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Analysis

# The cost of carbon abatement through community forest management in Nepal Himalaya

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ABSTRACT

This paper estimates the economic returns to carbon abatement through biological sequestration in community managed forest under future REDD policy, and compares these for three possible management scenarios. For the estimation, the research relies on forest inventory data together with other socio-economic and resources use data collected from forest users in three sites of Nepal Himalaya. The paper estimates the incremental carbon from forest enhancement on a yearly basis over a five-year period using the value of $ 1 and $ 5 per $tCO_2$ for conservative analysis. The results based on the three sites indicate that community forest management may be one of the least cost ways to abate carbon with a break-even price under Scenario 2 which ranges from $ 0.55 to $ 3.70 per $tCO_2$. However, bringing community forests into the carbon market may entail high opportunity costs as forests provide numerous non-monetary benefits to the local population, who regard these as the main incentive for conservation and management. An important finding of the research is that if forest resources use by local communities is not permitted, then carbon trading will not be attractive to them as revenue from carbon will not cover the cost foregone by not harvesting forest resources.



## 1. Introduction

New policy entitled 'Reduced Emissions from Deforestation in Developing Countries' (REDD) is under consideration by the United Nations Framework Convention on Climate Change (UNFCCC). If this policy is adopted, carbon abated by reducing deforestation and degradation and by forest enhancement may be eligible for carbon crediting. This opens the possibilities for communities that are engaged in forest management to participate in the global carbon market. Whether they will do so depends in part on the costs and benefits that they face in participating in this market.

The paper estimates the cost of carbon abatement by community forest management (CFM). Sequestration rates were measured in the field in three community managed forests in the Himalaya region of Nepal. The paper starts by reviewing literature on the cost of reducing carbon from forestry in general. It then explains the type of baseline or reference scenario that would be needed to estimate carbon credit under community forestry. Participation in the carbon market will involve costs as well as benefits. Different scenarios were created for a gross margin analysis, and the breakeven price of carbon offsets for each site and the net benefits are estimated under each of the scenarios. It is clear that to provide an incentive to communities to participate voluntarily in carbon trading, there must be a net gain.

The objective of this paper is to assess how the benefit of forest management and carbon measurement compares with the probable income from sale of carbon credits, thus establishing whether carbon trading could be profitable for local communities under a variety of management conditions. The underlying consideration is to assess whether this trade would deliver more benefit to communities than they currently derived from CFM. If this is the case, then there may be scope for community forest user groups (CFUGs) in Nepal to participate in the global carbon market under the UNFCCC REDD policy in the post Kyoto treaty.

The methodology adopted in this study included biomass survey for assessing carbon stock, following the IPCC (2003) Good Practice Guidelines. Gross margin data were collected through a socio-economic survey and through Focus Group Discussions in three sites (Ilam, Lamatar and Manang). To obtain the necessary economic data a reference scenario was created. Carbon credits were estimated on the basis of annual net increment of stock, over a five year period from 2004.

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## 2. Review of studies on the costs of reducing carbon emissions from forests

There is a growing amount of research investigating the cost of reducing forest carbon emissions. Emission reduction from reduced deforestation could be one of the least cost solutions in reducing atmospheric carbon. The Stern Review (Stern, 2007) analyzed data from eight countries in the tropics and estimated that the cost of stemming deforestation would be under $ 2 per $tCO_2$ for 65% of the world's forest, which is similar to the value estimated by Eliasch (2008).These values are very low and highly competitive with carbon savings resulting from energy interventions, and well below the expected costs of damage per ton of $CO_2$. In other studies however higher costs have been estimated.

Nabuurs et al. (2007:543) for example estimated that reductions could be achieved for $20 or less per $tCO_2$ with large variation between regions. In all estimates of carbon reduction costs, the main element is the opportunity cost of use of land. This varies considerably from place to place, depending on what the alternative use of the land would be. Van Kooten et al., (2004: 248), estimate that when opportunity cost is taken into account, the price of $tCO_2$ will be from $ 12.27 to more than $ 354.55. Interestingly Van Kooten et al., (2004: 246) also show carbon reductions from planting of forest (afforestation and reforestation) will be 257–297% more expensive than forest conservation (i.e. avoiding deforestation) and agroforestry 261% more expensive than conservation. These findings are derived from case studies spanning tropical to non-tropical areas and covering 55 different case studies.

Most studies on the opportunity costs of avoiding deforestation are based on marginal cost analysis, and on discounting of the future production benefits foregone over e.g. a 30 year period. There is considerable doubt as to whether this method is appropriate, given that a one-off payment at time T1, representing these future benefits, may not in reality be sufficient to deter later clearance of the forest. Moreover, if deforestation were to be stopped over large areas there would clearly be knock-on effects as prices of the forest products would rise. For a more accurate picture, a general equilibrium model would have to be constructed. Sathaye et al. (2006) have made global estimates using a partial equilibrium model, but these take into account a much broader range of costs and their results are not directly comparable with the local opportunity costs which are presented here.

All the studies available in the literature on costs and opportunity costs of avoiding loss of carbon stocks from forest refer, usually implicitly, only to deforestation and not to degradation. Deforestation implies a complete change of land use from forest usually to agriculture, pasture, or urban development. Degradation in the context of climate change mitigation implies that the forest remains forest, but with a lower density of biomass. Although in some humid tropical forests degradation is associated with selective logging for high value timbers, over the vast majority of tropical forests including dry and savannah forests, and indeed in the Himalayan forests of Nepal, degradation is related to over-exploitation of forest products by local communities for subsistence purposes and sometimes for trade. By and large, community forest management can be said to counteract these kinds of degradation. The opportunity costs of this have not been considered up to now.

## 3. Community forest management in Nepal

The concept of CFM emerged in response to the deteriorating condition of the state-controlled forests in the late 1970's. Nepal's forestry sector has under gone a paradigm shift that reflects devolution of forest resources from state control to community control (Gilmour and Fisher, 1991; Hobley, 1996).

Under state management, forests were prone to 'the tragedy of the open access' (Ostrom, 1990); anyone and everyone had unlimited access any time because the state owned the resource. This was turned around by implementing CFM and handing over forests to local communities in the 90's. Usufruct rights were spelled out for the commons (Gilmour and Fisher, 1991; Hobley, 1996) and deforestation rates were considerably reduced, particularly in the hills (Acharya & Sharma 2004; Banskota, 2000). At present over 1.1 million ha, or about one quarter of the country's forest (Kanel, 2004), is being managed by communities with 93% of this is in the hills and 7% in the Terai (plain areas) (Springate-Baginski et al., 2007: 47).

Handing over forests to communities for management has gradually improved the forest condition (Malla, 1997) with positive impacts on biodiversity conservation (Jackson and Ingles, 1994) and increased production of firewood, timber, fodder, forest litter and grass and other non-timber forest products (NTFP) which support subsistence livelihoods (Kanel, 2004; Acharya and Sharma, 2004). The same has also been observed by Banskota (2000) who states that numerous degrading ecosystems have improved due to decentralized and participatory forest policies. The impact of this policy in the forestry sector has undoubtedly been positive in reducing deforestation and forest degradation in Nepal Himalaya. From a climatic perspective, community forest has contributed to enhancing the capacity of natural sinks.

## 4. Case study sites

The three case study sites were selected in the Himalaya region namely Ilam, Lamatar and Manang. The characteristics of these sites are depicted in Table 1. Community forest in Nepal started in the Himalaya region in the 1980's and has expanded successfully in the Himalaya terrain which covers 89% of the forest land and 86% shrub lands in the country. About one third of this forest is now under community control and this has in most places reversed degradation. Most of the community forest in the Himalaya region involves guarding against encroachment and fires, and agreed quotas for off-take of products such as fodder and firewood which are used by the local population. The management is done at grass roots level by locally based Community Forest User Groups ('CFUGs'). This type of CFM forms an integral part of the rural subsistence economy in many parts of Nepal. The three sites were selected to represent different ecological conditions and tree growth conditions, and they also differ in size (see Table 1), but there are no significant social differences or differentials in the wage rates between them. They are in fact rather typical of the majority of community managed forests in Nepal Himalaya.

## 5. Setting the baseline for carbon measurement

Community managed forests such as those found in Nepal Himalaya would not be considered additional in Clean Development Mechanism (CDM) terms. They represent natural forests that had been managed by communities as described above for some years before the research started. In any case, the gains due to forest enhancement could not be claimed under CDM, which allows only for afforestation and reforestation (planting of trees in non-forest areas). However, under REDD, not only will forest enhancement and sustainable forest management be permitted, but also the additionality restriction is removed at the local level since it is dealt with at the national level by measuring improvements over the national reference scenario.

When forests are brought under such management, there are two carbon components which need to be measured; 1) the avoided emission due to stemming deforestation and forest degradation and 2) the increased carbon stock resulting from forest enhancement. Conceptually these are two different things, since the first involves