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Rural Development through Carbon Finance

Forestry Projects under the Clean Development Mechanism of the Kyoto Protocol

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1. Introduction

Development of rural areas and protecting the global climate at the same time: Is that possible? Too good to be true, one might think. Yet, this twin objective, in essence, describes what the so-called Clean Development Mechanism in the area of land use-related project activities is envisaging. But let us start chronologically.

In 1997, when the international community agreed on the Kyoto Protocol as the first-ever international, legally binding treaty to counteract global warming, the signatory countries assured themselves with a certain degree of flexibility to meet their pledged emission reduction commitments. The idea of the so-called 'flexible mechanisms' of the Kyoto Protocol was created. The underlying concept of those mechanisms is to meet the Kyoto commitments under the strict condition of economic efficiency. In effect, the flexible mechanisms aim to reduce emissions from the source with the lowest marginal costs of abatement. The costs of reducing emissions can vary substantially from region to region and technology to technology (SANDS (2004)). However, the benefit for the atmosphere is the same, presumably, irrespective of the fact where action is taken. One of the three mechanisms guaranteeing compliance flexibility is the abovementioned Clean Development Mechanism (or CDM in short).

The CDM provides a framework for investments in greenhouse gas (GHG) mitigation projects in developing countries. In doing so, the goal of the CDM is two-fold:

1. Developing countries, the so-called non-Annex I countries, are supposed to benefit from project activities fostering sustainable development while at the same time resulting in certified emission reductions (CERs) through the project activities.[1]
2. Industrialized countries, investing in such projects, can use the accruing CERs to contribute to compliance with at least part of their quantified emission limitation and reduction commitments under the Kyoto Protocol.

The numerous opportunities for mitigating atmospheric carbon emissions in developing countries include projects in the land use, land-use change and forestry (LULUCF) sector, often also called 'sinks' projects. In theory, such projects can include afforesting or reforesting degraded lands, implementing sustainable agricultural practices leading to increased soil carbon levels, or even slowing tropical deforestation. All these projects have in common that either the sequestration (i.e., storage) of carbon in biomass is enhanced or the release of carbon from biomass should be prevented. LULUCF projects take the sequestration of carbon in biomass into account and accordingly generate marketable emission reduction units. Thus, carbon becomes a tradable commodity. However, for po-

1 Developing countries are not listed in Annex I of the United Nations Framework Convention on Climate Change (UNFCCC) and are therefore called 'non Annex I countries' in the jargon of the international climate negotiations.

litical reasons, the Parties of the United Nations Framework Convention on Climate Change (UNFCCC) have limited the use of land use-related project categories in the CDM considerably. Only 1% of Annex I countries' Kyoto obligations can be met through those projects. Furthermore, eligible project activities are restricted to 'afforestation' and 'reforestation' activities for the time being.

However, this limitation of land use-related CDM projects is clearly at odds with findings regarding rural development and poverty alleviation. Forestry projects are considered a low cost and rapidly implementable means of climate change mitigation that can additionally contribute to poverty alleviation. Since approx. 70% of the world's poor are located in rural areas, with agriculture and forestry being a major source of their subsistence, a double dividend is expected (SUNDERLIN et al. (2005); THE WORLD BANK (2005)). The CDM in the LULUCF sector is expected to show substantial development benefits for project proponents, i.e., smallholders and rural communities in developing countries (NILES et al. (2002); NILES et al. (2002)). It is hypothesized that, in particular, land use-related projects are a direct and feasible investment at the local level which does not require a complex capacity building up front like other CDM project categories, e.g., in the energy sector. It is suggested that agroforestry projects can provide livelihoods, foster deforestation prevention and conserve irreplaceable biodiversity, notably, if it is part of an integrated approach that reduces pressure for forest conversion elsewhere. And on top, such projects should provide a continuous revenue stream by the sale of carbon certificates and can therefore make a direct pecuniary contribution to the alleviation of rural poverty.

Studies showed that particularly for Africa LULUCF projects are a major comparative advantage in the emerging international carbon market (HAMILTON et al. (2007)). At present, Africa has only very few carbon credits from other project categories to offer on the carbon market. Since the Kyoto Protocol does not address forest conservation or the prevention of deforestation, developing countries are restricted in their opportunities to benefit from the CDM (STRECK and SCHOLZ (2006)). A reasonable and comprehensive post-Kyoto regime will have to expand the existing system by creating a framework encompassing all LULUCF-related project categories. However, for the time being, concrete and policy-oriented advice is needed in order to explore the entire potential of the current CDM regulations for rural development. If local actors are to benefit from the set of laws agreed upon internationally, we hypothesize that the design and the implementation of A/R projects must be based on a sound understanding of household and community activities and decisions.

To this end, the study at hand analyzes socio-economic aspects of A/R projects established under the rules of the international climate regime in more detail and considers an African A/R project exemplarily.

As will be shown, field research in Tanzania delivered empirical and first-hand, household and community-based data to run a structural equation model. Structural equation models (SEMs) combine various types of models known

from other contexts, such as regression, path, and factor analytic models. SEMs aim to analyze a hypothesized context more exhaustively by taking observed or measured variables as expression of an underlying root cause to be explored and thus look for underlying causalities. Thus, not only directly observable, but also hypothesized 'latent' variables can be modeled in structural equation models, which allows for a more profound and holistic analysis, not only of the collected data, but also of the situation on the ground.

1.1 Objectives of the Study

This study focuses on the nexus of climate protection and its potential for development of rural areas through CDM projects in the land use and forestry sector. Given the fact that up to this date almost no studies exist with regard to the local effects of land use-related CDM projects, the first objective of the study is to

I. contribute to the understanding of the inter-linkages between international climate policy and national development policy through the CDM.

In consideration of the fact that the local impact of international decisions under the UNFCCC is of importance for potential development on the ground, the second objective is to

II. put the rural household at the center of analysis and to assess factors that determine the participation of smallholders in LULUCF carbon finance projects.

The international climate regime, its rules, and regulations are still evolving rapidly. So far, the huge majority of the internationally agreed rules is only valid until 2012, i.e. until the end of the so-called 'first commitment period' of the Kyoto Protocol. Therefore, the third objective of the study is to

III. give a rather long-term outlook with regard to the socio-economic impacts, LULUCF projects have on subsistence farmers.

The aforementioned objectives are of interest because the rules of the future CDM not necessarily go on with the existing framework but are going to be revisited before the end of 2012. Thus, there is a window of opportunity to stress positive aspects of the existing regulations leading to desired livelihood impacts. In the same way, potential adverse impacts can be reconsidered in the international decision-making process and altered accordingly. The fourth objective is hence to

IV. provide policy-oriented advice with regard to the local design and development of future LULUCF projects under the CDM.

1.2 Data, Methodology, and Hypotheses

Data for the analyses of this study was collected on the ground in Tanzania. As will be described further down, a field research campaign with agricultural household surveys implemented the household-centered research approach of this study.

Based on the aforementioned objectives, the study aims to assess the following hypotheses in more detail. Firstly, we put forward that

i. thoughtfully designed LULUCF projects under the Clean Development Mechanism of the Kyoto Protocol are able to combine both, aspects of climate change mitigation and rural development.

With regard to the methodology applied, the study hypothesizes that

ii. in order to contextually assess factors that determine the participation of smallholders in LULUCF carbon finance projects, structural equation modeling (SEM) offers the most suitable approach. SEM is not only confined to measure or observe variables but ideal to reveal underlying root causes of an adoption decision by modeling latent variables.

iii. Furthermore, it is assumed that land use-related climate mitigation projects go way beyond in their influence and have a positive impact on a very broad asset base on which poor farmers depend. This includes, but is not limited to natural assets, social assets, human assets, etc.

The study also addresses a major shortcoming of common agricultural adoption studies. The latter often mainly focus on issues related to farm resource endowment whereas aspects of social capital, i.e., social networks in rural areas that play a major role for adoption decisions are often overlooked. This results in the fact that

iv. the study at hand hypothesizes that particularly social interactions, the connectedness of the farm household within the village, is of utmost importance for the participation decision in land use related project categories of the CDM.

1.3 Content Outline

After this brief introduction, giving a first idea of the general topic, the objectives, and main hypotheses the dissertation is going to deal with, the subsequent chapters are structured as follows: Chapter 2 provides background information on the international climate regime, its flexible mechanisms and particularly the CDM. Special emphasis lies on the rules for land use, land-use change and forestry (LULUCF) projects as related to carbon sequestration. LULUCF projects are examined with regard to their potential development benefits. To do so, the CDM in the forestry sector is treated as a special case within the broader framework of payments for environmental services (PES). While PES were primarily

designed as a mechanism to improve the efficiency of natural resource management, possible synergies with poverty reduction and rural development are discussed in the literature. However, concerns about potential adverse impacts of PES payments exist, too. Chapter 2 outlines the current knowledge in detail and discusses the applicability for the CDM.

Chapter 3 describes the case study setting, field research, and the agricultural household survey which was applied. The modeling undertaken in the subsequent chapters is based on the data gathered during field research in Tanzania. In addition, chapter 3 presents a general overview of the 'International Small Group & Tree Planting Program' (TIST), which is locally involved in a carbon-related PES scheme. The agricultural household survey, its sampling procedure, and the data collection in Tanzania are described in detail before case study results are presented by means of mainly descriptive statistics. Special emphasis lies on socio-economic characteristics of the interviewed households, descriptives enlightening the farming system and the livelihood strategies of the interviewees.

The objective of chapter 4 is to assess in more detail under which conditions local farmers are in a position to participate in carbon finance projects. As will be shown, PES as well as forestry-related projects in the CDM are too recent for a straightforward assessment of participation decisions. Thus, scientific literature on participation in other rural programs or on the introduction of new agricultural technologies has been consulted in order to provide insights on parallels. At first, the results of a broader literature review on agricultural adoption are presented. Subsequently, chapter 4 develops a more specific theoretical model for the adoption of carbon farming. At the end of the chapter, particular factor categories determining participation are hypothesized. Those factor categories already introduce the subject of the subsequent chapter 5, which is structural equation modeling.

In chapter 5, a full structural equation model is built, estimated, tested, and modified. The chapter introduces the general idea of structural equation modeling and at first formulates an initial model based on the outcomes of chapter 4. In this initial model the identified factor categories potentially explaining adoption are brought together to form a first structural equation model. Subsequently, the model results are discussed in detail and the initial model is revised to ensure better fit and greater explanatory power. The 'lessons learned' of the modeling process directly feed into the synthesis of chapter 6.

Based on the modeling in chapter 5, chapter 6 elaborates on actual and potential project participants characteristics and describes their identity. Obstacles to participation are outlined and potential impacts on project participants and other groups are discussed. The asset-based approach of livelihood evaluation outlined in the last part of chapter 2 is revisited. On the basis of the modeling results we evaluate and discuss welfare gains and potential drawbacks for the assets on which poor farmers depend.

The conclusions and policy recommendations of chapter 7 finally summarize the findings of the preceding chapters. Prospective guidance with regard to the design and development of future LULUCF projects under the CDM is provided. The main findings of the dissertation cannot be summarized without pointing to the existing limitations of the findings and constraints of the methodology applied.