

CHAPTER 12

TOWARDS SUSTAINABLE FOREST MANAGEMENT AND IMPROVED LIVELIHOODS IN TROPICAL FORESTS: LESSONS AND CONCLUSIONS

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INTRODUCTION

This chapter synthesises the key themes emanating from the work in Malinau Research Forest (MRF), as pointers towards the sustainable management of tropical forests and positive outcomes for forest-based livelihoods. This book, a summary of the research findings from Phase II, and the technical report from Phase I (CIFOR, 2002) both present a picture of extreme change, from a period of centralised control characterised by large-scale logging operations to a period, following decentralisation, dominated by many smaller operators. This has resulted in local communities getting more of the action, and the local authorities becoming more powerful and influential. A new district has emerged, roads and bridges have been constructed, the district capital has grown at unprecedented rates and new actors entered the system (e.g. potential traders in carbon, investors in proposed oil-palm plantations). Major unanticipated changes may be common in dealing with large complex natural resource systems (see the chapter on Malinau in Sayer and Campbell, 2004).

EMERGING ISSUES IN SUSTAINABLE FOREST MANAGEMENT

Implementing decentralisation policies

Decentralisation has shifted the balance of power and introduced new actors in the logging and governance arena. When research was initiated in Malinau in the middle to late 1990s, the perceived problems were related to industrial logging by large state companies. The key research concerns at that time addressed damage to the local environment by logging, concerns about the sustainability of timber supplies from the ostensible permanent forest estates and the lack of benefits reaching local inhabitants. Shortly after the passing of Indonesia's decentralisation laws on 1 January 2001, small-scale logging became rampant throughout Indonesia, particularly in Malinau as the district is close to high-value timber markets in Malaysia. In early 2000 many small-scale logging permits covering areas of between 100–5,000 ha each were

allocated to hastily formed small companies. This resulted in extraordinarily high levels of intense, unsustainable timber extraction and considerable land and resource conflict. Later, this system of logging was withdrawn, partially due to pressure from the national government. The lack of technical capacity, financial resources and political will at the district level initially limited any attempt to manage natural resources on a sustainable basis. There currently remains considerable confusion and uncertainty as to who, from local to national levels, is primarily responsible for the varying aspects of natural resource management.

The focus of the research shifted from stand-level work on improving logging practices (Priyadi *et al.*, this volume) in Phase I to a more district-level focus on improving the understanding of landscape dynamics, and contributing tools, approaches and information for spatial planning and decision-making (Sheil *et al.*, this volume; Wollenberg *et al.*, both chapters, this volume). A wide variety of research has led to greater understanding of the possible trajectories of change, and a simulation model has been created to demonstrate different scenarios for land use (Suwarno *et al.*, this volume).

When Phase II commenced, the district had almost no capacity for spatial land-use planning. Considerable effort was exerted on establishing a district-level GIS laboratory, compiling the appropriate spatial information and building the capacity of the local authorities charged with this activity. As reflected on in both chapters by Wollenberg *et al.*, however, land-use planning can be unconnected to what actually happens on the ground, a situation that is likely to be common in remote forested landscapes characterised by weak governance and limited human capacity. As presented in this book, we propose five principles for a more focused land-use planning process and describe how they played out in Malinau: (a) linking local knowledge, experience and aspirations of different groups to formal land-use planning and decision-making; (b) using system frameworks for understanding land use as a process and anticipating change; (c) having leadership and institutions with adaptive capacity and bottom-up participation; (d) analysis and intervention at multiple levels; (e) explicit activities and procedures to build capabilities. The approach

emphasised finding ways to make local-level, practical knowledge and activities accessible to and usable by district decision-makers and communities.

Given the diversity of players at different levels and the often skewed power relations between them, a focus of the work was how best to undertake negotiations among the multiple stakeholders in such arenas. By adopting a learning process with the communities, one of the research teams was able to adapt to the swiftly changing circumstances in the district. The learning cycle was rapid, allowing for several cycles in a few years. At the national-district nexus, analyses of the impacts of decentralisation were undertaken, and facilitators worked with different groups to promote dialogue and action at the district level. Institutional analyses indicated the problem of the local legal system, and key players identified the need for assistance with drafting laws and regulations. This was followed by workshops on drafting legal texts so as to improve preparation of local laws.

Much of the work can be said to be leading to the empowerment of local communities, who are politically weak in the face of logging companies, district officials and entrepreneurs. The participation of Punan and women in our community work has visibly increased in Malinau. Communities have learnt better ways of stating their needs and what they imply to outsiders. This allows them better to articulate their preferences in various forums, notably more sophisticated land-use visions and spatial plans.

Securing forest livelihoods

Tropical forests are under threat globally. Whilst the rates of deforestation are slowing in some regions, there remains a net annual loss (FAO, 2005). The global and local-level drivers of deforestation are complex and differ from region to region, and even between sites within the same region (Achard *et al.*, 2002). Much of the argument against deforestation has been led by conservation agencies concerned with biodiversity loss, although the magnitude of biodiversity losses has been questioned by Sheil *et al.* (this volume). However, such debate has seldom considered the local livelihoods of forest

dwellers and how they perceive the arguments in favour of logging or for conservation. Typically a mix, or mosaic, of land uses seems the ultimate compromise and trade-offs are inevitable (Boedhihartono *et al.*, 2007). For example, Suwarno *et al.* (this volume) model the land-use options available at a district level, particularly the potential conversion of forest to oil-palm plantations, to promote local economic growth whilst simultaneously conserving as large an area of forest as possible for biodiversity conservation and local use. Yet Levang *et al.* (this volume) and Sheil *et al.* (this volume) indicate that relatively little of the MRF area is suitable for plantation development, a fact that as yet seems not to have been recognised by planning agencies. The same applies at the local level (Limberg *et al.*, this volume), where it is acknowledged that the majority of local village committees wish to implement a system of land zoning which consists of plantations, swiddens, production forest and some protection forest.

The results from work in the MRF indicated that forest-dwelling communities have considerable knowledge about the forest, at both the species level and system functioning (Sheil *et al.*, this volume), corroborating the growing literature indicating the considerable extent of local ecological knowledge by rural peoples in managing their landscapes and species (e.g. LaRochelle & Berkes, 2003; Casagrande, 2004; Phuthago & Chandra, 2004). This knowledge is constantly mobilised to sustain their local livelihoods, both for collection of NTFPs as well as in swidden agriculture. However, Levang *et al.* (this volume) reveal that by conventional measures of well-being, forest livelihoods are more vulnerable than non-forest dwellers, as is the case elsewhere in the tropics (Wunder, 2001; Shackleton *et al.*, 2007). Education and health levels are low, as is formal income. Yet forest dwellers aspire to acquire many of the trappings of modernity, primarily access to services such as clinics and education, but also ownership of electrical goods, outboard engines, chainsaws and the like. As commented by Levang *et al.* (this volume), local livelihoods remain dependent upon the forests, but the nature of the dependency has changed from subsistence needs to a more market-oriented approach.

Paralleling the finding that access to markets is a key factor in the extent and value of household trade in forest goods (Pyhälä *et al.*, 2006; Mamo *et al.*, 2007), is that the conventional measures of well-being of the forest communities are also strongly related to accessibility to Malinau Town, the local regional centre (see Levang *et al.*, this volume). Remote communities rely almost exclusively on forest products and swidden agriculture for their needs. In settlements closer and more accessible to regional towns, the proportion of income generated external to forest-related resources increases, as recorded elsewhere (e.g. Shackleton *et al.*, 2002; Stoian, 2005). However, this does not necessarily reduce livelihood vulnerability. An element of vulnerability persists in forest livelihoods due to unpredictable climate which affects rice yields, logging impacts on water quality, changes in population, abundance of key fruits or bushmeat species, the declining abundance of NTFPs such as *gaharu*, and so on. Yet for households living in or close to Malinau Town, these uncertainties are exchanged for other issues relating to uncertain employment prospects because of low education levels, undeveloped links with social and economic elites, price fluctuations of staple goods such as rice, the loss of cultural identity and fluctuating markets for forest goods. Consequently, the forest and its products remain a major safety net for households even in accessible settlements, and suggest the need for knowledge and experience of the forest to be maintained. This parallels work in both Central America and South Africa (McSweeney, 2004; Paumgarten, 2006; Stoian, 2005). Ultimately, reducing vulnerability and sustaining livelihoods, whether deep in the forest, on the periphery or in town, are a function of ensuring that people have a range of options available to them, especially, but not solely, during times of vulnerability.

Alternative uses for forest resources

It has long been appreciated in research circles that the value of forests, tropical and otherwise, consists of more than just the timber which they contain (for example, see Peters *et al.*, 1989). Tropical and dry forests are endowed with some of the highest concentrations of terrestrial biodiversity. This vast array of species offers many tangible products to forest users, such as medicines, food, fibres and construction timber.

These other products have been given a variety of labels, such as minor forest products, secondary products or non-timber forest products (Belcher, 2003), with the last term in widest use.

The research at MRF has identified hundreds of forest species used by local communities (Sheil *et al.*, this volume). Most are for local consumption, but many are also traded in local and regional markets, such as game, fish and *gaharu*, with the last being particularly significant. The extent of trade is strongly related to accessibility to markets, which are situated mainly in local towns. Many studies around the globe, including at MRF, have now indicated that the combined potential value of all these resources in the forest can be significant, at times greater than the value of the primary commercial focus of the land, such as logging or livestock (e.g. Peters, *et al.*, 1989; Melynk and Bell, 1996; Shackleton, 1996), although realisation of that value depends upon a number of factors, including market access (Pyhälä *et al.*, 2006). The challenge remains how to manage extraction of commercial timber in a way that has only limited impact on the sustainable supply of these non-timber forest resources.

However, with integrated land-use planning and modern management it need not be a case of having to choose between commercial timber or non-timber forest products. Timber harvesting approaches, such as Reduced Impact Logging (Priyadi *et al.*, this volume), can limit damage to the forest and the wider environment, thereby accelerating regeneration, with both outcomes ensuring that some NTFPs remain available (Barreto *et al.*, 1998; Holmes *et al.*, 2002). Moreover, commercial logging operations improve accessibility and abundance of some NTFPs species, especially those that thrive in secondary forest or areas opened up by logging operations, such as some species of rattan. For example, Meijaard and Sheil (this volume) detail how approximately one-quarter of the wildlife species investigated actually increased following logging and that there had been no local extirpation of any species, as has been often assumed. Additionally, commercial logging and swidden creation results in an abundance of waste wood. Iskandar *et al.* (this volume) have shown that this wood can be put to good use at household levels and can

provide promising commercial opportunities for charcoal manufacture and distillation of wood liquors/ wood vinegar.

Within the last decade, new values of forests and other systems, i.e. the ecosystem service values, are being elucidated, quantified and communicated (Constanza *et al.*, 1997; Higgins *et al.*, 1997; Portela & Rademacher, 2001). These include services such as water provision, carbon sequestration and pollination. In fact, Sumarno *et al.* (this volume) demonstrate how carbon payments could compete strongly with oil palm in terms of generating income for the Malinau district. Adding this knowledge to that regarding the value of non-timber forest products adds new weight to the need for sustainable forest management, which must happen at all levels of management and government. In Malinau, these have been appreciated at the local level, where some village structures (e.g. at Setulang) have opted to afford protection of a significant proportion of their forests from commercial logging, primarily because of their need to ensure good water quality. Given current global warming estimates, the carbon sequestration value of forests is being increasingly recognised as an important function of tropical forests and is a key reason why they need to be protected from large-scale land transformation (Adger *et al.*, 1995; van Beukering *et al.*, 2003). The negative impacts of forest clearance in many places on the health of local people should also not be underestimated (Colfer *et al.*, 2006; Dounias, this volume).

Cultural values are also widely appreciated, but difficult to assign a monetary value as with tangible forest products, and so they have rarely been included in calculations of the total economic value of a particular region. None the less, cultural values are clearly significant. For example, Seidl and Moraes (2000) estimated cultural aspects of forests in a region of Brazil to contribute 7.3% of total economic value, whereas in the dry forests of Zimbabwe, Campbell *et al.* (1997) reported that cultural use of environmental goods accounted for between 16% and 29% of the value accruing from total use of the environment. At the MRF such a valuation has not been undertaken, but there are clear cultural values, as evidenced by the perceptions of the forest by local people (Sheil

et al., this volume) and the recognised need to respect sacred burial sites in the forest (Limberg *et al.*, this volume).

However, translating research knowledge regarding the wealth and cultural value of products in forests into policies and ultimately land-use decisions has taken time. Many research and advocacy groups lament that these issues still seem to be ignored by government and planning agencies, with the focus still firmly on timber as the primary use and value of forests. None the less, there has been significant progress with implementation of decentralisation policies and management plans (Limberg *et al.*, this volume), as well as global reporting protocols, such as FAO's global State of the Forests Report, which serve to raise awareness.

Intensification of forest use

The various chapters in this book have described the many and various uses of forests and their resources. The type of use differs between settlements, especially in relation to proximity to regional centres, as well as land potential. None the less, a clear theme of the different studies presented in this volume is intensification of forest use, evident at both the species scale and the land-unit scale.

At the land-unit scale, communities are being faced with the need to zone the land under their control and to decide how to optimise the utilisation of each zone (Limberg *et al.*, this volume). This has happened in the past, but in a less formal manner and always with uncertain boundaries and the understanding that certain uses could always expand into relatively untouched forest if required. But the demarcation and allocation of specific forest areas to specific villages, and the need to ensure that the aspirations of all forest users are considered and (as far as possible) met, means that there is limited room for land expansion. Consequently, intensification is a logical option, especially in the face of parallel forces towards greater commodification and integration in the formal cash economy (Levang *et al.*; Limberg *et al.*, both this volume), to some extent typifying the Boserup (1965) model of intensification in agriculture. Consequently, communities have to consider allowing part or all of their forests

to be logged, and many are eager to do so because of the cash royalties it brings. Rotation rates of swiddens are declining, with perceived declines in yields, demanding greater inputs and management. Replacing forests with plantations is seen as an attractive option (Suwarno *et al.*, this volume). Even communities with a strong sense of identity and respect for the forests and what it provides, are pressed to establish secure means of generating income, with plantations as a primary option.

At the species level it is apparent that several resources have been over-exploited, either because of logging operations or heavy, targeted harvesting by local traders. For example, Levang *et al.*, (this volume) describe how *gaharu* used to be relatively abundant, but that now harvesters can search for days with a limited harvest, and Meijaard and Sheil (this volume) report that some mammal and bird species declined after logging. However, intensification need not concentrate solely on forest conversion but can also be accompanied by increased efficiencies of use, leading to less wastage. For example, the use of slash waste for charcoal or wood vinegars

may well provide a livelihood opportunity for some households (Iskander *et al.*, this volume).

Reduced impact logging

In the tropical forests of south-east Asia, the forest canopy is dominated by species within the family Dipterocarpaceae. Up to 80% of the timber species found in south-east Asian forests belongs to this family. As the dipterocarps are also the main commercially exploited timber, harvesting rates commonly exceed more than 10 trees per hectare (or 100m³ / ha). In standard logging operations, this intensity of exploitation commonly damages more than 50% of the original tree population. Hence, there are considerable concerns surrounding issues of sustainability of logging in Indonesia in particular. Prompted by a growing awareness of the need to protect forest ecosystem functions and maintain biodiversity in production forests, concerns have been raised as to whether logging can be compatible with other forest services. Efforts to promote more sustainable timber-harvesting techniques have promoted the implementation of Reduced Impact Logging



RIL training in Malinau (Photo by MRF team)

(RIL) (Priyadi *et al.*, this volume). The objective of RIL is to reduce soil disturbance, damage to residual trees (Sist *et al.*, 2003) and impacts on the wider biodiversity (Meijaard and Sheil, this volume) as well as ensuring future production of timber. RIL has been tested in a number of sites in south-east Asia and has shown that damage to the original stand can be reduced by 30–50% and can probably shorten the logging cycle due to better post-harvest regeneration.

Central to the implementation of RIL is a clear set of guidelines which define the actions necessary to achieve it. The guidelines presented by Priyadi *et al.* (this volume) conform to the guidelines of the TPTI (*Tebang Pilih Tanam Indonesia*, or Indonesian Selective Cutting and re-planting System). The guidelines concentrate on reducing the impacts of tree felling and heavy machinery on the residual stand and forest soil as well as providing 'best-practice' training for tree fellers, tractor operators and forest planners.

The work of CIFOR in the Malinau Research Forest on RIL has made a significant impact on the process of decree issuance, whereby all timber companies in Indonesia should now be implementing RIL in their concessions (Gustafsson *et al.*, 2007). Furthermore, for timber companies, the implementation of RIL techniques will generate important credit to the process of achieving forest certification (Ruslim, pers. comm).

However, the success of RIL implementation in the field will ultimately depend mainly on the motives and intentions of logging companies. At present, the common belief among loggers is that RIL techniques cost more to implement, in simple economic terms, than conventional timber-harvesting operations, and this is certainly affecting the adoption of RIL by many companies, including those operating in Malinau. With timber markets currently increasing the demand for timber from more sustainable, or certified, sources, the reluctance to adopt RIL may change in the short term.

Prompting conservation of forests and resources

Although there are undeniable pressures for intensification of forest use through logging and

land transformation to swiddens and plantations, the benefits of conservation are well appreciated and understood by local communities and officials (Limberg *et al.*, this volume). All community groups consider intact forest as the most valuable to meeting their varied needs for subsistence and income generation (Sheil *et al.*, this volume), as well as maintenance of local cultures and traditions. Some communities have zoned significant proportions of land under their jurisdiction as 'protected forest' and many have regulations regarding the harvesting of certain species (Limberg *et al.*, this volume). Interestingly, there remains a great deal of ambivalence about the benefits of logging, with only 56% in favour of timber exploitation, even before a targeted conservation awareness campaign (Sheil *et al.*, this volume). This proportion declined further as a result of a small, temporary awareness campaign, suggesting fertile scope for changes in conservation-related knowledge, attitudes and practices if a sustained and concerted campaign is mounted (Boedhihartono *et al.*, 2007).

However, the integration of conservation principles and practices into other land uses in the forest landscape, such as swidden agriculture and plantation establishment, remains to be explored so that the impacts of these activities can be minimised (Boedhihartono *et al.*, 2007). Logging stands out in this respect where there is considerable knowledge and growing pressures on timber companies to log according to best environmental practice, typified by Reduced Impact Logging (Priyadi *et al.*, this volume).

In balancing the need for conservation with that for sustainable livelihoods, it has to be accepted that areas of forest will be lost. The challenge becomes how to (i) integrate conservation areas and practices into the wider land-use process, and (ii) intensify land use as a means to minimise the areas of new forest converted or otherwise altered (Suwarno *et al.*, this volume). This needs to happen at the planning or district level, as well as at the community and household level. Centralised planning helps to examine the balance and trade-offs between different land uses. For example, Suwarno *et al.* (this volume) explore the extent of plantations that are proposed, as well as the magnitude of investment in intact forest to avert transformation. This sort of exercise now needs to be iterated with local role players, including local communities. At a

finer scale, local communities and households need to collaborate so that adjacent land uses are complementary and minimise fragmentation of the forest. Interestingly, modelling of forest use and total economic value under three scenarios in Sumatra indicated that selective use and conservation resulted in relatively similar returns, with both being approximately 30–36% higher than logging (van Beukering *et al.*, 2003).

But conservation at the local scale is not just about zoning of land. It also relates to how land and resources are managed to meet a specified output. Communities already have regulations or conventions that have conservation significance (e.g. regulations relating to the harvest of certain species, or at certain times of the year, where land can be cleared and so on (Limberg *et al.*, this volume). Approaches such as eco-agriculture and agroforestry could well have conservation benefits within the productive swidden areas, as well as plantations. Additionally the conservation significance of current logging practices needs to be examined. For example, the burning of slash waste and the slashing of lianas in logged areas to minimise residual stand damage all have deleterious environmental impacts (Priyadi *et al.*, this volume). Mechanisms for the control of soil erosion also need to be further implemented (*ibid.*).

Forests and health

Forest ecosystems are dynamic, as are the human societies depending on the forest. Forest dwellers have had to adapt to permanent changes in forest ecosystems. However, the changes that they face today are much more extreme and radical than those they have experienced in the past. As rates of deforestation, drastic modification of resource availability and the invasive influence of the cash economy increase, social, cultural, economic and political systems become increasingly difficult to accommodate. The choices made by foraging societies, such as the Punan in Borneo, could be costly in terms of ecological success. Social change of this nature may not necessarily be accompanied by a well-balanced biological optimum. It may sometimes invalidate defence mechanisms and nutritional status. The imbalanced biological side may in turn compromise the social and cultural integrity of the society.

Industrialisation and urbanisation accompanying the economic boom in the interior of Borneo have had an impact on the dietary habits of the people. As shown by Dounias *et al.* (this volume), there is a trade-off between the advantageous new crop resources, which bring with them a sedentary lifestyle, and the detrimental effects of modification in the availability and distribution of wild food resources near permanent settlements. Such changes affect nutritional status, as clearly shown by the peri-urban Punan, who tend to have an excess intake of energy-dense foods, especially snacks that are rich in fat and free sugars but low in complex carbohydrates. Evidence from epidemiological studies has confirmed the link between such diets and the risks of chronic degenerative diseases of middle and later adult life, especially cardiovascular diseases and certain types of cancer. Although they are not yet a critical problem for the Punan, other nutritional disorders, such as anaemia, excessive weight, hypertension, elevated cholesterol levels, and diabetes, are emerging signs of a dietary imbalance. This transition from the rural to urban milieu is taking place throughout the tropics, and Dounias (this volume) clearly highlights the health implications of such social and environmental change, despite the apparent material advantages.

The role of research in managing forests for livelihoods

The decentralisation process in administration and power in Indonesia has provided many opportunities for enhancing local livelihoods. However, the process is complex and at times poorly understood by the various actors, resulting in uncertainties and constraints (Wollenberg *et al.*, Chapter 6). As such, the issue is fertile ground for the development of meaningful and rewarding synergies between research and management.

The chapters in this book present a synthesised picture of the myriad research results emanating from the research programme in MRF. Many scientific papers have also been published in peer-reviewed journals. Yet this research effort, understanding and outputs will have been meaningless unless the research process and outcomes influence knowledge, attitudes and practices of the different agencies in the region

from local households and communities in the forest to district and national authorities, planners and logging companies (Sayer and Campbell, 2004). Clear evidence is presented that the research process has indeed offered new opportunities or insights to some local stakeholders. These include training courses in GIS technology (Suwarno *et al.* and Limberg *et al.*, both this volume), the training of entrepreneurs able to manufacture charcoal from waste wood (Iskander *et al.*, this volume), guidelines for Reduced Impact Logging (Priyadi *et al.*, this volume), changed perspectives on conservation (Sheil *et al.*, this volume), and increased knowledge on the local use and composition of the forest (Levang *et al.*; Limberg *et al.*, both this volume). In addition, the model described by Suwarno *et al.* (this volume) supported policy changes on land use in Malinau which tempered the local government's enthusiasm for oil palm and spurred their interest in investigating payments for environmental services (PES) schemes (Dwi, pers. com. 2007).

However, the research process can have far greater impacts when integrated into higher-level planning and decision-making processes, at all scales, including the Malinau district, Indonesia and globally. The very publication of this book will help disseminate key messages to other researchers, development agencies and forestry donors. In this regard, the research programme at MRF, whilst context-specific, acts as a model for other forests and communities in the world facing similar challenges. Thus, the process of ensuring the research outcomes of this programme in MRF become the basis for a viable model of sound land-use planning and sustainable livelihoods elsewhere, has only just begun.

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