早稲田大学審査学位論文
博士（人間科学）

Promoting equity in REDD-plus: the necessity of capacity building for developing countries to reduce greenhouse gas emissions from forests

REDD-plus における公平性の確保：開発途上国の森林からの温室効果ガス排出量を削減するためのキャパシティ・ビルディングの必要性

２０１１年1月

早稲田大学大学院　人間科学研究科
梅宮　知佐
Umemiya, Chisa

研究指導教員：　天野　正博　教授

Table of Contents

Figures

Tables

Abstract

As the loss of the world's tropical forests has been continuing at a 'highly alarming rate', reduction of deforestation and forest degradation, while enhancing carbon stocks in developing countries (REDD-plus) is being hotly debated within the UN Framework Convention on Climate Change (UNFCCC). While a market-based mechanism is expected to maximise efficiency to reduce emissions, it might bring inequitable opportunities since capacities are varied between and within countries. Equity considerations become vital especially for the people who depend on forests, yet whose livelihoods are not adequately secured. In this study, a phased approach, which provides capacity building before a market-based mechanism, is evaluated as the way to promote equity in REDD-plus. Based on Amartya Sen's capability approach, equitable REDD-plus in the context of this study means those with weaker capacities should be assisted more significantly than others in order to have equal opportunities to reduce emissions from forests. The diverse capacity relevant topics at different scales of governance (from national to local) are addressed by using mainly Thailand as a case study country.

Taking the national-level data, it was found in an explicit manner that the improvement of the quality of governance could contribute significantly to reduction of deforestation, even with other intervening variables being considered. For developing countries to reduce emissions from forests, national capacities thus are needed to improve the quality of governance in that country. Therefore to avoid inequitable benefit sharing, capacity building is essential to support those with weak capacities to improve the quality of governance.

Regarding the capacities of methodological development in REDD-plus, it was

demonstrated that a large number of datasets are favourable for the development of a national reference level (RL) to indicate the additionality of emission reductions and eliminate the unintentional efforts of a country. RLs with limited data had some constraints, including a significant variance in estimations caused by the selection of a base year or period. In order to provide equal opportunities for countries to fully participate in a market-based REDD-plus, a relaxation of requirements for RLs must be in place for those with limited data, which could be realised through capacity building of the phased approach. Moreover, once registered, countries should be able to improve a data collection system in that country, so that they may apply a sophisticated RL in the future.

Capacities are also needed to implement a market-based mechanism at the local level. It was shown that the forest-dwelling community, which was commercially motivated and capable, was more suitable for the application of a market system than another community with limited economic interest and ability. The former also indicated a higher potential to reduce emissions from forests additionally, as they hold a larger land area than the latter. Although it is the latter type of community who have preserved the forests, they would be likely to have few opportunities in REDD-plus. On the basis of equity, it is suggested that on-going forest conservation be included as an eligible activity type, and the communities, which have carried out sustainable land use manners, be supported to continue doing so through capacity building. Similarly, at the individual scale, it was indicated that only a group of farmers with certain income classes were motivated to participate in plantation schemes for economic purposes. Non-economic incentives, such as the technical kinds of support and guarantee for a long-term partnership, encouraged the participation of other farmers. Thus, capacity

building based on funds can be used to support the non-economic incentives to involve wider participation and promote equitable benefit sharing.

In order to provide equal opportunities, regardless of capacities, capacity building must be as part of REDD-plus design at various scales. Therefore, it is urged a phased approach should be adopted to operate REDD-plus. It is important to emphasise that the more opportunities countries, regions, communities, and individuals are given to reduce emissions in REDD-plus, the less likely the leakage of reduced emissions would occur. In addition, since the capacities to reduce emissions are strengthened, the permanence of emission reductions is more likely to be increased. REDD-plus which incorporates capacity building is not only globally equitable, but also environmentally effective for a long term. Such REDD-plus will certainly promote other non-carbon benefits of tropical forests, such as conservation of biodiversity and the provision of basic needs for local livelihoods.

Acknowledgements

First and foremost, I would like to express my sincere appreciation to Professor Masahiro Amano, my thesis advisor and who guided me literally at any time, and any place. I have learnt from him not only technical skills about research, but also how to use those skills to address the problems of others. By carrying on with what he has taught me, I hope at the same time to make some return to him. I am also grateful to the members of my thesis committee: Professor Yasushi Morikawa and Associate Professor Shunji Ohta of Waseda University, Dr. Yasuko Kameyama of the National Institute for Environmental Studies, and Dr. Ladawan Puangchit of Kasetsart University. Expert guidance from them was extremely helpful throughout the writing of this thesis.

Many people in Thailand provided me a great deal of assistance to carry out my research. I would like to express my warmest thanks to teachers and staff at Kasetsart University, especially Dr. Ladawan Puangchit, Dr. Vijak Chimchome, and Dr. Damrong Sriparam for their kind support to my day-to-day research activities while I was there for two years. My special thanks also go to Mr. Suchat Kalyawongsa and Ms. Teunjai Noochdumrong of the Royal Forest Department, who helped me to design and carry out field surveys; and Ms. Wanthipa Chanklom of the National Park, Wildlife and Plant Conservation Department, who assisted me in collecting data in various villages. At the beginning, I knew little about social forestry. Only with the strong support and assistance of these people was it possible for me to complete this thesis.

I am deeply indebted to those I interviewed and who shared their ideas and information, especially the village headman and villagers of Khun Saa Nai, Khun Saa Nok, Nikom Nong Chan, and Nong Bua Nguen. The kind cooperation of these people provided me with the opportunity to learn from them. I am grateful for their warm

hospitality and patience in answering my (sometimes long) research questions. I wish to keep exploring the ways in which this and other research I undertake can begin to give something back to them.

I would also like to thank Dr. Ewald Rametsteiner of the Food and Agriculture Organisation of the United Nations and Mr. Florian Kraxner of the International Institute of Applied Systems Analysis for collaborating in my research. They also helped me to better understand the field of international research.

Further, without my field survey team, it would not have been possible to conduct my research in Thailand. Suphawadee Wilamart (LekLek), my excellent interpreter, probably spent the longest time in the field with me. I also would like to thank Romana Unpong (Taa), Suttinee Pornpunpaibool (Nid), Paphada Suebplai (Praa), and Sirirat Suksusiang (Aor) for their hard work.

I gratefully acknowledge the financial support of the Japan Society for the Promotion of Science and the Environment Research and Technology Development Fund of the Ministry of Environment, Japan.

There are many others that I would like to express my gratitude to but may not list their names, including Tomoko Kusakabe for her kind assistance with geographical information analysis and my fellow students, Makino Yamanoshita and Kentarou Akase, with whom I had lively discussions on doing research. Lastly, I want to thank all my friends and family for their support and encouragement.

Abbreviations

BAU	Business As Usual
BDS	Benefit Distribution System
CDM	Clean Development Mechanism
CO_2	Carbon Dioxide
COP	Conference of the Parties to the UNFCCC
CV	Coefficient of Variation
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GHG	Greenhouse Gas
IER	Income to Expenditure Ratio
IFAD	International Fund for Agricultural Development
IPCC	Intergovernmental Panel on Climate Change
MRA	Multiple Regression Analysis
NC	National Communication
OECD	Organisation for Economic Co-operation and Development
PC	Principal Component
PCA	Principal Component Analysis
PAMs	Policies and Measures
RED	Reducing Emissions from Deforestation
REDD	Reduced Emissions from Deforestation and Forest Degradation
REDD-plus	Reducing Emissions from Deforestation and Forest Degradation and Enhancing Forest Carbon Stocks
RL	Reference Level
SRA	Simple Linear Regression Analysis
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change

UN-REDD	United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries
UNEP	United Nations Environment Programme
UNDP	United Nations Development Programme
WCED	World Commission on Environment and Development

Chapter 1. Introduction

1.1. Tropical deforestation and REDD-plus

The loss of the world's tropical forests has been continuing at a 'highly alarming rate' (FAO, 2010), signalling the accumulating threats to a large number of forest functions and services that our lives are substantially dependent on. Annual gross loss of forests was estimated at around 13 million ha (FAO, 2010), and the decreasing trend is expected to continue for the foreseeable future (Millennium Ecosystem Assessment, 2005). Human induced deforestation occurs due to various factors, including the expansion of agricultural land, extraction of wood resources, and infrastructure development (Brown and Pearce, 1994; Kaimowitz and Angelsen, 1998; Geist and Lambin, 2002). Among the actors who are directly involved with tropical deforestation are poor, forest dependent people. It has been estimated that almost 800 million people (among them 70 million indigenous people) rely on forest resources for much of their livelihoods (Chomitz, 2007). In addition, the 2001 Rural Poverty Report suggests that out of the 1.2 billion people who rely on less than a dollar a day, 75% of them (i.e. 900 million) live in rural areas (IFAD, 2001). Forests indeed play a pivotal role in providing for the needs of these people.

Currently, the topic of reducing tropical deforestation is being hotly debated within the international climate change regime, namely the UN Framework Convention on Climate Change (UNFCCC), joined by 192 state parties. The scientific finding indicates that around 20% of global CO_2 emissions during the 1990s originated from tropical deforestation. As a consequence, it was the second largest source of greenhouse gas (GHG) emissions after the burning of fossil fuels (IPCC, 2007). The

prevention of further emissions from forests is known to be cheaper than mitigation in other sectors (e.g., the energy sector) (Stern, 2007). Additionally, forests act as sinks of CO_2 emissions from the atmosphere. Thus, reduction of deforestation and forest degradation, while enhancing carbon stocks in developing countries (REDD-plus), is now broadly recognised as an integral part of international efforts to mitigate climate change (UNFCCC 2009a, 2009b). REDD-plus represents the idea of a multi-layered system for reducing GHG emissions from forests (Figure 1-1). Industrial nations transfer finance for developing nations to implement policies and measures (PAMs) to reduce emissions, involving further sub-national governmental bodies or local land users, such as forest dependent people. REDD-plus is expected to broaden opportunities for synergies between social and environmental benefits for these people.

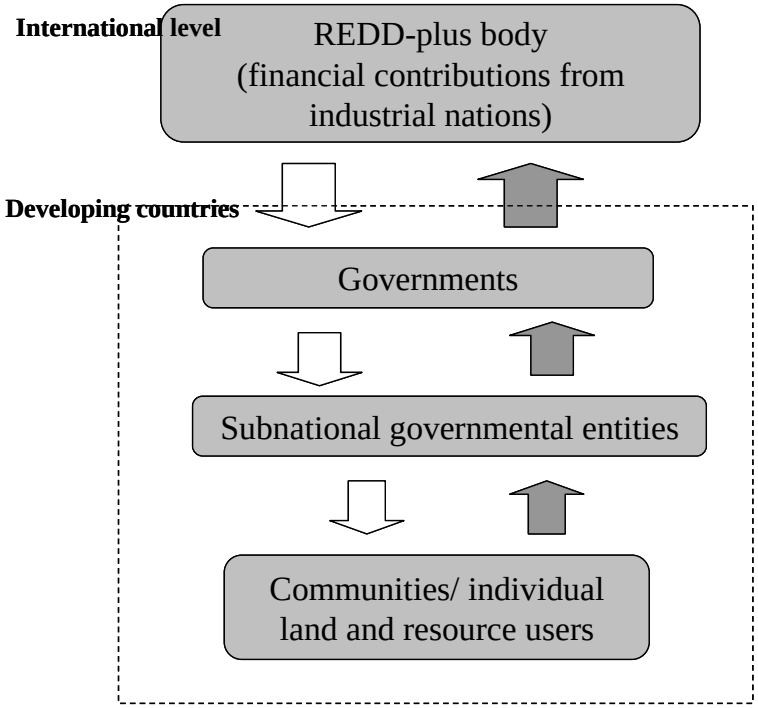


Figure 1-1 Image of REDD-plus with flows of finance (white arrows) and reduced emissions (grey arrows) (composed by the author)

Evolution of REDD-plus in UNFCCC

At present, the Clean Development Mechanism (CDM) of the Kyoto Protocol is the only channel through which developing countries are assisted by industrial nations to reduce GHG emissions, while promoting sustainable development (the Kyoto Protocol's Article 12). Reduced GHG emissions are traded as carbon credits between participating developing countries and industrial countries, which are the parties to the Kyoto Protocol. The Marrakesh Accords defines the eligible land use activity types in the CDM to be only afforestation[1] and reforestation[2], not including reductions of emissions from forests (UNFCCC, 2001). This was the result of negotiations at that time, considering particularly technical difficulties related to leakage (i.e., displacement of emissions) and additionality (i.e., emissions are reduced compared to a business-as-usual scenario) (Kanninen *et al.*, 2007), and high risks for non-permanence and a significant flow of carbon credits into a market (Peskett *et al.*, 2008).

Later at the 11th Conference of Parties (COP) in Montreal, the topic of reductions of emissions from forests returned to the negotiation forum following the submission from Coalition for Rainforest Nations, through Papua New Guinea and Costa Rica, on 'Reducing emissions from deforestation in developing countries: approaches to stimulate action (RED)' (UNFCCC, 2005). At the Bali COP, a commitment was established among state parties to include 'Reducing emissions from deforestation and forest degradation (REDD)' in the future beyond 2012 climate change regime (UNFCCC, 2007). The scope of REDD was further extended to be 'REDD-plus',

[1] The conversion of land that has not been forested for a period of at least 50 years to forested land.
[2] The conversion of non-forested land to forested land on land that was forested but that has been converted to non-forested land before 31 December 1989.

which covers conservation, sustainable management of forests, and enhancement of forest carbon stocks (UNFCCC, 2009a). Significant progress has been made in the UNFCCC negotiations, but at the same time a number of fundamental issues remain regarding the implementation of REDD-plus, such as the options for a financing mechanism, the methodologies for measurement of reduced emissions, and the ways in which environmental and social co-benefits should be dealt with (Verchot and Petkova, 2009). La Vina (2010) also highlights that for REDD-plus negotiation to move forward; one of the key factors is that agreements on the broader topics of UNFCCC should be made, such as parties' commitments for reductions of GHG emissions beyond 2012.

In a meantime, a number of international initiatives have rapidly emerged to support a future operation of REDD-plus (Wertz-Kanounnikoff and Kongphan-spirak, 2009). The major global REDD-plus initiatives include the Forest Carbon Partnership Facility[3], Forest Investment Program[4], and UN-REDD Programme[5]. Together, these three initiatives have assisted REDD-plus activities in 48 developing nations (UN-REDD Programme, 2010b). Many industrial countries have also actively initiated individual REDD-plus incentives, including Norway's International Climate and Forest Initiative and Australia's International Forest Carbon Initiative. There are more on-going and new REDD-plus activities implemented across the tropics.

[3] A global partnership of more than 50 countries, facilitated by the World Bank.
[4] A joint partnership of the African Development Bank, the Asian Development Bank, the European Bank for Reconstruction and Development, the Inter-American Development Bank and the World Bank Group.
[5] The collaborative programme between the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP), and the United Nations Environment Programme (UNEP).

1.2. The importance of equity in REDD-plus

The loss and damage of forest resources continues in many parts of developing countries. Also, as mentioned, the livelihoods of thousands of poor people who depend on forests are not being secured or sufficiently improved. As the international mechanism to govern forest change, the consideration of equity for distribution of REDD-plus benefits becomes morally essential. Equitability is also considered necessary to realise the environmental effectiveness of REDD-plus for a longer term (Peskett *et al.*, 2008). This is because, by involving the participation of wider countries, regions, communities and individuals, risks for the international and national leakage of emissions from forests will be minimised.

While a number of state parties and various observers have been supportive of equity in REDD-plus either for ethical, technical reasons or both, their concepts of equitable REDD-plus do not necessarily coincide with each other (Okereke and Dooley, 2010). Here, in this thesis, Amartya Sen's capability approach is used to indicate what equitable REDD-plus means. In the capability approach, the emphasis is on people's capability to function: functioning is the constitutive elements of human well-being, while capability is the freedom to achieve that functioning (Sen, 1992). In the context of REDD-plus, functioning represents the reductions of emissions from forests, and capability is related with the ability and circumstances to reduce emissions from forests. Under equitable REDD-plus, those with weaker capability should be assisted more significantly than others to realise equal opportunities to reduce emissions from forests.

REDD-plus essentially is proposed as a mitigation strategy to reduce emissions from forests thus adopts the results-based principle (UNFCCC, 2009b). As a matter of

course, focusing on reducing emissions has been the central goal of REDD-plus. This means the more efficiently emissions are reduced, the more valuable REDD-plus can be as a mitigation strategy. A market-based mechanism, in which reductions of emissions are traded as carbon credits between buyers and providers, has been discussed as one of the efficient ways to finance REDD-plus. Market systems are able to minimise costs, while involving large-scale financial flows, including private sources (Peskett *et al.*, 2008; Angelsen *et al.*, 2009b).

Consider much of the focus continues to be on a market-based mechanism, it is then likely that equitability in REDD-plus, defined as the enrichment of capability of those with weaker capability, would be completely forgotten. Instead, for the purpose of efficiency, international support would be provided in places where the potential for reductions of emissions is high. Just two countries, Brazil and Indonesia, accounted for more than 60% of the world's deforested area between 2000 and 2005. With four other highly deforested nations included (Sudan, Myanmar, Zambia, and United Republic of Tanzania), this rises to around 80% (FAO, 2006). In addition, while factors, such as forest governance and the capacity to tackle the problem of deforestation substantially influence REDD-plus outcomes, these features in some places are superior to those in other places. It seems clear enough as a market-based approach focuses on reductions of emissions, diverse capability (i.e., forest circumstances, ability) between and within nations would not be taken into consideration. As a result, inequitable benefit distribution would be unlikely to be avoidable.

1.3. A concept of the phased approach

A phased approach for implementing REDD-plus was proposed by the Government of Norway (UNFCCC, 2009c), and its significance has been increasingly recognised by governments (UNFCCC, 2009b) as well as observers (Angelsen *et al.*, 2009a). In this approach, activities are recommended to be carried out in phases:

- Phase 1: The development of national strategies or action plans, policies and measures (PAMs) and capacity-building;
- Phase 2: The implementation of PAMs, which could involve further capacity-building, technology transfer and demonstration activities; and
- Phase 3: Results-based actions.

Depending on national circumstances and capacities, countries are free to choose any of the phases as a starting phase (UNFCCC, 2009b). Moreover, it is suggested that the two finance mechanisms will be used: fund- and market-based instruments (Angelsen *et al.*, 2009b). As it can provide immediate and predictable finance, a fund-based instrument is recommended for the phases of capacity building (Phase 1 and 2). A market-based instrument dealing with carbon credits, on the other hand, is considered adequate for financing results-based actions (Phase 3), as it generates large-scale funding continuously, including private ones (Angelsen *et al.*, 2009b).

The uniqueness of the phased approach is that capacity building using funds will be offered before entering into a market-based REDD-plus. This emerged from the idea that various types of capacities must be in place to bring reduced emissions from forests, such as implementation of PAMs, measurement and reporting of reduced emissions, and distribution of benefits among participants. Capacities are also needed at smaller scales of implementation (subnational and local), such as engagement in

land use behaviours to reduce emissions from forests and participation in the national benefit distribution system of REDD-plus. With the phased approach, countries will be supported through capacity building before registering with a market-based REDD-plus. This can ensure the permanence of reduced emissions from forests.

While currently just a concept, clearly the phased approach incorporating capacity building based on funds has the potential to promote equity in REDD-plus, because unlike a market-based mechanism, it will assist those with weaker capacities to reduce emissions from forests. Nevertheless, to apply it, we certainly need further examination of the process. Importantly, as REDD-plus is moving rapidly with a scope of being in effect beyond 2012 (now we are in 2011), we need such examination to be carried out as early as possible.

1.4. The aim of the thesis

The aim of this thesis therefore is to examine the application of the phased approach to secure and promote equity in REDD-plus. As mentioned before, following the Sen's capability approach, equitable REDD-plus is defined as such that it can assist those with weaker capability more significantly than others to ensure equal opportunities to reduce emissions from forests.

The organisation of the thesis

The diverse capacity relevant topics of REDD-plus will be assessed, ranging from policy implementation (Chapter 2) to methodological development (Chapter 3) and local participation in a market-based mechanism (Chapter 4). The first two topics (Chapter 2 and 3) are the national-level capacities, while the other topic in Chapter 4 is the local-level capacities, further divided into the community- and individual-scale

capacities. As REDD-plus eventually will require interventions at the local scale and it is at this scale where impacts on people's livelihoods are likely to occur directly, assessing local equity in REDD-plus is vital (Blom *et al.*, 2010; Okereke and Dooley, 2010). Two different REDD-plus activity types will be addressed: reductions of emissions from avoided deforestation (Chapter 2, 3, and the first half of Chapter 4) and enhancement of carbon stocks through tree plantations (the second half of Chapter 4). Except for Chapter 2, Thailand will serve as a case study country because of its wider data and sample coverage: in Chapter 3, a wide range of national statistical data; in the first part of Chapter 4, two forest-dependent ethnic groups with distinct concepts of values; and in the second part of Chapter 4, successful small-scale plantation schemes, which are not so common in many other tropical nations, will be utilised. The organisation of this thesis in subsequent chapters is briefly described as follows.

Chapter 2: The quality of governance for reducing deforestation

A decent quality of governance is considered as one of the essential capacities for countries to implement policies to reduce emissions from forests. In this chapter, by taking the national-level data, the impacts of the quality of governance on changing deforestation rates will be explicitly analysed. Then, the role of capacity building will be identified in promoting equity in REDD-plus among countries with different capacities for improving the quality of governance. In the analysis, various dimensions of the quality of governance and the impacts of several intervening variables causing deforestation will also be taken into consideration.

Chapter 3: Data availability for developing national reference levels (RLs)

The national reference levels (RLs) are one of the methodological components of the market-based REDD-plus and used to determine the level below which reductions of emissions are measured and credited. To establish RLs, various types of data are necessary at country level. In this chapter, three RLs with different data requirements will be comparatively analysed to assess the applicability of each in a market-based mechanism. The potential contributions of capacity building to enhance the data condition in some of developing countries will then be discussed as the way to realise equitable REDD-plus. While the subject of Chapter 2, the quality of governance, is the policy-related capacities, the data availability issues are the methodological type of capacities to implement REDD-plus.

Chapter 4: Economic motivation and local participation in a market-based mechanism

One of the key factors for operating a market-based mechanism in REDD-plus is that participants would perceive economic return as an incentive. Various factors influence one's economic motivation, such as the concept of economic values and existing economic circumstances. Taking two case studies from Thailand, this chapter will present how different economic motivation impacts choices regarding engagement with market interventions at the local level. In the fist case study, two forest-dwelling communities with distinct concepts of economic values will be taken, and in the second case study, the motivation of farmers across different income classes who participated in one of small-scale plantation schemes will be analysed. By revealing the effectiveness of both economic and non-economic incentives, the

potential ways in which capacity building could enhance local equity in REDD-plus will be highlighted.

Chapter 5: Final conclusions

Based on the findings of the previous chapters, the necessity of capacity building using funds will be concluded to promote equity in REDD-plus. Policy recommendations will then be proposed regarding the establishment of the phased approach under REDD-plus.

Chapter 2. The quality of governance for reducing deforestation

2.1. Introduction

Human-induced deforestation is known to be driven by the diverse sets of direct causes and underlying factors (Brown and Pearce, 1994; Kaimowitz and Angelsen, 1998; Geist and Lambin, 2002), as presented in Figure 2-1. Among the underlying factors, the quality of governance in relation to forest and land use choices impacts on changing deforestation through various paths (Kanninen *et al.*, 2007; Eliasch, 2008), ranging from how policies about forest use are made, who is involved in the decision-making process, to the implementation of policy on the ground and enforcement of forest laws. For developing countries to reduce emissions from deforestation, decent quality of governance would thus be necessary. However, given the complicated mechanism of deforestation, as well as a lack of data, assessing the impacts of the quality of governance on change in deforestation rates is challenging. Ample studies exist which focus on the role of the quality of governance in affecting deforestation. But, most of them either mainly describe issues or investigate the issues which are theme-specific (e.g. Cashore, 2002; Jordan *et al.*, 2005; Mery *et al.*, 2005; Mayers *et al.*, 2006; Arts and Buizer, 2009; Rametsteiner, 2009). A few have analysed the significance of the impacts of governance quality, nevertheless they have focused only on limited aspects of governance quality (Kaimowitz and Angelsen, 1998; Smith *et al.*, 2003; Gibson *et al.*, 2005; Eliasch, 2008).

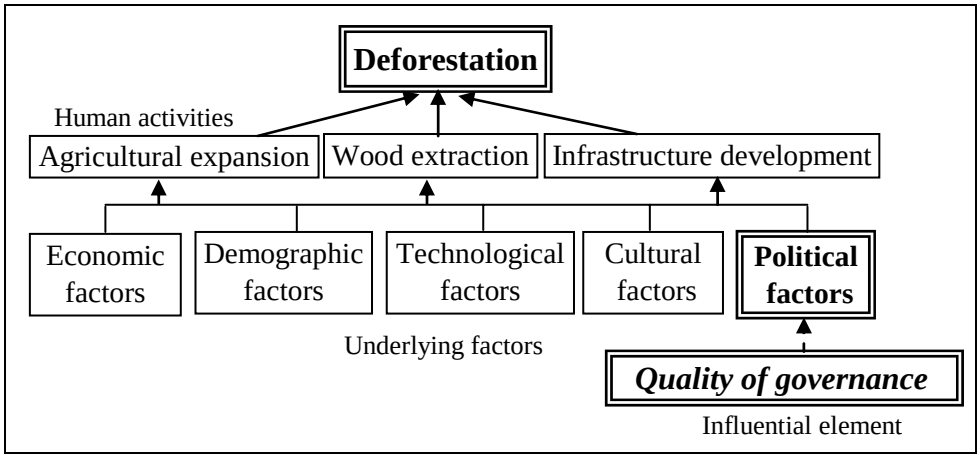


Figure 2-1 The conceptual mechanism for human-induced deforestation, including the quality of governance as an influential element (compiled by the author based on Geist and Lambin, 2002)

Objectives

In this chapter, taking national-level data, the impacts of the quality of governance on changing deforestation rates are analysed. Various dimensions of the quality of governance and the impacts of other intervening variables are also taken into consideration. It then addresses, given varying capacities to improve the quality of governance between nations, the ways in which capacity building could contribute to the equitable benefit sharing of REDD-plus.

The quality of governance in six dimensions

In this chapter, data representing the quality of governance at the national level are those of the World Bank Group (Kaufmann *et al.*, 2009). Under these data, governance as a term and concept is defined as *'the traditions and institutions by which authority in a country is exercised'*. There are six dimensions of the quality of governance that are assessed (Table 2-1): Voice and Accountability; Political Stability and Absence of Violence/Terrorism; Government Effectiveness; Regulatory Quality; Rule of Law; and Control of Corruption. The importance of these aspects of

governance quality is nowadays widely recognised by a number of international bodies, including the UNDP, World Bank and the OECD (UNDP, 1997; OECD, 2006; Rametsteiner, 2009). The governance quality data used in the analysis are based on a large number of underlying sources, of which 42% come from commercial business information providers, 22% from public sector organisations, and 18% each from surveys of firms and households and non-governmental organisations (Kaufmann *et al.*, 2009). It is assumed in the analysis that a country with decent quality of governance, as represented by the current data, may hold the quality of governance related to land use change equally sufficient. The current data on the quality of governance have also specified the margins of error.

Table 2-1 Definitions of the six dimensions of the quality of governance indicators (Kaufmann *et al.*, 2009) (modified by the author)

Voice and Accountability	Participation of a country's citizens in selecting their government as well as freedom of expression, association and a free media.
Political Stability and Absence of Violence	Risk of the government to be destabilized or overthrown through unconstitutional or violent means.
Government Effectiveness	Quality of the public and civil service as well as of the government's policy formulation and implementation.
Regulatory Quality	Ability of the government to permit and promote private sector development through sound policies and regulations.
Rule of Law	Credibility with the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
Control of Corruption	Vulnerability of public power exercised for private gain, as well as "capture" of the state by elites and private interests.

2.2. Methodology and data

The following variables and data on a national scale are used in the analysis (see also Table 2-2).

The quality of governance

As already mentioned, the quantified values of the quality of governance are applied. In addition to the existing six types of governance indicators, a so-called overall governance indicator, which is the combined value of the six dimensions of governance quality, is used. The average scores of each of the six indicators for the periods of 1996 to 1998 and 2000 to 2005 are taken (Kaufmann *et al.*, 2009), and the overall governance values for the same periods are estimated.

Deforestation rate

Using data from the FAO's Forest Resources Assessment (2006), deforestation rates are calculated as the ratio of change in forest area between 2000 and 2005, compared to the forest area in 2000. Forest is defined as land larger than 0.5 hectares which contains trees above 5 metres and a canopy cover of more than 10 percent (FAO, 2006). A country with a deforestation rate above zero means that it lost forest area between 2000 and 2005, while one with a negative deforestation rate experienced an increased area of forests.

Other intervening variables

To examine the relationship between the quality of governance and deforestation in a more realistic concept of mechanisms for deforestation, five intervening variables are included: ratio of forest cover to total land; population growth; growth of GDP; expansion of crop land and pasture; and change in wood removal. These variables are selected due to their relevance as causes for deforestation, as cited in the literature (e.g.

Brown and Pearce, 1994; Kaimowitz and Angelsen, 1998; Geist and Lambin, 2002). The availability of data for a large number of countries is also a key criterion to select these variables. Their represented years and sources for data are summarised in Table 2-2.

Statistical analyses

Three statistical techniques are applied in the analysis: correlation analysis, simple linear regression analysis (SRA), and multiple regression analysis (MRA). While correlation analysis examines the significance of correlation between two variables, SRA estimates the relative impact of one variable on the other variable (Ruppert *et al.*, 2003). In MRA, the backward, forward and stepwise selection functions are used. Though rarely occurred, when statistical results appear different among the three functions, explanatory variables are included only if they affect considerably the r^2 of the corresponding regression. In addition, sensitivity analysis is conducted, using the reported standard errors of the governance quality indicators, defined as 'there is roughly a 70% chance that the level of governance lies within plus or minus one standard error of the point estimate of governance' (Kaufmann *et al.*, 2009). Data on all the above mentioned variables are converted into the standardised form before being applied to the analysis.

Sample countries

All the nations of the world are in the scope of the analysis. However, the total number of sample countries depends on data availability: 178 countries for correlation and SRA and 120 countries for MRA. Since MRA requires more variables than the first two, the maximum number of countries applied in MRA appears smaller. All countries are divided into two groups: one experienced deforestation and the other

which did not (i.e. positive and negative deforestation rates). In addition to the global-level analysis, as the intention of MRA is to represent as realistic mechanism for deforestation as possible, MRA is conducted at the three regions with developing countries included only. Developing nations are identified as those which are not members of OECD.

Table 2-2 Variables, represented years, and sources

Variable	Year	Source
Quality of governance	1996-1998, 2000-2005	Kaufmann *et al.* , 2009
Deforestation rate	2000-2005	FAO, 2006
Other intervening variables		
Forest/land ratio	2000	FAO, 2006
Population growth	1995-2000, 2000-2005	UN Population Division, 2007
Growth of GDP	1995-2000, 2000-2005	UN Statistics Division, 2008
Expansion of agri. land	2000-2004	FAO, 2007
Change in wood removal	1990-2000, 2000-2005	FAO, 2006

2.3. Results

Correlation analysis

The results of the correlation analysis between the governance quality indicators and deforestation rates are given in Table 2-3. Two variables are correlated at the statistically significant level on a global scale. Such correlation is observed with all types of the governance quality indicators, including the combined overall governance. Among these governance indicators, there seemed little evidence indicating significant difference in the strength of their correlation with deforestation rates. The direction of the correlation was negative; meaning that globally a country with a better quality of governance, as reported, tends to have a lower rate of deforestation.

Correlation coefficients become higher when the governance quality indicators for more recent years are taken. This may suggest the possibility that an increase in the

governance quality in more recent years than in earlier ones has a stronger correlation with a decrease in deforestation rates. The negative correlation between the governance quality indicators and deforestation rates often appeared more strongly with the countries with positive deforestation rates (i.e. loss of forest area). By contrast, correlation is completely absent when countries experiencing negative deforestation rates are taken. This indicates that while the quality of governance is largely relevant to the extent of deforestation, it is not related to the increase of forest area.

Table 2-3 Pearson correlation coefficients of the governance quality indicators for deforestation rates in 2000-2005 with all countries included and countries with positive and negative deforestation rates

	All	Positive def. rate	Negative def. rate		All	Positive def. rate	Negative def. rate
Voi&Account				RuleLaw			
96-98	-0.240**	-0.352**	0.167	96-98	-0.377**	-0.375**	0.050
	(0.001)	(<.000)	(0.199)		(<.000)	(<.000)	(0.701)
00-05	-0.266**	-0.352**	0.165	00-05	-0.407**	-0.414**	-0.001
	(0.000)	(<.000)	(0.204)		(<.000)	(<.000)	(0.996)
PolStability				ControlCorr			
96-98	-0.344**	-0.356**	0.025	96-98	-0.390**	-0.410**	0.029
	(<.000)	(<.000)	(0.846)		(<.000)	(<.000)	(0.827)
00-05	-0.377**	-0.408**	-0.032	00-05	-0.401**	-0.405**	-0.001
	(<.000)	(<.000)	(0.806)		(<.000)	(<.000)	(0.995)
GovEffec				OverGov			
96-98	-0.359**	-0.381**	0.080	96-98	-0.355**	-0.391**	0.083
	(<.000)	(<.000)	(0.539)		(<.000)	(<.000)	(0.526)
00-05	-0.384**	-0.401**	0.056	00-05	-0.383**	-0.416**	0.053
	(<.000)	(<.000)	(0.670)		(<.000)	(<.000)	(0.686)
RegQual							
96-98	-0.260**	-0.270**	0.099				
	(0.000)	(0.003)	(0.447)				
00-05	-0.337**	-0.355**	0.096				
	(<.000)	(<.000)	(0.463)				
N	*178*	*117*	*61*		*178*	*117*	*61*

Note: Figures in parenthesis are 2-tailed significance at the .01 (**) level.

Simple linear regression analysis (SRA)

When the correlation of the governance quality indicators and deforestation rates is observed, as explained above, one can estimate the relative impact of the former on the latter by using SRA. We applies only the overall governance indicator for 2000 to 2005 in SRA, as strong evidence was not found in the earlier analysis that showed various types of the governance indicators correlate with deforestation rates differently. In addition, the correlation became stronger if the governance indicators for more recent years were taken. As presented in Table 2-4 and Figure 2-2, it is estimated the coefficients of SRA are: -0.383 for all nations and -0.357 for the countries with positive deforestation rates (i.e. loss of forest area). This explains that, in the case of all countries included, given a one-unit increase in the overall governance indicator, a mean deforestation rate would be reduced by 0.383 (both the overall governance indicator and deforestation rates are expressed in the standardised form). Under such hypothetical circumstance, taking the three largest tropical forest nations, Brazil, the Democratic Republic of the Congo, and Indonesia, as examples, it would indicate that forests would have been spared from deforestation roughly by the area of 15, 4, and 3 million hectares, respectively, in each country. This lower rate of deforestation would have been possible, only if the reported overall governance quality would have been improved as much as for Brazil to be like Slovenia or Estonia; for the Democratic Republic of the Congo to be Togo or Cameroon; and for Indonesia to be Thailand or the Maldives.

Table 2-4 Regression coefficients of the overall governance indicators in 2000-2005 for deforestation rates in 2000-2005 with all countries included and countries with positive deforestation rates

	Coeff.	St. dev.	p-value	F-test	Adjus. R^2
All *(N=178)*					
OverGov00-05	-0.383**	0.070	<.000	30.298	0.142
Positive def. rate *(N=117)*					
OverGov00-05	-0.357**	0.073	<.000	24.109	0.166

Note: Significane levels are indicated at .01 level (**).

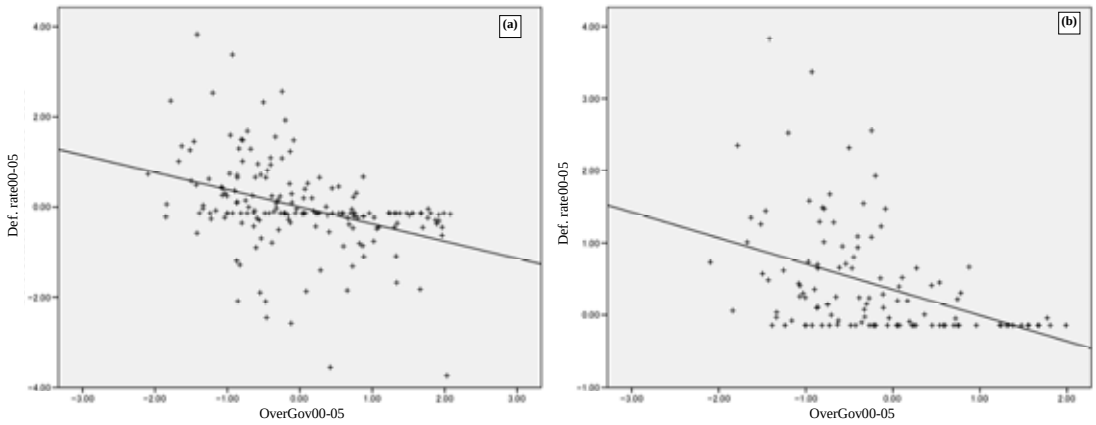


Figure 2-2 The relationship of the overall governance indicators in 2000-2005 with deforestation rates in 2000-2005 with all countries included ((a); n=178) and countries with positive deforestation rates ((b); n=117)

Multiple regression analysis (MRA)

For the same reasons as with the SRA above, the overall governance indicator for 2000 to 2005 is used as a representing factor for governance quality. The results of MRA are shown in Table 2-5. Both globally and regionally, except for Africa, the overall governance indicator is likely to have a negative impact on deforestation rates (i.e., an increase in the reported quality of governance corresponds to a mean decrease in deforestation rates); meaning that improving the quality of governance could avoid deforestation, even with the impacts of other intervening variables being taken into account. The identified intervening variables for the case with all countries included,

for instance, are the forest cover ratio and population growth rate for 1995 to 2000. Keeping in mind the representation of each regression model is not so high, as expressed by each of the adjusted r^2, it is useful to identify the possibility that change in the reported governance quality could be among the factors which are influential to reduce emissions from deforestation.

Table 2-5 Regression coefficients of the overall governance indicators in 2000-2005 and other intervening variables for deforestation rates in 2000-2005 at the global and regional scales

Variable	Coeff.	St. dev.	p-value	F-test	Adjus. R^2
Global					
All *(N=120)*					
OverGov00-05	-0.195*	0.085	0.023		
Forest/land ratio	0.148*	0.070	0.036	14.358	0.252
Pop95-00	0.270**	0.083	0.001		
Positive def. *(N=73)*					
OverGov00-05	-0.305**	0.089	0.001	11.889	0.131
Developing countries by region					
Africa *(N=37)*					
Pop00-05	0.423*	0.168	0.016	6.043	0.219
Agri.	-0.256*	0.107	0.023		
Asia *(N=19)*					
OverGov00-05	-0.688*	0.310	0.044		
Forest/land ratio	0.401	0.207	0.073	5.108	0.477
GDP95-00	-1.530*	0.690	0.044		
GDP00-05	-1.054*	0.370	0.013		
Latin America *(N=20)*					
OverGov00-05	-0.682**	0.233	0.001	8.552	0.284

Note: Significance levels are indicated at .05 (*) and .01 (**) levels.

Sensitivity analysis

It was identified only the negligible change is made when taking into account the reported standard errors of the governance quality indicators. Therefore, the results which were reported thus far are reliable even with an application of the standard errors.

2.4. Discussion

The analysis of the national-scale data on the quality of governance and deforestation rates indicated that improving the quality of governance could contribute to reducing deforestation rates, and such impacts are likely while other intervening factors need to be taken into account (Geist and Lambin, 2002). These findings confirm the importance of the quality of governance in changing deforestation explicitly (Eliash, 2008) and explain the possible links of poor governance to the loss and damage of forest resources (Repetto and Gillis, 1988; Mayers and Bass, 1999; Kanninen *et al.*, 2007). It was also found that the quality of governance matters regardless of its reported various dimensions, which means by improving the quality of governance in any of its dimensions as assessed above, the rate of forest loss will likely be lowered in countries experiencing deforestation.

One of the important implications of these results is that the improvement of the quality of governance is one of the essential capacity needs for countries to reduce emissions from deforestation. As countries' capacities to improve the quality of governance differ, some countries with weaker capacities may have more difficulty than others in reducing emissions from deforestation. Thus, if only market systems were to emerge in REDD-plus, countries with poor capacities to improve the quality of governance will likely have limited reductions of emissions. This will bring about a highly inequitable benefit distribution as those with better capabilities would be assisted more significantly than others with weaker capability to reduce emissions from deforestation. Therefore, capacity building could play an important role in assisting the capacities of countries to improve the quality of governance, so that the countries with limited capacities will have increased opportunities to reduce emissions from deforestation.

It should be cleared that the current analyses however have encountered limitations and challenges, and these should be taken into consideration in future research. The first issue was that it identified the impacts of the quality of governance between nations and not within a nation. In order to fully understand the impacts of the quality of governance on change in deforestation rates, it would have been ideal to compare the impacts of governance quality in different points in time in a given country. The current dataset however covered a limited time scale: around 10 years for the governance indicators, of which five years overlapped with years for deforestation rates. A longer timeframe would be desirable to assess how improvement or decline of a country's governance quality can influence change in deforestation rates in the same nation. Secondarily, the data on governance quality that are clearly defined in their roles in forest and land use choices and in other intervening factors (e.g. population growth, GDP growth, etc.) should be prepared (Solberg and Pelli, 1995; Barrett *et al.*, 2005). This will help the estimation of direct impacts of governance quality on deforestation rates. Finally, the potential error and uncertainty of the data used in the analysis is always critical (Grainger, 2009). This is especially so in this type of analysis as completely different data sources were used. How to control the quality of data and relate it to the user of the analysis thus will be extremely important.

2.5. Conclusions

It was identified in an explicit manner that improvement of governance quality is the essential type of capacities that countries experiencing the loss of forests should have to reduce deforestation. Given a high variance in countries' capacities, it is suggested that international support should be provided for countries with weaker capacities to

enhance their capacities to improve the quality of governance. This can encourage the equitability of REDD-plus, as through capacity building support, countries will have equal opportunities, regardless of their capacities, to reduce emissions from deforestation. Moreover, it should be stressed that with the enhanced capacity to improve the quality of governance to reduce emissions from deforestation, it is highly likely that reduced emissions would be sustained for a longer-term. This is essential for the guarantee of permanence of REDD-plus and the sustainable management of forests in developing countries.

Chapter 3. Data availability for developing national reference levels (RLs)

3.1. Introduction

National RLs are one of the methodological components of REDD-plus and determine the level below which the countries' reduced emissions could be measured and credited. The credited reductions of emissions could be traded in a future market-based REDD-plus. To date, there is convergence that RLs should be based on historic data, while taking into account national circumstances (UNFCCC, 2009d). Nonetheless, it is yet to be clear how countries should establish the RLs in practical terms. While a number of proposals have been made by parties and observers (Eliasch, 2008; Busch *et al.*, 2009; Angelsen *et al.*, 2009b; Parker *et al.*, 2009; Strassburg *et al.*, 2009), one of the important factors that countries would need to consider when developing the RLs is the availability of data (Huettner *et al.*, 2009; UNFCCC, 2009e).

Data availability issues in developing countries

The completion status of greenhouse gas (GHG) inventories, as part of national communications (NC), by developing (non-Annex I) parties to UNFCCC, is reviewed in Figure 3-1 (UNFCCC, 2010). The land use change sector is one component of the inventories, and should be estimated based on the guidance and guidelines of the Intergovernmental Panel on Climate Change (IPCC). Currently, there is convergence that the most recent IPCC guidance and guidelines should also be used for REDD-plus (UNFCCC, 2009d). Thus, it is useful to compare different levels of experience in the preparation of inventories, which could indicate some disparities in countries' capacities for estimating RLs, including the availability of data. Among 142 non-Annex I parties, half of them have completed the inventories at least once; while

others are still in the process of doing so, of which some are still to initiate work. Of those currently preparing for the submission of the first inventories, a difference in progress is evident. Therefore, it is highly likely that some developing countries will have fewer data than others to establish RLs (Huettner *et al.*, 2009). This may prevent some of the countries, who lack sufficient data, from fully participating in a market-based mechanism of REDD-plus.

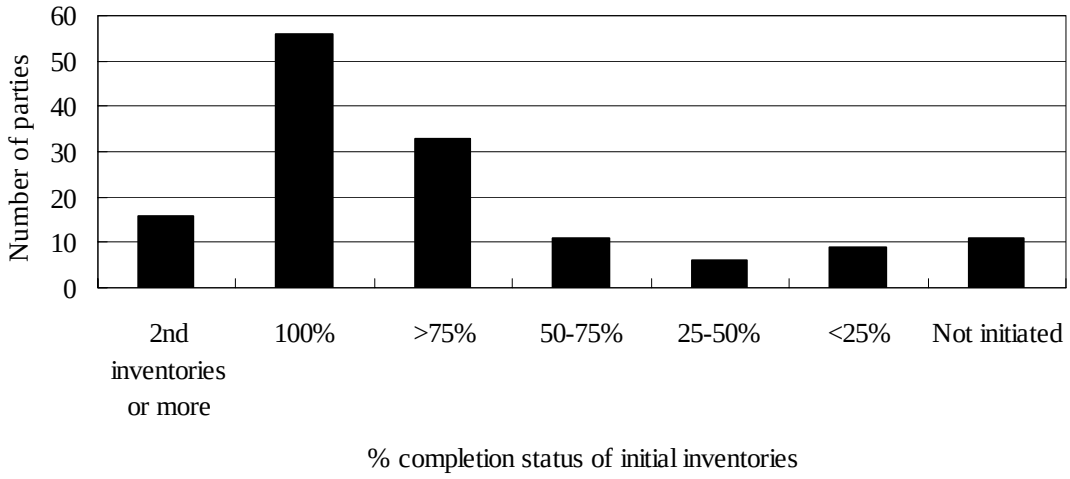


Figure 3-1 The completion status of GHG inventories in NCs by non-Annex I parties

Objectives

In this chapter, three types of RLs, which require different data levels, are examined, and the applicability of each to a market-based REDD-plus is comparatively assessed. It then discusses the importance of capacity building as the way to encourage equity in REDD-plus, regardless of disparities in data condition. Thailand is suitable for the analysis for two major reasons: 1) it has sufficient types of data to develop three different RLs, including those relevant to national policy approaches to prevent deforestation, which are the commercial logging ban in natural forests in 1989 and the protected area system (i.e., national parks and wildlife sanctuaries) starting from

1961; and 2) those data are available over a long period of time (e.g., forest area data from 1973 to 2006)[6].

3.2. Methodology and data

Three types of RLs, which require different levels of data, are compared (Table 3-1). The data were available only for estimating RLs on deforestation in terms of forest area, defined as *'forest of all types … with an area of 5 hectares or more with trees taller than 5 metres or more and with canopy covering more than 10% of the ground area'* (Royal Forest Department, 2007). The first and simplest RL is a historical RL; based on the annual deforestation area in the past period (Santilli *et al.*, 2005). The annual deforestation area in a year and that averaged over five years to smooth the yearly variation, are estimated. The second RL is referred to as a forest-trend RL, employing a quadric curve to the time-series forest area data. With the estimated deforestation trend curve, the future forest area is predicted. The third and most complex RL of this study is a business-as-usual (BAU) RL, which can project the future deforestation by incorporating a large number of variables, including key socioeconomic, technological, and political factors that drive deforestation (Eliasch, 2008). The econometric model is used to estimate a BAU RL, as it can be used to simulate the link between the chosen variables and deforestation (Adger and Brown, 1994; Kaimowitz and Angelsen, 1998). The econometric model of this analysis consists of two parts: one representing annual changes in area of three land use classes (i.e., forest, farmland, and unclassified land); and the other reflecting the variables linked to those changes. Because a BAU RL represents the relationship between the

[6] Thailand's official forest area data are updated and reported by the Royal Forest Department (http://www.forest.go.th/forestfarm1/farm/web/index.php).

variables and deforestation, it is possible to predict future deforestation under the hypothesised scenarios, under which the values of the variables are modified. Three scenarios are taken with the BAU RL, including: a Standard scenario; a Conservation scenario; and an Industrialisation scenario (see Table 3-2). In the Standard scenario, it is assumed that the variables would change in a constant manner in the period between 2000 and 2003. In the Conservation scenario, it is hypothesised that the country's protected area, which includes national parks and wildlife sanctuaries, would be doubled compared with the period between 2000 and 2003, while other variables would be the same as the Standard scenario. The Industrialisation scenario differs from the Standard scenario as it assumes that two industry-related variables, productivity for major agricultural crops and GDP in the non-agriculture sectors, would be increased at an accelerated rate than that which happened between 2000 and 2003.

Depending on the period for which the necessary data were available, the historical and forest-trend RLs were developed for 1975 to 2006, and the BAU baseline for 1981 to 2003. Then taking a year, 2013, as an example, which is right after the Kyoto Protocol's first commitment period, the values of the forest area by the three RLs are compared.

It was reported that there was discrepancy of the data on the forest area before and after 2000 as the resolution of imagery data was increased after 2000 (see also FAO, 2005). Therefore, values on the forest area after 2000 are estimated by a liner extrapolation of the last values between 1995 and 1999. The differences between the original and calibrated values on the forest area are added to unclassified land. To

reflect this adjustment on land use data, a dummy variable is used in the econometric model when developing a BAU RL.

Table 3-1 Variables used in the analysis

RL	Variable	Unit	Source
Historical	Forest area	10^3 ha	(1)
Forest-trend	Forest area	10^3 ha	(1)
BAU	Land use area (forest, farmland, unclassified land)	10^3 ha	(1)
	Population	10^3 persons	(2)
	GDP at the country level	10^9 Baht	(3)
	Sectoral GDP (in agriculture, manufacture, construction, sales, transportation, finance, public)	10^9 Baht	(3)
	Production of major agricultural crops	10^3 tonnes	(4)
	Production of major meat	10^3 tonnes	(4)
	Production of wood products	10^3 m^2	(5)
	Productivity for major agricultural crops*		
	Area of national parks and wildlife sanctuaries	10^3 ha	(6)

(1) Office of Agricultural Economics, 2008; (2) Department of Provincial Administration, 2007; (3) Office of the National Economic and Social Development Board, 2007; (4) FAOSTAT; (5) Royal Forest Department, 2007; (6) National Park, Wildlife and Plant Conservation Department, 2008; * 'Production of major agricultural crops' divided by area of 'farmland'

Table 3-2 Scenario design for a BAU RL

Scenario option	Modification on variables
Standard	All the variables adjusted at the changing rate equal to 2000-2003
Conservation	Annual increased area of national parks and wildlife sanctuaries adjusted to be 100,000 ha from 50,000 between 2000-2003; and other variables consistant with the Standard
Industrialisation	Annual growth rate of productivity for major agricultural crops and GDP in non-agriculture sector (i.e., manufacture, construction, sales, transportation, and finance) adjusted to be 10% from 7% and 5% in 2000-2003, respectively; and other variables consistant with the Standard

3.3. Results

Historical RL

The area of forest loss per year and that averaged for the period of five years are presented in Figure 3-2 (a) and (b), respectively. The annual loss of forest area is considerably larger in earlier rather than recent years, regardless of the values being averaged over some years or not. If we take reference years of 1985 and 1995, for example, the estimated values are 178,642 ha and 99,743, respectively. Instead, if we follow a 5-year reference period of between 1985 and 1989 and 1995 and 1999, the figures are estimated as 184,711 ha and 70,122, respectively.

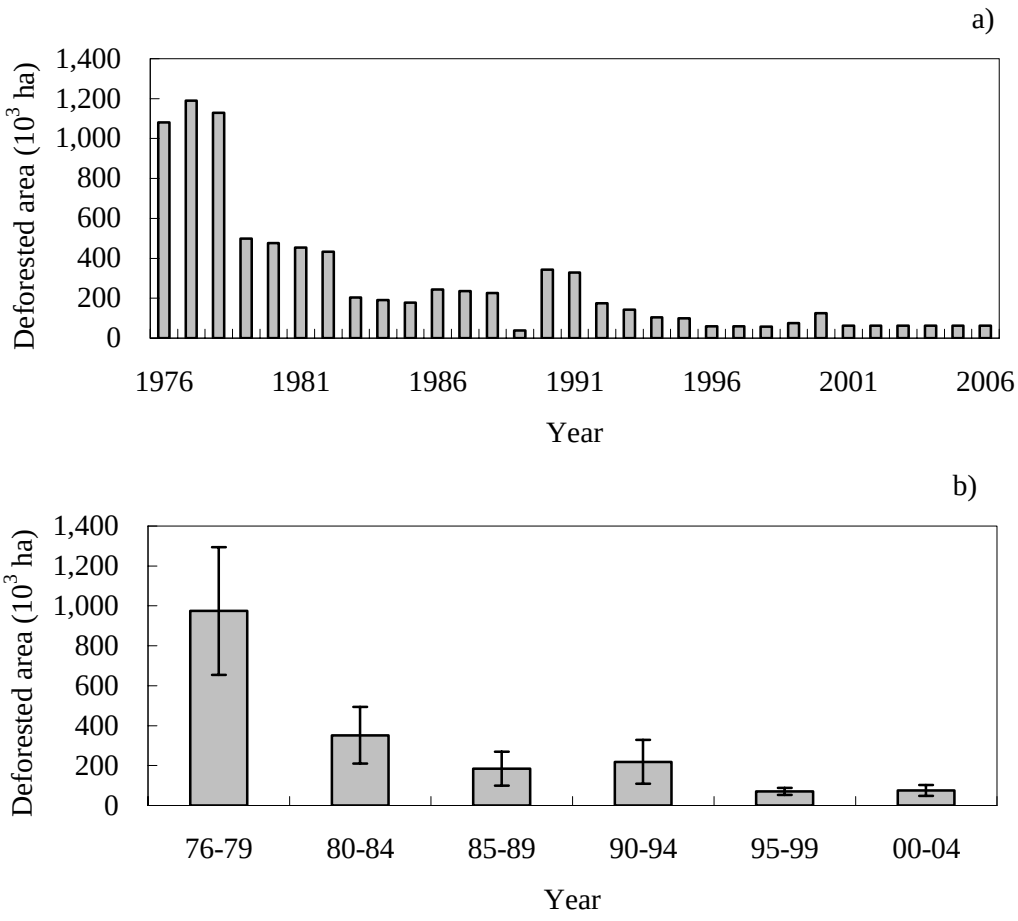


Figure 3-2 Historical RLs in Thailand: annual deforestation area (a) and annual deforestation area averaged for five years (b) with vertical bars indicating the standard deviation of values

Forest-trend RL

The quadric model based on the historical trend of the forest area is as follows:

$FOR = 10.595t^2 - 42394t + 4.242*10^7$

(adj. R^2: 0.962; S.E.: 432.432)

Where: *FOR*, forest area; *t*, year

The fitness of the model appears high (adjusted R^2=0.962; see Figure 3-3), which means that the projected trend of deforestation is likely. However, this is possible only under the condition of a country, such as Thailand, where the deforestation trend shapes a relatively smooth curve.

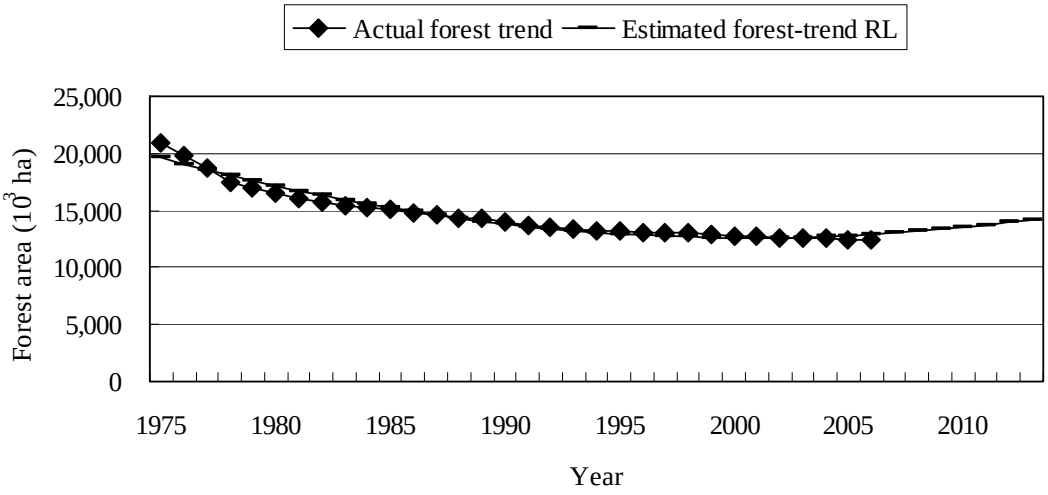


Figure 3-3 Comparison of the estimated forest-trend RL and the actual forest trend data in Thailand

BAU RL

The components of the econometric model to estimate a BAU RL are presented in Table 3-3. The results of the model show a satisfactorily high projection level (Figure 3-4). In the model, it is interpreted that as agricultural GDP increased and productivity

for major agricultural crops and implementation of the protected area system decreased, the area of new farmland was likely to have expanded. This means that as more economic demand was placed on the agriculture industry, the area of farmland was assumed to have increased, while the improvement of productivity for major agricultural crops and the protected area system was likely to have reduced such pressure on new farmland. Unclassified land, on the other hand, was likely to have enlarged, as GDP in the non-agriculture sector increased. This indicates that as the country has become more industrialised and urbanised, more land was categorized as unclassified land, which includes, such areas as cities, industrial sites, and various types of infrastructure.

Table 3-3 The econometric model for a BAU RL in Thailand

$FOR_{(t)} = 21274.88 + 0.575*FOR_{(t-1)} - 0.918*FA_{(t)} + 0.501*FA_{(t-1)} - 0.877*UNC_{(t)} + 0.439*UNC_{(t-1)} - 18.514*D_{(t)}$

(1.864) (2.562) (-8.665) (2.036) (-9.895) (1.808) (-0.541)

(adj. R^2: 0.999; S.E.: 31.956)

$FA_{(t)} = 3745.355 + 0.816*FA_{(t-1)} - 22.064*PDT_{(t)} + 5.315*GDPA_{(t)} - 0.0460*NPWS_{(t)}$

(3.956) (15.248) (-2.216) (1.843) (-0.888)

(adj. R^2: 0.950; S.E.: 109.500)

$UNC_{(t)} = 4009.106 + 0.734*UNC_{(t-1)} + 0.325*GDPN_{(t)} + 79.238*D_{(t)}$

(2.405) (6.646) (2.820) (0.803)

(adj. R^2: 0.972; S.E.: 131.306)

Where: *FOR*, forest area; *t*, year; *FA*, area of farmland; *UNC*, area of unclassified land; *D*, a dummy variable; *PDT*, productivity for major agricultural crops; *GDPA*, GDP in agricultural sector; *NPWS*, area of national parks and wildlife sanctuaries; *GDPN*, GDP in non-agricultural sector

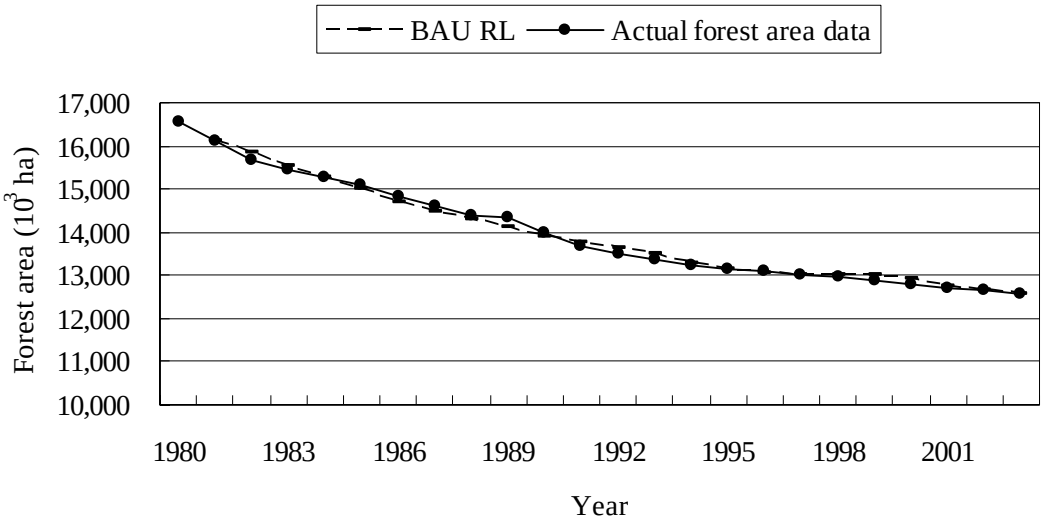


Figure 3-4 Comparison of the BAU RL and the actual forest area data in Thailand

With the model, BAU RLs with three different scenarios, as explained before, are estimated for the years after 2003 as shown in Figure 3-5. Among the three BAU RLs, deforestation continues under the Standard and Conservation scenarios; while in the Industrialisation scenario, the forest area starts to recover then increase. The incremental growth of forest area under the Industrialisation scenario could be caused by factors such as the natural regeneration of forests, where there once was farmland, and increased tree plantations. The deforested area in the Conservation scenario is slightly less than that in the Standard, which obviously is associated with the enhanced protected area system under assumption.

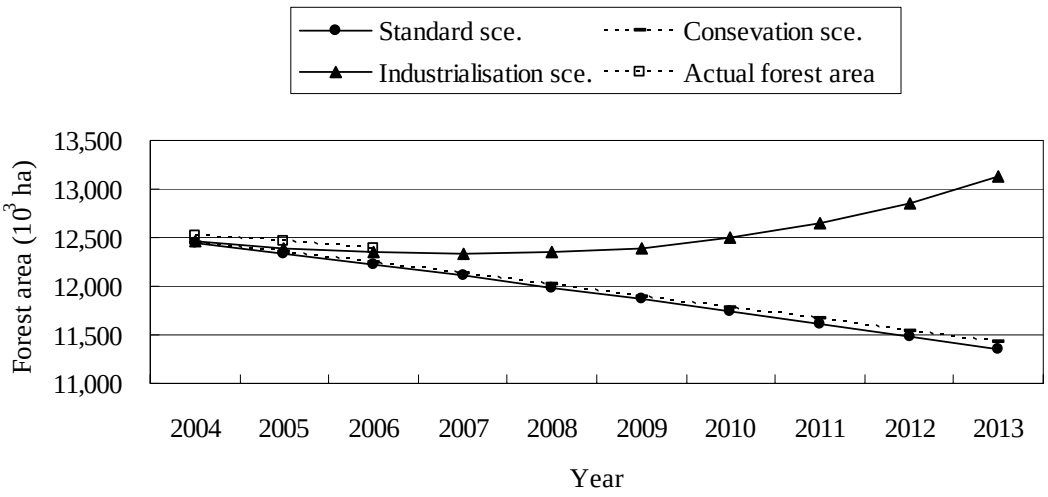


Figure 3-5 Projections for forest area by the BAU RL with three scenarios and the actual forest area data in Thailand

Comparison of the three RLs

Projection on the forest area for 2013 as a sample national RL is summarised (Table 3-4). To compare the findings easily with the other two RLs, the results of the historical RL are converted from the annual deforestation area to the forest area, based on the value of the forest area in 2003 (i.e., the estimated annual deforestation area in 2013 was deducted from the 2003 figure for forest area). The forest-trend RL and BAU RL for the Industrialisation scenario produce a high estimation of the forest area, which is above the forest area in 2003. The results of the other RLs, especially of the BAU RL for the Standard and Conservation scenarios, appear low compared with the situation in 2003.

Table 3-4 Projected forest area for 2013 by three RLs in Thailand

RL		Forest area (10^3 ha)	Ratio to forest area in 2003 (%)
Historical			
	With sample base yr/period of:		
Yearly	1985	12,405	98.6%
	1995	12,484	99.2%
Periodical	1985-89	12,399	98.5%
	1995-99	12,513	99.4%
Forest trend		14,196	112.8%
BAU			
Standard sce.		11,351	90.2%
Conservation sce.		11,427	90.8%
Industrialisation sce.		13,130	104.3%

3.4. Discussion

The characteristics of each of the three RLs, which require different levels of data, can be highlighted with respect to their potential use in a market-based mechanism. First of all, not surprisingly, different RLs yielded different estimations for the future forest area. The analysis showed that a RL with limited data (i.e., historical and forest-trend RLs) did produce a higher estimation of forest area than RLs with a large number of datasets (i.e., a BAU RL with the Standard and Conservation scenarios). This reminds us that the data availability of a country can influence not only the choice of a national RL, but also the incentives that it can receive (Angelsen *et al.*, 2009b; Parker *et al.*, 2009).

The estimation results of the simple historical RL could be varied considerably, depending on the selection of a base year or period. The forest-trend RL, which is relatively simple and likely to be more reliable than the historical RL, could be useful,

when the country's deforestation curve is formed smoothly. These two types of RLs relied only on forest area data.

On the other hand, other than the fact that it reflects the national circumstances related to deforestation, the BAU RL with a wide range of data types showed its strengths at least in two manners. First, it could demonstrate the effects of the country's policy approaches to reduce deforestation. This can be useful for identifying the country's reductions of emissions that are additional. Such information should be valuable at the registration process with REDD-plus market systems (Eliasch, 2008). Second, the BAU RL could eliminate the unintended effects of a country's development on reduced deforestation. The analysis indicated that industrialisation in Thailand could help to reduce national deforestation. Nonetheless, industrialisation in many parts of the developing world (e.g., in China, India, and other rapidly growing countries), is likely to be promoted even without REDD-plus incentives. Therefore, it is necessary to prevent such unintentional reductions of emissions from being counted as part of REDD-plus credits.

These findings suggest that depending on their data conditions, countries would have different choices for RLs, and as a result, a number of countries with limited data availability might be challenged to establish a sophisticated RL to fully participate in a market-based mechanism (Dahal and Banskota, 2009). For REDD-plus to be equitable across countries experiencing deforestation, a relaxation of requirements for a national RL is necessary for countries which have less data. They should be able to select the RLs that can be developed with available datasets (Huettner *et al.*, 2009). To do this, it is recommended they estimate the RLs in a carbon conservative manner

to avoid crediting unfavorable ‘hot air’ (i.e., credited emissions without a country’s additional efforts). Capacity building using funds can then support the countries with limited data to enhance a data collection system in that country. With that improved data condition, they may be able to apply a more sophisticated RL to fully participate in a market-based mechanism in the future.

3.5. Conclusions

Given that data availability in developing countries is extremely varied, countries participating in REDD-plus should be able to use the RL that fits into the situation which relates to their available datasets. Moreover, once registered, they should be able to strengthen capacities to collect data to develop a more sophisticated RL, which is adequate to fully participate in a market-based mechanism. This can promote equity in REDD-plus, as those with poorer capacities will be able to have equal opportunities to reduce emissions from forests. REDD-plus that involves wider participation, regardless of countries’ data availability, can minimise a risk for the international leakage. Further, the enhanced data collection system in developing countries would assist the sustainable management of forests in that country, which could benefit not only reductions of emissions from forests, but also a number of other forest functions and services, including biodiversity conservation and the provision of the needs for many forest dependent people.

Chapter 4. Economic motivation and local participation in a market-based mechanism

4.1. Introduction

A market-based mechanism dealing with carbon credits is recognised as one of the potential financial mechanisms for REDD-plus (Angelsen *et al.,* 2009b). Various observers indicate that this emerged from the concept of payments for environmental services, which have been widely used in the fields of carbon sequestration, watershed protection, and biodiversity conservation (Angelsen and Wertz-Kanounnikoff, 2008; Blom *et al.,* 2010; Borner *et al.,* 2010). Payments for environmental services are defined as voluntary transactions wherein environmental service buyers compensate service providers (Wunder, 2006). In the case of REDD-plus, the environmental service is reduced emissions from forests and generated only when local land and resource users engage in behaviours for 'payments' as an incentive. While certainly whether payments are profitable than earlier behaviours is a key concern, one's real economic motivation is diverse and known to be influenced by many factors (e.g., Fehr and Falk, 2002; Kumar, 2002; Sommerville *et al.,* 2010). The diverse economic motivation potentially means that market incentives would not work everywhere equally effectively; indicating that there might be inequitable outcomes between those whose economic motivation is varied.

Objectives and the brief overview of the two case studies

The objective of this chapter is to examine the impacts of diverse economic motivation on choices regarding market interventions at the local scale. It also seeks to indicate the ways in which incentives be designed to effectively invite wider

participation and make changes in behaviours, including the potential roles of capacity building based on funds. Two case studies from Thailand are contained in this chapter: one is at the community scale and the other at the individual scale. The brief overview of the studies is described below.

Case study 1: One of the factors influencing economic motivation is the concept of economic values. How one perceives economic incentives depends on, to unknown extents, the meaningfulness of economic means in her own values. In this case study, two forest-dwelling communities in North Thailand which have distinct concepts of economic values are taken. The two communities belong to different ethnic groups: Thai and the Karen and the Hmong. The impacts of the concept of economic values on choices are then compared with respect to land use patterns and preferences on the design of a hypothetical benefit distribution system (BDS), which includes a market-based mechanism. It is assumed that a community with the concept of higher economic values will tend to be more economically motivated, thus suitable for a market-based REDD-plus.

Case study 2: The economic motivation to engage with a market-based mechanism should be diverse among the farmers whose economic circumstances are varied. For instance, given the same level of additional income, rich farmers are likely to find it less important than the farmers who are poorer. In north-eastern Thailand, there have been a growing number of farmers who planted eucalyptus on their land under a contract-like partnership with private pulp and paper companies (e.g., Hoamuangkaew *et al.*, 1999; Makarabhirom and Mochida, 1999; Ubukata, 2001). A company usually not only promises to purchase timber from farmers, but also offers a variety of

services, including provision of technical know-how and planting materials, such as seedlings. In this case study, using one of these plantation schemes, the motivation of farmers across different income classes is investigated. It is hypothesised that depending on farmers' economic conditions, they were attracted to different incentives that the scheme provided to them.

4.2. Case study 1: The concept of economic values and participation in a market-based mechanism at the community scale

Description of the study site

The study area, situated near the border between Mae Hong Song and Chiang Mai, North Thailand, is in a mountainous landscape, designated as Mae Lao Mae See Wildlife Sanctuary in 1987. The area includes the two study communities, which are the villages of Khun Saa Nok (or Huay Laai) and Khun Saa Nai. For convenience, the first is referred to as A, and the second as B. The road distance between the two communities is approximately 16 km, which takes about an hour by car. B is located at a higher altitude than A at the above sea level around 1,250 m.

In both communities, swidden cultivation, or also known as shifting cultivation, is traditionally practiced, and as a result, has caused change in the forests. In A, consisting of Thais (60%) and the Karen (40%), households often conduct short cultivation and long fallow periods. The Hmong of B, on the other hand, carry out long cultivation and very long fallow swidden periods, which originated from the cultivation of opium in the past (Fox *et al.*, 1995). The estimated land dependency of each household in 2007, expressed by mean holding area, was at 1.6 ha and 4.7 ha for A and B, respectively. Land is not entitled through any formal land titles as it is

managed by the Thai government. Around half of the holding area is cultivated and the rest abandoned in a year. Households in both communities grow agricultural crops for consumption (e.g., rice) as well as for major cash income (see Figure 4-1 and 4-2). Off-farm income sources, including wage-labouring, supplement the households' income. The population of the two communities were 194 (A) and 689 (B) in 2007 with annual growth rates of 2% (A) and 4% (B) for the period between 1993 and 2008.

Figure 4-1 Paddy fields are common and supply rice for consumption in Khun Saa Nok (Community A) (Photograph by the author)

Figure 4-2 Khun Saa Nai (Community B) is climatically suitable for cultivating highland vegetable and fruit (Photograph by the author)

Methodology and data

Household-level socioeconomic and land use data and surveys on preferences on a hypothetical BDS

Questionnaire surveys were carried out twice in July 2009 and 2010 to collect data from randomly selected households covering around 25% of households in each community (13 households in A and 24 in B were surveyed). All questionnaires were conducted by the author with the help of an interpreter and four to six research assistants following training. Households were selected at first through the guidance of village headman or someone whom the headman appointed. But later households were chosen randomly by walking through the communities. Men as well as women participated in the survey as a representative of a household, although men appeared more frequently than women (around 54% and 71% of respondents were male in A and B, respectively).

Questionnaires consist of two parts: one on socioeconomic and land use information, and the other on preferences on the design of a hypothetical REDD-plus BDS. The first part of questionnaires is made to capture information on households' economic circumstances, including perceptions of income sufficiency, agricultural practices, demographics, and education. The market value of consumed rice in a household is added to the total income of households.

The second part of the questionnaires uses a scoring method focused on preferences on the two key designing features of a BDS: (i) the type of benefits and (ii) the form of receiving that benefit (UN-REDD Programme, 2010a). The types of benefits are categorised into two: monetary and non-monetary. The latter is intended to include any kinds that respondents would like to receive, other than the generation of income (i.e., monetary benefits). An example is such a service as infrastructure development (e.g., maintenance of road, construction of hospitals and schools). The forms of receipt of benefits are grouped into three patterns: (i) at the individual household level, (ii) with a group of other households in a community, and (iii) through a community organisation.

Before the second part of the questionnaires started, it was necessary to explain the concept of REDD-plus and the role of a BDS to the respondents. The same explanation is used for both communities, except for REDD-plus activity types. In A, given the limited holding area (i.e. 1.6 ha per household), it was difficult for respondents to consider participating in reducing emissions from deforestation, which would require the abandonment of part of their land under use. Therefore, it was

explained in the survey that an eligible REDD-plus activity type in A would be forest conservation; while that in B could be reducing emissions from deforestation.

Analysis

In order to understand the concepts of economic values in the two communities, two types of household economic data, total income and the income-to-expenditure ratio (IER), are compared between households with and without a self-recognition of income sufficiency by using the analysis of variance. For the purpose of analysing the impacts of economic interest on land use patterns, multiple regression analysis (MRA) is employed, taking into account selected non-economic intervening variables, including the number of cash crop types, on-farm investment, educational levels, and family size. A stepwise selection function is used to identify significant variables. All of the household-level data are converted into the standardised form before being applied in the analysis. Further, principal component analysis (PCA) is applied to analyse the variance of the data on households' preferences on the design of a hypothetical BDS, in relation to the concepts of economic values. PCA can explain the variance of the data space by creating new dimensionalities, called a PC.

Results

Economic conditions

The difference in the economic conditions of the two communities is highlighted in Table 4-1. The mean annual income of a household in A is around 90,000 baht, less than a quarter of that in B (above 360,000 baht). This is owing to a significant portion of on-farm income in B at almost 90%; while in A it is 51%. The expenditure of households is more significant in B than A, as the former covers much higher on-farm investment. As a result, overall, IERs of households in B accounts for 1.8, which is

higher than that in A at 1.4. Nonetheless, according to the estimated coefficients of variation (CV) for total income and IERs, of which both are higher in B than A, the economic conditions of households varies more significantly in B than in A.

Table 4-1 Summary of economic status in the two communities

Variable	A (*N=13*)			B (*N=24*)		
	Mean	St. dev.	CV	Mean	St. dev.	CV
Total income[1)] (Baht/yr)	88,767	35,151	0.40	365,494	307,934	0.84
On-farm income[2)]	46,101	33,807	0.73	324,406	304,640	0.94
Ratio	51.9%			88.8%		
Off-farm income[3)]	20,897	16,136	0.77	17,504	22,824	1.30
Ratio	23.5%			4.8%		
Others	21,769	14,595	0.67	37,733	54,783	1.45
Ratio	24.5%			10.3%		
Total expenditure	64,500	26,383	0.41	199,976	126,648	0.63
Living costs	41,315	25,561	0.62	46,990	29,730	0.63
Ratio	64.1%			23.5%		
On-farm investment	2,511	1,994	0.79	108,775	73,531	0.68
Ratio	3.9%			54.4%		
Others	20,675	21,091	1.02	53,575	65,888	1.23
Ratio	32.1%			26.8%		
IER	1.4	0.4	0.29	1.8	1.0	0.57

Notes: 1) Sum of on-farm, off-farm, and other income, including loans; 2) Sum of agricultural crops, including market-values of rice consumed in households, and livestocks in A (averaged 7% contributions to total income); 3) Sum of wage-labouring, remittance from family members, and private business.

Concepts of economic values

A significant difference is indicated for the variable of total income between households with and without a self-recognition of income sufficiency in B ($p=0.03$; Table 4-2). Though no significant difference is observed for IERs in B ($p=0.10$), it appears that IERs of households with income sufficiency also tend to be higher than those without it (see Figure 4-3). It is thus likely that the concept of sufficiency with income is dependent on achieved economic conditions in B.

On the contrary, there was no difference for the total income and IERs of households with and without income sufficiency in A. What this finding indicates is that in A, some households were able to be satisfied with moderate economic levels which others found unsatisfactory. In other words, in order to be economically sufficient, while households in B should have high economic conditions, some with the concept of low economic values in A do not have the same necessity.

Table 4-2 Results of the analysis of variance between households with (n; 6 in A, 16 in B) and without income sufficiency (n; 7 in A, 8 in B)

	A		B	
Variable	F-value	p-value	F-value	p-value
Total income	4.84	0.87	4.30	0.03*
IER	4.84	0.21	4.30	0.10

Note: * indicates significance at the .05 level.

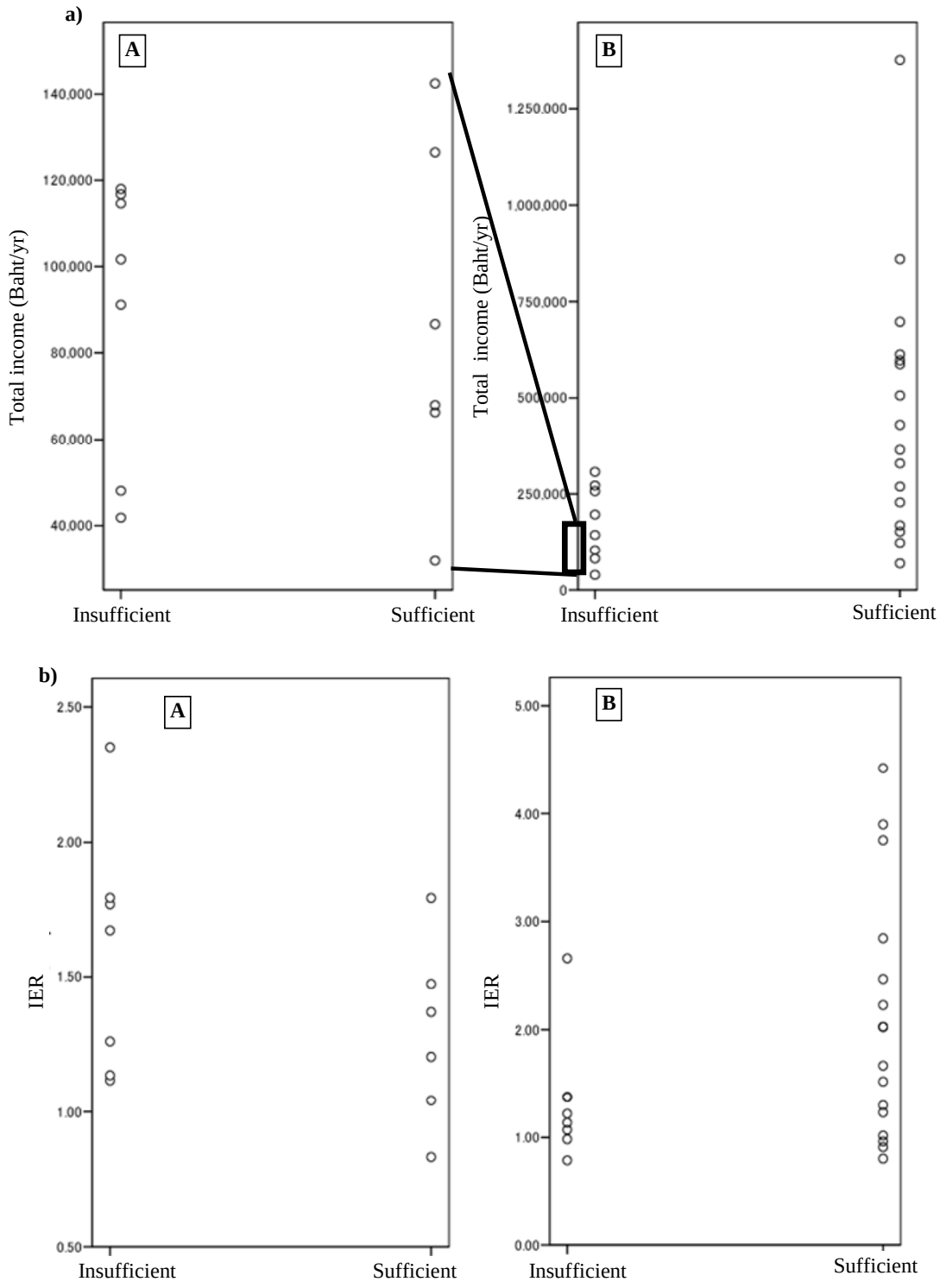


Figure 4-3 Contrasts of total income (a) and IERs (b) of the households with income sufficiency (n; 6 in A, 16 in B) and insufficiency (n; 7 in A, 8 in B)

Impacts of economic interest on land use

Among others, two variables, total income and an IER, are selected as significant in relation to change in the households' holding area (adjust. R^2=0.63; see Table 4-3). The variable of total income positively impacts on increase in the holding area, indicating the association of a higher income with a larger land holding area in B and of a lower income with a smaller land holding area in A. On the other hand, IERs are negatively associated with change in the land holding area. This means that an increase in IER contributes to a decrease in the holding area, in connection with a decrease in income. An increased IER indicates enhanced efficiency of generating income, which could happen by factors, such as improvement of farming techniques (e.g., use of fertiliser and machinery) and choice of species with a better price. On average, IERs are higher in B than A. An improvement in the factors causing higher IERs likely contributed to decreased land dependency, while increasing net income in B.

Table 4-3 Selected regression coefficients for households' holding area (n=37)

Variable	Coeff.	St. dev.	t-value	Adjus. R^2
Total income	1.01	0.13	7.77	0.63
IER	-0.47	0.13	-3.60	

Preferences on the design of a hypothetical BDS

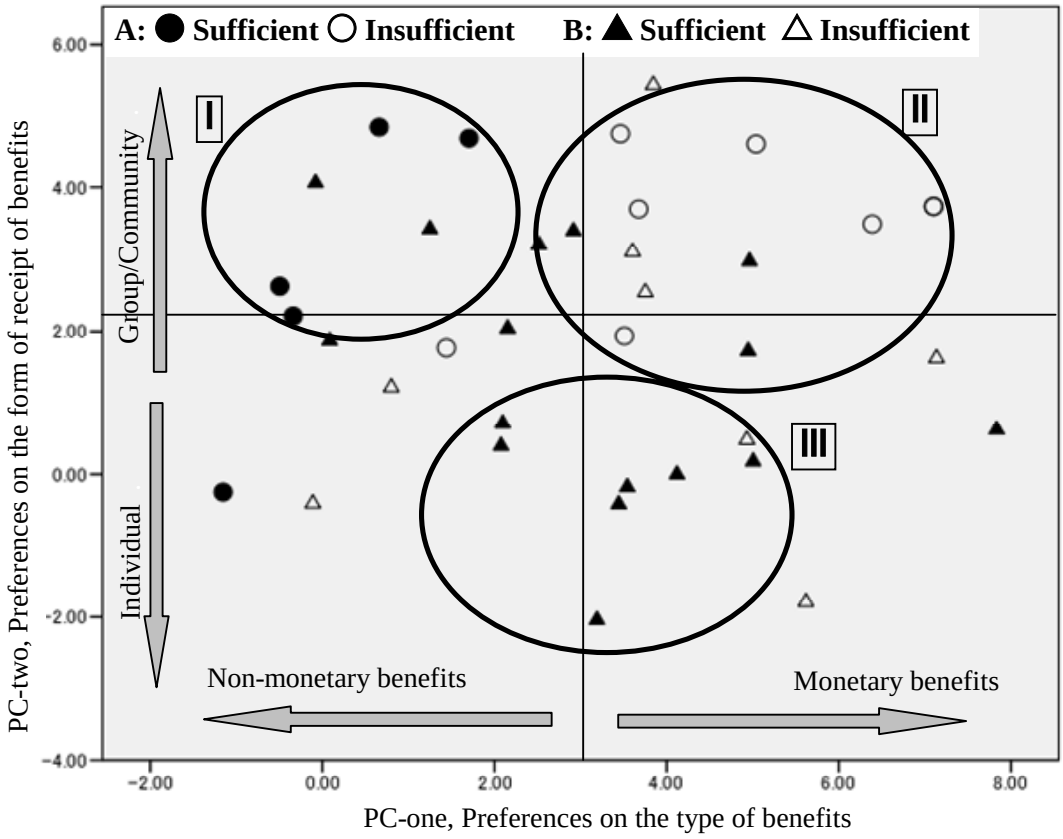
Two PCs are identified on preferences on the design of a hypothetical BDS, accounting for 55% of the total sample variance (Table 4-4). Based on the factor loadings, PC-one is interpreted as representing the type of benefits (i.e., monetary or non-monetary) and PC-two the form of receiving that benefit (i.e., individually; with a group of other households in a community; or through a community organisation).

Three groups are identified in the contrasts of two PCs in relation to income sufficiency/insufficiency (Figure 4-4): in Circle I, the households with income sufficiency in A prefer receiving the non-monetary benefits collectively; in Circle II, those with income insufficiency in A are attached to the collective receipt of monetary benefits; and in Circle III, some of the households with income sufficiency in B are motivated to receive the monetary benefits at the individual level. The households with income insufficiency in B are scattered. In summary, only the first group (Circle I), who indicated the concepts of lower economic values, likes the idea of non-monetary benefits, and the rest prefer monetary benefits. In addition, almost all the households in A prefer collective actions, while some of the households in B, who were commercially successful, select individual decision-making.

Table 4-4 Principal components (PC) of preferences on the hypothetical BDS (n=37)

Variable	PC	
	1	2
Type of benefits		
Monetary	0.64	-0.35
Non-monetary	-0.71	-0.25
Form of receipt		
Individual	0.69	-0.29
Group	-0.01	0.70
Community	0.38	0.68
% variance	30.81	24.46
Accumulated %		55.27

Note: 1=PC-one (Type of benefits); 2=PC-two (Form of receipt)



Note: The vertical and horizontal lines indicate the mean value of each PC.

Figure 4-4 Contrast of PC-one (Type of benefits) and PC-two (Form of receipt) with indication of income sufficiency/insufficiency (Total 37)

Discussion

The concept of economic values impacted the choices related to land use patterns and preferences on the design of a hypothetical BDS at the community level. The community with the concept of higher economic values, characterised as being satisfied at the achievement of improved economic conditions, carried out large-scale agriculture to increase income. While doing this, they invested significantly to improve per area productivity and income. It was their economic motivation that has driven land use change. Also, most of them indicated their interest in the receipt of monetary benefits at the individual scale through a REDD-plus BDS. These findings suggest that this type of community might be attracted to join a market-based REDD-

plus to change behaviours. However, high economic motivation and ability means that the opportunity costs of their land use manners are also high. As Wunder (2006) notes, economic incentives work effectively at the margin of profitability. If payments are not compatible with the opportunity costs, desirable change in land use may not be realised (Borner *et al.*, 2010).

It was found that the other community made choices which did not necessarily bring economic benefits to them. Some of them indicated the concept of lower economic values, while others lacked the ability to improve economic circumstances as they wished. If a market system only appears in REDD-plus, this type of community would most likely to be left out either because of a lack of interest in economic incentives or of the ability to change behaviours for economic incentives. Moreover, importantly, the land use patterns of this community impacted the forests relatively insignificantly; meaning that even if they were to participate in a market system, they would have few credits, as tradable credits should be additional to what would otherwise occur. Since their land use manners are already conservative, meeting this criterion would be extremely challenging. Despite their conservative land use behaviours earlier, they could not be rewarded under the REDD-plus that is based on a market system. This is similar to what has been discussed at the national level on how to reward the early implementers of reductions of emissions from forests in REDD-plus (e.g., da Fonseca *et al.*, 2007; Griscom *et al.*, 2009, Parker *et al.*, 2009). Eliminating these conservative land and resource users from REDD-plus is not only inequitable, but also may have impacts on leakage and permanence of reduced emissions. It is therefore suggested to provide capacity building to these communities to continue their sustainable land use manners, taking into account the needs of

community livelihoods (Blom *et al.*, 2010). For instance, farmers' capacities to generate income without increasing pressures on forests could be enhanced through such as intensification of agriculture and provision of off-farm employment opportunities (Perz, 2004). For those with the concept of low economic values, capacities could be promoted to secure and improve their livelihoods through non-economic manners, such as the provision of adequate access to education and health services.

4.3. Case study 2: The economic conditions and participation in a market-based mechanism at the individual scale

Description of the study site

Two adjacent villages, Nikom Nong Chan and Nong Bua Nguen, in the Nong Bua Lum Phu Province of North-eastern Thailand, are selected as the study site. The villages have typical eucalyptus plantations which have been established through a contract-like partnership between farmers and a private company since the early 1980s (Figure 4-5 and 4-6). In the frequently observed system of partnership, a company not only promises to purchase timber from farmers, it also offers a variety of services to participating farmers, including provision of technical know-how and planting materials, such as seedlings. As shown in Table 4-5, the content of the company's promotional activities changed over time in the study site (i.e. either intensified or weakened), depending on how it demands eucalyptus as raw material.

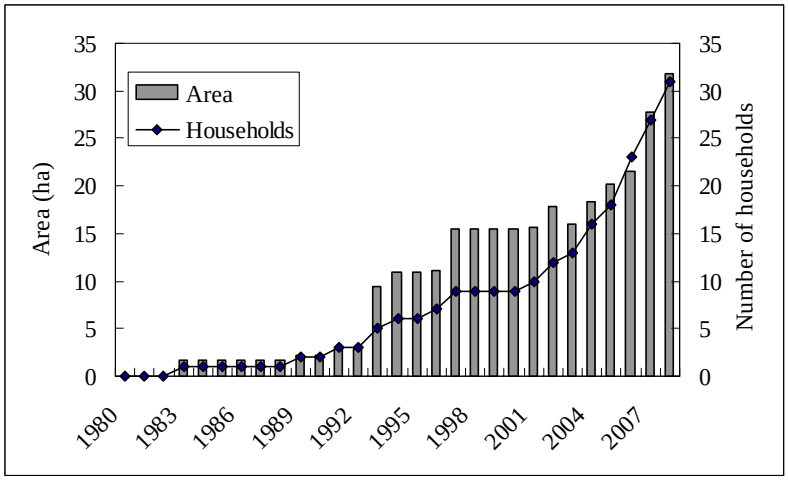


Figure 4-5 Area of eucalyptus plantations and the number of households participating in eucalyptus plantations in the study area (Total sum of 31 surveyed households)

Figure 4-6 Eucalyptus plantations are planted on farmer's land for four to seven years before harvesting in the villages (Photograph by the author)

Table 4-5 Some of the company's promotional activities over time in the study area, based on interviews with two company's extension officers and several villagers

Before 1990 to 1997	1997-2006	2006 to present
• Distribution of seedlings for free • Provision of technical know-how (e.g. training at company and on-site) • Information sharing (e.g. seminar at villages)	• Promotion continued as previously on a larger scale • Intensified promotional activities in 2004 and 2005: payment for each planted seedling; free ploughing service	• Previous promotion cancelled, except for information sharing • Sales of seedlings

Methodology and data

Data collection

Field surveys were carried out twice from February to March in 2008 and in July in 2009. Thirty-one eucalyptus planting households, or 10% of the total households in the villages, were surveyed. In the initial survey, semi-structured interviews were conducted to develop a list of motivational factors that the surveyed farmers identified (Table 4-6). During the second survey, the surveyed planters were requested to give a score for each of the motivational factors, depending on the significance of each factor in their choices to join the plantation scheme. This scoring method can identify the motivation of farmers both comprehensively and comparatively.

The surveys were implemented by the author with the help of an interpreter and four to six research assistants following training. Households were selected at first through the guidance of village headman or someone whom the headman appointed. But later households were chosen randomly by walking through the villages. Men as well as women were asked to participate in the surveys (around 68% of respondents were female).

Analysis

Principal component analysis (PCA) is applied to the collected data on the planters' motivational factors. To examine the impacts of economic circumstances on farmers' choices to participate in the scheme, the results of PCA are analysed based on planters' annual income levels; high (above 150,000 Baht); medium (between 70,000 and 150,000); and low (below 70,000). The number of surveyed households accounted for under each of income categories is; eight, ten, and thirteen, respectively. In the villages, roughly 75% of annual income per household is generated from off-farm sources, such as general employment, and the rest from on-farm sources including plantations.

Results

The results of PCA on the planters' motivational factors are shown in Table 4-6. The identified four PCs jointly explain the sample space of data by around 55%. In accordance with factor loadings of the given PC, PC-one is interpreted as representing interest in selling; PC-two dependency on or independence from the company; PC-three passiveness; and PC-four strategic attitude about plantations.

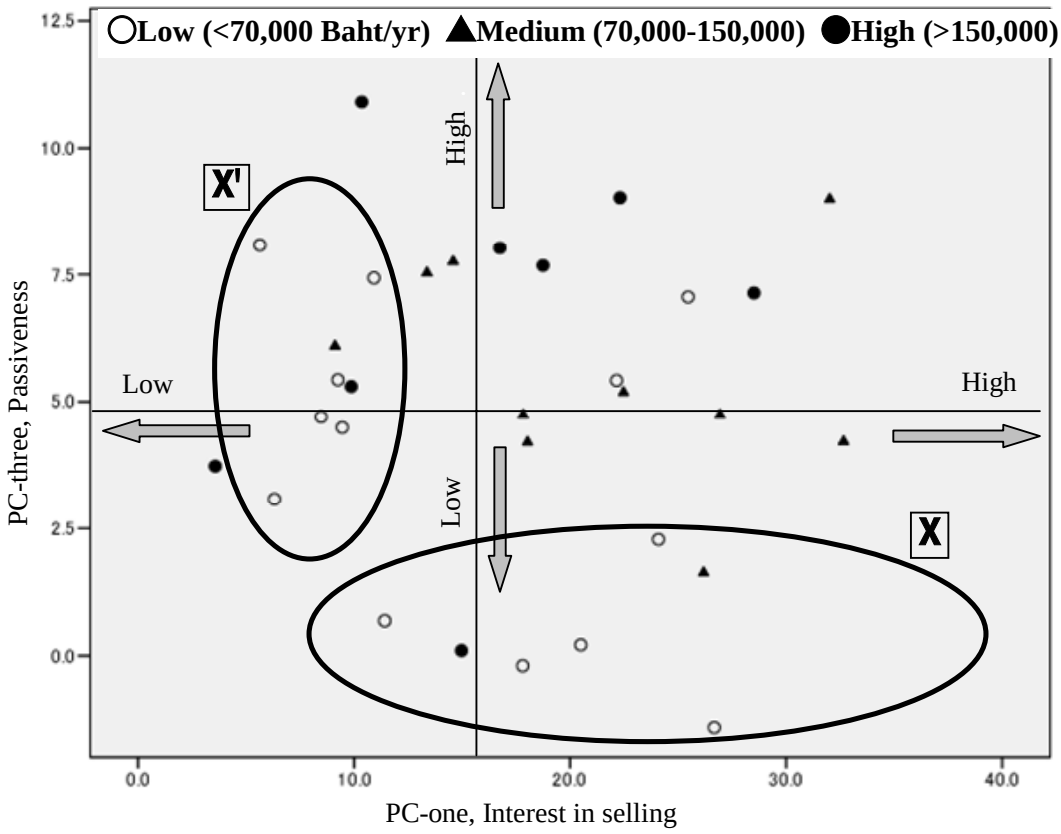
Using Pearson's (r) correlation, among the four PCs, only PC-three (i.e. passiveness) is correlated with income levels ($r=0.375$, $p=0.038$). This can suggest that the higher the level of income, the more passive a planter could be with respect to PC-three. Then, the passiveness of planters, represented by PC-three, and their interest in selling explained by PC-one are contrasted in Figure 4-7. It shows that the level of passiveness does not determine the level of interest in selling. In fact, with similar passiveness, a planter's interest in selling can be either high or low. However, in the

case of the low-income group, it is clear that one sub-group with low income (X), which is more committed to sales, tends to be less passive than the other sub-group (X'), which is least interested in selling. Therefore, aggressive planters with low income tend to be eager to sell eucalyptus.

Table 4-6 Principal components of the planters' motivational factors (n=31)

Motivational factors	Principal component			
	1	2	3	4
Self-consumption	-0.33	0.22	-0.35	0.39
Price is high	0.73	0.15	0.11	0.16
Price is not so high but investment is cheap	0.45	0.33	0.14	0.32
Price is high and investment is also reasonable	0.67	0.36	-0.11	0.01
Price is not so high but stable	0.76	0.24	-0.32	-0.02
Possibility for higher price in future	0.31	-0.73	0.32	0.26
The land was free	0.37	0.36	-0.23	0.40
The land has limited fertility	0.47	-0.22	0.18	-0.02
Suitable for schedule of family	0.50	-0.31	0.10	0.25
Low labour intensity	-0.07	-0.03	0.46	0.58
Technically easy	0.41	-0.27	0.40	-0.38
Good service from other bodies	0.30	0.43	0.49	-0.30
Neighbour has recommended	0.35	-0.50	-0.26	-0.26
Family has recommended	0.49	-0.46	0.01	0.06
Middleman or company has recommended	0.29	0.61	0.44	-0.27
Wanted to try	0.52	-0.06	-0.54	-0.30
For children	0.72	-0.03	-0.17	0.15
%variance	23.15	13.50	9.90	8.03
Accumulated %variance	23.15	36.65	46.55	54.58

Note: 1 = PC-one (Interest in selling); 2 = PC-two (Company-dependency); 3 = PC-three (Passiveness); 4 = PC-four (Strategic attitude).

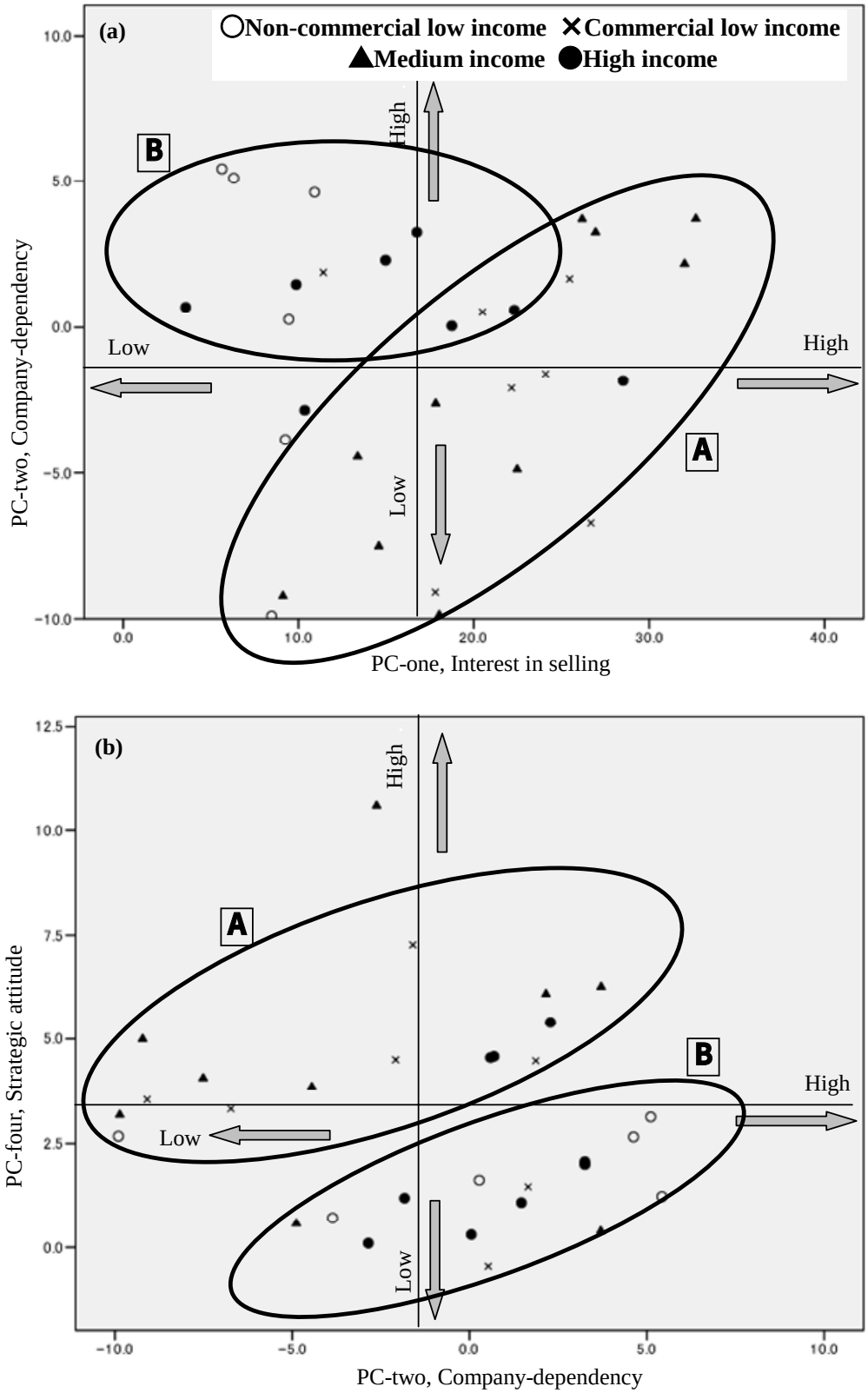


Note: The vertical and horizontal lines indicate the mean value of each PC.

Figure 4-7 Contrast between interest in selling (PC-one) and passiveness (PC-three) (n=31)

Dependency on the company's interference, as measured in PC-two, and interest in selling in PC-one are contrasted in Figure 4-8(a). The two sub-groups of the low-income group, as identified above, are added to income categories. Company-dependency appears to be linearly associated with interest in selling for the group of medium-income and the commercially driven low-income sub-group (A) (i.e. as one's interest in selling increases, attachment to the company also increases) (r=0.589, p=0.013); no such association is observed for the high-income group and the low-income sub-group without a commercial mind (B) (r=-0.087, p=0.767). What this can indicate is that while planters in the first group A tend to have a buy and sell relationship with the company; those in B rely on the company, irrespective of their business interest. The distinct feature of planters between A and B can be

supplemented by the other comparison of PC-two (i.e. dependency) and PC-four (strategic attitude) presented in Figure 4-8(b). It is indicated that, overall, planters in A are likely to be more strategic and well-planned about planting than those in B. As a result, some farmers in A likely appear more independent from the company than planters in B. Given an equal level of company-dependency, planters in A are more committed to selling than those in B in Figure 4-8(a).



Note: The vertical and horizontal lines indicate the mean value of each PC.

Figure 4-8 Contrasts between interest in selling (PC-one) and company-dependency (PC-two) in (a); and company-dependency and strategic attitude (PC-four) in (b)

Discussion

The motivation of farmers participating in plantation schemes in relation to their income levels is summarised in Table 4-7.

Table 4-7 Relative characteristics of planters' motivation in four PCs, classified by income levels

Income / PC	High	Medium	Low (commercial)	Low (non-commercial)
Interest in selling	Varied			Extremely weak
Dependency on the company	Generally high	None; or high, if interested in sales		Mostly high
Passiveness	High	Normal	Very weak	High to normal
Strategic attitude	Low to normal	Normal to high		Low to normal

The motivation of the medium-income and low-income business-minded planters was mostly characterised by their commercial attitude. They relied on the company only when they would like to sell eucalyptus. Their strategic attitude about plantations was also identified. The economic advantage of the scheme motivated their engagement with the plantations. In fact, the economic competitiveness of eucalyptus plantations in comparison to other crops, such as cassava and sugarcane, has been widely recognised to motivate farmers (Pousajja, 1996; Niskanen, 1998; Ubukata *et al.*, 1998). If a market-system of REDD-plus offers competitive economic incentives, it is likely that these farmers would be attracted to increase plantations.

On the contrary, the planters were identified who did not participate in the scheme only for economic purposes. Firstly, the surveyed wealthy planters appeared passive

or minimally strategic about planting. The constant company-dependency, irrespective of interest in selling, was also identified. These findings are not so surprising, as their income level was already high and plantations could be just one additional income source. Under such conditions, it is reasonable to consider that the technical kinds of service of the company (e.g., distribution of seedlings, provision of technical know-how on site) might have been especially effective as they could eliminate any burdens incurred by planters.

Secondly, the poorest farmers of this case study depended on the company the most unconditionally (i.e., the complete absent of interest in selling). Most of them had also started plantations early, before 1997, while the majority of others began after 2004; implying that their reliance on the company is not just strong, but also stable over a long period. It is possible to consider this is because plantations could be one of important, and probably very few ways of earning income to them. As a consequence, their choices to participate in the scheme might have become a necessity. Moreover, the technical support of the company assisted them a lot as they may have had limited capacity for investment. What these results indicate is that the singular application of a market-based instrument providing economic incentives is just one of the options for encouraging farmers' participation. Farmers' engagement with plantation is more complex and dynamic (Ubukata, 2001), thus the provision of non-economic incentives is also necessary to encourage wider participation of farmers, such as the technical kinds of service and guarantees for the stable long-term partnership (e.g., contract-based partnership including price guarantee, insurance service in case of unexpected incidents). Capacity building based on funds has an important role to play

in this aspect to offer non-economic incentives which could support the wider participation of farmers in the plantation schemes.

Figure 4-9 Learning from the villagers is an important source of information (Photograph taken in Nikom Nong Chan by the author)

4.4. Conclusions

A market-based mechanism providing economic incentives is an effective way to promote desirable land use change at the community and individual scales. Nevertheless, since economic interest, ability, and existing land use practice are varied, it is also necessary to provide non-economic incentives to realise equitable participation. Capacity building using funds could offer such non-economic incentives, while local livelihood needs should be considered. Increasing local participation as well as promoting the capacities to manage forests would definitely enhance the long-term environmental effectiveness of REDD-plus, which will certainly benefit the multiple forest functions and services that our lives are dependent on.

Chapter 5. Final conclusions

5.1. Thesis summary

While it is the major goal of REDD-plus to reduce emissions from forests in order to mitigate climate change, equity is a crucial aspect of it for governing forest change internationally. Equity considerations become vital especially for the people who depend on forests, yet whose livelihoods are not being secured. In this thesis, by taking the principle of Sen's capability approach (Sen, 1992), equity means promoting the capability of those, who otherwise could not have opportunities to reduce emissions from forests by avoiding the loss and damage of forests while enhancing carbon stocks. Various types of capacities were examined that are necessary to reduce emissions through a market-based instrument, one of the potential ways to govern REDD-plus (UNFCCC, 2009b; Okereke and Dooley, 2010). These capacities included were: the improvement of governance quality for policy implementation (Chapter 2); the establishment of a data collection system for methodological development (Chapter 3); and economic interest and ability for local engagement with desirable land use manners (Chapter 4). In this final chapter, the findings of the previous chapters are summarised to identify and discuss the necessity of capacity building for securing and promoting equity in REDD-plus. Then policy recommendations are made for the on-going and future REDD-plus negotiations and discussions.

In Chapter 2, it was assessed in an explicit manner that improvement of the quality of governance could contribute significantly to the reduction of deforestation at the national level. The positive impacts of the improved quality of governance were

identified, even with other intervening variables being considered, such as the growth of GDP, population increase, and changes in agricultural and wood production. Therefore, for developing countries to reduce emissions from forests, national capacities are needed to improve the quality of governance in that country. However, those capacities are varied between countries. As a result, some may have more difficulty than others in improving the quality of governance to reduce emissions from forests. If a market-based mechanism is only applied in REDD-plus, the countries with weaker capacities will be likely to have fewer benefits than the countries with stronger capacities, if both were to make the same efforts. Capacity building could enhance the capacities of those who need such support and provide them with more equal opportunities to reduce emissions from forests in REDD-plus.

In Chapter 3, it was demonstrated that national RLs based on a large number of datasets are favourable for the use of a market-based mechanism, as they can indicate the additionality of reduced emissions, while avoiding unintentional efforts to be credited. RLs with limited data, on the other hand, showed some constraints, including a significant variance in estimations caused by the selection of a base year or period. This finding signifies the possibility that only a small number of countries with sufficient data can develop a sophisticated RL to fully participate in a market-based REDD-plus. Therefore a relaxation of requirements for the development of RLs is necessary to encourage the participation of those with limited data. Moreover, once registered, countries should be supported to improve a data collection system in that country through capacity building. With that improved data condition, countries may apply a sophisticated RL, so that they can participate in a market system equally fully with other countries that have sufficient data.

Capacities that are locally necessary to implement a market-based mechanism are examined in Chapter 4. In the first half of this chapter, it was found the forest-dwelling community which is commercially motivated and capable, is more suitable for the application of a market system than the community with limited economic interest and ability. Also, the former indicated a higher potential to reduce emissions from forests additionally, as they hold a larger land area than the latter. Although it is the latter type of community who have preserved the forests, compared with the former type of community, they would not have opportunities to reduce emissions from forests and be rewarded in a market-based REDD-plus. To enhance equity in REDD-plus, it is therefore suggested to include on-going forest conservation as an eligible activity type. Capacity building based on funds then can support communities to continue the sustainable land use manners, including the provision for local livelihood needs.

In the second half of Chapter 4, farmers' motivation to join one of small-scale plantation schemes was analysed in relation to income classes. It was found that only a group of farmers with certain income classes, who were capable of planting without external support, was attracted for economic reasons. For wealthy planters, technical kinds of support were motivational to them, and for some of poor farmers, a long-term partnership encouraged them to participate in the scheme. In order to encourage the participation of farmers, regardless of their economic circumstances and ability, it is recommended to employ both economic and non-economic incentives in REDD-plus. Capacity building based on funds can support the latter type of incentives and promote the participation of those who otherwise could not.

It was identified that various types of capacities are necessary to reduce emissions from forests and join a market-based instrument at different scales of governance (national to local). There certainly are the types of capacities that are needed to implement a market-based REDD-plus but were not taken in this thesis (Angelsen and Wertz-Kanounnikoff, 2008; Parker *et al.*, 2009). Because these capacities are significantly varied between countries, regions, communities, and individuals, if only a market system is applied, equitability of REDD-plus is likely to be poorly managed; that is, providing opportunities to those with high capacities to reduce emissions from forests and be rewarded for that action. Therefore, to operate REDD-plus on the basis of equity, capacity building must be in place as part of REDD-plus design to offer developing countries equal opportunities, regardless of capacities, to avoid the loss and damage of forests and enhance carbon stocks.

Peskett *et al.* (2008) showed that in the CDM, in search for economies of scale, a high volume of investment has been spent on cost-efficient projects, especially in China and India. A country like Nepal, on the other hand, is known to be not so successful in meeting with the strict regulations of the CDM to receive the certified emission reductions, due to a lack of sufficient capacity (Dahal and Banskota, 2009). Experiences from different conservation activities in the tropics have also told us that for the sake of greater project efficiency at the local level, resources of projects have often been captured by community elites who usually have a higher capacity than others to benefit from those resources (Kumar, 2002; Blom *et al.*, 2010). By incorporating capacity building in part of its design, REDD-plus can avoid these

unfavourable treatments and provide all with the opportunities to reduce the loss and damage of forests and enhance carbon stocks.

Here, the most significant attention should be provided to the people who depend on forests and are likely to have the weakest capacities to reduce emissions from forests without external support. Capacity building of REDD-plus is required to improve the capacities of these people by fulfilling their essential livelihood needs, as without it, sustainable forest management and use can never be realised (Blom *et al.*, 2010). Boyd *et al.* (2007) points out that one of the ways to realise this is to involve local participants from the moment of project conception and design, which often is ignored in projects seeking efficiency. Capacity building of REDD-plus however can afford to do this. As Okereke and Dooley (2010) calls for, REDD-plus needs to be evaluated not only on the basis of efficiency outcomes but also on its ability to ensure meeting basic human needs, which is the core of sustainable development, defined by the Brundtland Report (WCED, 1987).

It should be emphasised that the more opportunities countries, regions, communities, and individuals are given to reduce emissions from forests in REDD-plus, the less likely the leakage of reduced emissions would occur. Moreover, since the capacities to reduce emissions are strengthened through capacity building, the permanence of reduced emissions would be likely achieved. That said, through capacity building, it would be the people with capacities to actively mange the forests, which corresponds to what Sen (1999) frames as the goal of development. Avoiding the risks of leakage and non-permanence will certainly contribute to attracting wider investors from industrialised countries, including those from the private sector. Therefore, capacity

building of REDD-plus can promote not only global equity, but also the long-term environmental effectiveness for mitigating climate change. Surely, such REDD-plus can contribute to the enhancement of other functions and services of tropical forests that are essential for our lives.

5.2. Policy recommendations

To secure and promote equity in REDD-plus, while ensuring its long-term environmental effectiveness, it is urged the phased approach incorporating capacity building should be adopted to operate REDD-plus. The REDD-plus funds for supporting capacity building in the phased approach need to be established. It is the industrial nations who have the responsibility to fulfil financial requirements, following the common but differentiated principle (UNFCCC's Article 3). Capacity building activities are needed across different scales of governance (from national to local), and should depend on the respective needs of capacities to reduce emissions from forests.

5.3. Future research

A potential direction of future research could be to extend the analysis of this thesis to cover other capacity relevant issues in other countries and regions. This thesis addressed a wide range of capacity relevant topics at different scales of governance, and Thailand was suitable for examining these topics as it had sufficient data and sample coverage. Nonetheless, there exist still more, a number of capacity relevant issues that need to be investigated. For example, as data on forest degradation were not found, which is common in many other developing countries, the analysis was limited to two activity types, deforestation and tree plantations. The future research

could include the capacity related topics on forest degradation and other activity types. The evaluation of capacity building is also important in places where the capacities are particularly vulnerable, such as in the least developed countries and forest-dependent indigenous communities. Furthermore, as REDD-plus is going to move rapidly, it would be useful to conduct this type of analysis with the actually demonstrated REDD-plus activities.

Another important area of future research could be to analyse the link between capacity building of REDD-plus and sustainable development in developing countries. In this thesis, in the framework of REDD-plus, capacity building was considered mainly in search of emission reductions from forests. The future research therefore could examine the roles of capacity building in REDD-plus in achieving the sustainable development of developing countries.

References

Adger, W. N. and Brown, K. (1994) Land Use and the Causes of Global Warming. John Wiley & Sons, New York. 271 p.

Angelsen, A. and Wertz-Kanounnikoff, S. (2008) Chapter 2: What are the key design issues for REDD and the criteria for assessing options? In: Angelsen, A. (ed.) Moving ahead with REDD: Issues, options and implications. Center for International Forestry Research (CIFOR), Bogor, Indonesia. p. 11-21.

Angelsen, A., Brockhaus, M., Kanninen, M., Sills, E., Sunderlin, W. D. & Wertz-Kanounnikoff, S. (eds) (2009a) Realising REDD+: National strategy and policy options. CIFOR, Bogor, Indonesia. 362 p.

Angelsen, A., Brown, S., Loisel, C., Peskett, L., Streck, C. & Zarin, D. (2009b) Reducing Emissions from Deforestation and Forest Degradation (REDD): An Options Assessment Report. The Meridian Institute. 100 p.

Arts, B. and Buizer, M. (2009) Forests, discourses, institutions. A discursive-institutional analysis of global forest governance. Forest Policy and Economics, 11: 340–347.

Barrett, C., Gibson, C., Hoffman, B. & McCubbins, M. (2005) The complex links between governance and biodiversity. Available at http://preprodpapers.ssrn.com/sol3/papers.cfm?abstract_id=715083.

Blom, B., Sunderland, T. & Murdiyarso, D. (2010) Getting REDD to work locally: lessons learned from integrated conservation and development projects. Environmental Science & Policy, 13: 164-172.

Börner, J., Wunder, S., Wertz-Kanounnikoff, S., Tito, M. R., Pereira, L. & Nascimento, N. (2010) Direct conservation payments in the Brazilian Amazon: Scope and equity implications. Ecological Economics, 69: 1272–1282.

Boyd, E., Gutierrez, M. & Chang, M. (2007) Small-scale forest carbon projects: Adapting CDM to low-income communities. Global Environmental Change, 17: 250–259.

Brown, K. and Pearce, D.W. (1994) The causes of tropical deforestation: the economic and statistical analysis of factors giving rise to the loss of the tropical forests. University of British Columbia Press, Vancouver. 338 p.

Busch, J., Strassburg, B., Cattaneo, A., Lubowski, R., Bruner, A., Rice, R., Creed, A., Ashton, R. & Boltz F. (2009) Comparing climate and cost impacts of reference levels for reducing emission from deforestation. Environmental Research Letters, 4: 1-11.

Cashore, B. (2002) Legitimacy and the Privatization of Environmental Governance: How Non-State Market-Driven (NSMD) Governance Systems Gain Rule-Making Authority. Governance: An International Journal of Policy, Administration, and Institutions, 15(4): 503–529.

Chomitz, K. M. (2007) At loggerheads? : agricultural expansion, poverty reduction, and environment in the tropical forests. World Bank, Washington DC. p. 1-18.

da Fonseca, G.A.B., Rodriguez, C.M., Midgley, G., Busch, J., Hannah, L. & Mittermeier, R. A. (2007) No forest left behind. PLoS Biology, 5(8): 1645–1646.

Dahal, N. and Banskota, K. (2009) Cultivating REDD in Nepal's Community Forestry: Discourse for Capitalizing Potential? Journal of Forest and Livelihood, 8(1): 41-50.

Department of Provincial Administration. (2007) Census on Population. Bangkok.

Eliasch, J. (2008) Climate Change: Financing Global Forests - The Eliasch Review. The Office of Climate Change, UK. Available at http://www.occ.gov.uk/activities/eliasch.htm.

Food and Agriculture Organisation of the United Nations (FAO). (2005) Global Forest Resources Assessment 2005: Country Report of Thailand. FAO, Rome. p. 6-8.

FAO. (2006) Global Forest Resources Assessment 2005: Progress towards sustainable forest management. FAO, Rome. 320 p.

FAO. (2007) Statistical Yearbook 2005-2006: Production. FAO, Rome.

FAO. (2009) FAOSTAT for crops production and export, consumption of fertilizers, and livestock meat production. Available at http://faostat.fao.org/site/567/default.aspx#ancor.

FAO. (2010) Global Forest Resources Assessment 2010: Key Findings. FAO, Rome. 12 p.

Fehr, E. and Falk, A. (2002) Psychological foundations of incentives. European Economic Review, 46: 687 – 724.

Fox, J., Krummel, J., Yarnasarn, S., Ekashingh, M. & Podger, N. (1995) Land Use and Landscape Dynamics in Northern Thailand: Assessing Change in Three Upland Watersheds. Ambio, 24(6): 328-334.

Geist, H. J. and Lambin, E. F. (2002) Proximate causes and underlying driving forces of tropical deforestation. BioScience, 52(2): 143-150.

Gibson, C. C., Williams, J. T. & Ostrom, E. (2005) Local Enforcement and Better Forests. World Development, 33(2): 273–284.

Grainger, A. (2009) Towards a New Global Forest Science. International Forestry Review, 11(1):126-133.

Griscom, B., Shoch, D., Stanley, B., Cortez, R. & Virgilio, N. (2009) Sensitivity of amounts and distribution of tropical forest carbon credits depending on baseline rules. Environmental Science & Policy, 12: 897-911.

Hoamuangkaew, W., Prasomsin, P. & Sunthornhao, P. (1999) Inventory of Private Eucalyptus Plantation in Thailand 1997. Kasetsart University, Bangkok. 83 p.

Huettner, M., Leemans, R., Kok, K. & Ebeling, J. (2009) A comparison of baseline methodologies for 'Reducing Emissions from Deforestation and Degradation'. Carbon Balance and Management, 4:4.

International Fund for Agricultural Development (IFAD). (2001) Rural Poverty Report: The Challenge of Ending Rural Poverty. Available at www.ifad.org/poverty/S.

Intergovernmental Panel on Climate Change (IPCC). (2007) Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the IPCC [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, USA. p. 1-22.

Jordan, A., Wurzel, R. K. W. & Zito, A. (2005) The Rise of 'New' Policy Instruments in Comparative Perspective: Has Governance Eclipsed Government? Political Studies, 53:477–496.

Kaimowitz, D. and Angelsen A. (1998) Economic Models of Tropical Deforestation: A Review. CIFOR, Bogor, Indonesia. 139 p.

Kanninen, M., Murdiyarso, D., Seymour, F., Angelsen, A., Wunder, S. & German, L. (2007) Do trees grow on money? The implications of deforestation research for policies to promote REDD. CIFOR, Bogor, Indonesia. p. 1-3.

Kaufmann, D., Kraay, A. & Mastruzzi, M. (2009) Governance Matters VIII: Aggregate and Individual Governance Indicators 1996-2008. Policy Research Working Paper 4978. The World Bank, Washington, DC. 103 p.

Kumar, S. (2002) Does ‘‘Participation’’ in Common Pool Resource Management Help the Poor? A Social Cost–Benefit Analysis of Joint Forest Management in Jharkhand, India. World Development, 30 (5): 763–782.

La Vina, A. G. M. (2010) The Future of REDD-Plus: Pathways of Convergence for the UNFCCC Negotiations and the Partnership. Foundation for International Environmental Law and Development. Available at http://www.field.org.uk/files/FIELD_La_Vina_REDD_PAPER_Sept_2010.pdf.

Makarabhirom, P. and Mochida, H. (1999) A Study on Contract Tree Farming in Thailand. Bulletin of Tsukuba University Forests 15. 157 p.

Mayers, J. and Bass, S. (1999) Policy that works for forests and people. Policy that works series no. 7: Series Overview. International Institute for Environment and Development, London. 336 p.

Mayers, J., Bila, A., Khaukha, S., Opoku, K. & Simwela, W. (2006) Forest governance and social justice: practical tactics from a learning group approach in Africa. International Forestry Review, 8(1): 101-109.

Mery, G., Alfaro, R., Kanninen, M. & Lobovikov, M. (eds.) (2005) Forests in the Global Balance – Changing Paradigms. IUFRO World Series Volume 17. Helsinki. Available at http://www.iufro.org/publications/series/world-series/worldseries-17/.

Millennium Ecosystem Assessment. (2005) Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC. 137 p.

National Park, Wildlife and Plant Conservation Department. (2008) Statistical Data of National Park, Wildlife and Plant Conservation. Bangkok.

Niskanen, A. (1998) Financial and economic profitability of reforestation in Thailand. Forest Ecology and Management, 104: 57–68.

Office of Agricultural Economics. (2008) Agricultural Land Use of Thailand in Level of Country, Region and Province. Bangkok.

Office of the National Economic and Social Development Board. (2007) Gross Regional and Provincial Products 2007 Edition. Bangkok.

Okereke, C. and Dooley, K. (2010) Principles of justice in proposals and policy approaches to avoided deforestation: Towards a post-Kyoto climate agreement. Global Environmental Change, 20: 82–95.

Organisation for Economic Co-operation and Development (OECD). (2006) Applying Strategic Environmental Assessment: Good Practice Guidance for Development Co-operation. DAC Guidelines and Reference Series. Available at http://www.oecd.org/dataoecd/4/21/37353858.pdf.

Parker, C., Mitchell, A., Trivedi, M. & Mardas N. (2009) The Little REDD+ Book. Global Canopy Foundation, Oxford. 132 p.

Perz, S. G. (2004) Are Agricultural Production and Forest Conservation Compatible? Agricultural Diversity, Agricultural Incomes and Primary Forest Cover Among Small Farm Colonists in the Amazon. World Development, 32 (6): 957–977.

Peskett, L., Huberman, D., Bowen-Jones, E., Edwards G. & Brown, J. (2008) Making REDD Work for the Poor. Poverty Environment Partnership, London. 78 p.

Pousajja, R. (1996) Eucalyptus Plantations in Thailand. In: Kashio, M., *et al.* (eds) Reports Submitted to the Regional Expert Consultation on Eucalyptus - Volume II. FAO Regional Office for Asia and the Pacific, Bangkok. Available at http://www.fao.org/docrep/005/ac772e/ac772e0m.htm#bm22.

Rametsteiner, E. (2009) Governance Concepts and their Application in Forest Policy Initiatives from Global to Local Levels. Small-scale Forestry, 8:143–158.

Repetto, R. and Gillis, M. (1988) Public policies and the misuse of forest resources. Cambridge University Press, Cambridge. 432 p.

Royal Forest Department. (2007) Forest Statistics of Thailand 2007. Bangkok.

Ruppert, D., Wand, M. P. & Carroll, R. J. (2003) Semiparametric Regression. Cambridge University Press, Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, Sao Paulo, Delhi. p. 15-56.

Santilli, M., Moutinho, P., Schwartzman, S., Nepstad, D., Curran, L. & Nobre, C. (2005) Tropical deforestation and the Kyoto Protocol. Climatic Change, 71: 267-276.

Sen, Amartya. (1992) Inequality reexamined. Harvard University Press, Massachusetts. 207 p.

Sen, Amartya. (1999) Development as Freedom. Oxford University Press, Oxford. p. 35-53.

Smith, R. J., Muir, R. D. J., Walpole, M. J., Balmford, A. & Leader-Williams, N. (2003) Governance and the loss of biodiversity. Nature, 426: 67-70.

Solberg, B. and Pelli, P. (eds.) (1995) Forest Policy Analysis - Methodological and empirical aspects. Proceedins No.2. The European Forest Institute, Joensuu.

Sommerville, M., Jones, J. P.G., Rahajaharison, M. & Milner-Gulland, E.J. (2010) The role of fairness and benefit distribution in community-based Payment for Environmental Services interventions: A case study from Menabe, Madagascar. Ecological Economics, 69: 1262–1271.

Stern, N. (2007) The Economics of Climate Change: The Stern Review Cambridge University Press, Cambridge. p. 537-553.

Strassburg, B., Creed, A. & Ashton, R. (2009) Estimating Tropical Forest Carbon at Risk of Emission from Deforestation Globally. Applying the Terrestrial Carbon Group Reference Emission Level Approach. Terrestrial Carbon Group.

Ubukata, F., Takeda, S., Watanabe, H. & Jamroenprucksa, M. (1998) The Profitability of Eucalyptus Farm Forest in Northeast Thailand. For. Res., Kyoto, 70: 35-42.

Ubukata, F. (2001) The Expansion of Eucalyptus Farm Forest and its Socioeconomic Background: A Case Study of Two Villages in Khon Kaen Province, Northeast Thailand. Southeast Asian Studies 39(3): 417-436.

UN. (1992) United Nations Framework Convention on Climate Change.

UN. (1998) Kyoto Protocol to the United Nations Framework Convention on Climate Change.

UN Development Programme (UNDP). (1997) Governance for sustainable human development - A UNDP policy document. Available at http://mirror.undp.org/magnet/policy/.

UN Framework Convention on Climate Change (UNFCCC). (2001) The Marrakesh Accords & The Marrakesh Declaration.

UNFCCC. (2005) FCCC/CP/2005/MISC.1.

UNFCCC. (2007) FCCC/CP/2007/6/Add.1.

UNFCCC. (2009a) Copenhagen Accord.

UNFCCC. (2009b) FCCC/AWGLCA/L.7/Add.6.

UNFCCC. (2009c) FCCC/AWGLCA/2009/MISC.4/Add.2.

UNFCCC. (2009d): Decision 4/CP.15.

UNFCCC. (2009e): FCCC/SBSTA/2009/2.

UNFCCC. (2010): FCCC/SBI/2010/INF.3.

UN Population Division. (2007) World Population Prospects: The 2006 Revision. Available at http://data.un.org/Data.aspx?q=population+growth&d=PopDiv&f=variableID%3a47.

UN-REDD Programme. (2010a) Design of a REDD-Compliant Benefit Distribution System for Viet Nam. Available at http://www.unredd.net/index.php?option=com_docman&task=doc_download&gid=3712&Itemid=53.

UN-REDD Programme. (2010b) Putting Forests First: Global Forest Initiatives Enhance Collaboration with Forest-Rich Developing Countries. Major REDD+ initiatives meet in first-time gathering. Available at http://www.un-redd.org/NewsCentre/Collaboration_Press_Release/tabid/6383/Default.aspx.

UN Statistics Division. (2008) Key Global Indicators. Available at http://data.un.org/Data.aspx?q=gdp&d=CDB&f=srID%3a29918.

Verchot, L. V. and Petkova, E. (2009) The state of REDD negotiations. Consensus points, options for moving forward and research needs to support the process. CIFOR, Bogor, Indonesia. 24 p.

Wertz-Kanounnikoff, S. and Kongphan-spirak, M. (2009) Emerging REDD+. A preliminary survey of demonstration and readiness activities. CIFOR, Bogor, Indonesia. 44 p.

World Commission on Environment and Development (WCED). (1987) Our Common Future. Chapter 2: Towards Sustainable Development. Available at http://www.un-documents.net/ocf-02.htm#I.

Wunder, S. (2006) The Efficiency of Payments for Environmental Services in Tropical Conservation. Conservation Biology, 21(1): 48-58.

Appendix – Questionnaire for household surveys

A.1. Socio-economic and land use information

Date

Questionnaire number

Interviewer

General Information

1. Village name, Sub-district, District, Province

2. Interviewee, Sex, Age, Educational level

3. How much was your gross annual income for the whole household?

3.1 On-farm income by category

1) Rice (specify paddy or upland)

2) Cash crop

3) Fruit orchard

4) Livestock

5) Forest plantation

6) Non-timber forest products

7) Others (specify)

3.2 Off-farm income by category

1) General employment

2) Pension/Government supporting

3) Family/Relatives

4) Private business

5) Private business

6) Loan

4. Please describe details of off-farm income (except for remittance from family).

4.1 Did you have different income between 2007 and 2009?

4.2 Why did your household need off-farm income (choose one or more from below)?

1) On-farm income is not sufficient (for what)

2) Free time and likes to have extra income (for what)

3) Asked by others (by whom)

4) Other reasons

Details of Off-farm income

5. What types of general employment is your household engaged with (choose one from below)?

1) Farming of other farmers

2) Construction

3) Others (specify)

5.1 Where is the location of this employment (choose one from below)?

1) Inside village

2) Outside village, specify where

5.2 When did you start this employment?

5.3 How did you find this employment (choose one from below)?

1) Middle-man/Agency

2) Relatives

3) Neighbours

4) Government/NGO

5) Others (specify)

5.4 Who is your employer (choose one from below)?

1) Middle-man/Agency

2) Relatives

3) Neighbours

4) Government/NGO

5) Others (specify)

6. Pension and Government supporting:

6.1 When did you start receiving the pension?

6.2 What is the name/source of the pension?

6.3 How does that pension work?

7. Private business:

7.1 When did you start the business?

7.2 Where? (Inside/Outside village, specify)

7.3 What is your business and how does it work?

8. Loans:

8.1 When did you start receiving the loan?

8.2 Why did you choose to have loan, instead of increasing income from other sources?

8.3 What is the name/source of the loan?

8.4 How does that loan system work? (Annual interests)

Details of expenditure in your household

9. What was your expenditure for the whole household by each item below?

1) On-farm

2) Electricity

3) Water supply

4) Education

5) Food and drinks

6) Savings

7) Clothes

8) Pay installments

9) Donation (e.g., temple, church, ceremonies)

10) Medical care

11) Communication

12) Transportation

9.1 Please describe the details of on-farm expenditure by each of your crops.

1) Crop

2) Cultivation methodology (Monoculture/Mixture)

3) The number of times of rotation (In the same area/other area)

4) Area

5) Fertilizer (kg or l per area, Unit price, Total cost)

6) Insecticide (kg or l per area, Unit price, Total cost)

7) Herbicide (kg or l per area, Unit price, Total cost)

8) Labour (Number of people, Unit cost, Total cost)

9) Machinery (Maintenance, Gasoline, Wage, Total cost)

10) Transport (Gasoline per time, Car rental per day, Total cost)

11) Others (specify)

9.2 Please describe the details of expenditure for Education.

1) Person (which member of household)

2) School (Nursery/Kinder garden/Primary/Junior high school/High school/College/University)

3) Location

4) Expenditure details (Tuition fee, Text book and uniform, Meals, Transportation, Accommodation, Others)

5) Total expenditure for a year

6) Other notes

9.3 Please describe the details of expenditure for Health service.

1) Person (which member of household)

2) Health condition (Healthy/Sick)

3) Type of illness

4) Treatment ways (Herb/Public health center or Hospital/Do not take care)

5) Expenditure details (Medicine, Doctor fees, Transportation, Others)

6) Total expenditure for a year

7) Do you have savings for health care?

Factors affecting the crop selection

10. Please describe factors affecting on your selection of crops by each crop.

1) Crop

2) Starting year

3) Factors (indicate the level of significance on the following factors by 1 to 5; the least significant to the most significant)

    a) Good price

    b) Low cost for investment (specify the amount of investment)

    c) High possibility for the rising of price in the future

    d) Land suitability

    e) Limited labour

    f) Contract with middle-man or buyers

    g) Self-consumption

    h) Other (specify)

4) Who suggested you to grow this crop (choose one or more from below)?

    a) Middle-man or one who you have a contract with (specify who)

    b) Neighbours

    c) Family

    d) Government/NGO (specify which organisation)

    e) Learnt by yourself (with which learning material source)

5) Who did you learn about techniques from (choose one or more from below)?

    a) Middle-man or one who you have a contract with (specify who)

    b) Neighbours

    c) Family

    d) Government/NGO (specify which organisation)

    e) Have experience before

    f) Learnt by yourself (with which learning material)

Marketing network by crops

11. Please describe your marketing network by each crop.

1) Crop

2) Purpose (Sell/Give/Self-consumption)

3) To whom (Market/Middle-man/Customer/Relatives/Neighbours/School/Others)

4) Amount of products

5) For sales:

a) Who introduced to you? (Middle-man/Neighbours/Relatives/Government/NGO/By himself)

b) How much was the selling price?

c) Can you negotiate the selling price?

d) Are you charged for selling products?

e) Do you have a contract with a buyer?

f) What does the contract include? (Selling price; Service for fertilizer, herbicide, etc.; Service for transportation; Service for operational techniques; Guarantee for buying products more years; Others)

g) Are you satisfied with the contract, and why so?

Yearly schedule

12. What was the schedule of each of your household member?

1) Person (which member of household)

2) Activity by month

Belief and its relation to living

13. Do you have a specific belief or religion (specify what and since when)?

13.1 If you have changed your belief or religion, what was your previous belief or region, and why did you decide to change?

13.2 Do the members of your household have the same belief or religion as yours (choose one or more from below)?

1) Yes, all of them

2) Yes, but not all of them

3) Only I do

13.3 Please list up to five customs you practice regularly in your daily living because of your belief or religion.

14. Please describe your philosophical thinking about natural resources and the environment.

A.2. Preferences on the REDD-plus BDS

Date

Questionnaire number

Interviewer

General Information

1. Village name, Sub-district, District, Province

2. Interviewee, Sex, Age, Educational level

3. What was your gross income for the whole household? (Annual income, On-farm income, Off-farm income)

Income sufficiency

4. Is the above income sufficient?

4.1 If yes, why is it sufficient (indicate related ones from below in order of significance)?

1) Income is higher than expenditure

2) Income is about the same as expenditure

3) Income is not so important for life

4) Don't know how to increase income

5) Others (specify)

4.2 If no, for which item(s), do you need more income (indicate related ones from below in order of significance)?

1) General living (e.g., food, water, cloth)

2) Agricultural investment

3) Children's education

4) Hospitals and medicine

5) Savings

6) Would like to earn more

7) Others (specify)

5. Assume that you are going to make more income (next year or in next 5 years or so), how would you do (indicate related ones from below in order of significance)?

1) Do farming more

2) Do private business (specify)

3) Work as a general worker

4) Ask for support from family (specify)

5) Borrow money (e.g., from village fund)

6) Others (specify)

6. How do you think you could earn more income through farming (choose related ones from below)?

1) Put more chemical inputs

2) Apply new techniques (specify; e.g. water pumps, new machines)

3) Plant new species (specify)

4) Cultivate more land

5) Negotiate a selling price

6) Others (specify)

Preferences on forest conservation and REDD-plus

7. Do you know Mae Lao Mae See Wildlife Sanctuary, its role, and the establishment year (indicate how an interviewee knows well by 1 to 5; the least to the most)?

7.1 Do you like the idea of Wildlife Sanctuary (indicate by 1 to 5; the least to the most)?

7.2 What are the reasons for your liking it (indicate related ones from below in order of significance)?

1) Help the government

2) Nice natural environment

3) Protect water resources

4) More forest products will become available

5) Good for children in the future

6) Others (specify)

7.3 What are the reasons for your not liking it (indicate related ones from below in order of significance)?

1) Land is necessary

2) Didn't hear sufficient explanation from the government

3) Don't like to be controlled by the government

4) No direct benefits for us

5) Don't understand why forests be protected

6) Others (specify)

8. Would you be interested in participating in REDD-plus (indicate by 1 to 5; the least to the most)?

8.1 What are the reasons for your interest (indicate related ones from below in order of significance)?

1) Additional income through carbon credits

2) Want to work with the government

3) Want to protect the forests

4) Good for children

5) Good for the village and villagers

6) Easy to do

7) Others (specify)

8.2 What are the reasons for your not being interested in REDD-plus (indicate related ones from below in order of significance)?

1) Farming is more important than forests

2) Have to use all the land I have

3) Maybe credits (=money) would be too little

4) Don't know why forests be protected

5) Too complex

6) Others (specify)

9. Assume you would participate in REDD-plus, how much area of your land do you think you would offer to be protected, and why?

10. If you were to participate in REDD-plus, how important are the following conditions (indicate by 1 to 5; the least to the most)?

1) High price for carbon credits

2) A long-term contract with the government

3) The strong leadership of the government

4) Strong organisation at the village

5) Everyone in the village participates

6) Non-credit support from the government

7) Others (specify)

11. Do you generally agree with the idea of forest conservation, and why (choose related ones from below in order of significance)?

1) Nice natural environment

2) Protect water resources

3) More forest products will become available

4) Good for children in the future

5) Help the government

6) Others (specify)

A.3. Farmers' plantations and basic socio-economic and land use information

Date

Questionnaire number

Interviewer

General Information

1. Village name, Sub-district, District, Province

2. Interviewee, Sex, Age, Educational level, Details of household members

3. What was your gross income for the whole household? (Annual income, On-farm income, Off-farm income)

Land use history

4. What was the history of land use change in each plot of holding land?

1) Plot number

2) Land entitlement

3) Area

4) Starting year of holding

5) The way to acquire the plot (choose related one from below)

a) Purchase

b) Heritage

c) Occupied

d) The government allocated

6) Location

a) Inside village

b) Outside village

7) Type of ownership

a) Self-owned

b) Renting

c) Borrowing

d) Occupying

8) What is the history of utilisation of the plot? (e.g., farming, housing, abandoned)

9) If the plot was lost, when and why (choose related one from below)?

a) Give away

b) Selling

c) Taken by the government

5. At present, what kind of crops do you grow?

1) Species

2) Area

3) Starting year

4) Production in quantity

5) Selling price

Potential reasons for planting eucalyptus

6. What were important reasons for you to plant eucalyptus (choose related ones from below and indicate the significance of the reason by 1 to 10; the least significant to the most significant)?

1) Having enough land

2) Having enough money to invest

3) Having enough money for household consumption

4) Having enough workers

5) A market for eucalyptus is secured

6) Good price

7) Easy access to information on management and a market

8) A market is near, and it is convenient to transport

9) Having experiences on eucalyptus plantations

10) Having skills

11) Having knowledge of markets

12) Willing to take a risk

13) Recommended by neighbours

14) Recommended by a company

15) Others (specify)

7. Do you have a contract with any company to plant eucalyptus?

7.1 If you are with a contract, what are the details of that contract?

1) With which company are you contracting with?

2) Staring year

3) Do you have any obligations with this contract, and if you have them, what are they?

4) The unit price of eucalyptus

5) Do you receive any support from the company for you to plant eucalyptus (e.g., seedlings)?

6) Do you have to pay for those supplies from the company?

7) With the contract, who is responsible for transportation costs?

8) Does the company offer you the technical kinds of support or consultation?

10) Are you satisfied with the contract, and why?

8. What were important reasons for you to choose not to plant eucalyptus (choose related ones from below and indicate the significance of the reason by 1 to 10; the least significant to the most significant)?

1) Having no land

2) Having not enough money to invest

3) Having not enough money for household consumption

4) A lack of workers

5) A market is not secured

6) Low price

7) It will take long time before having income

8) Hardly have access to information about maintenance and a market

9) A market is far, and it is not convenient to transport

10) Having no experiences with eucalyptus plantations

11) Having no skills on maintenance

12) Having no skills on marketing

13) Do not want to take a risk

14) Neighbors have failed

15) Others (specify)

9. Have you depended on eucalyptus plantations, except for selling?

1) Activity (e.g., for construction)

2) Starting year

3) Ending year

4) Frequency of collecting eucalyptus as material

5) Amount of collected eucalyptus wood

History of eucalyptus plantations

10. Have you participated in activities to protect eucalyptus plantations?

1) Activity

2) How were you informed of this activity?

3) Who supported this activity?

4) Starting year

5) Ending year

11. Do you think the area of eucalyptus plantations have been increased or decreased?

11.1 If the area has been increased, why (choose related ones from below and indicate the significance of the reason by 1 to 10; the least significant to the most significant)?

1) The government planted

2) The major private companies planted

3) The minor (small) private companies planted

4) Villagers planted

5) Villagers protected

6) Others (specify)

11.2 If the area has been decreased, why (choose related ones from below and indicate the significance of the reason by 1 to 10; the least significant to the most significant)?

1) The government requested land to farm agricultural crops

2) Selling to private companies became unprofitable

3) Eucalyptus plantations were damaged by strangers

4) Forest fire for hunting

5) Forest fire for land preparation for farming

6) Accidental forest fire

7) Other crops were promoted

8) Having problems with planting eucalyptus

9) Others (specify)

12. Do you think eucalyptus plantations have had environmental impacts?

12.1 If yes, what were those impacts (choose related ones from below and indicate the significance of the impact with either 'high', 'medium', or 'low')?

1) Drought

2) Decrease of fertility

3) Decrease of water contained in soil

4) Decrease of wildlife

5) Rising temperature

6) Others (specify)

13. Are you willing to plant more eucalyptus?

1) Location

2) Area

3) Starting year

4) Purpose

5) Necessary/Desirable support

a) Investment

b) Seeds/Seedlings

c) Fertilizer/Insecticide

d) Land

e) Good price

f) Market

g) Technical knowledge

h) Others (specify)

6) Who would you like to receive support from?

a) The government

b) NGO

c) A private company

d) Others (specify)

A.4. Farmers' motivational factors to plant eucalyptus

Date

Questionnaire number

Interviewer

General Information

1. Village name, Sub-district, District, Province

2. Interviewee, Sex, Age, Educational level, Details of household members

Factors affecting choices

3. Which factors were influential for you to plant eucalyptus plantations (indicate the significance of each factor below by 1 to 5; the least significant to the most significant)?

1) Self-consumption

2) Economic return

a) Price is high

b) Price is not so high, but investment is cheap

c) Price is high and investment is also reasonable

d) Price is not so high but stable

3) Possibility for a higher price in future

4) Suitable land area

a) The land area was not used

b) The land area has limited land fertility

c) Got new land

5) Availability of labour

a) Suitable for schedule of household members

b) Low labour intensity

6) Technically easy

7) Good external service (specify)

8) Recommended by neighbours

9) Recommended by family/relatives

10) Recommended by a middle-man or a company

11) Recommended by the government or an NGO

12) Wanted to try

13) For children

14) Others (specify)