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Review

Compatibility of timber and non-timber forest product management in natural tropical forests: Perspectives, challenges, and opportunities

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ABSTRACT

Tropical forests could satisfy multiple demands for goods and services both for present and future generations. Yet integrated approaches to natural forest management remain elusive across the tropics. In this paper we examine one combination of uses: selective harvesting of timber and non-timber forest product (NTFP) extraction. We analyze the current status of this combination and speculate on prospects and challenges regarding: (i) resource inventory, (ii) ecology and silviculture, (iii) conflict in the use of multipurpose tree species, (iv) wildlife conservation and use, (v) tenure, and (vi) product certification. Our conclusions remain preliminary due to the relative paucity of published studies and lessons learned on what has worked and what has not in the context of integrated management for timber and NTFPs. We propose at least three ways where further research is merited. One, in improving 'opportunistic' situations driven by selective timber harvesting that also enhance NTFP values. Two, to explicitly enhance both timber and NTFP values through targeted management interventions. Three, to explicitly assess biophysical, social, regulatory and institutional aspects so that combined benefits are maximized. Interventions for enhancing the compatibility of timber and NTFP extraction must be scaled in relation to the size of the area being managed, applied timber harvesting intensities, and the dynamics of multi-actor, forest partnerships (e.g., between the private sector and local communities). In addition, training and education issues may have to be re-crafted with multiple-use management approaches inserted into tropical forestry curricula.

Contents

1. Introduction

Tropical forests have the potential to satisfy multiple demands for timber and non-timber forest products (NTFPs), marketed and non-marketed ecosystem services, while including industrial and

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non-industrial actors—both for present and future generations (Kant, 2004). To accommodate these requirements, sustainable forest management (SFM) emerged in the early 1990s (Poore, 2003), and multiple-use forestry became entrenched within SFM as a way to achieve socially and environmentally driven development models in the tropics (Panayotou and Ashton, 1992). Yet, clearly defined multi-use approaches to natural forest management remain elusive (García-Fernández et al., 2008). The application of Reduced impact logging (RIL) guidelines (reviewed in Putz et al., 2008) largely contributed to an increase in the area of natural forest under SFM from less than one million ha in 1988 (Poore et al., 1989) to about 36 million ha by 2005 (ITTO, 2006). However, this quest for sustainability was largely disconnected from other forest goods and services, including NTFPs which are still treated in relative isolation (Lawrence, 2003). Clearly, SFM is about more than RIL, and there is now renewed interest in developing multiple-use tropical forestry (e.g., Sist et al., 2008 and accompanying papers; Shanley et al., 2008).

Diversified forest demands can be met either by spatially segregating uses for particular goods and services (Vincent and Binkley, 1993; Binkley, 1997; Zhang, 2005), or by managing forest stands to meet multiple objectives from the same area. The latter model is widespread across the tropics (Sayer and Byron, 1996; Poore, 2003; Nittler and Tschinkel, 2005), but whether or not multiple-use of forest goods and services facilitates sustainability still generates much debate. For example, skeptics question the extent to which economic returns from NTFPs and/other values are sufficient to outweigh the financial costs of modifying and/or applying RIL norms (Barreto et al., 1998; Pearce et al., 2003) and silvicultural practices needed for sustaining timber production over the long term (e.g., enrichment planting, Schulze, 2008; liberation thinning, Wadsworth and Zweede, 2006). Advocates of multiple-use forest management emphasize that by incorporating many forest goods and services, including the voices of different stakeholders, a social and financial edge can be gained over timber-dominated models (Ashton et al., 2001; Campos et al., 2001; Hiremath, 2004; Wang and Wilson, 2007). This paper examines one of the possible combinations for multiple-use: extraction and management of timber and NTFPs. We discuss the current status of this combination, speculate on both the barriers and opportunities for integrated management for timber and NTFPs as a land use option, and provide insights on moving forward. Our paper focuses on mechanized, selective logging as this remains the dominant and most profitable option in natural tropical forests and excludes agroforests, regenerating fallows, and/or planted forests (where timber and NTFPs may also be managed concurrently; e.g., Toledo et al., 2003; Belcher et al., 2005; Michon et al., 2007).

2. Examining the compatibility of timber and NTFP management

The degree of compatibility between management of timber and NTFPs can be discerned along different axes. A simple framework (Titus et al., 2006) has been proposed which covers a continuum of management actions that either indirectly benefit NTFP values (''passive'' or ''opportunistic'' compatibility), or that are explicitly applied to enhance both timber and NTFP values concurrently (''active'' compatibility). Examples on one end of this continuum are (i) the establishment of timber concessions with the *potential* to secure long-term access to NTFPs; and (ii) the positive effects of increased light levels on a given NTFP species after selective logging. An example on the other end is the extension of RIL guidelines to minimize collateral damage to NTFP-bearing trees during timber extraction. Although much of this paper may well fit into the above framework, we emphasize six topics: (i) resource inventory, (ii) ecology and silviculture, (iii) conflict in the use of multipurpose tree species, (iv) wildlife conservation and use, (v) tenure and access rights, and (vi) product certification. These topics are key components of SFM (e.g., Durst et al., 2005), and encompass the most relevant published information and examples in the context of our analysis. However, we recognize that other factors (e.g., seasonality, legal frameworks, gender) may cut across the above topics. We provide an indicative list of these additional set of factors and the way they may affect compatible management outcomes of timber and NTFPs in Table 1.

2.1. Resource inventory

Based on a global assessment, Vantomme (2003) concluded that national statistics on NTFPs, including data on the resource base, are absent for all but a few internationally traded products (where data are usually limited to export quantities). It is therefore not surprising that little effort may have been directed at integrating inventories of NTFPs into timber censuses. When implemented, these inventories concentrate more on tallying the *presence* of locally important NTFPs than on estimating yields for guiding management. In the Congo Basin, NTFPs including bushmeat and/or evidence of bushmeat hunting are routinely recorded in timber inventories, but in most cases this information (e.g., Van Vliet and Nasi, 2008) is rarely used in informing the design of multi-use management plans. Mapping the presence of locally important NTFP species before logging may, nevertheless, be necessary to ensure that they are maintained in forests managed primarily for timber. In Indonesian Borneo, for example, the palm *Eugeissona utilis*, one very important emergency forest food for the Punan hunter gatherers, grows along ridge tops and is often damaged when opening skid trails (Sheil et al., 2008). In this context, local knowledge is potentially critical in informing NTFP inventories alongside timber (Cunningham, 2001; Lawrence et al., 2005; Shanley and Stockdale, 2008).

Even in cases where timber and NTFPs have high commercial value, the cost-effectiveness of implementing integrated inventories of timber and NTFPs may depend on the extent of biological similarity between both types of product. Despite early efforts (e.g., Pineda, 1996) in the community forestry concessions of Petén, Guatemala, in designing integrated inventory protocols for timber and NTFPs, including the fronds of high-valued *xate* (*Chamaedorea* spp.) understory palms, their implementation has been limited to date (Louman et al., 2008). Timber in the Petén is harvested from annual compartments of fixed area under decades-long rotations, while *xate* palms take only 4–6 months to regain pre-harvest yields. Because of its wide distribution across the entire forest *xate* can therefore be harvested more frequently and over larger areas than within annual logging blocks; hence a different inventory protocol was designed (outlined in Godoy et al., 2009). Moreover, the size of plots used for timber inventory was insufficient for concurrent, reliable estimates of sustainable harvest rates of *xate* leaves that were needed to fulfill FSC-certification standards currently enjoyed by this NTFP (see Section 2.6). In contrast, arborescent palms or other NTFP-bearing trees are more amenable for integrated timber–NTFP inventories since little deviation is needed from common practice. For example, the management potential of both timber and NTFPs derived from palms and trees (fruit, seed oils, latex) in Amazonian floodplain forests was determined through standard, tree inventory assessment (Fortini et al., 2006). Another advantage of shared biological similarity is that, in the case of arborescent life forms, logging damage to NTFP-bearing trees can be easily minimized by marking them during routine, pre-harvest timber inventories (Guariguata et al., 2009).