Can Carbon Income Combat Forest Degradation?

Community Forest Management for Climate Mitigation and Poverty Alleviation

Rationale and Case Studies

Edited by Margaret Skutsch

Technology and Sustainable Development,
University of Twente, the Netherlands

2006

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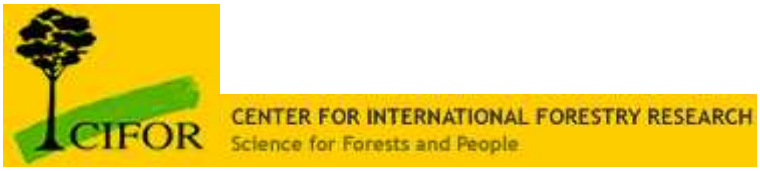
The views expressed in this booklet are those of the project members and do not necessarily represent those of the Netherlands Development Cooperation.

University of Twente



ENDA

Further information about the project may be found on the website:

www.communitycarbonforestry.org

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Chapter 1: Introduction

The rationale for carbon crediting for community forest management

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1.Introduction

Deforestation in the tropics is known to be a major source of carbon emissions and an active contributor to global warming. The IPCC estimates that 1.7 billion tons of carbon are released annually due to land use change, of which the major part is ascribed to tropical deforestation (IPCC, 2001). This represents 20-25% of current global carbon emissions. Deforestation emissions from Brazil and Indonesia alone are equivalent to the entire reduction commitment of the Annex 1 countries during the first commitment period. *Degradation*, the loss of biomass from within the forest as a result of thinning out of the vegetation, is also a major source of carbon emissions, but statistics on its incidence and on the associated carbon losses are virtually non-existent.

Under the current agreements in the Kyoto Protocol and the Marrakech Accords, neither deforestation nor degradation of tropical forest are addressed. Possibilities under the CDM are limited to afforestation and reforestation, and do not include management of natural forest. In other words, they allow for planting of new trees to establish additional sinks, but they do not allow crediting for reduction of emission from existing sinks.

In response to calls from a number of Parties, the UNFCCC at CoP11 in December 2005 initiated a two year process for the consideration of a policy for "reduced emissions from deforestation". This debate is on-going, and covers political issues, methodological challenges, such as how to measure and include degradation, and alternative financial mechanisms that might be employed if such a policy were to be adopted. The Kyoto: Think Global, Act Local project has been working since 2003 to develop methods and to make policy suggestions in this area. This booklet explains the rationale and presents preliminary findings on the basis of six case studies from sites in Africa and Asia.

2. Deforestation and Degradation: different drivers, different processes

There is no doubt that deforestation, the full conversion of forest land to other uses, is occurring on a large scale in many non-Annex 1 countries and images of this – fire-devastated hill slopes, massive chain saws felling large buttressed tree trunks in tropical jungles – appear frequently in the popular media in an appeal to people's innate love of nature. To counter deforestation effectively however it is important to understand the underlying causes and drivers.

Much deforestation is the result of planned activities which are necessary for development. It is an inevitable (though regrettable) side effect of rational choices that are made by governments and individuals, which bring about land use change for the sake of greater production. The expansion of area under cultivation for food crops and under pasture may be a priority for economic growth, for feeding the growing population and for earning export income. Conversion of forest to plantation crops increases national income. Logging provides essential funds for investment in development. Cities grow and infrastructure is constructed as part and parcel of modernization and the increasing scale of the economy. These are *governed* activities, which for the most part cannot and should not be stopped; they are essential for development. At best, the impact on forests could be softened by ensuring good coordination between sectors and overall land use planning, the use of more sustainable timber extraction methods, and the encouragement of agricultural systems which retain as much carbon as possible.

However, there is a great deal of what might be called '*ungoverned*' deforestation going on as well. This is deforestation which is not sanctioned, and usually takes place at the frontiers of the forest. The stakeholders are individual farmers or small agricultural concerns working more or less on their own accord, although in many cases an 'agent' organizes the deal, and it sometimes occurs with corrupt complicity and a 'blind-eye' from local authorities. It mostly involves agriculture but in some places illegal logging is the main cause. Many countries find it very difficult to control this kind of deforestation, which is driven by market incentives and lack of alternative opportunities, and thrives on weak enforcement of law and lack of government capacity.

Degradation - the gradual reduction of stocks of biomass within the natural forest – is however a quite different process. Degradation results from extracting more biomass from the forest than it can sustainably produce. Levels of biomass – and therefore of carbon – dwindle; slowly at first, but gradually the forest thins out more and more until one could say that the area is really deforested. Often this is not the result of a single or coordinated and rational decision to clear the forest, but of a number of processes that have to do with the livelihoods of people nearby. Grazing of cattle within the forest prevents regeneration of saplings and shrubs; over-harvesting of wood for the production of charcoal to sell in the cities overstresses the productive capacity of forest; slash and burn agriculture, a traditional and normally sustainable forest land use, becomes devastating if the fallow cycle is too short to allow the forest to recover.

Local people are well aware of the impact of these activities on the forest and of their negative implications. There are two sets of reasons why they continue to carry them out. Firstly, there is usually no alternative means of making an income, and secondly, the forest is to all intents and purposes an uncontrolled resource. The majority of the forest is owned by the state, but apart from heavily protected areas such a nature reserves, most is *de facto* open access. With no rules for usage, or no enforcement of rules, each individual makes the most of his or her opportunity, because if not, someone else will – *the tragedy of the commons* – or, as it may more correctly be described, the *tragedy of the open access resources.*

How much of the global loss of forest biomass is due to full deforestation and how much due to creeping degradation? This is difficult to know, not least because most countries do not monitor degradation at all – it is not easily visible from remote sensing – and therefore do not report it to FAO (FAO, 2005). Tropical rainforest has very high carbon densities (up to 400 tons per hectare) but forms only a small proportion of all forest area. It is threatened by large scale deforestation in some areas, most famously in the Amazon. The vast majority of tropical forest is dry, with carbon densities of 40-80 tons per hectare. Some of this, particularly around cities, is being cleared wholesale, but much of the rest is subject rather to degradation. The processes are not entirely independent, but they tend to be focused on different sorts of forest and in different geographical situations. What we can say is that both deforestation and degradation contribute significantly to global carbon emissions, and for that reason *reducing emissions from deforestation and degradation (REDD)* is the most appropriate general term for actions designed to curb these processes.

3. Community Forest Management for Reducing Degradation.

In recent years the inability of the state to control degradation of forest has been recognized in many countries. Governments are seeing the benefits of handing over forest areas to local communities under a variety of community forest management schemes, in India, Nepal, Papua New Guinea, Burkina Faso, Tanzania, Cameroon, Mexico, Peru and many other countries – it is estimated that around 14% of all forest in developing countries is under this kind of management today, three time more than 12 years ago (White and Martin, 2002). Under such schemes, villagers get the formal, legal rights to use and profit from the forest products, under jointly agreed management plans which ensure that off-take is kept at sustainable levels. Communities organize themselves by setting by-laws and by self-regulation as regards access to forest products. Their motivations to take part in such a scheme can be various: to maintain the forest to ensure future benefits is a clear overall reason. For some, it is to ensure a continued supply of firewood and fodder; for others, to enable eco-tourism; yet others participate in the hope that the wild animals that have disappeared from the shrinking habitat will return, and provide a means of sustainable subsistence in the future. In a few, sustainable timber off-take is the aim. The benefits are usually small in financial terms, but real and tangible in non-monetary ways.

Initial experiences of such community forestry are by and large positive. Areas which are community managed are clearly distinguishable from surrounding areas which are not; as natural regeneration appears to be taking place and biomass is more dense, so that instead of being a net emitter of carbon, the forest becomes a sink. Furthermore, it is probable that without such management, the biomass would decrease, through forest degradation, leading to additional carbon emissions. As the case studies in this book show, the gains could be anything from 4 to about 12 tons of CO_2 per hectare per year, depending on the type of forest.

4. Could payment for carbon services act as a strong incentive against degradation?

If carbon has a monetary value, could payment for reduced emissions from deforestation act as an incentive for this kind of forest management activity at the local level? Would it stimulate more communities to adopt simple management rules over much larger areas of natural forest, to bring rates of extraction into balance with the forests' natural capacity to reproduce? If this were the case, then many parts of the forest in tropical areas might be involved in reducing carbon emissions, and very many small communities might earn some income from this new service. Naturally, there would be many additional positive side effects, not least the maintaining of biodiversity, water management, erosion control and the fight against desertification.

It is clear that the attractiveness of this kind of option to local people will depend greatly on the opportunity costs of keeping the forest as forest. In areas where an alternative land use – plantation, or pasture – is likely to give high financial returns, then it will be difficult for carbon to compete; these areas are likely to be deforested, come what may. But in more remote areas, particularly drier areas where agricultural production potential is low, there could be a real niche for 'community carbon forestry' targeted at reducing and reversing degradation.

5. What do we need to know?

In order to assess this possibility in more depth, it makes sense to look carefully at community forest management experience and evaluate its impact on carbon stocks. There a number of questions that would need to be addressed, such as:

- What rates of degradation and carbon loss are typically occurring in unmanaged forests?
- What sorts of management activities are used by communities under CFM schemes and how much carbon is saved as a result?
- Is there leakage to other areas? How much?
- What is the opportunity cost of this management?
- How could the carbon stock changes be measured and monitored in a cost-effective manner?

The 'Kyoto: Think Global Act Local' research project, funded by Netherlands Development Cooperation, has set out to answer these questions and to assess the potential for community carbon forestry.

Working with local NGOs and research institutes in Mali, Senegal, Guinea Bissau, Tanzania, Uganda, Nepal and Uttranchal (India), communities already engaged in local forest management have been trained in the use of a small handheld computer with GPS and GIS equipment which enable them accurately to map the boundaries and the strata in the forest – a prerequisite if the carbon savings are to be verifiable. Further they have been trained in standard forest inventory methods, using fixed sample plots, and in entering this data into a tailor-made database on the computer. None of these villagers has more than 7 years of primary education, and none of them has ever seen a computer before, but this is no hindrance. The local NGOs help in the

training, maintain the computers and supervise the laying out of the sample plots to ensure that the carbon measurements meet rigorous scientific standards.

If such an approach were to be considered viable, then a number of further questions need to be posed:

- When local people measure and monitor carbon stock changes, are the results reliable? What technical problems arise?
- What is the cost of such an exercise (local transaction costs) in relation to the amount of carbon generated? Is the exercise worthwhile in the eyes of the local people; what level of payment would be necessary to make it worthwhile?
- What will be the impact of carbon payments on other forest values, and on the social network? Who will benefit, who will lose?

In the six case studies that follow, all of which are included in the research programme, we try to answer these questions.

In chapter 8, consideration is given to financial mechanisms that could be used to support community carbon forestry, both at an international level and nationally, and to means by which payment systems could be set up.

We hope to demonstrate that carbon payments could act as an important stimulus in the reduction of forest degradation over a large part of the tropics and in the corresponding reduction of global carbon emissions, while at the same time providing a sustainable livelihood for many marginalized people.

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Chapter 2: Case Study

Kafley Community Forest, Lamatar, Nepal

by
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1.Introduction

Community forest plays a prominent role in the hills of Nepal where agriculture and livestock rearing and forest are strongly interlinked. Based on the 1976 National Forestry Plan, the government of Nepal made a policy to involve local communities in forest management, with a view to tackling deforestation and the deteriorating state of the forest all over the country. By 2004 about 25% of all national forests, or around 1.1 m ha., were being managed by Community Forestry User Groups (CFUGs). There are more than 13,000 CFUGs in the country, involving 1.4 million households (i.e. 35% of population) (Kanel, 2004), mostly in the hilly regions of Nepal. The Federation of Community Forest Users Nepal (FECOFUN) has grown over the years to become the largest organization in the country.

The impact of this policy in the forestry sector has been positive. Where communities are managing their forests, the degradation trend in the hills has been checked. Forest conditions have improved in most places with positive impacts on biodiversity conservation. Communities have easier access to firewood, timber, fodder, forest litter and grass. Soil erosion has been mitigated and water sources have been conserved in such areas.

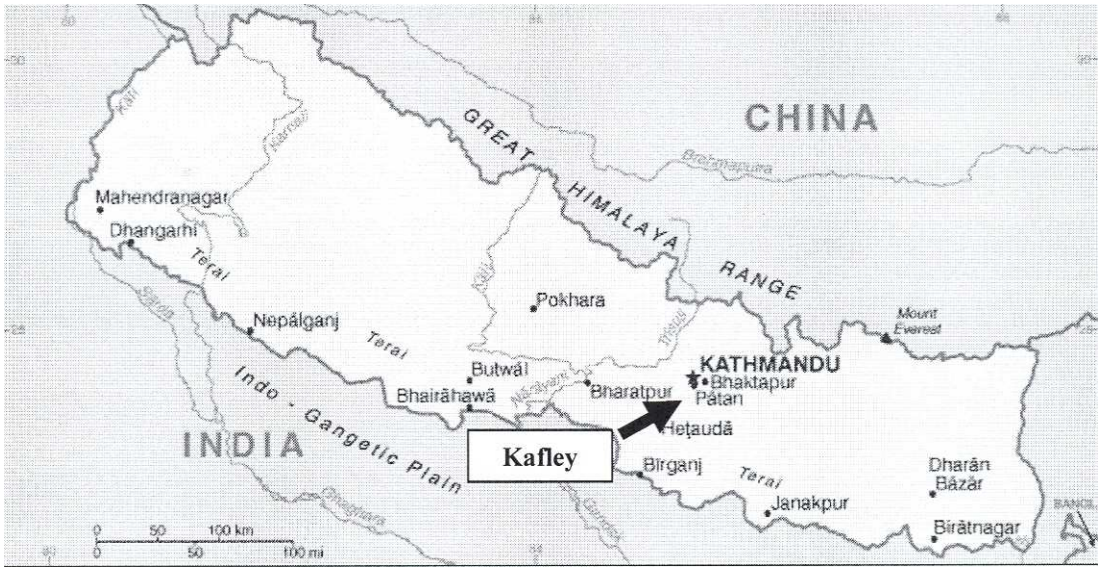
As a general rule, members of the CFUGs pay a nominal fee for the various forest products they consume and are restricted from harvesting of forest products for commercial purposes. Timber harvesting in particular is heavily regulated and only conducted under Forest User Committee (FUC) supervision; selling is done through an open bidding process. All income from such sales is retained by the CFUG. Revenues collected by the CFUG from the members and through selling products are mostly reinvested in social infrastructure as requested by the community members. About 28% of the revenue generated from the community forest is expended on forest protection and management.

This case study looks at one example, the community forest in Lamatar, to demonstrate that in addition to other forest benefits, community forest management results in increasing carbon sequestration and also quite probably in decreasing emissions.

2. Brief history of the Kafley forest

Lalitpur district has 15,253 ha of forest of which 9,993 ha are managed by 162 CFUGs. Kafley Community Forest is one of these. It is a block of 96 ha which is being managed by the Kafley CFUG, which consists of 60 households. This forest

lies at an elevation of between 1,830 and 1,930 meters and is dominated by temperate broad-leaved species, particularly *Schima-Castanopsis* (katus-chilaune).



Map of Nepal showing location of Kafley

The tradition of community managed forest here is not new, what is new is the formalization of the traditional management practice in modern terms. Villagers recalling the history of their forest management explain that the forest in the Kafley area historically belonged to the Ghimere family, who were Brahmins living to the south of the main valley. They had agricultural lands in the fertile valley below the hills; the hills themselves were unsuitable for agriculture and were covered with forest. They were granted this forest as *Birta*[1] by the State for services rendered. It is told that the forest was rich in biodiversity at that time, as it was well managed. In 1957, however, this forest, like all forests in Nepal, was nationalized. After that, as narrated by the locals, the forest gradually decreased, both by outright deforestation (loss of forest area) and in terms of degradation (loss of biomass within the forest). Noticing this change, the Department of Forestry carried out a reforestation programme in 1978 by developing a sallo plantation (*Pinus roxburghii*) and putting forest guards in place to protect it. But deforestation and forest degradation continued unabated, converting the entire hilly area to almost barren land by the early 1980's. Unregulated livestock grazing and fodder collection were the major causes of forest degradation as they prevented natural regeneration, while unrestricted fuelwood and timber collection were the major cause of deforestation. This was a classic case of the *tragedy of the open access*; anyone and everyone had unlimited access any time because the state owned the resource and it was managed by their staff, to whom the local people did not feel answerable.

The scenario at Kafley was occurring all over the country which meant that Nepal was losing forests at a rapid rate especially in areas adjacent to settlements. In the late 1970's however a paradigm shift occurred, when foresters began to realize that forest protection and management was not possible without involvement of the local people. Between 1975 and 1993, a series of milestone decisions brought about the community

[1] 'Birta' = land or forest grants from the State

forestry policy that we see practiced so widely in Nepal today. Most of the handing over of forests to the local communities took place in the 1990s. In Lamatar this happened in 1994, a year after the formation of the Kafley Community Forest User Group. Since then, forest has been managed effectively with strict restrictions and user guidelines and norms. Forest degradation and deforestation have been checked and forest regeneration (which is mainly natural regeneration) is taking place after stringent protective measures were deployed by the local people through the CFUG. Today the forest is recuperating ecologically and already has a rich diversity in tree species. One of the most important resources obtained from this forest is water. This forest has several springs which are carefully protected and used by the village for drinking purposes, at no charge to the users. It has been reported that the flow of water has markedly increased with the rejuvenating forest ecosystem.

3. Management regime

Membership of the CFUG is not compulsory but all villagers who need forest products are members, to ensure their access to the forest. The Kafley CFUG has a constitution and a five-year operation plan that indicates how and for what purpose the forest will be managed. The CFUG is headed by a Forest User Committee (FUC) consisting of 11 elected executive committee members (of whom 6 women), which makes day to day decisions and calls the CFUG meetings. The primary mission of the Kafley CFUG is to increase the harvesting capacity of fuelwood, timber and fodder through better management of forest resources for the benefit of the local CFUG members and to make the CFUG a self-sustaining institution. But in addition, the CFUG aims to conserve spring water sources, soil and biodiversity and promote environmental stability in their village area. The CFUG also assists in raising living conditions from the use and access of forest resources, and is trying to develop this area for recreation and tourism uses.

Community management of forest entails numerous tasks which the locals perform. Technical ones are undertaken with the support from the government forest rangers. Community management practices witnessed in the Lamatar area can broadly be classified into protection, administration, harvesting and forest management.

Protection is a major task and often the most expensive as well. CFUG has not hired anyone for patrolling the forest but is divided into subgroups taking the responsibility for patrolling on a rotational basis. While working at home or in the field below the forested hill, people keep an eye on the hillside and watch their forest for irregular movements, such as illegal logging, animal grazing or forest fire. In the past, people have been able to fight forest fires after seeing them from the field and rushing to the site immediately. It is compulsory for all members of the CFUG to participate in putting out fires, with penalties for failure in this regard. Penalties are in fact used for deterring all kinds of unsustainable forest resource extraction. Monetary fines are fixed by the CFUG meeting, with different rates for the illegal collection of fodder and litter, sand, gravel and stones, timber and fuelwood and bamboo, at times when such activities are not permitted. Hunting is permanently banned; grazing livestock and charcoal making likewise. Fencing as a protective measure is however not found here. It is the promulgation of these restrictions on use that has been the main

management intervention and which has resulted in avoided forest degradation and deforestation.

The willingness of the community to implement these forest protection measures is related to and dependent on the pay-back they derive. It is clear to people in the Lamatar area that strict conservation measures, which are designed to maximize natural regeneration, in practice result in the harvesting of greater quantities of forest resources, and this is the incentive to cooperate in forest management under the CFUG.

Community forestry also entails numerous administrative tasks such as calling and organizing meetings, conducting elections, recording and minuting meetings, maintaining accounts, getting accounts audited, etc, as well as those directly connected with forest activities such as setting dates for extracting resources and circulating the information, and developing the management plan and five-year operational plan with the assistance of a ranger. In Lamatar, such official administrative processes were found to be conducted rather professionally although not all CFUGs in Nepal are able to maintain such high standards in this regard.

The table below shows the balance accumulated by Kafley CFUG which over the last seven years, which overall has been increasing.

Table 2.1: Kafley CFUG financial balance

Annual savings of Kafley CFUG	
Fiscal year	**Rs**
2004/05	22,699
2003/04	6,910
2002/03	19,285
2001/02	3,081
2000/99	17,245
1999/98	6,254
1998/97	81

Annex 1 shows the financial flow of the Kafley CFUG between fiscal years 2001/2002 to 2004/2005. From it we see that 13% of the financial income from 2004/05 was spent on school and Red Cross activity in the village, while in the year before that 16% was spent on college and school building repairs.

Harvesting is done by all members. The main products extracted are timber, fuelwood (dried and green), fodder, litter, nigalo, *(*small bamboos: *Drepanostachyum intermedium, Drepanostachyum falcatum,* and *Sinarundinaria falcata)* and other non-timber forest products (NTFP). Of these, timber is the most heavily regulated; a decision to harvest is taken by the FUC together with the local forest range officer via an official process, and the timber is sold through a bidding process to anyone, including people from outside the village. Fuelwood, fodder, litter, nigalo and NTFP on the other hand can be collected by CFUG members when the forest opens; the FUC decides on the days and dates on which harvesting of these products is allowed in the different seasons and accordingly informs all CFUG members. Members pay a small fee for firewood and bamboo, but fodder and litter are free. From records held by the CFUG, it appears that each household extracts about 1000 kg of green

fuelwood, 500 kg of dry fuelwood, 500 kg of grass fodder, 1000 kg of leaf litter and 500 kg of nigalo every year. On special occasions such a marriage, religious ceremony or funeral, 350 kg of fuelwood can be harvested by any CFUG member for the same price. Products extracted collectively after an operation such as thinning or clear cutting are distributed equally among the users. Members of the CFUG may sell any of their personal excess of these products to non-members within the village, but they may not be sold commercially outside the village. Sale of timber is the largest source of income for CFUG, followed by fuelwood fees, as shown on Annex 1. But unlike timber, fuelwood is extracted by the CFUG members only for fulfilling their subsistence needs and that of their fellow villagers, and though financially it is lower in value in terms of its contribution to the CFUG income, volume-wise it is the main resource extracted.

Most locals in Lamatar have their own clear understanding of silviculture as they have been interacting with forest even before going to school. Some of the locals can identify all the tree species in their forests, though the older men seem to be more knowledgeable on this than younger ones. Some of the activities they conduct on a regular basis include weeding, cleaning, pruning/branch cutting, singling, thinning, clear cutting and regeneration management. The CFUG has maintained demonstration plots using modern techniques to propagate a number of species such as Chilaune (*Schima wallichii)* and Jhingane *(Eurya acuminate)* as well as several additional varieties of NTFPs (e.g. cardamom, fodder grass). In future Kafley CFUG intends to develop a forest nursery and also increase the number of medicinal plants in the forest.

4. Forest inventory

As a result of participation in the *Kyoto, Think Global Act Local* project, members of the CFUG were trained in forestry inventory and mapping and conducted their own forest carbon stock assessment. Data from this is now available for two consecutive years. The figures in Table 2.2 show very high number of stands and yet a low biomass per hectare (91.76 tha^{-1}) indicating that the forest is mostly at a young stage with vigorously regenerating saplings. However, in addition to the above-ground biomass as measured by the community, it would be possible to calculate the below-ground biomass using standard biometric equations, which would augment the annual carbon gains.

Table 2.2 Biomass data for Kafley CF in Lamatar

Lamatar	Units	2005	2006
Above ground live biomass in 8 plots	Kg	7,236.68	7,444.37
Above ground live biomass per ha	t	90.46	93.05
C per ha[2]	t	45.2	46.5
Increase in C per ha	t/year		+ 1,30
Carbon dioxide equivalent	t/year		**+ 4.78**
Total tree count in 8 plots		152	159
Tree per ha		1,900	1,988
Average dbh per tree	cm	9.33	9.39
No of species		22	21

This is also verified by the looking at distribution of dbh (diameter at breast height) measurement as shown in Table 2.3, where it is clear that most of the trees are relatively young (nearly 75% have dbh ranging between 5 to 10 cm). This is because the forest was only handed over in 1994; it is only since then that forest protection measures were taken up by CFUG, allowing the forest to regenerate.

Although the data must be viewed as preliminary – more years of data are needed before a clear trend can be established - the data indicates that there has been an increase of total carbon stock of more than 1 ton per hectare, which represents around 2% growth annually of the carbon stock. This is equivalent to over 4 tons of CO_2 per hectare per year.

Table 2.3 Percent distribution of tree dbh class in Kafley CF

	Dbh Classes (cm)							
	5 < 10	**10 - 20**	**21 - 30**	**31 - 40**	**41 - 50**	**51 - 60**	**61 - 70**	**> 70**
Year 1	71.71%	22.37%	3.95%	0.66%	1.32%	0.00%	0.00%	0.00%
Year 2	72.96%	20.75%	5.03%	0.63%	0.63%	0.00%	0.00%	0.00%

If further analysis shows that this trend persists, it means that the CFUG is responsible for the additional sequestration of around 440 tons of carbon dioxide per year over its total area of 94 ha, which assuming a conservative price of $2 after transaction costs could bring in an income of some $880 per year (Rs 58,400 at $1 = 73 Rs) – a significant cash income for the community, comparing this to their financial statement where the total annual financial income has never been more than $600[3]. This is in addition to the reduction in emissions that would have occurred if there had been no

[2] Carbon stock based on above ground biomass in trees of over 5 cm diameter only (carbon in other pools such as shrub layer and litter layer, soil etc is not included).

[3] A price of $2 per ton carbon dioxide has been used in all the cases studies, for illustrative purposes. The current market price is around $5 per ton of carbon dioxide (CER), but credits for forestry projects are at present *temporary carbon emission reduction* (tCERs), and these have a much lower market value than regular CERs. We have selected a conservative value to indicate that even with these assumptions, forest management for carbon makes economic sense.

forest management and the forest had continued to deteriorate in the way it was going before the CFUG started its work. It also excludes the fact that if the forest had been allowed to degrade, dependency on and consumption of imported fossil fuel for cooking would probably be much more than now. Whether the community might also claim for this carbon, would depend on how the baseline would be constructed, and over what historical period it would rest. For example, if it were based on the rates of deforestation and degradation prior to 1994 which were on the order of 5% loss of biomass per year, the total carbon stock increases would be around 7% per year or 3-4 tons carbon stock, with corresponding financial implications.

Since community forest management has been promulgated for many years in Nepal, with about a quarter of all national forest now managed in this way, it would be difficult to argue that the forest management activities of villages like Lamatar are truly 'additional' in Kyoto terms. On the other hand, it is clear that there is very little leakage, since all the forest in the area is managed by other CFUGs on more or less the same terms. There is simply no forest around in which the leakage could occur.

Would there be then, in principle, justification for CFUGs and their members to claim the monetary value of all the carbon that is being sequestered, and/or the carbon that is retained rather than lost to deforestation, if a policy for crediting reduced emissions from deforestation is adopted by UNFCCC? Or should payment only be claimed for increases over an above what has been achieved in the past?

These questions do not yet keep the members of the CFUG awake at night, but they are questions that need to be answered in a fair and environmental sound way in the very near future.

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Annex 1. Financial Statement of Kafley CFUG

2004/2005	
Income titles	**Rs**
Membership charge	550
Sale of firewood	869
Sale of timber	18558
Sale of ghaga	7090
Interest from Bank	6527
Service charge	2040
Prize from VDC and DDC	6100
Rent of cooking utensils	120
Total	41854
Expenditure titles	**Rs**
General assembly	3600
Stationery	1069
Forest User Committee	350
Advertisement of timber sale	5186
Transport	750
Bamboo plantation	350
Tax for interest	316
Le pa charge	50
Depreciation	266
Miscellaneous	1157
Donations	
1. School	5200
2. Red Cross	400
Total	18694

2003/2004	
Income titles	**Rs**
Membership charge	920
Sale of firewood	2726
Sale of timber	11039
Sale of ghaga	1380
Interest from Bank	5402
DDC training fund	19070
Total	40537
Expenditure titles	**Rs**
General assembly	3607
Stationery	647
Forest management	1077
Training	17570
Range post coordiantion committee	820
Auditing charge	300
Tax for interest	316
Constrution of chautaro	1294
Depreciation	282
Miscellaneous	1088
Donations	
1. School	1125
2. College	5501
Total	33627

2002/2003	
Income titles	**Rs**
Membership charge	610
Sale of firewood	2417
Sale of timber	18095
Sale of ghaga	671
Interest from Bank	3780
Sale of dry twigs	412
Sale of tree	1536
Total	27521
Expenditure titles	**Rs**
General assembly	1231
Stationery	722
Member charge in kalyankari	1379
Educational tour	670
Road construction	2000
Acc. Closing charge	100
Banner	120
Loss of daak	233
Depreciation	135
Donations	
1. School	1600
Total	8190

2001/2002	
Income titles	**Rs**
Membership charge	1990
Sale of firewood	3338
Sale of nigalo	100
Sale of forest product	760
Interest from Bank	1566
Sale of dry twigs	346
Grant from VDC	1000
Dried and burnt tree	796
Total	9896
Expenditure titles	**Rs**
Inventory	542
Stationery	698
Forest User Committee	100
Training	3120
Range post coordiantion committee	100
Banner	1335
Purchase dade	160
Depreciation	238
Miscellaneous	682
Total	6975

Chapter 3: Case Study

Handei Village Forest Reserve, Tanzania

by
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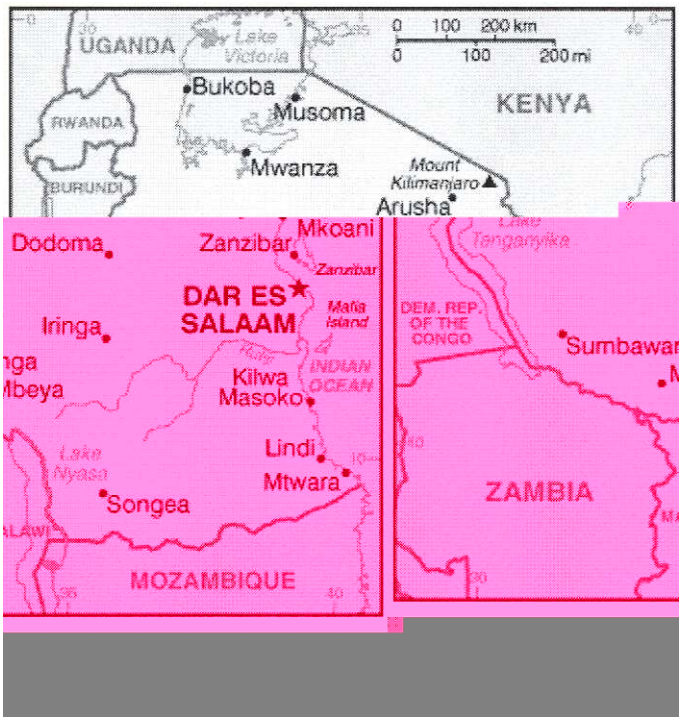
1.Introduction

Community Forests Management initiatives were introduced in Tanzania in the early 1980's with some experiences of success stories from Nepal and India. The practice is already legitimized by the parliament through the current forest act (2002). Under this act there are mainly two main ways in which communities are involved in forest management: these are Joint Forest Management (JFM) and Community Based Forest Management (CBFM). Under JFM, the government involves local communities in carrying out different forest activities (such as patrolling, fire fighting and boundary clearing), as such forest ownership remains with the government while local communities are duty bearers and in turn get use-rights and access to some forest products and services. On the other hand in CBFM the local communities are the owners, as well as right holders and duty bearers. Most of the CBFM forests are demarcated as part of village general land. Thus they are also called village forest reserves. To date there is a total of 994 different areas involving 2009 villages with a total area of about 3 million ha under community forest management in the country. However, current statistics also reveal that the remaining forest area in general land is about 18 million ha. These forests are "open access" characterized with insecure land tenure, shifting cultivation, harvesting for wood fuel, poles and timber, and heavy pressure for conversion to other competing land uses, such as agriculture, livestock grazing, settlements, industrial development. In addition, the lands are subject to wildfires which are caused by human activity. The rate of deforestation in Tanzania which is estimated at more than 500,000 hectares per annum is mostly impacting such general land forests. Therefore there is a room for many more community forest management activities that may alter the observed high rate of deforestation in the country.

2. Handei Village Forest Reserve

Handei village forest reserve is located in the Eastern Usambara mountains in Tanga region and is just outside the Amani Nature Reserve. It consists of 156 hectares of sub-montane evergreen forest characterized primarily by *Parinari excelsa, Sapium elleplicum, Cynometra sp* and *Alanblankia stulhamanii* species. Part of the forest is on hanging rocky cliffs harboring *Saintpaulia usambarensis* (African Violet) species that attracts ecotourism. The forest has been under community based forest management by residents of Magambo-Miembeni village since 1996. Formerly, the forest was under open access and suffered considerably from agricultural expansion and uncontrolled harvesting mainly for commercial timber and building material, the

consequence of which were changes in microclimate of the area and drying up of important water sources to the local communities.



Map of Tanzania showing location of Handei

With current management, utilization is confined to a buffer zone of 50 m from all sides of the forest boundary, the interior part of the forest is for protection without utilization. Uses permitted in the buffer zone include: ecotourism, timber harvesting, collecting dry firewood, vegetable, mushroom and collection of traditional medicines. To ensure proper utilization, the village has set down various bylaws on how and when these forest products can be utilized, the general idea being that utilization is done in a sustainable manner.

There is a village forest committee composed of twelve members (currently 4 women and 8 men) operating under the village government that manages the forest. The committee is responsible for all activities regarding the forest, these include: selecting forest guards, monitoring of all activities conducted in the forest such as enrichment planting in open areas of the forest, provision of permits for various activities such as harvesting of timber and collection of fees from ecotourism. It is also responsible for following up on legal issues pertaining to the management of the village forest reserve.

The committee reports on a monthly basis to the village government, district forest officer and a local supporting organization (the Amani Nature Reserve conservation office). The role of the district forest officer and the supporting organization is to provide technical support to the forest committee and interpretation of policy guidance.

3. Carbon stock changes as a result of management activities

As a result of participation in the Kyoto: Think Global Act Local project, five members of the Forest Committee (three men and two women) were trained in mapping techniques using GIS/GPS on a hand held computer and in standard forest inventory methods as described in the IPGG Good Practice Guide (Penman et al. 2003). They established 19 sample plots of 5.6m radius, laid out at intervals of 218 meters using transects separated by 286 meters. Locally derived allometric equations were used to calculate the total biomass and to convert this into tons of carbon stock. Below ground carbon stocks were not estimated but in principle could be calculated and added to the total.

Table 3.1 shows the stand parameters for Handei village forest reserve. Observed stem numbers in this forest are comparable to other forests in similar (protected) site conditions while volume, biomass and carbon per hectare are generally lower. This is probably because the forest is still regenerating following previous disturbances including agricultural fields with few trees. However, analysis of data between 2005 and 2006 shows that the forest is growing and has sequestered about 3 tons of carbon per hectare in the year interval between the two measurements. Data for several more years will need to be collected before a growth curve can be drawn, but the evidence is clear: the forest is increasing in carbon stock as a result of the management practices used by the villagers.

Table 3.1 Stand parameters for Handei Village Forest Reserve

	Year	**N** (stems/ha)	**V** (m^3/ha)	**Biomass** (t/ ha)	**Carbon** (t/ ha)	**CO2** (t /ha)	**Area** (ha)	**Total C02** (tonnes)
Handei VFR	2005	926	261.2	151.5	74.2	278.3	156	42,480.1
Handei VFR	2006	643	272.0	157.9	77.4	284.1	156	44,311.6
Unmanaged forest outside the VFR	2006	1,914	139	81	40			

Table 3.1 also shows that the tree stocking in terms of volume, biomass and carbon in the general land of this village (unmanaged forest) is about half of that in the reserve forest. The reserved forest has fewer trees, but these are of large sizes with correspondingly large volume, biomass and carbon contents compared to unmanaged forest, which in contrast has many very small trees. These unmanaged areas are forest in which some subsistence agriculture is being done, particularly on small hillside plots. These small farms are not fully cleared but retain some trees as part of the local agroforestry practice. These are also alternative sources of woodfuel and timber for construction.

The managed forest clearly shows an increase in carbon stocks due to the suppression of unsustainable harvesting of fuelwood and charcoal, of around 5 tons CO_2 per hectare per year. The village forest management regime is thus sequestering a considerable amount of carbon as shown above. From the data so far available, it is

not clear to what extent emissions are being reduced in addition, since the rate of depletion of forest in the unmanaged area has not yet been established. In order to make an accurate assessment of this, data over several years will be required, and any leakage from the managed area will have to be accounted for.

It is the intention of this research project to continue monitoring carbon stock changes to establish annual rate of carbon loss and predict future carbon stocks. This will form the baseline scenario against which carbon benefits of the reserved forest will be compared.

4. Conclusions

This case has provided some facts on the growth trends in both the unmanaged land and the village forest reserve that is under community management. These preliminary findings provide promising positive evidence on the effectiveness of the village forest management against open access regimes. The growing stock differences between the two will be the carbon benefit the communities are creating from their forest management, and for which they might claim carbon credit compensation in the future.

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Chapter 4: Case Study

Kitulangalo Forest Area, Tanzania

by
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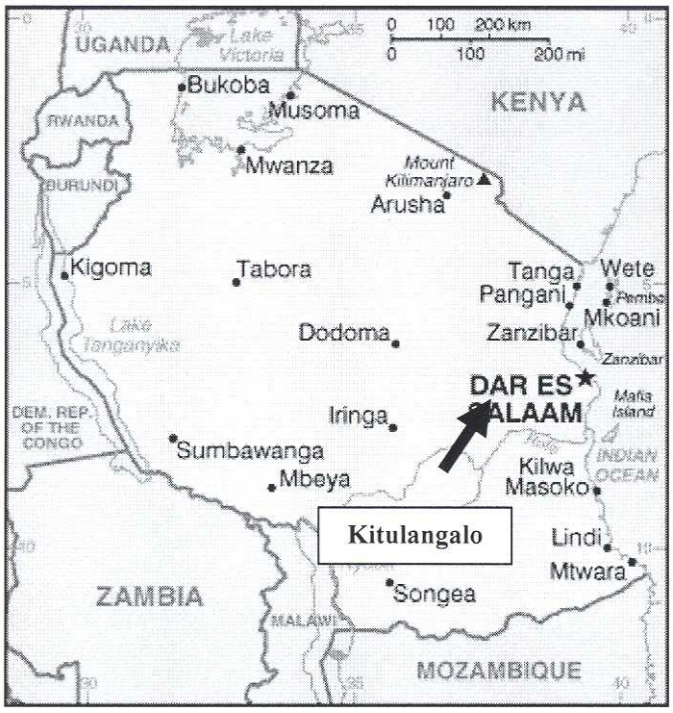
1.Introduction

Kitulangalo forest area lies about 50 km to the east of Morogoro town, on the side of the Dar es Salaam-Morogoro highway. This is a relatively dry area with an average annual rainfall of about 850 mm. Formerly the forest was part of the Kitulangalo Catchment Forest Reserve. The high level of accessibility to the highway made this area a prime charcoal production area for the supply of the nearby Morogoro municipality and Dar es Salaam city. But in addition the forest suffered from timber extraction through the activities of local pit-sawyers, and from cutting of tree stems for building poles. The human resources of the Forest Department were insufficient to maintain control over the area and to prevent the over use of this important catchment forest. It was *de facto* an open access resource.



Map of Tanzania showing location of Kitulangalo

In 1995 however, part of the forest (600 ha) was made over to Sokoine University of Agriculture (SUA) as a Training Forest Reserve; it is now used for training students and for research purposes, although protection was a major reason for its new status. This part of the forest is under joint forest management with Gwata village, which

means that the land is still owned by the government, but the management is mainly in the hands of the local community, following jointly prepared management guidelines. In 2000, another 420 ha was demarcated for the village community, and is now called Kiminyu village forest reserve. As a community forest, the land is now the property of the village, which has full responsibility for management. Both areas are characterized by Miombo (savanna woodland) and the predominant species are *Brachystegia* and *Julbernadia.*

2. Different management strategies and rules

The fact that two different management regimes are operating next door to each other in essentially the same type of forest makes the Kitulangalo forest a particularly interesting one to study.

In Gwata village an environmental committee has been established and given the responsibility for supervising the management of the forests on behalf the village government. This committee has been established to look after all forest management activities in the villages. The committee members are selected by village government and approved by general village assembly. The considerations for selection to the committee are; village residence, married person, and ability to work. Intrinsically, gender balance is also carefully considered in order to involve women in the management of the village forest reserves. To institute its mandate, the committee sets up bylaws that are approved by the village general assembly. These bylaws are also approved by the responsible district authority and are recognised by the court of law. They consist of different penalties charged against offenders who violate the rules regulating sustainable forest management and use in the village. These bylaws are applicable in both village and government owned forests in the village.

Sokoine University manages the training forest jointly with the village government through the village environmental committee. Two members from the committee are employed by the university as forest guards for the forest. These are responsible for making routine patrols and they supervise different silvicultural activities that are done by villagers who receive daily wages in return. For example, the university involves villagers in clearing of forest boundaries to safeguard against fire. This is normally done during the dry season when the grasses are dry and vulnerable to fires. In the same boundary lines, villagers plant trees, which are used to demarcate the reserves and general village land. If there is fire outbreak, the villagers are also involved in extinguishing it. However, it may be noted that incidences of fire outbreak in the Training Forest Reserve have considerably reduced in recent years since local people have been involved in forest management.

The village environmental committee bears full responsibility for managing the village forest (Kimunyu Forest). It mobilises local people, and selects villagers to patrol the forests every day and report to the village government through the committee. Although this forest is being managed for production purposes, currently there is no tree harvesting allowed. There are not yet enough large timber tree species in the forest, and the only product that could be extracted at present would be charcoal. However a decision has been made to stop charcoal production and to allow the forest to regenerate naturally. The result is that currently, there are higher trees

stocking levels in this forest compared to the adjacent public land that is under open access management.

3. Growing carbon stock

The improving health of the forest can also be seen from the point of view of carbon stock. In Gwata village, 6 persons (4 women and 2 men) were trained in mapping and forest inventory techniques as in all the other study sites under the Kyoto: Think Global Act Local project, with the help of two forest guards who are employed in connection with training forest reserve. In the Training Forest Reserve, 89 plots were set out at intervals of 150 meters along transects set 300 meters apart: in the Kiminyu village forest reserve, 43 plots were set out at distances of 170 meters, on transects separated by 500 meter. The number of sample plots was in each case calculated based on estimates of standard error, based on preliminary sampling as outlined in the IPCC Good Practice Guide (Penman et al. 2003) and the Winrock/Biocarbon Fund Sourcebook (Pearson, Walker and Brown, 2005).

Table 4.1 shows the results of the forest inventory carried out by the villagers.

Table 4.1. Stand parameters for the forests at Kitulangalo

	Year	**N**	**V** (m3/ha)	**Biomass** (t/ha)	**Carbon** (t/ha)	**CO2** (t/ha)	**Area** (ha)	**Total C02** (tonnes)
Training Forest	2005	694.9	55.3	35.2	17.2	63.1	600	37,874.4
	2006	638.9	63.0	39.3	19.3	70.8		42,498.6
Kimunyu	2005	845.5	78.9	40.5	19.8	72.6	420	30,519.7
	2006	817.2	88.2	45.0	22.1	81.1		34,064.9

What is clear is that over a period of one year, management activities have resulted in a considerable tree stock change. Although the number of stems per hectare (N) has decreased, the tree volume has increased, and therefore also the biomass and corresponding carbon. In this one year there has been an increase is stored carbon dioxide of about 7 tons per hectare in both of the sites.

To draw firm conclusions concerning rate of carbon sequestration, data over more years will be required. However it may be borne in mind that, had the forest been left without community management, carbon stock would certainly have decreased, as had been the pattern over earlier years. The rate of forest loss and of degradation can be determined from studies that were carried out in areas in the vicinity of Kitulangalo, which show that the rate of loss of forest is strongly related to distance from the highway (Figure 4.1). Over a period of 6 years stock levels dropped by as much as 80% in sites up to 5 km from the highway, but only by 20% at 10 km. This is the result firstly of charcoal production and later of wholesale clearance for agriculture.

The increase in standing volume at 15 km is due to the fact that this area is now under community management for some years (this is the area that is now Kimunyu village forest). If a conservative estimate of 5% biomass loss per year was to be assumed as

the average baseline, then the net gain in carbon terms as a result of community forest management would be on the order of 10 tons per hectare per year. At a nominal value of $2 per ton[4] after deduction of external transaction costs (ie non-local costs involved in verifying and certifying the carbon gains), this would be equivalent to an annual income of $20 per hectare or $8400 for the Kimunyu forest alone.

It might be expected however that there is some leakage, in the form of displaced activities, from these sites. Villagers in this village collect firewood and building materials from the general land that is at close by distances from their homes. Only tree felling for commercial timber extraction and for charcoal making could be assumed to be displaced somewhere else. However, there are no evidence of villagers' migration to other areas to deforest. Of course, it could be argued that the charcoal may still be produced elsewhere, by other people, to meet the urban market demand for this vital product, and thus represents a form of leakage, but it is difficult to prove this or to estimate its impact.

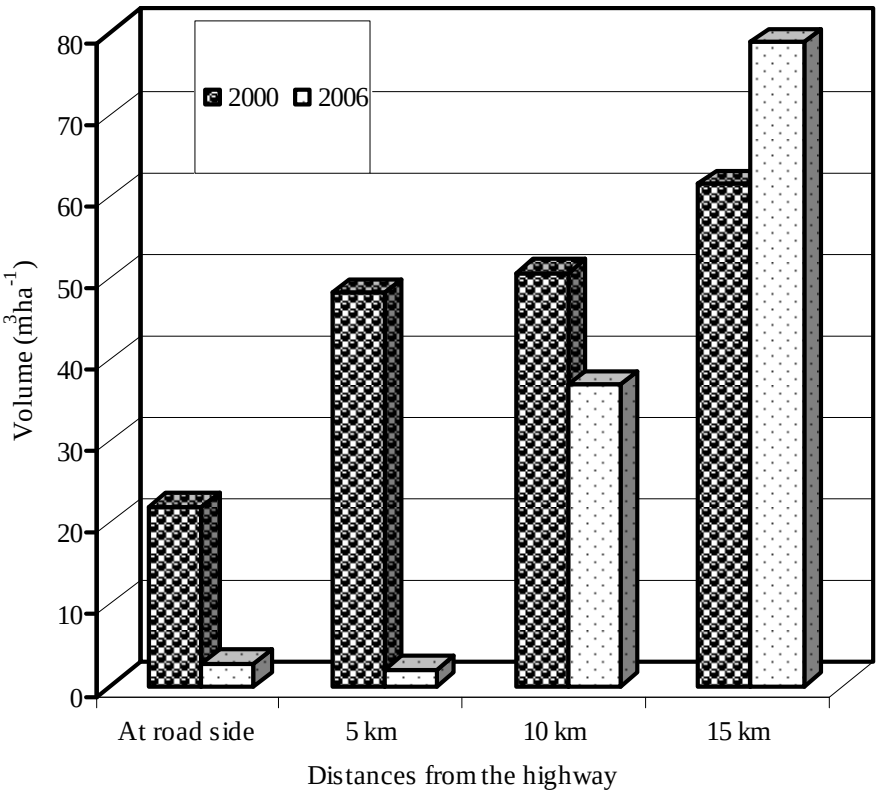


Figure 4.1: Rates of degradation in forests similar to the Kitulangalo forest (Malimbwi et al 2005)

4. Local transaction costs

Measuring biomass stock to determine changing carbon levels itself involves costs, which are considered to be local transaction costs. At Kitulangalo the costs involved

[4] This is a conservative price for carbon; please see footnote 3 in Chapter 2 for explanation.

were recorded. A comparison of costs of carbon assessment by local communities against the professionals reveals that it costs twice as much to hire professionals for carbon assessment in the village forests studied, as to engage villagers to do this, including the cost of technical assistance and training, which is considerable in the first year of assessment. It is to be expected that the villagers will be able to undertake the same work at progressively lower cost in the preceding years as the cost for training and supervision are reduced (Table 4.2). It is assumed that from the fourth year, the villagers can work on their own with assistance only from staff from their local supporting organization. It is also clear that it is more cost effective to work with villages which are managing large forest areas, since the cost of training is a fixed cost.

Table 4.2: Estimated local transaction costs for monitoring carbon[5]

Activities	If carried out only by professionals		If carried out only by local communities with a little assistance from professionals				
	No. of Days	Cost (€)	No. of Days	Cost (€)			
				1st Year	2nd Year	3rd Year	4th Year
1. Pilot and Inventory Planning	3	640	10	2,597	1,343	525	-
2. Field Assessment							
- Kitulangalo SUATFR	10	2,475	10	2,597	1,800	1,470	975
- Kimunyu VFR	6	1,460	6	1575	1,080	915	585
- Without Project Case	5	1,210	5	1,312	817	653	375
3. Data punching and analysis	10	2,250					
4. Consultation fees							
- 1 Inventory specialist	34	6,120					
5. Institutional fees (10%)		1,410					
Total		**15,565**	**31**	**8.081**	**5.040**	**3,563**	**1,935**
Costs per hectare ($)		**15**		**8**	**5**	**3.5**	**2**

5. Conclusions

Although more data would be needed to strengthen the case, it is evident that community involvement in management, both under joint forestry and in full community forest management, have resulted in significant reductions in degradation together with significant increases in sequestration of carbon in both types of forest in Kitalangulo. The local transaction costs, though much lower than costs of profession measurement and monitoring, represent a not insignificant proportion of the likely financial benefit, but nevertheless it seems there is still a good margin of profit to me made. This is particularly important since the other financial benefits from such forest management are small. This is particularly the case since charcoal production

[5] The cost of the computer and software are not taken into account in the calculations but see chapter 8 for a discussion on the impact of these.

has been banned, meaning that this source of income has been totally stopped, at least for the present time. The conclusion may be drawn that carbon as a 'non-timber forest product' could offer a real incentive for this community to continue with its forest management activities, and for more communities to become involved in managing their forests.

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Chapter 5: Case Study

Dhali Village, Utranchal, India

by

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1.Introduction

Uttaranchal, the newly formed hill state of India, is situated in the Indian Central Himalayas. The total geographical area of Uttaranchal (UA) is 5,563,174 ha, of this agricultural land is 792,000 ha (about 13% of the total area) and 3,671,695 ha is forest (about 66%). At present there are more than 12,000 Van Panchayats (VPs), the local forest councils responsible for forest management in UA occupying nearly 0.5 million ha of the total forest area.

Table 5.1: Distribution by district of VPs in Uttaranchal

Sl	District	Number of VPs	Area (ha)
1.	Almora	2,199	69,854
2.	Nainital	496	28,068
3.	Pithoragarh	1,661	87,054
4.	Champawat	629	31,233
5.	Bageshwar	822	38,783
6.	Pauri Garhwal	2,430	52,184
7.	Chamoli	1,073	167,310
8.	Rudraprayag	574	20,702
9.	Uttarkashi	643	5,510
10.	Dehradun	205	7,659
11	Tehri Garhwal	1,332	14,932
	Total	**12,064**	**523,289**

Note: Haridwar and Udham Singh Nagar districts do not have any VPs

Source: Uttaranchal Forests Department, July 2005

From Uttaranchal a number of major rivers originate and nurse the great Gangetic Plain of the Indian subcontinent. Forest cover found in the Himalayan belt is not only an important habitat for high altitude flora and fauna, but also crucial for providing hydrological benefits downstream. The water resources from the Himalayan region of Nepal and India that flow to the Gangetic Plains support over 500 million people and sustain the agriculture system in one of the most densely populated parts of the world.

2. History of Van Panchayats

The history of VPs dates back to the British colonial period. The restrictions imposed by the British on the customary forest rights of people towards the end of the 18th

century and beginning of 19th century were resented by the locals. These acts of government led to alienation of the local communities from the British government.

Between 1911 and 1917 vast areas of forests were burnt down by the people in protest against the imposed restrictions. In 1921, the government appointed a committee known as the Kumaon Forest Grievance Committee to enquire into the rights of people over forests resources. It was on the recommendation of this committee that the British government decided to introduce Van Panchayats (forest council or forest committee) to Kumaon in 1930's. The landmark Van Panchayat Act 1931 handed over the control of the designated forest to elected Van Panchayat (VP) members in place of the State Forest Department (SFD).

The VP probably represents one of the largest experiments in decentralized management of common property in collaboration between the locals and the state (both SFD and State Revenue Department). The VP, an elected body, holds responsibility for harvesting, conserving and managing the village forest resources. However, the various activities performed by the VPs are under the regulations of the SFD and the Revenue Department, the former also provides technical backstopping as and where necessary. The village forest is a resource used by a definite user group (the village people) that is liable to degrade when over exploited. Though called village property, the land is owned by the State; however, village people consider it as a collective property as they are allowed the usufruct rights and resent government interference.

Most community forests were initiated on degraded lands, officially on a kind of Civil Soyam forest, falling under administration of Revenue Department. But unlike Civil Soyam forests the community forest are not open-access forests. Depending on a number of households in a village, there are generally 5-9 elected members in a VP, who elect a *"Sarpanch"* (chairman) from among themselves. Elections are held every 5 years.

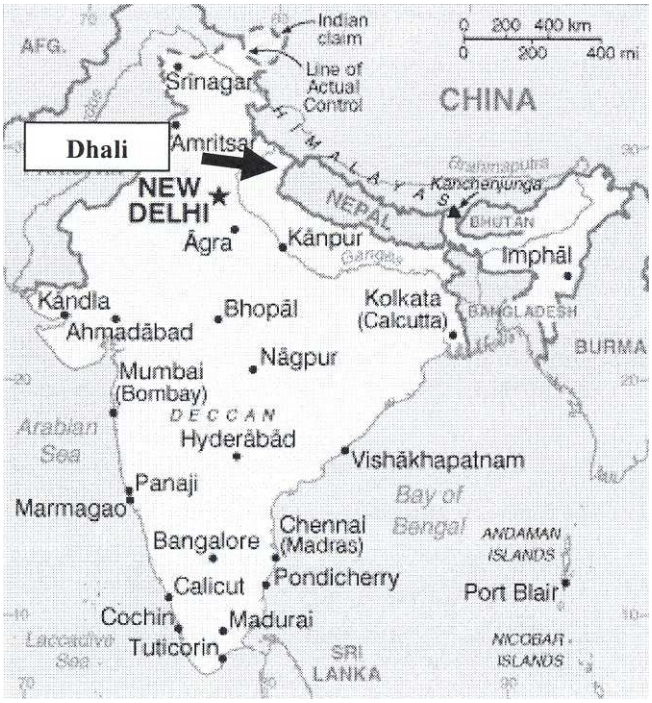
3. Gender issues in VPs

The prevailing rules state that the Van Panchayat shall consist of nine members; four seats are for representatives of Schedule Castes and Schedule Tribes, out of which one must be a woman. Though state rules require that at least one women from the village is in the VP (Van Panchayat Rules 2001; Uttaranchal Government), this forced inclusion may not foster genuine participation in the VP. The female representatives often send their sons or husbands to the VP council meetings as they are reluctant to attend the meetings due to work load. The most obvious constraint is the heavy workload involving household work, collection of fuel wood, fodder, litter, water collection, taking care of children and performing agricultural activities. In this hilly region the village women have to travel 4-5 kms daily to fetch drinking water, while simultaneously contributing almost 70-80 percent of agriculture work. Also, they feel that they are not encouraged by men to attend the meetings. In recent years this issue has been raised repeatedly and men in some cases seem to welcome women participation, but much progress has yet to be made.

4. Dhaili Van Panchayat

The Dhaili Van Panchayat is located at an altitude of about 1830 m.a.s.l. The area under this VP forest is about 60 ha, of which 56 ha is good forest (more than 58% crown cover). The Dhaili Van Panchayat was formed in 1999 and comprises of even aged oak (*Quercus leucotrichophora*) forest with undercanopy of *Myrica nagi* and *Rhododendron arboretum.* The average canopy cover of the forest is close to 60%.

Of the 1050 people living in Dhaili, 514 are males and 536 females, in 105 families. The average literacy of Dhaili village is 50%, with male and female literacy being 70.0 and 30.0%, respectively. The main source of income for the people is by working as daily labourers, and agriculture is secondary. The average income per family is about Rs. 32,422/year which in the Indian context is considered close to or below the poverty line.



Map of India showing location of Dhali

The present strength of VP council is seven, with all male members. Fresh election for the Village VP council in light of new Forest Panchayat Rules is pending and hopefully will take place in the near future. The VP meetings are generally held once a month. The main source of the income for the VP are the sales from dry fodder at Rs. 10 per family, and green fodder at Rs. 30 per family or Rs. 10 per head load. In addition to sales of fodder, the imposition of fines also generates some income for the VP. The total income generated by the VP was Rs. 9,500 from the sale of permits and fines in the year 2004-05.

After the formation of VP, the people of Dhaili accepted that the condition of their forest has improved, as indicated by the reduction of distance travelled for collection of fuelwood, fodder and drinking water. Some 150 temporary small earthen ponds

(water percolation micro reservoirs) dug during 2003-04 in the catchment of 4 major springs have increased water discharge in the springs during lean summer months. The VP of Dhaili also has a forest guard who is paid around Rs. 600-800/month which is met from the income generated by the forest and many people have been fined in last 5 years. The VP also carried out plantation of bamboo, bhimal (*Gravia optiva*), and utis (*Alnus nepalensis*) in about 6 ha in 2004-05 with the help of villagers. The villagers also clear the fire lines for the protection of forest during the dry summer season. No fire has occurred in this forest in the past 10 years. However, there is no control of grazing in Dhaili Van Panchayat.

In Dhaili VP all the families are using fuelwood for cooking and heating purposes. Though LPG is available in the area no family is using it. The daily requirement of fuelwood is 6-8 kg of dry fuelwood per family. The pattern of collection of fuelwood shows that about 85% is from Van Panchayat forest, 10% from trees on private areas and 5% from government or reserved forest. Other non-timber products, for example, resin, medical plants, and lichens are rarely extracted from Van Panchayat forest.

5. Impact of the Project: Kyoto: Think Global, Act Local

The village level investigators (selected members of the VP) have become trained in forestry measurements and mapping of the forest area. The measurements of biomass stocks and C-sequestration rates of Dhaili VP are given in Table 5.2. This forest is sequestering C at the mean rate of around 12 tons carbon dioxide per hectare per year. As the area of this VP forest is 60 hectares, it is sequestering a total of 720 tons carbon dioxide annually, worth US $1440 annually at a nominal rate of $2 per ton.

Table 5.2 Carbon stock and c-sequestration rates in forest types of Dhaili VP forest in Uttaranchal, India

Dhaili forest strata/types	**Above ground Carbon Stock** (t/ha)		**C sequestration rate** (t carbon/ha/year)	**CO2 equivalent** (t/ha/year)
	2005 **(ts/ha)**	2006 **(t/ha)**		
Even aged banj oak forest	172.1	176.5	4.4	16.2
Dense mixed banj oak forest	255.7	260.2	4.5	16,5
Mixed banj oak chir pine degraded	18.8	20.8	2.0	7.3

The situation in other VPs of Uttaranchal is similar. These VPs are using their forests on a sustainable basis and meeting their requirements of fuelwood and fodder. Their forests are sequestering carbon at a reasonable rate but with increasing population pressure from the village, the forest resources are under constant pressure from deforestation and degradation, and the situation could quickly reverse so that the forest becomes a source of carbon if care is not taken. To maintain these forests as carbon sinks it is essential that community forestry is given recognition under the climate change agreements. The importance of community forest management as a carbon sequestering measure should be recognized before it is too late.

Chapter 6: Case Study

The regeneration of Tomboroconto forest, Senegal

by
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1.Introduction

Senegal is a country which is for the most part Sahelian, with a semi-arid climate. It has about 6m of classified forests, representing 21.6% of its total area. In addition to the 213 classified forests, it has 20 silvo-pastoral reserves, 6 national parks, 8 special reserves and a number of so-called protected forests, which all together represent 31.7% of the total land area. In addition to conservation activities in these areas there is a significant amount of reforestation going on.

At the same time there are other forest areas, in harsh climatic conditions, which have a tendency to be over-utilised. These supply the woodfuel needs of part of the rural population and the growing urban population. In addition they are used by pastoralists for grazing. Some places are subject to salinization, various forms of erosion, wild fires and desertification. All these factors together result in an estimated deforestation rate for the country of 50,000 ha per year.

2. Participatory forest conservation activities in Tambacounda

In Tambacounda region, the relatively favourable climatic conditions have resulted in a forest of considerable significance for the whole country. In Kedougou district the forest vegetation is abundant, but more and more species are threatened and in some places they have already disappeared. At first sight this does not appear to be too serious, but it hides a process of exploitation in which selected trees disappear completely. Species like 'ronier', a type of palm called 'siboo' in the Mandingue language, are almost extinct in these areas. Of the 160 tree and shrub species, 46 are in grave danger and a further 25 are likely to be so soon.

Map of Senegal showing location of Tomboroconto

In this district, local populations in 11 different villages (Figure 6.1) have recently been involved in natural resource management under a programme called PROGEDE[6], with the aim of halting the degradation of the Tambacounda forests. Firstly, they have been trained in silvicultural techniques such as nursery management, assisted regeneration and reforestation. Water catchment areas are being protected and village grazing areas have been set up. Remaining forest areas have been protected and forest tracks have been maintained. These activities have provided the means by which the local populations can earn more than they previously gained from charcoal production and firewood sales to the cities. Clearly, from a climate change point of view, the advantage is that the carbon stock in the area is increasing, which in the long run could be an additional source of income. It was for this reason that research was started to assess the potential of these kinds of activities for REDD carbon mitigation.

[6] Programme de gestion durable et participative de énergies traditionnelles et de substitution

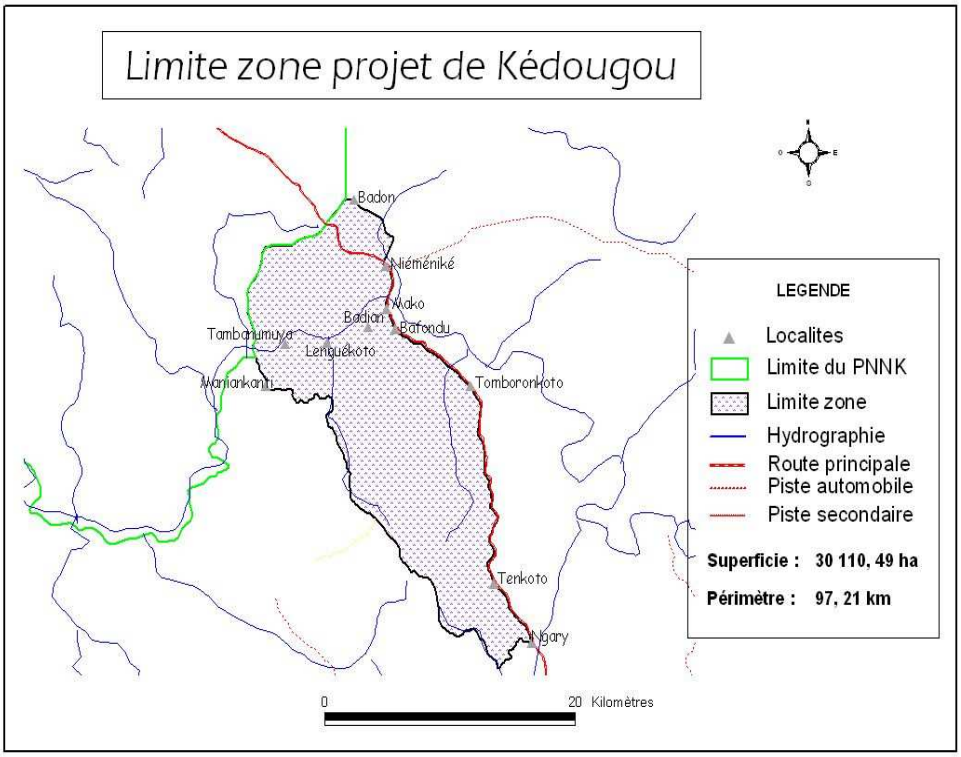

Figure 6.1. The map of Kedougou districts showing the location of villages managing Tambacounda forests.

3. Development of above-ground carbon stocks

The area selected for study was Tomborokonto, a community forest in the district Kedougou, south of the Niokolo-Koba National Park. In this area, villagers were trained in 2005 to map forest areas under management using the hand held computers and to do forest inventory work, in a similar way as reported for the cases in Nepal and Tanzania. Here, protection activities have been carried out by villagers for the last five years. For comparison, secondary data for a site of very similar forest conditions and population density (Dialamakhan, in Kedougou district) is given, for the period before the management was started (2000), as data for Tomborokonto is not available for earlier periods. Although one has to be careful in comparing different locations, this does give some idea of the magnitude of the carbon stock changes that result from community forest management (Table 6.1).

Table 6.1: Above-ground carbon/CO2 stocks (tonnes/hectare)

Type of forest	Dialamakhan in 2000 (before community management)	Tomboroconto in 2005 (after community management)
Forest	19.8 / 72.6	31.1 / 114.1
Woody savanna	8.0 / 29.4	18.1 / 66.4
Shrub savanna	8.2 / 30.1	18.2 / 66.8

From these figures it appears that there has been an annual increase of about 10% in carbon stocks, or more than 7 tons carbon dioxide per hectare per year, as a result of management activities, although this varies by vegetation type.

4. Conclusions

It is evident that the management activities are having a major impact on the restoration of ecosystems in the area. Although detailed ecological inventories have yet to be made, according to local people biodiversity is improving, as threatened species are present in larger numbers and some which have been absent for years are beginning to return.

It may be noted that the integrated forest management programme is having three major effects other than just increasing the carbon stocks and the fuelwood and timber supply. (1) As far as cattle raising is concerned, the management of forest track and water sources has improved production (2) Honey production has increased considerably due to the use of improved hives and (3) The provision of high quality poultry stock means the local population is not dependent anymore on hunting wild birds for protein.

Although the management was not carried out for the purposes of carbon sequestration, it is clear that there is an enormous potential for increasing sequestration in the future using quite simple participatory forest management techniques. From the figures on growth rates so far obtained, and assuming a price of $2 per ton of carbon net of transaction costs, an income of about $15 per hectare per year could be earned.

Chapter 7: Case Study

Chitwan, Nepal: Will Poor People and Women Benefit Too?

by
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1.Introduction

In Nepal community managed forest has been seen not just as a tool to improve forest management but also as a means to alleviate poverty and promote equity in communities living in the periphery of the forest areas. Nepal is an agrarian society and from high land to the low land rural population is highly dependent on the land they cultivate and the forest from where they derive their basic needs. Forest is a source of livelihood, and most particularly for the poorer sections of the population. It is also a source of energy for the women, providing their supply of cooking fuel. Thus improved management by communities under the Forest User Group (FUG) system is envisaged as a means to help these groups particularly.

The concept of community forest was introduced in the late 1970's and over the last two decades it has proliferated over the whole country, with about 25% of the national forest area now under management by FUGs. The programme in Nepal is considered to have been successful over the years and several other countries have adopted the general concept. There are many studies which indicate success in terms of the overall physical improvement of the forest (for example Neupane, 2003; Nurse et al. 2003), but up to now there have been almost no studies looking at the evidence for improvement in the local livelihoods, particularly of the poorer sections and as regards women.

If forest management which reduced degradation and deforestation were to be eligible for financial rewards in proportion to the carbon savings, as per the current discussion concerning reduced emissions from deforestation, then Nepalese community forestry might become eligible for carbon credits. The issue that is discussed in this chapter is whether the benefits of such payments would be likely to reach the poorer parts of the village community and in particular the women. To make such an assessment, one needs to look carefully at the distribution of the benefits of forest management today.

2. Women and marginalised groups in Nepali rural society

Nepalese society is strongly hierarchical. Caste, religion and ethnicity are dominant social structures which traditionally effect control over, and access to, common resources such as forests. Furthermore, Nepalese society is patriarchal; most of the decisions, domestic as well as social, are made or influenced by men. As such women have less power in decision-making and in the case of women from poor and low caste groups, their voices are not heard or are simply ignored. It is common therefore

in social studies of Nepali villages to differentiate between families of the higher castes, who tend to be richer, and so-called 'marginalised groups', lower caste or tribal people who are in general much poorer. Although the social status of women from high caste groups is also high, their power in practice is low because of the traditions within the family. Often women in general and the marginalised population groups are referred to as 'weaker social groups'.

3. The organisation of Forest User Groups

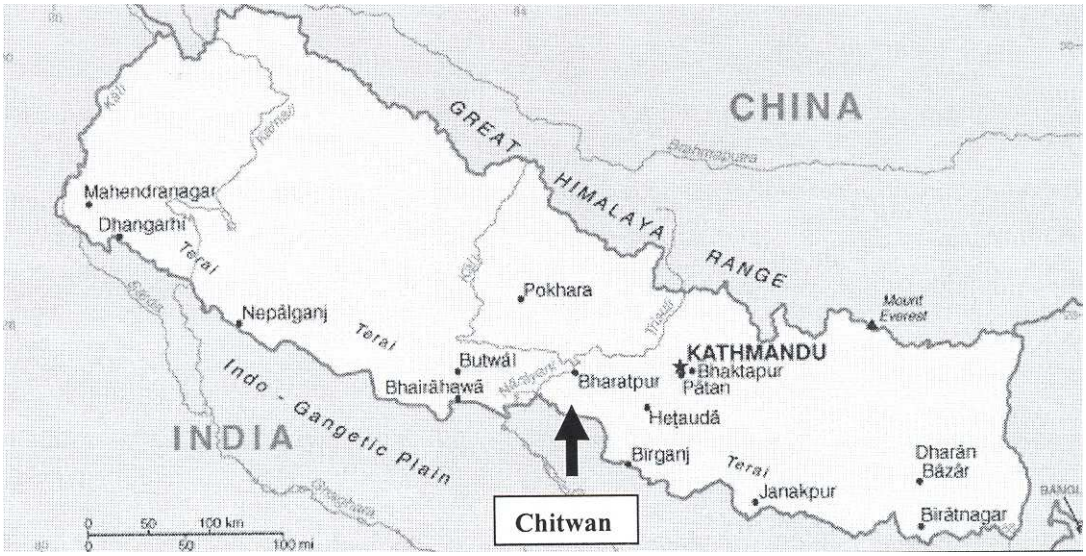
A characteristic of the organisation of community forestry in Nepal is that the FUGs are socially heterogeneous, with members from both the dominant and the weaker social groups. The statutes require democratic decision making within the FUG, so this would seem to offer a vehicle for more participation of women and of poorer and marginalised groups and thus also an equal share in the benefits. The question is, whether this is the case in practice.

Several authors (for example Hobley, 1996) have suggested that women are not equally represented in FUG decision making, since each household is normally required to send one member to meetings, which in most cases will be the male head of household. Others (for example Nightingale, 2002) say that despite the principle of heterogeneity of FUGs, there remain power relations which result in more benefits reaching the more powerful members. In order to investigate whether these claims are valid, a case study was made in Baghmara Buffer Zone Community Forest in Chitwan, which is around 185 km to the south-west of Kathmandu.

4. The community forest in Chitwan

Baghmara Buffer Zone Community Forest is in Bachhauli Village Development Committee (VDC), located on the northeast boundary of the Royal Chitwan National Park. The area is surrounded by the Rapti River in the south, the Budi Rapti River and Khagedi River in the northwest and the human settlements in the east. It is under the jurisdiction of Department of National Park and Wildlife Conservation (DNPWC). Prior to the handover of the Baghmara Buffer Forest as community forest it was heavily degraded and deforested by illegal activities such as timber felling, unsustainable collection of fodder, over grazing etc. Since this area was an extension habitat for the wildlife and in order to stop further degradation and deforestation and to conserve the forest, a plantation programme started in 1989 and in 1995 the DNPWC handed over Baghmara Buffer Zone Forest as a community forest to the people living near the forest area. Baghmara Buffer Zone Community Forest (BZCF) has 215 hectares comprising mono plantation, mixed plantation, natural regeneration, indigenous tree species such as sissoo (*Dalbergia sissoo*) and khayar (*Acacia catechu*), grasslands and lakes. The Forest Users Group (FUG) currently has 780 households as members, and these come from all castes and tribes: high caste Brahmins; middle caste Giri and Shresthas; low caste Darai, Pariyar, and Kumal together with people from ethnic groups or tribes (Bote, Majhi, Tharu, Tamang, Musahar and Magar). The Bote, Majhi and Musahar are the lowest in this social hierarchy; they are all well below the poverty line and are illiterate. For the members who joined at the start (in 1996) there was no charge for membership, but for new

members, the membership fee is 3,000 rupees (wealthy class), 1,500 rupees (middle class) and 300 rupees (poor class).



Map of Nepal showing location of Chitwan

5. Involvement of 'weaker groups' in FUG decision making

Baghmara BZCF operates in accordance to its constitution and annual work plan approved by DNPWC. An executive committee is the apex body and is accountable for every activity that the FUG undertakes. Currently there are 13 members in the executive committee and these committee members were selected by the FUG members. The executive committee of Baghmara BZCF is socially heterogeneous and has representation from wealthy, middle and marginalised groups. According to the constitution of Baghmara BZCF, it is also mandatory to have at least two women members in the executive committee. Decisions made by the committee are first put in the general meeting and if two thirds of members agree, they are implemented. It is important to understand that in addition to daily management of the forest, the FUG is also responsible for the distribution of the forest products including any financial benefits that result from sale of forest products. In theory the executive committee works democratically and in a participatory manner, listing all the decisions to be made on an agenda for the general FUG meeting and accepting only those decisions that receive majority consent.

However, people of the Musahar tribe, a poor, marginalised group who are mainly involved in fishing activities, expressed their unhappiness as regards the composition of the executive committee. No Musahar has ever sat in the executive committee since the establishment of Baghmara Buffer Zone Community Forest. Currently, there are 23 Musahar households in the village and all live together in one part of the village in houses constructed by a Dutch NGO. Their children's education is funded by the same Dutch organisation. The adults in this group are illiterate and it is said to be for this reason that they have been excluded from the committee. They themselves do not often attend the general meetings of the FUG: they say that even when they are present, nobody listens to what they have to say. Their perception of the way the FUG

works is that it is only nominally participatory, and that most decisions are made by the committee members or by the affluent members, and the general meeting is simply told what has been decided, rather than consulted.

There are 4 women on the executive committee, and these members are not from the high castes but from the better-off families of the marginalised groups. However, most of the decisions are made by the men members. The women have portfolios for particular tasks such as maintaining ledgers and organising meetings, and are involved in suggesting income generation activities that could be set up for other marginalised and poor women members, but weighing of the firewood during harvest and collection of money from eco-tourism is mainly done by the men.

Before a general meeting of the FUG, the members are informed about the agenda and the issues which are going to be discussed, but they are not consulted about it or asked whether there are other issues they would like to include. Most of the members have no idea or interest in what is in the forest management operation plan. Their concern is rather with the decisions on the use of money that flows from the forest management activities. Many members stated that most of the decisions taken by the executive committee relate to community development investments such as schools, road and embankment construction, installation of water taps, training for income generation activities such as bee keeping, stitching, goat and pig farming, and individual loans for biogas construction. By no means all of these decisions are discussed in the general meeting of the FUG, and it is the executive committee that controls what is on the agenda of these meetings.

It is perhaps not surprising then that attendance at these meeting is low, and many people leave the meeting early. Most of the poor members say they do not fully attend the meeting for two reasons: firstly, as already mentioned, because the important decisions are made without any consultative meeting beforehand, but also secondly because the meetings are long: they waste one full day's work, meaning that poorer members have to go to bed without food. One poor man from a marginalised group commented that the meeting date is pasted on the executive committee's office board but that he does not participate in any meeting called by the executive committee since it does not solve his livelihood problem, on the contrary, it makes life more difficult. For example, members of the FUG have been prohibited from fishing. Earlier they used to fish in the river for free but after the area was incorporated within the community forest, the executive committee has barred them from this activity, to protect the aesthetic view of the river. As for women: when asked why they did not attend the meetings, most of them responded that they do not like to attend the meeting because they sit at the back and don't hear what is being discussed and even if they put forward some ideas for discussion, their agenda is ignored. The result is that these "weaker groups" are little exposed to new information and knowledge in forest management, a fact which has been noted by other researchers in Nepal. (Neupane, op.cit.).

6. Distribution of the forest products

Power relations are crucial within community forestry because in many user-groups it is the socially dominant individuals who are influential within the management

committee, yet it is believed to be the more marginalised members who are more dependent on forests and harvest the majority of the forest resources (Nightingale, op.cit.). All members pay membership fees and collection fees for forest products. In Baghmara BZCF the members are allowed to harvest firewood twice annually, and this is usually done during the big festivals (*Dasain* and *Maghi*). For every 100 kilos of firewood a member has to pay 50 rupees. On the other hand, grass and fodder may be collected throughout the year and there is no fee attached to this activity.

In the case study area, it seems that firewood collection is carried out by both better-off and poorer families, although some poor families sell part of their share to middle class and wealthy members. Other studies in Nepal indicate that the better off families may in fact be collecting much more firewood than poorer families (Neupane, op.cit.). However in Baghara some women from poor and marginalised groups commented that they are unable to pay the collection fee as they don't have enough money. A few claim that that the Chief Warden of the Park has instructed committee members to distribute firewood free of cost to the poor members but that the committee has not done this. A number of women of the Musahar tribe say that although after paying the fee they are allowed to go inside the forest to collect firewood like all women members of the FUG, their group is instructed not to collect large branches, while women from more affluent groups collect large branches with impunity. If they are caught with larger branches, then the committee people reprimand them, and tell them they have to pay extra money. This is despite the fact that they do not have sharp sickles and are thus unable to cut as much wood as the high caste women. Their men folk cannot afford the time to collect wood because they have to go to work. Two days of patrolling and other forest work is obligatory for all male members, who in return are allowed to take a load of firewood on those days, but according to informants of the Musahar tribe the amount of firewood allowed is so little that it hardly lasts a few days for a large family.

Although grass and fodder may be collected throughout the year, and no fee is charged, even this does not always result in an equitable distribution. Unlike other groups, the Musahar do not gather fodder from the forest, since they do not possess cattle. Since fodder is, in term of volume, the major non-timber product of the forest, and given their complaints about the way they are hindered in firewood collection and fishing, some Musahar women are beginning to question whether it is worth being a member of the FUG at all. Yet the Musahar are the most vulnerable group in the whole community and depend more than any other group on natural resources. Evidently, the regulations and system of fees that have been introduced by the FUG are not really conducive to participation by this group, and create asymmetry in the sharing of resource benefits. It seems that even after ten years of operation, the Baghmara FUG is unable to address this problem.

7. Distribution of other benefits of forest management

Apart from firewood and fodder, which are direct products, considerable income is derived from the forest from the sale of timber, from the collection fees, from eco-tourism, and from funds from other organisations. For example, in 2006 Baghmara BZCF was awarded the prestigious King Gyanendra Nature Conservation Award, with prize money of 100,000 rupees, by the Royal Nepal Academy of Science and

Technology (RONAST), for contributing to sustainable development by promoting eco-tourism and conservation of biodiversity through community forest management.

These funds are used to support a variety of community development projects. Many of these are of a general nature and in principle benefit the village as a whole (road improvement, embankments, schools etc), but others are targeted towards individuals, in particular the projects for training in income generation activities. These include bee-keeping, seasonal vegetable farming and animal farming. In addition, financial support is given to individual families for construction of toilets, rice husk stoves and biogas plants, in the form of loans.

These benefits do not reach all families equally. The Musahar women mentioned that they have not received any kind of training, only few are enrolled in adult literacy classes. In any case they do not have sufficient money to start any micro enterprise and cannot raise animals as they do not have land. So although the programmes devised by the executive committee are intended for poor and marginalised women, they are often in practice of little relevance to them. Most of the training sessions and workshops are in fact attended either by the wealthy or the middle class groups. "Weaker groups" are unable to attend as they are day labourers, and their families will go hungry if they miss a day's work (the workshops generally provide a meal for the participants, but the families of these participants of course do not get fed). One woman member of the executive committee explained that they try hard to bring poor and landless people into income generation training but they do not come. Most marginalised people, the poor and particularly poor women indeed leave their houses early in the morning to work as labourers in the road or building construction industry in the city and return home only after dark.

As regards the issuing of loans for the purchase of equipment, particularly for biogas, the "weaker groups" say that they do not benefit at all. The research showed that biogas is mostly installed in wealthy and middle-class houses, which is not surprising as the loan only covers part of the total cost, and only these families are able to pay the extra money needed for the installation. Moreover, it is only the wealthy and middle class that have enough cattle to supply dung for a biogas plant, and can afford to stall-feed them close to the house, which is necessary for transferring the dung to the biogas plant. The poor have fewer (or no) cattle, and lack the space to build stalls close to their houses, and the time to gather fodder for stall feeding. The poor do not take loans for other equipment such as toilets and husk stoves because they do not have any collateral and in any case they often have difficulty paying back the interest.

From this one can conclude that distribution of the benefits of the community forest management effort are not equally distributed within the community. It is not necessarily the case that this mal-distribution is deliberate on the part of the FUG and its executive committee, although the exclusion of the Musahar people does seem to indicate on-going bias. It is more that there is deep-rooted, structural inequality within the village already, which is very difficult to overcome. Indeed it would be very surprising if a single programme like community forest management were able to totally change these economic and social relationships, although recognition of the problems, and efforts to design community forest management procedures which take them better into account, could certainly be improved.

8. The fate of carbon funds in the future

If the local community were to be rewarded in financial terms for the carbon saved as a result of their forest management, would principles of equality hold, and would the poorer and less powerful part of the population, and women, benefit at all? The preliminary findings from the case study in Baghmara Buffer Zone Community Forest as regards the current distribution of benefits indicate that particularly as regards financial benefits, it is the richer parts of the population who gain most, even though most of the poorer people (Musahar excepted), and women, get a fair share of the products in terms of fodder and firewood. This outcome is not surprising since it is the men of higher caste and income that get to make the main decisions, despite the idea that the FUGs are supposed to be run on democratic lines. Whether this pattern would be repeated if a greater financial reward is entered into the system through sale of carbon sequestered or deforestation avoided, is not entirely clear. For example, one of the main reasons why the richer families benefit is because they are able to take loans for certain equipment from the community forestry fund; they have the means to match loans and collateral against the repayment. If money for carbon were not handled in the form of loans but (at least in part) distributed to members directly as an annual payment, then this problem should be overcome, and indeed the poor people would stand to earn a welcome, if small, additional income. It remains to be seen whether rules on membership would be tightened to limit membership in some way, if the financial rewards from carbon credits were considerable. At present membership is all inclusive. All this implies is that if equity goals are to be taken seriously, some serious consideration needs to be made regarding how the whole system of rules and procedures for internal payment of carbon services is to be designed, and that particular attention needs to be paid to how the needs and rights of the "weaker groups" will be guaranteed.

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Chapter 8:

Mechanisms and Means

by
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1.Introduction

The case studies presented in chapters 2 to 7 have demonstrated that small scale, low key forest management by local communities may be an effective way of reducing rates of degradation and increasing the rate at which natural forest is able to sequester carbon. They have also shown that a large part of the benefits could reach poor rural communities, if not always the very poorest within these communities. The values we have estimated for the carbon stock increases (based on a value of $2 per ton CO_2) are in the order of $8 to $24 per hectare per year, depending on the re-growth characteristics of the forest. This refers only to above-ground biomass and only to sequestration. If below-ground biomass and changes in the litter and soil layers were to be included, the values would be higher. Moreover, if the rate at which the forest would have degraded in the absence of community management is included, the carbon savings would be higher again, depending on the baseline rate of degradation that is assumed. The sequestration growth will at some point reach a maximum stocking level, but since the management puts a stop to degradation processes, at least part of the carbon gain could be reckoned to be additional in the long term. If forest resources are continuously and sustainably harvested, for example for firewood, the sink function will continue in perpetuity.

2. In what situations can forest management for carbon compete with other land uses?

The sites which were selected for this study are all in places where historically, degradation is the main process by which forest carbon was being lost. These are zones of rather low land value, where there is no obvious competition for alternative land use such as agriculture, because of the terrain, infrastructure such as irrigation, or because of the distance from markets. In such areas, the opportunity costs are low, and a small reward for carbon stock increase or for reduced carbon emissions may represent an attractive financial opportunity. In zones close to cities or in areas of high agricultural potential, there is more likelihood of wholesale land clearance (deforestation), and the value of carbon is probably not sufficient to counteract these processes.

The areas studied were all also managed by communities, rather than individual landowners or land users. This means that the unit forest size is in the range of 50 to 600 hectares, an area in which carbon stock can easily be measured and monitored by two or three people in two or three days. This offers considerable economies of scale

over individual landholdings, where each individual would have to be trained, or for each of which a special arrangement would have to be made to carry out the stock assessments. It is also the case that forest degradation is related to uncontrolled community land uses (open access behaviour) while deforestation is more likely to be the result of individual land management decisions, as for example in the Amazon frontier where individual settlers (legal and illegal) move in and clear forest for pasture or for cropping, and the West African rain forest belt where timber companies may (legally or illegally) engage in clear felling. Thus there are several reasons why community forest management is particularly well placed as regards crediting for reduced emissions from degradation.

3. Local transaction costs of measurement: hi-tech equipment in low tech situations

The case studies have also demonstrated the utility of handheld computers with GIS/GPS equipment which make possible accurate mapping of the forest areas and which facilitate the storage of data on carbon stock. This seemingly 'high-tech' approach was found to be very suited to the local conditions, and village people with only a few years of primary education were able to use it after only a day's training (most of them were quite experienced in using mobile phones, which, anno 2006, are common even in the most remote villages). Indeed, local people were quick to recognize the power of such a mapping system and the additional uses to which it could be put (resolution of boundary problems with neighbouring villages etc).

Of course, maintenance of the equipment is another matter, including recharging of the computer batteries (most of the villages were off the grid), scanning into the computer a suitable basemap, and setting out the sampling plots. For these activities it is clear that an NGO or private sector organization with some technical expertise is essential. Given this, and the cost of the computers (about $500, with a similar amount for the software) it is also clear that if the carbon stock change assessments are to be made in a cost effective manner, community forests would have to be clustered into groups, with an NGO or umbrella organization with one set of equipment assisting in perhaps 20 or 30 such forests. Under this assumption, the local transaction costs might be as shown in table 8.1 below:

Table 8.1 Net financial benefit after deduction of local costs

Item	Assumption	$/hectare/year
Purchase cost of computer and associated equipment	One set at $1000 for 25 CM forests each of 100 ha; machine life two years	$0.20
Personnel costs	Average of years 2 and 3 (see table 4.2 in chapter 4)	$2.5
Total		< $3
Typical CO_2 gain	8 tons, at $2 per ton	$16
Net financial benefit		Approx. $13

More conservative costs estimates as regards the computer equipment (for example, assuming the hardware has a life of only one year) hardly affect the overall outcome of this calculation.

4. Financing the carbon

If community forest management is to be employed as a means for reducing emissions from deforestation, and particularly from degradation, in developing countries, then mechanisms to support this will be required, of which financial mechanisms will play a central role. There are issues as regards both international channels for finance and local channels for finance within the countries concerned. Here these are considered from the point of view of community forest management and how such communities could be rewarded for involvement in reducing emissions from deforestation.

4.1 *International finance mechanisms*

At the international level, two distinct modes for finance of 'reduced emissions from deforestation' are under discussion, although some combination or hybrid would be possible. The first draws inspiration from the Kyoto flexible mechanisms, and might be placed under the Kyoto Protocol through amendment or in a re-negotiated agreement relating to the second commitment period, which is expected to cover the years 2012-2017. In this approach market mechanisms are central; carbon credits are issued per ton of carbon emission reduced or sequestered, and in principle payment is made ex-post on the basis of this output. The idea is that these can be used directly to meet Annex 1 emission reduction goals.

Within this general model of finance tied to carbon credits, there could be two possible ways in which this could be organized: either at a project level, as in the current CDM, with a project specific baseline representing the 'business as usual' rate of deforestation, or at a sectoral level, as in the proposal for 'Compensated Reductions' (Box 1), in which a non-Annex I Party voluntarily accepts a national level target as regards emissions from deforestation, and the baseline is based on national rates of deforestation in the recent past. Either way, any reduction in the observed rate of deforestation compared to the baseline would be translated into tons of carbon, which would have to be verified and certified in some way before they can be sold. The important difference between these two versions is that in the first, the actors on the ground who are responsible for the reductions are directly involved in the deal, as with any CDM; in the second, the marketing deal is with the nation state, and nation state itself would decide how to distribute incentives or payments to encourage the actors on the ground to cooperate in reducing deforestation, or in what other ways the funds generated were to be used.

The second, quite different model for international finance is more in line with a traditional ODA approach to forestry. Financial assistance could be pledged to support efforts to counter deforestation, with a view to reducing emissions but without a direct or quantitative link to the number of tons of carbon saved, and without a direct link to the Annex 1 reduction targets. Such an agreement might fall directly

under the UNFCCC rather than the Protocol, or indeed under another international agreement relating to forestry. Funds would be made available by Annex 1 states to support technical assistance and training, forest monitoring and inventory work, and other development activities with a view to helping developing countries implement policies and measures to effectively counter current rates of deforestation and degradation.

There are of course advantages and disadvantages relating to each of these models, which are much under debate at the moment. Many observers feel that ODA funds for forestry have had limited effectiveness as regards reducing deforestation in the past. Moreover they fear that if this model is used, the ODA payments will remain voluntary and not be forthcoming in large enough amounts to really change the current situation. It can be argued that only if payments are linked to legal and obligatory targets (as is the case with carbon reductions under the Kyoto Protocol) will there be sufficient pressure on Annex I countries to contribute the funds that would be required, rather than just making token payments. There is also the understanding that a market system will be the most efficient in selecting the most economical carbon mitigation opportunities. On the other hand, the causes of deforestation and degradation are not simple; they result from combinations of many different factors, many of which cannot be tackled directly or individually. A holistic, developmental approach which provides opportunities for alternative livelihoods may be the best way to deal with the problem, but to relate this directly to observable reductions in emissions could be very difficult indeed, given the many drivers and causes at work, and the variations in this in different parts of the world and indeed in different parts of any country. It can be argued therefore that it makes little sense to fund reducing deforestation on the basis of simple carbon output.

Proponents of the market-based approaches take the view that the only means to stimulate real and sufficient investment by Annex 1 countries is to tie this to performance and to binding caps of some sort. The current reduction quotas (average of 5.2% reductions over 1990 emissions) were negotiated before deforestation was considered as a CDM option, and clearly if reducing deforestation were to be admitted as a mitigation option in a Post-Kyoto regime, these caps would have to be re-negotiated, otherwise the market value of carbon would be threatened. Some have proposed that there should be a two target system, one for reductions in fossil fuel emissions, and a separate, but equally binding one, for bio-carbon emissions, including those from deforestation (Grassl et al. 2003).

The advantage of carbon credits tied to projects is that the savings can be pinpointed easily to particular project activities and investments, as in any CDM arrangement. The major disadvantage and difficulty of including deforestation under the CDM approach is that it is very subject to leakage, through displacement of the deforestation activities to other sites, which is virtually impossible to avoid and very difficult to account for. For that reason a national approach in which the average rate of deforestation over a whole country is measured, rather than individual sites, is much to be preferred (as in, for example, the Compensated Reduction approach). This could, where necessary and sensible, be modified to refer to particular regions within a country. It could in principle also be expanded to cover a multi-nation region (to account for cross-border leakage which is common in many places) although this

would make for a more complicated international agreement as regards sharing the credits.

4.2 *Finance mechanisms at the national level*

Whichever of the two basic models is eventually selected – a market based, carbon credit system or a system of greatly increased ODA financing to the forestry sector, focusing on reducing deforestation – there remains the question of how such funding is deployed within the country itself. It is noted that many non-Annex 1 countries have had considerable difficulty in controlling rates of deforestation in the past, not least because of increasing demand for timber products globally, but also because of internal pressures and competition for the use of land. In many cases the economic rent on retaining forest is so much lower than the potential rent from other activities that it is virtually impossible to prevent such shifts. This has of course a lot to do with the fact that the 'true' value of forest (its long term, environmental, intrinsic, and global value) is not reflected in the market system which drives such clearance.

Policy mechanisms that can be used to control deforestation and degradation of forest within a country fall into three general categories, in common parlance referred to as 'sticks, carrots and sermons'. 'Sticks' are punitive measures designed to discourage activities leading to loss of forest; they include fines and other punishments for those who infringe laws and regulations designed to protect it. 'Carrots' are positive incentives such as payments for environmental services, or other rewards for not destroying forest. 'Sermons' refers to a wide range of informational activities which in different countries may be referred to as 'raising awareness' or 'education' of local people about the value of forest, or 'motivating' people to reduce their forest-destructive practices, through persuasion. Naturally, forest policy can rest on a combination of carrots, sticks and sermons.

Finance is required for measures in each of these categories, as well as to monitor closely the actual situation as regards deforestation/degradation. Clearly, whatever the package or mix of measures selected, some finance will be needed centrally to pay for the overall management and for activities that need input from the centre, while other finance will need to be distributed, particularly in the case of 'carrots', but also for the implementation of measures of the 'stick' and 'sermons' sort. The appropriate balance will be different in every country. Table 8.2 gives a sketch of some of the possibilities. Here it is important to consider deforestation separately from degradation, since the two processes may have quite different drivers, as discussed in chapter 1, and thus may require quite different counter-measures. Apart from other reasons, as already noted degradation often needs to be tackled through an organization at community level, since it affects the common property resources, while deforestation may be more often associated with individual or state land holdings and would need a different organizational approach.

4.3 *Finance mechanisms to local community level*

Most measures employed by states in the past have not made the distinction between deforestation and degradation and have generally been of the 'stick' or 'sermon' type, but there is currently a movement which is suggesting that 'carrots' might be more effective, at least in some combination with these more traditional methods. These could be targeted at local communities who are engaged in forest management, as well as individual forest land owners in some cases. Particularly for the case of degradation, there is a good case for Payments for Environmental Services (PES) as a tool which can be used at national level, with countries such as Costa Rica and Mexico experimenting with payments to local communities and land owners for water, carbon and biodiversity services.

Table 8. 2 Examples of measures for controlling deforestation and degradation

	Measures which directly affect or involve local land users/civil society			**Measures typically to be carried out by central authorities in support of overall policy**
	'Sticks'	**'Carrots'**	**'Sermons'**	
Monitoring of:				
deforestation				Remote sensing imagery analysis and maintaining national level statistics
degradation		Local communities and/or NGOs paid to do regular forest inventory		Compilation of locally gathered statistics for national database
Slowing rates of:				
deforestation	Rapid and effective reporting on infringements; strong enforcement of fines etc; introduction and enforcement of strict fire codes; effective local forest courts	Subsidies for retention of forest cover on private land; subsidies for SFM practices; support to whistle-blowers who report infringements; stimulation of alternative employment opportunities/ intensified agricultural practice.	Campaigns (eg on sustainable forest management) by environmental NGOs/local government Coverage of cases by media	Support to local forest departments: patrols and reporting systems; support to overall land-use planning and inter-ministerial coordination; finance for NGOs/civil society campaigns
degradation	Effective fencing and patrolling; enforcement of extraction rules by forest guards; effective local forest courts	PES systems for local communities and individual farmers; support to wood-energy saving technology	Campaigns by environmental NGOs/local government	Finance for local PES

A nationally organized, internal payments-for-carbon-savings-system could offer financial incentives on a project basis ('internal CDMs' - payment per ton of carbon

saved) to communities or individual landowners who are engaging in forest management to reduce degradation, yet could derive the finance from international financial mechanisms which are based on a sectoral approach (compensated reductions). This would imply that the state would set the internal rules and the procedures according to local norms and modalities, and do all the monitoring internally, yet the carbon reductions could still be traced to a particular project being carried out by a particular local partner, as in a CDM project.

Such an approach would have the advantage of transparency, and thus increase confidence of the international market in the validity of the carbon; moreover, there are undoubtedly many international carbon buyers who would require information on the origin of the carbon, because they have an interest in the knowing that the carbon sequestration is also benefiting the local people, and is not being produced in such a way that they loose their livelihoods, which is a fear that many hold with regard to afforestation and reforestation CDMs.[7]

Such a system could only be employed in areas where communities operate as communities and have the mandate and the ability to organize themselves effectively to manage forest, or alternatively where individuals are legally owners of forest land and have the option of managing it for carbon rather than, or in addition to, other products. This tends to be the case in areas which have a long history of settlement and where population pressure and lack of alternative production potential are driving people to degrade forests to supplement their income. It is much less the case in so-called forest frontier zones where forest is being opened up for the first time: here, deforestation is a greater threat than degradation and the opportunity costs are high. Thus an 'internal system for CDM for avoided deforestation' could only ever form part of a total national approach. Nevertheless, this form of carbon payment to communities for avoidance of degradation could become one very interesting sector of an overall national programme on the lines of 'compensated reductions'.

Another area in which local communities might be directly involved is in monitoring. In most non-Annex 1 countries, national data on deforestation is poor and unreliable, and data on degradation rates is completely unknown. As the case studies in this booklet show, local communities are well able to make accurate forest inventories themselves, with minimal training, and if these are repeated at intervals to establish rates of change. In a system in which rates of deforestation, and particularly degradation, need to be carefully and reliably monitored so that the state can claim compensation for carbon emission reduction, up to date local level data is going to be essential. It is clear that even if deforestation rates can be established from remote sensing imagery (and this is still in dispute), loss of carbon stocks due to degradation can only be reliably measured at the ground level. Thus there is a necessary role for local monitors, and, as our research shows, this role can easily be taken on by local people with very low levels of education. Their payment for such work would be a necessary part of the transaction costs associated with certifying the carbon credits claimed.

[7] There are fears in some circles that afforestation and reforestation under CDM will lead to alienation of land which would otherwise be under cultivation by local people, and that it may produce monocultures which may be disadvantageous to the local environment.

5. What type of credits for reduced emissions from degradation?

At present, afforestation and reforestation carried out under the CDM are rewarded with temporary carbon credits (tCERS or lCERs)[8] rather than CERs, which are issued to energy projects. Temporary CERs have a life of 20 or 30 years, at the end of which the purchaser has to replace them with others. The reason for this is that tree plantations (new sinks brought about by sequestration) are inherently non-permanent, and could reverse. Not only is there a risk that they will disappear (through fire, or illegal cutting), but at the end of the life of the trees, the carbon will in any case be released into the atmosphere. Since they have a short life and have to be replaced, temporary CERs have a much lower monetary value than CERs. Depending on the discount rate applied and their life length, their face value is likely to be 15-30% of regular CERs. If REDD is to be credited under a market based system like CDM and using temporary CERs, it is clear that the financial incentive to communities and landowners to maintain forest, will be much reduced.

Many negotiators in the climate policy process have assumed that all bio-carbon related options should be credited with temporary credits. Conceptually however, reduced emissions from deforestation or degradation (REDD) are not of the same category as afforestation and reforestation projects: they do not create new sinks, but reduce emissions, just like energy conservation and renewable energy. Renewable energy that substitutes for fossil fuel is rewarded for the tons of fossil fuel carbon that it displaces, because it slows down the rate at which fossil fuels are mined or pumped up from underground. Measures to reduce emissions from deforestation and degradation are analogous to this. They slow the rate at which forest biomass is converted into atmospheric carbon. Every year in which these emissions are reduced is a gain in terms of climate change. The fact that a forest not cut this year, might be cut next year, does not make the saving a temporary saving, any more than a ton of coal underground that is not mined this year, but could be mined next.

There is therefore a strong case that REDD, as carried out for example by community carbon forestry management, should be credited using CERs and benefit from their higher market value.

6. Conclusions

This chapter has attempted to elaborate on a number of mechanisms and means that could be used to support community carbon forestry as a carbon mitigation option or REDD strategy, and to conserve tropical forests which are gravely threatened in many places. It has not been comprehensive – for example, it has not considered methodological issues such as the question of how baselines can be determined, nor of what the non-local transactions are likely to be (including, for example, the costs of establishing a national or regional baseline) - but it has touched on a number of topics which are less frequently discussed, such as the idea that degradation of community forest, particularly on low value land, is probably much more amenable to carbon crediting than deforestation by individual landowners. It has discussed different ways

[8] tCERs are temporary Certified Emission Reductions, with a life of 20 years (but can be renewed twice); lCERs are long-term CERs, which have a non-renewable life of 30 years.

in which international finance could be harnessed for REDD activities, and the problems that this brings up at the national and local level as regards distribution. It has also touched on the question of what type of credits would be most appropriate for initiatives that result in reduced emissions from forests in non-Annex 1 countries. All these issues need to be discussed in much more detail in the course of the development of international policy.

One point however stands out clearly, and that is that community forest management is a cost-effective and socially responsible way of mitigating carbon emissions, and particularly appropriate as regards emissions from tropical forest degradation. Commnity forest management brings with it a raft of other benefits, both ecological and social. Crediting the carbon from community forest management could provide a new means of livelihood for some of the most poor and marginalized communities on the globe, and help poor countries participate in the international climate change regime in a meaningful way. The international climate policy making process needs therefore to take serious account of it as one of the future options for combating climate change.

Box 1 Compensated reductions

Compensated Reductions is an approach that was first proposed by a group of researchers at the Instituto de Pesquisa Ambiental da Amazonia (Brazil) as a means of allowing crediting of carbon from avoided deforestation in non-Annex 1 countries. This basic principle is currently under discussion by Parties to the UNFCCC. Taking as the baseline the average annual national rate of deforestation over the 1990's, they propose that developing countries may elect to reduce their emissions from deforestation during the five years of the first commitment period. They would be entitled to issue certificates for any such reductions, with the support of relevant multi-lateral bodies, and these certificates would be eligible for sale on the international carbon market. They would thus receive finance compensation for the emissions avoided, calculated on the basis of an areal measure of forest times some factor representing the carbon stock per hectare. The strategy for achieving progressive and consistent reductions in deforestation would be entirely the responsibility of the country itself, and would combine law enforcement and the promotion of sustainable activities.

Moutinho et al. (2005)

References

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