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CHAPTER 27

CONSTRAINTS FACED BY COMMUNITY MANAGED FORESTS IN QUALIFYING UNDER THE KYOTO PROTOCOL

By

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ABSTRACT

Forest land use plays a significant role in stabilizing the accumulating concentration of carbon dioxide in the atmosphere, so the Kyoto Protocol calls for incentives for projects that will store carbon, such as afforestation and reforestation. The estimation of carbon in community managed forests illustrates that these kind of forests are mainly young and emerging as viable carbon pools, and if permitted for carbon offset projects, they could attract substantial foreign investments in addition to the revenue generated currently. But when it comes to claiming payments for the biological sequestration of carbon, community managed forests like those in Nepal cannot qualify as sink projects and receive carbon credits under the Clean Development Mechanism (CDM) of the Kyoto Protocol primarily due to issues related to the establishment of baselines, leakages and additionality.

Keywords: carbon sequestration, Clean Development Mechanism, community forest

INTRODUCTION

The Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) identified carbon sequestration, carbon conservation and carbon substitution as three forest management strategies to effectively reduce CO_2 concentrations in the atmosphere (Kauppi & Sedjo 2001; Bass *et al.* 2000). These strategies include activities such as afforestation, reforestation, mitigating deforestation, protecting and expanding forest area, increasing use and lifespan of wood products, and using wood products as biofuels and as construction materials. In the long run, uses of forest products to substitute fossil fuel and carbon-intensive building materials from a sustainably managed forest can also be an efficient strategy (Watson *et al.* 1996). In the Kyoto Protocol (KP), Article 12 on the Clean Development Mechanism (CDM) covers afforestation and reforestation activities only (Aukland *et al.*, 2002; UNFCCC 2001). The KP came into force in February 2005 and Nepal became a Party to the Protocol seven months later. The CDM is a flexible mechanism whereby non-industrialized countries like Nepal can participate in the KP. By creating markets for carbon credits, CDM can generate private sector investment from Annex I (developed) countries towards climate-friendly projects that may not otherwise take place in developing countries (Yamin & Depledge 2004). Given the fact that public sector spending on conservation is experiencing global cut backs (Koziell & Swingland, 2003), CDM can be viewed as an incentive for afforestation and reforestation activities, especially in the resource-scarce non-industrialised world.

Important reasons for the inclusion of forests in the Kyoto Protocol include:

- Reducing carbon emissions, as it is estimated that 20% of the increase in GHG levels is contributed by deforestation and degradation of forests (Bishop & Landell-Mills 2002).
- Being cost effective in comparison with other carbon sequestration methods (Kauppi & Sedjo 2001).
- Providing the potential capacity to store large volumes of carbon as huge historic losses have occurred from terrestrial ecosystems (Upadhya *et al.* 2005; Kauppi & Sedjo 2001).
- Opening up a 'virtual' market for carbon as a non-timber forest product (NTFP) where previously forest products had no linkages with markets (Skutsch, 2004), thereby contributing to the development of Payments for Environmental Services (PES).
- Improving soil fertility, ecosystems and biodiversity which in turn leads to other benefits (Janzen 2004).
- Enhancing livelihood options for the poor communities that are dependent on forest resources.
- Providing an adaptive strategy to cope against adverse effects of climate change.

COMMUNITY FOREST PRACTICES IN THE NEPAL HIMALAYA

Community forests play a prominent role in the hills of Nepal where agriculture, livestock rearing and forest are strongly interlinked (Gilmour & Fisher 1991). To mitigate the growing deforestation and deteriorating state of the forest all over the country, the government of Nepal established a policy based on the 1976 National Forestry Plan to involve local communities in forest management. As of 2004 about 25% of the total national forests covering around 1.1 m ha were being managed by Community Forestry User Groups (CFUGs). The more than 13,000 CFUGs in the country are spread across 1.4 million households (about 35% of the population) (Kanel 2004). The bulk of this population lives in the hilly regions of Nepal. The Federation of Community Forest Users Nepal (FECOFUN) has over the years become the largest civil society 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 (Mikkola 2002; Springate-Baginski *et al.* 1998 cited in Acharya & Sharma 2004). Numerous degrading ecosystems have improved due to decentralized and participatory development strategies (Banskota 2000). Communities have easier access to firewood, timber, fodder, forest litter and grass (Kanel 2004; Acharya 2003 cited in Acharya & Sharma 2004). Soil erosion has been mitigated and water sources have been conserved in such areas.

While members of the CFUGs pay a nominal fee for the various forest products they consume, these products earn a much higher price when marketed by the CFUGs. While timber and fuelwood are the two most extensively demanded domestic products, communities also market some timber externally (Kanel 2004). The estimated monetary value of timber extracted (NRs. 1.27 billion ≅ US$ 18 million) by the communities is higher than the value of fuelwood (NRs. 0.39 billion ≅ US$ 5.5 million), although in terms of the volume, fuelwood extracted is about three times more than the harvested timber. Revenues collected by the community from the members are often invested in social infrastructures that are demanded by the community members (Kanel 2004). Part of the revenue (about 28%) is also used for forest protection and management.

FORESTRY UNDER THE KYOTO PROTOCOL

Forests play a significant role in climate change as they emit as well as sequester carbon dioxide (CO_2). Trees absorb atmospheric CO_2 for their growth and increase the carbon content in the soil as well. Revitalizing degraded forest lands and soils in the global terrestrial ecosystem can sequester 50-70% of the historic losses (Upadhyay *et al.* 2005). Forests play a profound role in reducing ambient CO_2 levels as they sequester 20 to 100 times more carbon per unit area than croplands (Brown & Pearce 1994). Currently under the KP framework only two forestry activities, namely afforestation and reforestation, are eligible for support. These activities fall under the flexible CDM mechanism described in Article 12 of the protocol and are designed to assist non-Annex I countries in achieving sustainable development and to assist Annex I countries in achieving compliance with their quantified emission limitation and reduction commitments (UN 1997).

However, experience, has shown that many communities in developing countries have transformed unsustainable management of existing natural forests to sustainable management, under a variety of community-based forest management (CBFM) programmes and policies. The community forestry example in Nepal is an outstanding example. This type of management results in additional carbon sequestration through reduced emissions from deforestation (i.e. avoided deforestation). Payment for carbon services may tip the balance in such cases and provides the incentive for many more communities to practice CBFM. Such multipurpose CBFM serves sustainable development goals, and provides on-going income opportunities for poor communities and other benefits. One reason for not recognising the sink capability of CBFM has been the difficulty of measuring the carbon saved and the supposed high transaction costs involved in employing professional scientific methods. A solution to this problem is to find techniques which can partially be carried out by communities themselves at a much lower cost, and to demonstrate that these are as reliable as ‘expert’ methods.

MEASUREMENT OF CARBON IN COMMUNITY MANAGED FOREST

Research Sites in Nepal Himalaya

In order to illustrate the role community managed forests can play in biological sequestration of carbon and to analyze the constraints they face in complying with the KP, three community-managed forests were specifically selected at different altitudes in the Nepal Himalayan belt for assessing their carbon pool levels and for testing the recommended methodology for carbon estimation. The three sites were in Ilam, Lamatar and Manang (see Table 1). The community-managed forest in Manang is the largest but the area is also very sparsely populated and has a low species density, due to its high altitude. The other two regions, being at a lower altitude, are both more densely populated and the forests have relatively higher species density.

To estimate the carbon pool in the forest, only the above-ground biomass of plants >5 cm diameter at breast height (dbh) only was included. Other carbon pools such as carbon in below ground biomass, soil organic carbon, carbon in herbs/grass and litter and in trees <5 cm dbh were not included.

The forest inventory methodology was based on MacDicken (1997), which was recommended in the good practice guide for carbon inventory in forest (IPCC 2003). The steps in the methodology included: 1) forest identification; 2) boundary mapping and stratification; 3) pilot survey for variance estimation; 4) calculation of optimal sampling intensity; 5) executing inventory; and 6) data analysis.

Carbon Sequestration in Community Managed Forests

Carbon measurements have been conducted for two consecutive years in sample plots in Ilam and Lamatar. The second year data collection will take place in Manang as soon as the winter snow has melted. The results of the carbon measurement in the three sites are presented in Table 2 along with the estimated carbon sequestered by the community forests in Ilam and Lamatar.

The per hectare biomass is inversely correlated with altitude of the sites, with Ilam (lowest altitude) recording the highest biomass per hectare and Manang (highest altitude) recording the lowest. The second year data for Ilam and Lamatar show marginal increment in the biomass growth. The 47ha community forest in Ilam sequestered almost 50tC at the rate of 2.10tha^{-1} biomass growth, while the 96 ha forests in Lamatar sequestered about 122tC at the rate of 2.54tha^{-1}.

Although the annual biomass increments are small, they nevertheless are important as they indicate that these forests managed by the community are not degrading and demonstrate environmental additionality. Even the small increment is significant, because these naturally regenerated forests are also harvested for fuelwood, timber, fodder and NTFPs by the local people to meet their subsistence needs.

Sustainable management, harvesting, and utilization of forest resources assist in the management strategy of carbon sequestration, carbon conservation and carbon substitution (Bass *et al*, 2000). For example, when using biomass energy from a sustainably managed forest, there is no net carbon emission as CO_2 released in combustion by using fuelwood is compensated by CO_2 sequestrated during regrowth (Watson *et al.* 1996). The small amounts of carbon sequestered per ha by the forests also indicate the reduced emissions from deforestation. This sequestration therefore scientifically qualifies these community managed forests to be viable carbon offset projects.

If community forests could qualify under the CDM for carbon trading, then carbon sequestration would be an additional forest product or a non-timber forest product that could accrue financial benefits to the local CFUG. Field plots shown on Table 2 illustrate that on an average two community managed forests can sequester around 1.16tCha^{-1} per year after subtracting forest harvested for fuelwood, timber, NTFP, fodder and grass, and excluding below ground biomass and soil organic carbon in carbon calculation.

If the above carbon sequestration results were applied to the 1.1m ha of forest managed by CFUGs, the net CO_2 sequestration for the country from community forest would stand at about 1.28mtC per year. At US$ 5 per tC, this would be valued US$ 6.4 million per year, worth 27% of what is currently generated from timber and fuelwood (US$ 23.5 million). Given the dearth of funds in rural Nepal, this fund could provide an impetus for more effective management of forests, as well as an incentive for communities to bring more forests under management and better conservation. This additional revenue from carbon credit that may be generated is equal to the amount expended currently on forest management and protection.

Community forest management is actually about avoiding deforestation. After the handover of the forest management to the local communities from the state, local communities themselves started protecting the forest which regenerated naturally. The state of the forests is better understood by examining the dbh class distribution as illustrated in Table 3. Nearly 3/4 of the trees in Lamatar and about a half in Ilam have dbh between 5 to 10 cm, indicating a relatively young forest. Despite the forest in Manang being much older, with over 40% of the trees having dbh between 21 to 50 cm class, the forest still retains about 14% of the trees having dbh > 41 cm indicating relatively a rich forest ecosystem.

The community in Manang, more than two decades ago, mobilised themselves to check the ongoing deforestation. This community forest in Manang consists of naturally regenerated forest through the application of stringent local norms in forest protection.

Lamatar and Ilam forests were also severely deforested as both these forests were linked with roads and in the vicinity of a growing population that had an increasing demand for forest resources. Forest protection only started after the formal handover of the national forests by the government to local communities in the 1990s. Community forest management therefore is viable even without Kyoto; but making community forests eligible for support under the KP would provide additional economic incentives that could enhance the success of the approach.

DISCUSSION

Policy Constraint: Reduced Emissions from Deforestation not Included

In the first commitment period (2008 to 2012) of the KP, only afforestation and reforestation (AR) activities qualify as carbon sink projects. Afforestation is the direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land. Reforestation is the direct human-induced conversion of non-forested land to forested land on lands that did not have forest before 1990. In other words, during this first commitment period neither the community forests such as those in Nepal quality as carbon sink projects nor the reduced emission from deforestation (i.e. avoided deforestation) are recognized.

Some fear that permitting avoided deforestation could lead to a market glut, with carbon credits forcing the price so low that eventually CDM might be counterproductive (Trexler 2003). If the credits are cheap enough, Annex 1 countries could meet a large part of their reduction commitments at home and continue their business as usual scenario, justifying the exclusion of avoided deforestation for the first commitment period.

In essence the present CDM criteria permit large-scale monoculture plantations and ignore biodiversity-abundant and sustainable management practices, even though one of the twin objectives of CDM is to assist non-Annex 1 countries in achieving sustainable development. Sustainable development goals are better addressed in small-scale community managed sustainable forests than in large-scale commercial monoculture plantations.

Technical Ambiguity: Uncertain Baseline Measurement

No clear standardized methodology is yet available to assess baselines in the forestry sector with discussions still under way to recommend a standard methodology for beyond the year 2012.

Community forests in Nepal rehabilitate degraded forests by assisting natural regeneration by protective measures, thereby avoiding deforestation and reducing emissions. Carbon sink projects are to show additional emission reduction compared to the business as usual scenario, i.e. the baseline.

Much of the accessible forests of the hills in the vicinity of settlements have already been handed over to CFUGs. It may not be appropriate therefore for the without-project scenario to be based on state-owned forests which are not managed by the communities, are far from settlements and whose condition generally continues to degrade. Avoided deforestation is also difficult to prove especially if the current community managed forests were not under imminent threat from deforestation (additionality) at the time communities took over the management of the forests (Smith & Scherr 2003).

Issues of baseline, additionality and leakage complicate quantifying carbon credits for avoided deforestation at the project level. The 11th Session of Conference of the Parties to the UNFCCC (COP 11) and the First Meeting of the Parties to the Kyoto Protocol (MOP 1) held in Monteral in 2005, opened the door for discussion on drawing baselines at national level instead of project level for deforestation projects so that baseline, additionallity and leakage could be better monitored. For instance, if Nepal halves its deforestation rate of 180,000 ha/yr, it could claim credit for the carbon sequestrated in 90,000 ha on a yearly basis.

Even predicting the baseline for deforestation rate at national level is not an easy task. Past baseline data produced by FAO are not reliable as these come from the countries themselves. An alternative would be to use satellite imagery and for poor countries like Nepal this would be expensive and would require external support. However, if the baseline is established at national level, then a country could benefit from reduced deforestation if it were able to prove that there was no leakage and the reduced deforestation was permanent.

Unabated Deforestation: Leakage in Community Forest

Leakage is a negative externality beyond the project boundary that leads to greater carbon emissions. Protecting a forest may cause deforestation to occur in another forest (leakage) (Brown 1999; Pagiola *et a.* 2002). Thus if deforestation in the national forests continue, providing credit for carbon in community forests would be difficult. For Nepal, the national forestry data reveals an increasing deforestation trend; between 1981 to 1990, the average deforestation rate was 54,000 ha/yr increasing to 180,000 ha/yr from 1996 to 2000 (Lal 2004).

Some deforestation has been retarded by the 35% of the Nepal's population who manage the 25% of the forests (Acharya & Sharma, 2004; Mikkola, 2002). However, the remaining 75% of the national forests that are generally remote from settlements are under pressure due to their 'open access' nature and hence 'leakage' arising through deforestation is unabated. In these forests, often the forest area is intact but the biomass density is greatly reduced (Upadhya *et al.* 2005). This is mainly because community forests have strict protection norms and thus are being protected at the cost of national forests. In the three research sites of this study, timber was found to be imported from other regions; such resource inflow needs to be monitored carefully and compared with the local forest growth rates. Until leakages can be accounted for and checked, forests as sinks cannot qualify for CDM. One effective way to monitor leakage effectively is to draw the baseline at national level.

CONCLUSIONS

Forests can act as carbon sinks and sources, but avoiding deforestation is reducing emissions at source. Community managed forests in Nepal are becoming an important carbon pool as these forests are beginning to show signs of regeneration in previously deforested areas. It is imperative to monitor such forests over extended periods to evaluate their real capacity in stabilizing the emission of CO_2 into the atmosphere by increasing their carbon pool. Baseline and leakage are issues pertaining to community forestry which must be dealt at the policy level if such forests are to be considered as carbon offset projects in the future.

With the Kyoto Protocol now in force, the CDM has opened new opportunities for afforestation and reforestation activities. The CDM does not cover sustainable forests managed by communities like those found in Nepal Himalaya, even though halting deforestation is a paramount issue to be addressed for the stabilization of atmospheric CO_2. At US$ 5 per ton for carbon credit, community forests may potentially add another 27% of financial value to the existing revenue generated from timber and fuelwood.

As the CDM policy is a global protocol driven by the industrialized nations, it fails to bring benefits to the marginal communities living in the Himalayas and for those that are the most vulnerable to adverse impacts of climate change. The existing forestry sector rules under the CDM provide no incentives for the managers of sustainable mixed forests in the Himalayas. Avoiding deforestation is a compelling decision the locals have to choose for their own necessity while the world can free ride on the carbon benefits these poor communities provide globally.

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Table 1: Some Characteristics of Research Sites in Nepal

Strata	**Hill region of Nepal Himalaya**		
	Strata 1: Hills-Churia	**Strata 2: Mid Hills**	**Strata 3: High Mountain**
Altitude (masl)	400-800	1400-2100	3200-3500
Forest Type	Sub tropical broad leafed	Lower temperate broad leaf	Temperate conifer
Area of Cf (ha)	47	96	240
Name of Site	Ilam	Lamatar	Manang
No of tree species	>31	22	2
No of households in CFUG	40	60	120

Table 2: Biomass and carbon difference in the three research sites

Ilam

Year 1			**Year 2**			**Difference per annum**		
Total biomass (Sum of 14 plots)	14369.26	kg	Total biomass (Sum of 14 plots)	14662.86	kg	Total biomass (Sum of 14 plots)	293.60	kg
Per ha biomass	102.64	t	Per ha biomass	104.73	t	Per ha biomass	2.10	t
Per ha C	51.32	t	Per ha C	52.37	t	Per ha C	1.05	t
Total C (47 ha)	2411.98	t	Total C (47 ha)	2461.27	t	Total C (47 ha)	49.28	t

Lamatar

Year 1			**Year 2**			**Difference per annum**		
Total biomass (Sum of 8 plots)	7241.57	kg	Total biomass (Sum of 8 plots)	7444.37	kg	Total biomass (Sum of 8 plots)	202.81	kg
Per ha biomass	90.52	t	Per ha biomass	93.05	t	Per ha biomass	2.54	t
Per ha C	45.26	t	Per ha C	46.53	t	Per ha C	1.27	t
Total C (96 ha)	4344.94	t	Total C (96 ha)	4466.62	t	Total C (96 ha)	121.68	t

Manang

Year 1			**Year 2**	**Difference per annum**
Total biomass (Sum of 9 plots)	12377.94	kg		
Per ha biomass	55.01	t	Data collection ongoing	
Per ha C	27.50	t		
Total C (240 ha)	6600.91	t		

Table 3: Percentage distribution of dbh class

		dbh class (cm)							
Strata	Site	5-10	11-20	21-30	31-40	41-50	51-60	61-70	>70
Hills (Churia)	Ilam	48.21	32.14	14.29	0.00	1.79	0.00	0.00	1.79
Mid Hills	Lamatar	73.03	21.05	3.95	0.66	1.32	0.00	0.00	0.00
High Mountain	Manang	27.68	26.79	14.29	16.96	8.93	2.68	0.89	1.79