Adaptation Together: A Global Assessment of Agriculture and Forestry Projects

Rico Kongsager, Bruno Locatelli, Florie Chazarin


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Review

Linking Climate Change Adaptation and Mitigation: A Review with Evidence from the Land-Use Sectors

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Abstract: There is extensive scientific evidence that both adaptation and mitigation are essential to address the problem of climate change. However, there is still limited knowledge about the possibilities for exploiting the interrelationships between these measures in the design and implementation of climate change activities. In this paper, first the adaptation–mitigation dichotomy and definitions of adaptation and mitigation are discussed. This is followed by a comprehensive scrutiny of the perceptual overlaps and distinctions between adaptation and mitigation, which include a meta-analysis of synergies and trade-offs between adaptation and mitigation in the agriculture and forestry sectors. The analysis shows that activities greatly depend on their context, design and implementation, so actions have to be tailored to the specific conditions, as few, if any, outcomes are universal. The analysis also indicates that the forestry sector delivers more synergies and has more trade-offs when compared to agriculture, which could be because of the fact that forest areas contain significantly more carbon, but at the same time they also compete with alternative land-uses. The article closes by going through a list of research gaps related to the linking of adaptation and mitigation and by providing implications for climate change policy.

Keywords: climate change; adaptation; mitigation; forestry; agriculture; land use; linking; integration; interaction; inter-relationship

1. Introduction

The overall aim of this review article is to contribute to the empirical knowledge base on the opportunities and challenges of enhancing the linkages between adaptation and mitigation, with a special emphasis on the land-use sectors (i.e., agriculture and forestry). The findings should assist in funding being invested more effectively, as well as lead institutions and project developers to consider linking adaptation and mitigation in climate-related projects and activities as a trajectory to enhance overall outcomes in combating climate change. Today, there is no longer any doubt about the need for both adaptation and mitigation if climate change is to be abated effectively, and there is agreement that actions are necessary at all spatial scales and that they should address short-term as well as long-term issues. However, the climate debate has in recent decades been focused on a global mitigation agreement with long-term perspectives, with less attention being given to adaptation. One could ask why climate projects are still one-sided regarding adaptation or mitigation when the doubts about the need for both have gone? The intuitive thought is that it must be feasible and better to make 'climate' projects that address both objectives. At least in the cases where interlinkages between adaptation and mitigation exist, because the divide can often be explained by the spatial and temporal differences and sectoral circumstances between the two objectives. However, in the land-use sectors, for instance, which is the main field of research in this article, this sharp split and narrow-minded focus appears at first sight remarkable.

Others have made the same observation; some scholars have referred to it as 'the false dichotomy' framed by scientists and policy-makers [1–5]. Several studies have made reflections on a number of

Research Topic & Why Important

- There is a **vast load of literature** concerning how data collection can be conducted, which provides **guidelines and recommendations** on how **data collection** might be done. However, only a very limited part of this literature describes in detail how data actually is collected in the field
- However, to carry out fieldwork should not be done by following a **strict recipe**. But the **less experienced researcher** (including me when I conducted the fieldwork described in this paper) should also not be operating in the dark.
- This paper is intended to be an example, where the **methodology is explained in detail** to assist and inspire other researchers (experienced and inexperienced), on their way to conduct interesting and important research
- This is important as the **smaller considerations** are very **seldom elaborated** on in the method books and rarely described in the method sections in the scientific papers (often due to lack of space)
- As a result of this, methodological considerations, including the **rational (and irrational) decisions** made before, during, and after data collection in the field are seldom presented in the literature.
- Consequently, data collection is a craft that researchers must obtain **by experience**, and sometimes with a **trial-and-error approach**, which not always is desirable, as it can ruin the data collection. This paper is an attempt to address this shortage by providing an illustrative case.

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Linking Mitigation and Adaptation in Carbon Forestry Projects: Evidence from Belize

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Summary. — Committed action to deal with climate change requires reducing greenhouse gas emissions, i.e., mitigation, as well as dealing with its ensuing consequences, i.e., adaptation. To date, most policies and projects have promoted mitigation and adaptation separately, and they have very rarely considered integrating these two objectives. In this article, we develop a multi-dimensional framework to explore the extent to which climate mitigation forestry projects bring adaptation concerns into their design and implementation phases, using three Belizean projects as case-study material. We demonstrate that linking mitigation and adaptation has not been possible, because the mandate of forest carbon markets does not incorporate adaptation concerns. The projects' contribution to forest ecosystems' adaptation, for instance, by reducing human encroachments and by increasing ecosystem connectivity, has been limited. The projects' contribution to improve local livelihoods has also been limited, and projects have even been contested by neighboring communities on the grounds of tenure conflicts and food security concerns. Furthermore, the projects' mitigation potential is constrained by their poor additionality and lack of rigorous enforcement. We then conclude that the integration of mitigation and adaptation in Belize's carbon forestry projects remains a laudable but elusive goal. Consequently, we request climate change donors to refrain from providing support to narrowly designed projects and we urge them instead to promote more holistic and territorial-based approaches targeting both mitigation and adaptation goals.

Key words — climate change, REDD+, validation, additionality, livelihood, development

1. INTRODUCTION

The latest IPCC report (2014) states that both mitigation and adaptation actions are required to respond effectively to climate change. In some instances, adaptation measures can positively or indirectly foster mitigation, or vice versa, resulting in co-benefits regarding both objectives (co-benefits). However, mitigation and adaptation measures often differ in both sector and scale of implementation, as well as in assessment periods and metrics. For example, while emission-reduction projects and programs are often targeted at energy-intensive activities, with impacts expected in relatively short periods of time, adaptation actions can be more diverse in their aims, expectations, and evaluation criteria, with varying degrees of involvement by public, private, and civil-society sectors, as with the construction of sea defenses or the take-up of drought-resistant seed varieties by local farmers. These differences explain why mitigation and adaptation have traditionally been distinguished as separate domains (Klein *et al.*, 2005; Swart & Raes, 2007; Tol, 2005).

Integrating mitigation and adaptation should nonetheless remain a relevant concern in forestry and agriculture, where combining them appears to be essential in order to prevent 'maladaptation' and 'malmitigation' and produce synergies instead (Kongsager *et al.*, in press). Forestry projects are relevant to both mitigation and adaptation, with potential synergies or trade-offs (Illman *et al.*, 2013; Locatelli *et al.*, 2011; Matocha *et al.*, 2012; Ravindranath, 2007). Concerning mitigation, land-use changes contributed to 12.5% of global carbon emissions from 1990 to 2010, mainly through tropical deforestation (Houghton *et al.*, 2012). Regarding adaptation, measures are needed to adapt forests to future climates, since forest ecosystems can be vulnerable to climate variability and climate change (Keenan, 2015; Reyer *et al.*, 2009). In addition, forests contribute significantly to rural livelihoods in many countries (Angelsen *et al.*, 2014) and so are central to the adaptive strategies of local communities. For example, forests provide ecosystem services that reduce the vulnerability of local communities and the wider society to climate variations (Locatelli *et al.*, 2011). However, Colfer (in press) shows that linking mitigation and adaptation in agriculture and forestry projects worldwide has not yet been realized in practice, even though approaches to 'climate-smart' development are proliferating (Someshwar, 2008). Research to establish the conditions under which mitigation and adaptation can be effectively integrated is required (Dang *et al.*, 2003; Duguma *et al.*, 2014; Locatelli *et al.*, 2011; Verchot *et al.*, 2007), but case studies of the actual or potential integration of mitigation and adaptation in land-use projects are lacking. Knowledge is thus needed to contribute to the growing number of studies documenting

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Article

Barriers to the Adoption of Alley Cropping as a Climate-Smart Agriculture Practice: Lessons from Maize Cultivation among the Maya in Southern Belize

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Abstract: Climate-smart agriculture (CSA) is proposed as a necessity, as the agricultural sector will need to adapt to resist future climatic change, to which high emissions from the sector contribute significantly. This study, which is an exploratory case study based on qualitative interviews and field observations, investigates the barriers to making a CSA-adjustment in maize production among Maya communities in southern Belize. The adjustment is alley cropping, which is a low-input adjustment that has the potential to result in both adaptation and mitigation benefits, and furthermore, to enhance food security. The findings show that a CSA-adjustment in small-scale maize production in Maya villages in southern Belize is possible in principle, though several barriers can make the overall climate-smart objective difficult to implement in practice. The barriers are of a proximate and indirect nature, exist at different spatial scales, and involve various levels of governance. The barriers are shown to be land tenure, market access, and changes in the traditional culture, however, these barriers are not homogenous across the villages in the region. To break down the barriers an overall district-level strategy is possible, but the toolbox should contain a wide variety of approaches. These could happen, for instance, through alterations to land tenure and the land taxation system [illegible] agricultural [illegible] [illegible] knowledge [illegible] at the district level, and support to a less complex [illegible] [illegible] at the village level.

Keywords: adaptation; Belize; Central America; climate-smart agriculture; deforestation; livelihoods; maize; Maya; mitigation; shifting cultivation

1. Introduction

The Intergovernmental Panel on Climate Change (IPCC) estimates 24% of global anthropogenic emissions of greenhouse gases in 2010 originated from agriculture and land use change [1]. Around 10–12% came directly from agriculture [2,3] and 10–13% from changes in land use largely associated with food production [4]. Likewise, it is realized that agricultural production and food security in the Global South and North are already being affected by climatic changes [5], and that land use systems globally will have to change in response to future climate change, which will cause major changes in livelihoods and landscapes [6]. Smallholders practicing rainfed farming in tropical regions are particularly exposed to climatic changes and low food security [7–10].

On this background, climate-smart agriculture (CSA) has been proposed as a broad framework of techniques and measures to promote synergies and circumvent trade-offs between adaptation and mitigation in the agricultural sector [6,11]. CSA includes, for example, practices to improve soil water-holding capacities by adding crop residues and manure to arable soils, which not only affects

Data Colection for two case studies in Belize

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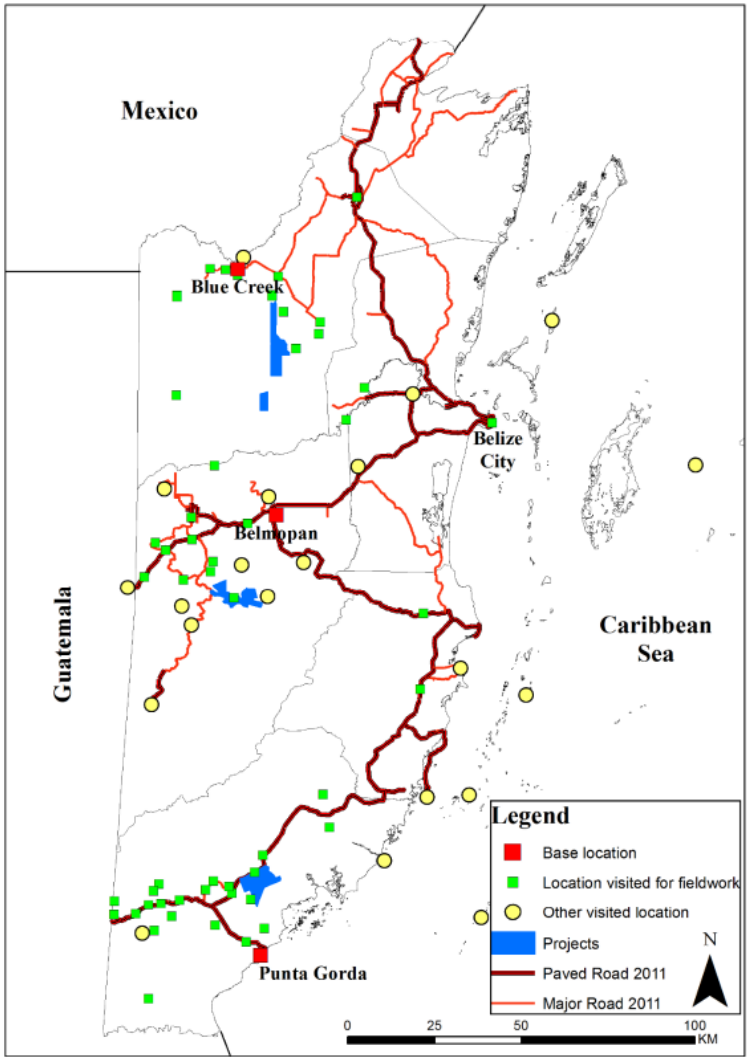
Methodology

Table 1

Main fieldwork (205 days): spatial and temporal frames, and main aims

Spatial frame: Base locations Town (District)	*Temporal frame: Start and end date*	*Purpose (location)*
Belmopan (Cayo)	8/8-2013 → 8/11-2013	• Qualitative interviews (Belmopan, Belize City, San Ignacio, Gallon Jug, Succotz, Mountain Pine Ridge, Yalbac, San Antonio, Central Farm, Belize Int. Airport) • Village surveys (El Progresso, Upper Barton Creek) • Other areas visited (Spanish Lookout) • Project areas visited (Bull Run) • Visited citrus processing plant (Pomona) • Presentation of work (Belmopan)
Blue Creek (and Orange Walk Town) (Orange Walk)	8/11-2013 → 29/11-2013	• Qualitative interviews (Blue Creek, Orange Walk Town, San Felipe, San Carlos) • Village surveys (San Felipe, San Carlos) • Other areas visited (Indian Church, Indian Creek, La Milpa, Reinland) • Project areas visited (Rio Bravo) • Visited chicken slaughterhouse (Tres Leguas) and papaya plantation company (SE of Rio Bravo)
Punta Gorda (Toledo)	30/11-2013 → 26/2-2014	• Qualitative interviews (Punta Gorda, Maya Mountain Research Farm, Eldridgeville, San Jose, Naluum Ca, Jalacte, Crique Sarco, Blue Creek) • Village surveys (Indian Creek, Pine Hill) • Maya villages visited (Crique Sarco, Trio, Blue Creek, San Jose, Jalacte, Big Falls, Indian Creek, Naluum Ca, San Antonio, San Felipe, Silver Creek, San Miguel, San Pedro Colombia, San Vicente, Santa Elena, Santa Cruz, Golden Stream) • Other area visited (Maya Center, Cockscomb Jaguar Basin, Belcampo, Maya Mountain Research Farm, Placencia, Monkey River) • Project areas visited (Boden Creek) • Visited chocolate-processing facility (Punta Gorda) and banana plantation and packing facility (Logans Bank) • Community meetings (Crique Sarco, San Jose, Jalacte) • Presentation of work (Punta Gorda)
Belmopan (Cayo)	26/2-2014 → 28/2-2014	• Qualitative interviews – cross-checking findings and initial conclusions (Belmopan, Central Farm)



Coincidences

Engage, involve and take part

Understand

Take chances

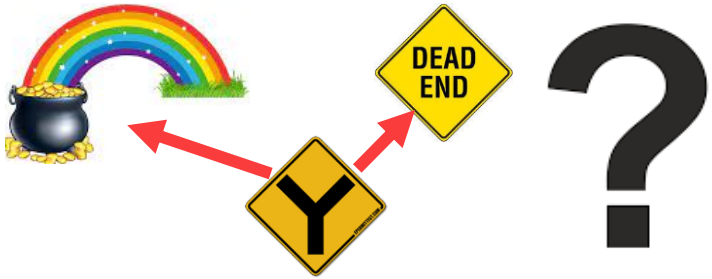
Positioning, power, and ethics

Interest

Share

Lessons learned

- go down the road and have a plan B



- **Coincidence** is a part of fieldwork, but coincidences only happen to those who are present and curious. Thus, stay curious all the time during fieldwork, as invaluable information will arise – and often when it is entirely unexpected. During this process, you have to go down several **dead-end roads**, before you find the right way. However, there is, unfortunately, **no signs** at the main road that will tell you if this side road is a dead-end road.
- The same goes for the people you meet. At first, you might consider **someone as being unimportant** concerning your research but giving a few minutes for a small informal conversation with a stranger, **might be the best minutes you spent during fieldwork**. Later, this person could turn out to be the right gatekeeper to immeasurable contextual information and provide access to important contacts.
- Always have a **plan B.** No good research has been conducted, not even by the professor you admire, without some larger changes. Key informants will turn you down, you will experience some problems with logistics, and weather might also play a trick on you – **which all are issues manageable for the well-prepared researcher that have thought of alternatives**.

Question & Answer

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