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Forest biomass assessment in support of REDD by indigenous people and local communities[1]

Introduction and Rationale

Forest inventory work is usually considered a professional activity requiring specialised forest education. However, it is well established that indigenous communities have extensive knowledge as regards the local ecosystem, tree species distribution, age distributions, plant associations, etc. Such information is needed for inventories, and there is growing evidence that land users with very little professional training can in addition make adequate and reliable stock assessments. It is argued in this submission that community forest management (CFM) groups and societies are in a very good position to carry out forest inventories, and that it would be worthwhile for them to do so if and when there is any prospect of payment for environmental services, since for accountability in PES systems there is a need for reliable, detailed measurements[2]. Carbon services under REDD are a prime example, if communities who are engaged in forest inventory work are to be rewarded for improvements in stock with benefits in cash or kind. Moreover, if communities measure the carbon stock changes in the forests they manage, they may establish 'ownership' of any carbon savings, to strengthen their stake in the REDD reward system and greatly increase transparency in the sub-national / intra-national governance of REDD finances.

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[1] This submission was prepared by Dr. Patrick Van Laake (ITC), vanlaake@itc.nl, and Dr. Margaret Skutsch (University of Twente, The Netherlands), with contributions from fellow researchers in the "Kyoto: Think Global, Act Local" research project. More information, publications and supporting material can be found on http://www.communitycarbonforestry.org. A more elaborate description of the approach here presented will be given in the new release of the GOFC-GOLD "REDD Sourcebook".

[2] See also the submissions by ICIMOD ("The role of community-based forest management in addressing degradation") and RECOFTC ("Community-based forest management: a key element of effective REDD methodologies") to the current call from the SBSTA for a more comprehensive overview of the role that CFM groups can play in REDD.

How the involvement of local communities in REDD will be achieved in individual countries is within the purview of the national government. Government philosophy, land ownership and tenure rights, competing claims on forest resources (e.g. commercial logging operations) all contribute to creating a variety of conditions, such that no single solution will fit all cases. However, in general the requirements for large scale data collection in the field call for the meaningful involvement of local communities, if only to reduce the cost of the inventories.

The methodology for forest inventory here presented is based on procedures recommended in the IPCC Good Practice Guidelines, but structured in such a way that the involvement of forest-dependent communities becomes an obvious choice. Intermediary organizations may be required to support some of the tasks, but such intermediary organizations are often already present and assisting communities in their forest management work. The procedures described have been tested by the KTGAL research project at 35 sites in seven countries. The reliability of the measurements has been cross-checked using independent professional forest surveyors. In all cases, the communities' estimates of average carbon content in the forest differed by less than 5% from that of the professionals.

Forest biomass assessment

The assessment of reductions in emissions from above-ground biomass due to deforestation and degradation in tropical countries is typically undertaken using one of two methodologies approved by the IPCC[3]:

1. The **default method**, in which annual increments and reductions in the biomass are calculated. (Also known as the gain-loss method.)
2. The **stock change method**, in which periodic changes in biomass between two observations of stand volume are calculated.

With both methodologies, countries are facing two primary obstacles in generating estimates of emission reductions in the entire national forest estate with sufficient accuracy:

1. The forests are **heterogeneous**, being an expression of ecological condition determined by environmental factors such as elevation, soil type, (seasonality of) precipitation, etc. For each of the resulting forest types specific parameters have to be derived. Impacts from anthropogenic sources vary by population density, regional socio-economic development status and accessibility to the forest and markets for forest products. In combination, these make for a very diffuse picture, which has important implications for the default method in particular (since different approaches may be necessary to account for different growth and

[3] IPCC Good Practice Guidance for LULUCF, Section 3.2: Forest Land

extraction scenarios). The heterogeneity needs to be addressed by stratifying the forest into more homogeneous sub-units in terms of eco-type (both methods) and exploitation regime (default method). Obviously, this requires substantial effort from experts in the national forest services.

2. The **measurements** have to be fine-grained in space and time and accurate in terms of biomass, to capture relatively small changes in emission reductions, as this will lower the uncertainties in the estimates and thus raise the credibility of the national emission reduction claim and hence the (potential) revenue through sale in the international carbon market. In addition, small local emission reductions could generate substantial revenue for individual land owners, communities or local governments, and attribution of emission reductions to such individual actors requires localized estimates.

Much emphasis is placed on the application of satellite imagery to address the above obstacles. Satellite imagery can indeed play an important role in several aspects of a national REDD program, in particular the stratification mentioned above, a national monitoring and accounting system, and validation of emission reduction claims, but for the direct assessment of biomass the technology has not yet reached a level of accuracy that would qualify it for application in this area[4].

A more fundamental problem with the reliance on satellite imagery is that it is exclusive, accessible only to highly trained experts in short supply even in central governments in many developing countries, and that it does not address the drivers and underlying causes of deforestation and forest degradation: even the best satellite technology is of little value unless it relates directly to, and can pick up accurately real emission reductions that are achieved in the forest due to improvements in management. It is our contention that these two activities – improved forest management to achieve emission reductions and monitoring of biomass in the forest – are in fact two sides of the same coin. While the first issue is clearly recognized[5], the second has not yet reached that level of prominence in the debate. In the remainder of this paper we will present a method that bases the assessment of carbon in the forest on the collection of basic forest properties by local communities, thereby addressing issues of accuracy, ownership and cost.

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[4] The Woods Hole Research Center released a report at CoP-14 that indicated an error in the estimate of 25 tC/ha in forests with a biomass content corresponding to 0-225 tC/ha, i.e. an error of at least 11%. When compared to typical year-over-year changes of 3-5 tC/ha as observed by the KTGAL project it is immediately clear that the current uncertainty is too large for practical application. The report "Mapping and Monitoring Carbon Stocks with Satellite Observations: An Update" can be accessed online at: "http://www.whrc.org/policy/PoznanReports/assets/C Stock Monitoring.pdf".

[5] Both the Forest Carbon Partnership Facility of The World Bank and the UN-REDD program require the meaningful participation of forest dwellers in the implementation of REDD activities.

Community participation in biomass assessment

There are many good reasons to include communities in the collection of data for REDD, especially when the IPCC stock change method is used. Foremost are ownership and commitment: if the communities are involved and get a fair share of the benefits, then they will automatically become custodians of the forest and protect the local resources. More practically, the IPCC stock change methods require only basic data on the forest and community involvement is the most cost-efficient mechanism to collect large volumes of such data, achieving a fine granularity in space and time in the assessment of forest carbon. There are, however, limitations to the kind of data that communities can reliably collect, and it is best limited to a small set of basic forest properties:

- Species identification, with common names. (Botanical expert to convert common names to scientific nomenclature.) Periodic (e.g. once every five years).
- Tree count. Annual.
- Measurement of girth. Annual.

Such data need to be paired with more traditional forest inventory data – e.g. wood density, average tree height, biomass expansion factor, root-shoot ratio – or allometric equations, specific to the forest type. The collection of such data is simple and repetitive and can be carried out by people with very little education, working in teams. Certain activities, such as laying out permanent sample plots, need expertise, but once they are established, periodic measurements can be made by the communities without further assistance. Hence there will be higher costs in the initial years, but these fall rapidly over time.

Even while reporting of carbon emission reduction is not done annually, it is important to collect the basic data annually. There are a number of reasons for this:

- If forests are measured annually, communities will be more aware of changes in the forest, moreover they will not forget how to make the measurements.
- Assessment of the quality of the data collection process. Data quality assessment over time in a given community can be augmented by jointly analyzing the data from many communities in a single ecological zone or forest type. If a certain community is found to produce data that is divergent from that of the other communities, then remedial action can be taken by investigating its cause:
    - Errors in the measurement procedure. Any errors of measurement in a particular year may be more easily detected and eliminated.
    - Errors in the stratification of the forest (e.g. forest belongs to a different ecological zone).
    - Effectiveness of intervention (improved forest management) is different.
- It provides insight in the effectiveness of interventions to reduce emissions.

- Off-take of timber or minor products may result in deleterious effects on the forest or the biomass content. Such effects may be countered if they are detected in time.

It is likely that national REDD programmes will have to offer annual incentives for carbon savings rather than end-of-commitment-period payments, as communities are unlikely to accept a five year waiting period. The KTGAL project estimated costs of community forest inventory as ranging between $1 and $4 per hectare per year, including day wages for the community members involved and an intermediary, and a factor for use of any required equipment (PDA, GPS, etc). The costs in the first year are higher than this, given the substantial inputs by the forest service or an intermediary in training community members and establishment of the sampling plots. The equivalent costs if professional organizations were to be employed instead of communities are two to three times higher than this.

Carbon may be credited on a longer time interval (e.g. 5 years), but local communities need to be paid annually or even more frequent to maintain their commitment to the process. How payments are effectuated and on what basis, is a matter that will be decided by each national government in accordance with its own forms of governance, but essentially there are three types of options:

1. Communities implement activities to stop deforestation and reduce forest degradation and regularly inventory the forest to assess the amount of biomass. Payment is for the actual amount of emission reductions or forest enhancement. There is positive feedback from effective forest management by the communities (more payment) but it will be very difficult to administer such an arrangement. Payments will have to be made prior to receipt of CERs by the government in order to maintain community involvement. A direct link between reported emission reduction and payment will open possibilities for manipulation through overestimation of the emission reduction; an independent verification and accounting mechanism must be established to minimize such abuse.
2. As above, communities are involved in improving forest management and inventorying biomass. Inventories done by communities are paid for by government, as compensation for the effort made by the communities. There is thus no link with reductions in emissions or carbon sequestration – or increased emissions for that matter – payment is made for services rendered. This is probably the easiest to implement but it is a "dumb" approach: the communities are not rewarded for activities that lead to reducing emissions or enhancing the forest. There are fewer options for abuse compared to the previous option: at best can measurements be fabricated, but such manipulation should quickly be exposed upon data analysis necessary for biomass determination.

3. Inventories are done by government who indemnify the communities for loss of opportunities (i.e. right to extract timber or NTFPs). This may be the preference by governments that to date have a strong and active forest service, but it does not address the drivers and underlying causes of prior deforestation or forest degradation.

Conclusion

The successful implementation of REDD can only be expected when the drivers and underlying causes of deforestation and forest degradation are addressed. This requires the meaningful involvement of local communities. Involving the same communities in the assessment of biomass in the forest, providing the basic data to estimate emission reductions, is then the logical choice. Involvement creates ownership – and thus protection of the forest resources – and generates a steady revenue stream to the local communities that may help establish sustainable livelihoods. The costs associated with community-based assessment of forest carbon are typically lower than any other method – including remote sensing – yielding estimates with accuracy sufficient for international marketing of CERs. The CERs will have a "production profile" acceptable to buyers concerned with the rights of indigenous groups and continued accessibility to forest resources for their sustainable livelihood.