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EDITORS  
*Jeffrey A. McNeely, Thomas M. McCarthy,  
Andrew Smith, Linda Olsvig-Whittaker and Eric D. Wikramanayake*

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## **Constraints Faced by Community Managed Forests in Qualifying Under the Kyoto Protocol**

### **Authors:**

**B S Karky** - PhD Fellow at University of Twente, The Netherlands and King Mahendra Trust for Nature Conservation -Nepal

**K Banskota** - Senior Environment and Resources Economist, International Centre for Integrated Mountain Development, Nepal

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## **Constraints Faced by Community Managed Forests in Qualifying Under the Kyoto Protocol**

### **Abstract**

Forest land use plays a significant role in stabilizing accumulating concentration of carbon dioxide in the atmosphere and so the Kyoto Protocol calls on incentives for sink projects such as afforestation and reforestation. The estimation of carbon in community managed forests illustrate that such 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, such forests are not permitted under the Clean Development Mechanism (CDM) of the Kyoto Protocol. However, under the existing Kyoto Protocol regime, community managed forests like those in Nepal cannot qualify as sink projects and receive carbon credits, primarily due to issues related to the establishment of baseline, leakages and additionality.

Key words: Clean Development Mechanism, carbon sequestration, community forest

## **Introduction**

The International Panel on Climate Change (IPCC) in the Third Assessment Report identified carbon sequestration, carbon conservation and carbon substitution as three forest management strategies to effectively reduce CO<sub>2</sub> concentration in the atmosphere (Kauppi & Sedjo 2001; Bass et al. 2000). These strategies include activities such as afforestation, reforestation, increasing carbon stock in existing forests and soils, mitigating deforestation, protecting and expanding forest area, increasing use and lifespan of wood products, using wood products as bio fuels and as construction materials etc. Also in the long run, uses of forest products to substitute fossil fuel and carbon intensive building materials from a sustainable managed forest can be an efficient strategy (Watson et al. 1996). The Kyoto Protocol (KP) Article 12 under the Clean Development Mechanisms (CDM) permits 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-industrialised 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 take place otherwise (Yamin & Depledge 2004) in developing countries. Given the fact that public sector spending on conservation is experiencing global cut backs (Koziell & Swingland 2003), CDM can be viewed as a promotional agent for afforestation and reforestation activities, especially in the resource-scarce non-industrialised world.

Several important reasons for the inclusion of forests in the Kyoto Protocol are highlighted below. Biological sequestration of CO<sub>2</sub> by forest is considered to:

- Reduce carbon emission as it is estimated that 20% of the increase in GHG levels is contributed from deforestation and degradation of forest (Bishop & Landell-Mills 2002).
- Be cost effective over other carbon sequestration methods (Kauppi & Sedjo 2001).
- Bare the potential capacity to store large volumes of carbon as huge historic losses have occurred from terrestrial ecosystem (Upadhya et al. 2005; Kauppi & Sedjo 2001).
- Open up of a 'virtual' market for carbon as a non-timber forest product (NTFP) where previously forest products had no linkages with markets (Skutsch 2004), there by assisting in the development of Payment System for Environmental Services (PES).
- Replenish of carbon in terrestrial ecosystem has a multitude of benefits in improving soil fertility, ecosystem and biodiversity which in turn has series of other benefits attached (Janzen 2004).
- Enhance livelihood options for the poor communities that are dependent on forest resources.
- Be one of the adaptive strategies to cope against adverse effects of climate change.

## **Community Forest Practice in the Nepal Himalaya**

Community forest plays a prominent role in the hills of Nepal where agriculture and 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 made 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 are being managed by Community Forestry User Groups (CFUGs). The more than 13,000 CFUGs in the country are spread across 1.4 million households (i.e. 35% of population) (Kanel

2004). 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 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 fetch a much higher price when marketed by the CFUGs. While timber and fuelwood are the two most extensively demanded products, communities also market some timber (Kanel 2004). The estimated monetary value of timber extracted (NRs. 1.27 billion  $\approx$  US\$ 18 million) by the communities is higher than the value of fuelwood (NRs. 0.39 billion  $\approx$  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 Kyoto Protocol**

Forests play a significant role in climate change as it emits as well as sequesters carbon dioxide (CO<sub>2</sub>). Trees absorb atmospheric CO<sub>2</sub> for their growth and also 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<sub>2</sub> 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 permitted. These activities fall under the flexible mechanism stated in Article 12 of the protocol on CDM 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).

Experience however, 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 a glaring example. This type of management results in additional carbon sequestration through reduced emission from deforestation (i.e, avoided deforestation). Payment for carbon services may tip the balance in such cases and provide the incentive for many more communities to practice CBFM. Such multipurpose CBFM serves sustainable development goals, provide 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 play in biological sequestration of carbon and to analyze the constraints it faces 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). Community managed forest in Manang is largest but the area is also very sparsely populated and has a low species density, due to its high altitude nature. The other two regions being at a lower altitude are both more densely populated and also the forests have relatively higher species density.

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

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 as the final step.

### **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 site (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 in the last year at the rate of 2.10tha<sup>-1</sup> biomass growth, while the 96 ha forests in Lamatar sequestered about 122tC at the rate of 2.54tha<sup>-1</sup>.

Although the annual biomass increments are small, it nevertheless is important as it indicates that these forests managed by the community are not degrading and proves environmental additionality. Even the small increment is significant, because these natural 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 three carbon 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 CO<sub>2</sub> emission as CO<sub>2</sub> released in combustion by using fuelwood is compensated by those sequestered 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 a viable carbon offset project.

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<sup>ths</sup> 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 ecology.

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 90s.

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<sup>-1</sup> 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 handed over to CFUGs, the net CO<sub>2</sub> 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 reaching out to approximately 1.4 million households i.e. 35% of the population through over 13,000 CFUGs. This revenue generated from carbon credit is worth 27% of what is currently generated from timber and fuelwood (US\$ 23.5 million). Given the dearth of funds, 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.

## **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 for 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 do the community forest such as those in Nepal qualify as carbon sink projects nor is the reduced emission from deforestation (i.e. avoided deforestation) recognized.

There also exists the fear that by permitting avoided deforestation, there could be a market glut with carbon credits forcing the price so low, that eventually CDM might work counter productive and hence they have been restricted (Trexler 2003). If the

credits are cheap enough, Annex 1 countries could meet a large part of their reduction commitments at home and continue business as usual scenario, hence avoided deforestation remained excluded for the first commitment period.

In essence the present CDM criterion permits large-scale monoculture plantations and ignores biodiversity abundant and sustainable management practices albeit one of the twin objective of CDM being 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**

Till date there is no clear standardized methodology 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 are actually a result of rehabilitating degraded forests by assisting natural regeneration by protective measures and avoiding deforestation and reducing emission. 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 forest 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 currently managed community managed forests were not under eminent 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 project levels. The 11<sup>th</sup> Session of Conference of the Parties to the UNFCCC (COP 11) and the First Meeting of the Parties (MOP 1) held in Montreal in 2005, opened the door for discussion on drawing baselines at national level instead of project level for deforestation projects so that baseline, additionality 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 sequestered in 90,000 ha on a yearly basis.

Even predicting 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. 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 they were able to prove 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 emission. Protecting a forest may cause deforestation to occur in another forest (leakage) (Brown 1999; Pagiola et al. 2002). Thus if deforestation in the national forests continue, crediting for carbon in community forest would be difficult. For Nepal, the national forestry data reveals increasing deforestation trend as between 1981 to 1990, the average deforestation rate was 54,000 ha/yr that increased to 180,000 ha/yr between 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 away 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 baseline at national level.

### **Conclusions**

Forests can act as carbon sink and source, avoiding deforestation is reducing emission 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<sub>2</sub> 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 enforced, CDM has opened new opportunities for afforestation and reforestation activities. It disqualifies 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<sub>2</sub>. At US\$ 5 per ton for carbon credit, community forest may potentially add another 27% financial value to the existing revenue generated from timber and fuelwood.

As this 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. As of existing rules for the forestry sector under the CDM, the Kyoto Protocol has no incentive for the managers of sustainable mixed forests in the Himalayas, for 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 it extends globally.

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**Table 1: Some Characteristics of Research Sites in Nepal Hill region of Nepal Himalaya**

Strata	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									
Per ha C	27.50	t									
Total C (240 ha)	6600.91	t									

**Table 3: Percentage distribution of dbh class**

Strata	Site	dbh class (cm)							
		5 to 10	11 to 20	21 to 30	31 to 40	41 to 50	51 to 60	61 to 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%