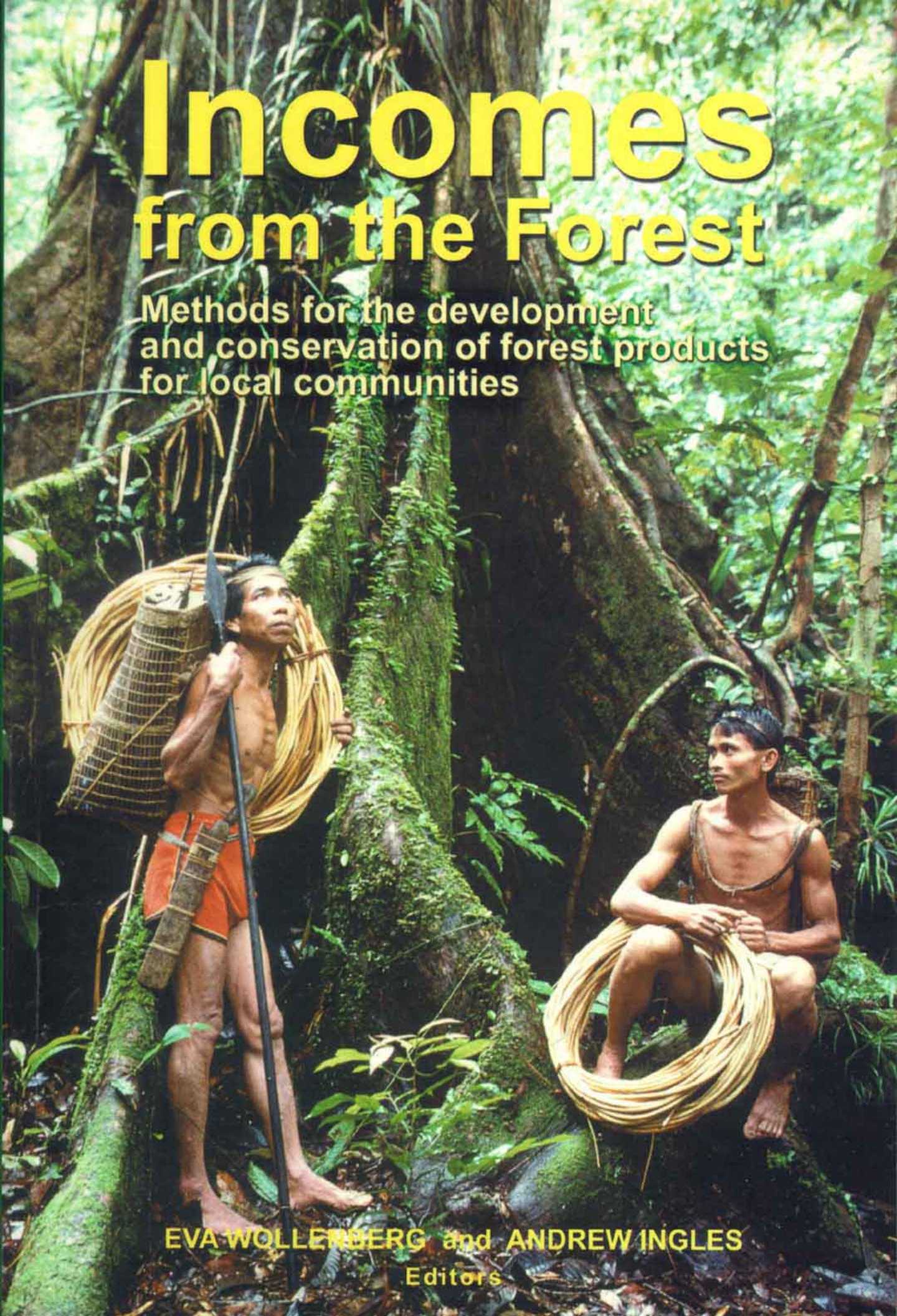
# Incomes from the Forest

## Methods for the development and conservation of forest products for local communities



EVA WOLLENBERG and ANDREW INGLES
Editors

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Editors

**Eva Wollenberg and Andrew Ingles**






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# Foreword

Hundreds of millions of people in the tropics derive a significant part of their livelihood from forest products. Many of these people live on lands designated for forest conservation. To resolve the growing tension between local people's livelihood needs and these conservation aims, there has been significant interest worldwide in uses of forests that are compatible with conservation.

Much attention has been given to the potential of non-timber forest products, ecotourism, small-scale timber enterprises and environmental services, but we now know that such uses do not guarantee either sustained forests or improved livelihoods. Seemingly low-impact uses can have high impacts if the product or service is economically successful. With economic success, incentives for over use exist, unless appropriate institutional controls are present.

The world is also changing quickly. People living in forest areas are engaged in a series of rapid shifts in their economic strategies to accommodate these changes. The globalisation of markets, transportation and communication in combination with economic expansion and political reform are transforming forest areas, leading to new economic opportunities, livelihood patterns and ways of managing forests. People previously dependent on forests are reaching new markets, as well as having to cope with new forms of competition from outside collectors and synthetic or cultivated substitutes. Much of the traditional use of forests, which contributed to the maintenance of forests' biodiversity, is in a state of flux. The impacts of these changes on both the forest and the people are unclear.

As a result there has been a call for more site-by-site understanding of forest uses and their potential impacts. This must include assessment of the local distribution and ecology of products and the incentives for their sustainable management. We also need to know more about how local institutions affect these incentives and the local value derived from use. To date, we have lacked adequate methods for these assessments. Although much can be borrowed from agriculture or forestry the number of forest products, the size and remoteness of many forests and the lack of knowledge of the ecology or productivity of many products means that new approaches are needed. To be practicable, methods need to be simple and must provide the feedback needed for adaptive management.

CIFOR recognises that there is already a wealth of field-based methods that could be used for more adaptive management of forests. This book is an effort to document our experience in this area. It brings together a cross-section of current methods as they are being practised and seeks to highlight tools appropriate for increasing the adaptability of management, i.e., tools for assessing options and monitoring impacts. Each chapter tackles a method or family of methods and reports on its strengths and weaknesses. In the spirit of adaptability, the main lessons to be drawn from this book are not about how to implement a particular method, but rather, how practitioners can think more critically about the methods available and criteria for their evaluation.

The methods and analyses reported here should help us to better understand the potential for optimisation of conservation and development benefits.

The catalyst for this book was a workshop held in Cianjur, Indonesia. Andrew Ingles and members of the Southeast Asia Non-Timber Forest Product Network helped to organise the meeting and guide the development of the book. We are very grateful to them and to the contributors to this volume. We hope that the book will serve as an inspiration for both researchers and practitioners to develop their own repertoire of methods enabling the improved realisation of forest-dwelling people's economic aspirations and the better management of their surrounding forests.

Jeffrey A. Sayer
Director General of CIFOR

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Chapter One

# Methods for Assessing the Conservation and Development of Forest Products

## What We Know and What We Have Yet to Learn

Eva Wollenberg

## Background

During the last ten years, an interest in non-timber forest products (NTFPs) has taken the world by storm. Vast sums have been invested in exploring the potential of non-destructive uses of forests to provide substantial benefits to local people while conserving forests. The importance attached to NTFPs has possibly changed forever the way forest values and their development potential are assessed. Interest in NTFPs has launched significant advances in enterprise development, marketing and income generation among forest dwellers. Research has expanded the opportunities for combining income generation with conservation and has complemented other development strategies such as non-forest based enterprises, employment, ecotourism, community logging, domestication of forest products and agricultural intensification.

Despite the enthusiasm for and surge of activity surrounding NTFPs, there also has been a healthy measure of caution, criticism and mixed success. Not everyone has shared an unqualified optimism about the potential of NTFPs for jointly meeting the complex demands of both conservation and development (Browder 1992; Homma 1992; Dove 1993; Godoy and Bawa 1993; Godoy *et al.* 1995).

The collection of papers in this volume has arisen in response to the current debates about the development and conservation potential of NTFPs. These discussions suggest that the level of benefits and sustainability of NTFP use is site and species specific, warranting close inspection of each case over time. Effective methods are needed to assess NTFPs locally and monitor their impacts to ensure that the development and conservation objectives desired are likely to be met.

The purpose of assembling this volume is to present concepts and approaches for assessing forest-based income-earning opportunities that are potentially compatible with conservation. The authors' collective interest is to inform programmes that aim to improve the livelihoods of people dwelling in forest areas by presenting and analysing methods that have been or are currently in use. Both practitioners and researchers concerned with promoting sustainable development of NTFPs are seen as the audience of this volume.

This book arose from a workshop on *Methods for Conservation and Development of Non-Timber Forest Products* co-sponsored by CIFOR and the IUCN: World Conservation Union in April 1996 in Cianjur, Indonesia. The meeting brought together 25 professionals involved in different aspects of forest-based enterprise development – including private business people, researchers, ecologists, NGO community organisers, government foresters, trainers and project advisors. The workshop aimed to identify and document a range of relevant methods by encouraging participants to share their substantial knowledge and personal experiences (Haury and Saragih 1995; Elfian and Perbatakusumah 1996; Foppes *et al.* 1996; Graefen and Syafrudin 1996; Karki 1996; Lecup 1996; Mittelman 1996; Panathpur *et al.* 1996; Shiva 1996; Upadhyaya *et al.* 1996; Warner 1996; Yayasan Dian Tama 1996). At the end of the meeting participants agreed on the need to document the methods available and to provide a comparison of their advantages and disadvantages. Researchers and practitioners found that while their methods were often used in different contexts there was much to learn by sharing approaches and techniques.

To meet the needs expressed in the Cianjur meeting, a set of chapters were commissioned to present a range of methods available and a comparison of their strengths and weakness. A number of organisations working on NTFP conservation and development shared their experiences and the lessons they had learned. The organisations included Appropriate Technology International (ATI), the Biodiversity Conservation Network (BCN), the International Network for Bamboo and Rattan (INBAR), the UK Overseas Development Administration (now DfID), GTZ, the Tropenbos Foundation, IUCN, Conservation International and Technoserve. The chapters in this volume are the product of this collaboration.

The authors of each chapter do not present step-by-step guidelines, but rather review a range of methods and analyse their appropriateness for different circumstances. The intent is to discuss the diversity of methods in use and enable readers to determine for themselves which might work best for them. Chapter bibliographies provide further sources of guidance.



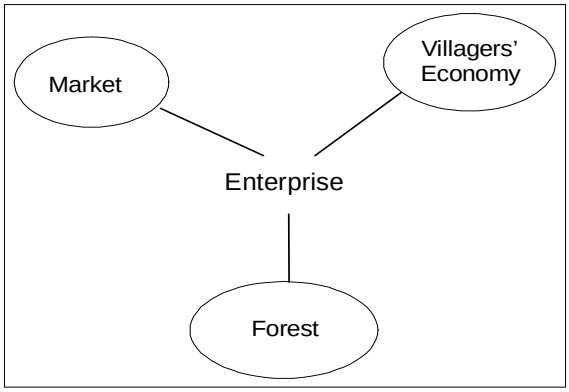
The importance of sustainably harvested timber for local use and marketing by communities has sometimes been obscured by the interest in NTFPs.

The book is based on several important assumptions. First, while NTFPs provide the point of departure, most of the methods are relevant to both timber and non-timber products. Improving the livelihood opportunities of forest dwellers must take into account the full range of forest products that people use, especially timber. While timber harvesting has often been associated with large commercial operations acting independently or in opposition to the interests of local people, there is growing evidence of sustainable small-scale timber production by local communities (Land Tenure Center/IES 1995). Consequently, the question is whether

a forest product or a service such as bioprospecting or ecotourism can contribute to local people's livelihoods rather than whether a product is derived from timber or not. We distinguish activities intended to benefit communities from industrial activities by referring to the former as small-scale forest product enterprises. Many programmes, including those of CIFOR, have moved away from an exclusive focus on NTFPs to reflect this broader perspective. Some of the chapters in this volume therefore address timber (see chapters by Ames and Bennett), in addition to more conventional NTFPs. We refer interchangeably to NTFPs, forest products and small-scale forest products. Although more attention is given to plant products in the book, this is only a reflection of these authors' experiences and does not suggest that animal products or environmental services are not of equal potential importance in achieving conservation and development objectives.

Another underlying assumption is that any effort to enhance the use of forest products must consider the ecological, financial and social impacts of such actions. Forest product conservation and development is thus situated in a set of three-way relationships between a forest product enterprise and the market, the forest and the villagers' economy (Figure 1.1). The chapters therefore contain techniques to determine enterprise viability by assessing markets and profitability, to predict the sustainability of a population of a specific species, and to measure household income. They also offer ways to assess whether the three complementary objectives of enhancing income, conserving forests and improving social conditions have been achieved. Although some of the chapters focus on business enterprise planning, the intent of the book is to provide methods appropriate to the use of forest products for consumption and barter as well as for the sale of products. The term 'enterprise' in Figure 1.1 is therefore interpreted broadly to encompass NTFP activities intended to provide economic benefits, whether in cash or some other form.

**Figure 1.1** The forest enterprise




Finally, the approaches discussed here range from the academic and theoretical to the more hands-on and practical. Academic researchers and practitioners potentially have much to learn from each other's methods. Often researchers are interested in methods for operationalising and testing concepts and producing research designs,

while practitioners are more concerned with the need to implement activities and learn from experience. The Cianjur workshop highlighted that many approaches and methodological issues were common to both groups. For example, methods to sample and conduct inventories of NTFPs are relevant to both basic and applied studies. Measuring the social or ecological impacts of NTFP development is a key concern for both scholars and development practitioners.

With these assumptions in mind, we turn to a discussion of the areas of methodological achievement and the gaps in our knowledge. The chapter concludes with an overview of the structure of the book.

## Overview of Methodological Issues

### What do we already know?

Although development practitioners have been working with NTFPs and other forest products for decades, interest in developing methodologies specifically for this group of products has only developed in recent years with the increase in community forestry, agroforestry and integrated conservation and development projects (ICDPs). Only a small proportion of the techniques presently in use or documented have dealt specifically or exclusively with forest products. They fall into four main groups: (1) enterprise development; (2) ecological assessment; (3) participatory development; and (4) monitoring and evaluation.

Guidelines and methods for NTFP enterprise development are the most commonly documented as well as those most specific to forest products (Thomas and Schumann 1993; Nadkarni *et al.* 1994; Warner and Pontual 1994; ATI 1995; FAO 1995; Lecup *et al.* 1995; Margoluis and Salafsky 1996; Taylor 1996). Most guidelines deal inadequately with the problem of simplifying the volume and complexity of information for their audience. Long lists of required information and complicated business planning techniques are unlikely to be implemented by projects with limited skills and tight budgets. Such projects are interested in rapid implementation. Literature is available on more general topics like the design of projects and assessing project viability in microenterprise development (Buzzard and Edgcomb 1992; Haggblade and Gamser 1991). There has been extensive documentation of the methods used by development NGOs with expertise in income generation such as CARE, BRAC, ATI, PACT, Save the Children, Environmental Enterprises Acción, Catholic Relief Services and Technoserve. This documentation tends to be more user-friendly (including videos, computer software and guidebooks), and should be appropriate to forest product-based enterprises.

Work on ecological assessment includes guides for determining sustainable harvest levels of non-timber forest products (Hall and Bawa 1993; Peters 1994), conducting vegetation analysis in community-managed forests (Metz 1991), inventorying NTFPs (Stockdale and Ambrose 1996) and measuring biodiversity in natural forests (Boyle and Boontawee 1995). Assessment methods seem most refined for providing insights about specific products, rather than about ecosystem relationships and larger-scale impacts. The concepts of biodiversity or 'ecosystem integrity' and their translation

into measurable indicators have proved difficult (Prabhu *et al.* 1996). The lack of botanical, zoological or management information for many forest products has also been a limitation to ecological assessment. Simple taxonomic information, for even commercially traded, important species such as cardamom in Laos, is often lacking, and further hinders assessment.

Much has been written about methods for improving local participation in forest project design and assessment, including the use of participatory mapping (Fox 1988; Carter 1996; Stockdale and Ambrose 1996), co-management (Fisher 1995), participatory development of indicators of sustainability (IUCN 1996, Colfer *et al.* 1998a, Colfer *et al.* 1998b) and enhancing the relevance of conservation projects to social needs (Borrini-Feyerabend and Buchan 1997). Participatory Rural Appraisal (PRA) methods (Davis-Case 1989; IIED 1998) are now abundant and widely used in NTFP activities. Ranking products, drawing seasonal calendars or resource maps and walking transects with local people have become commonly used techniques. Attention to the needs and participation in decisions by different interest groups, whether by gender, ethnicity or class, is also common in many NTFP projects.



Participatory mapping has become a common tool for identifying forest boundaries (photo by Eva Wollenberg).

There is an ever-growing literature on indicators for monitoring and evaluating project impacts and sustainability, including for NTFP projects (McKone and Phaengsintham 1996), community forestry sustainability (Stevens 1997), forestry projects (Gregersen *et al.* 1993; Prabhu *et al.* 1996; van Bueren and Blom 1997), NGO development projects (Bowman *et al.* 1989) and biodiversity projects (World Bank 1997). At least one guide has been produced about how to implement sustainable forest management (SGS Forestry and IIED 1997), in this case specifically for acquiring sustainability or ecolabelling certification.

### What do we still need to learn?

Despite the availability of a wide range of methods, new techniques still need to be explored and issues related to existing approaches debated. Cianjur workshop

participants noted that key areas where methods needed more development and discussion include:

- establishment and implementation of viable microenterprises based on forest products;
- measurement of the ecological sustainability of harvesting forest products;
- interaction with different stakeholders and building alliances with them; and
- collection of information about policy, markets and stakeholders at national and international levels.

These concerns reflect a more general interest in developing better methods for planning and assessing the feasibility of developing forest products and for then monitoring the impacts of these actions. This collection of essays was structured to address these concerns by including a set of five chapters on methods for planning and feasibility assessment, and a second set of three chapters on monitoring and evaluation. The approaches discussed do not address nevertheless important methodological concerns related to the implementation of initiatives (e.g., how to establish an enterprise) dealing with the uncertainty and variability of forest product supplies or how to increase the bargaining position of local people in the market. The chapters focus instead on methods directly related to information flows as a means to advance understanding about how to deal with conditions of high uncertainty and complexity. Iterative information gathering provides the foundation for more adaptive, responsive management to assess whether the conservation and development outcomes of forest product initiatives are indeed being achieved.

Aside from the need for better methods of feasibility assessment and monitoring, two more general overarching issues emerge from existing experience and the available literature on NTFP-related methods: (1) the need to borrow approaches from other fields; and (2) the need to use many and diverse techniques.

### *Adaptation of existing methods*

In seeking to expand knowledge about appropriate methods, the first issue is the extent to which those developed for other purposes – e.g., non-forest based incomes, enterprise development, community forestry, forestry or biodiversity assessment – are applicable to forest products. Fortunately, there is much that can be borrowed. This raises the question of how forest products and the use or sale of forest products by forest-dwelling people differ from other products, enterprises or development activities. At least five distinctive features of forest product conservation and development initiatives can be identified:

- Forest products usually involve economic strategies based on **multiple products**, many of which have relatively low value; methods may have to be repeated for each product and take into account the complexity of interactions and trade-offs among products. The costs of collecting information may be high relative to the benefits gained from the product activity.
- **The ecology, management and demand for many forest products is poorly understood.** As a result of what has been conventionally considered their 'minor' status, many forest products have not been well studied or documented. Methods may require information that is not easily available.

- Forest products are often in **remote areas** requiring high transport costs; production or collection may be irregular. Methods must be flexible, mobile and light; long periods of time and large areas might need to be covered.
- There is often a **lack of formal skills** in business, finance, ecological assessment and social impact evaluation among the people implementing small-scale forest product initiatives. Methods need to be simplified and where resources permit, training provided.
- Forest products are often managed under **sensitive and complex social arrangements,** especially in common property regimes, where rights are disputed or where multiple management objectives exist. Multiple and overlapping management regimes or objectives may require repeating activities with different groups, being alert to possible conflicts and continually tracking interactions. Methods will probably require consultation with different social groups and need to be sensitive to the possibilities of conflict.

Approaches specific to forest products therefore should be adapted to take into account these attributes. The chapters in this book attempt to address these special features and offer suggestions for reducing the complexity, cost, lack of information and multiple objectives associated with implementation. The need for more systematic and simple 'field-friendly' methods is a theme that emerges strongly among the chapters, especially with regard to business planning, income assessment and determining ecological sustainability.

The analyses also demonstrate how methods from other fields can be borrowed and developed. Belcher's discussion of production-to-consumption systems in Chapter 3 builds upon concepts from agricultural and institutional economics as well as subsector and market chain analysis. Ames makes use of business concepts about profitability in Chapter 5. Lecup *et al.* adapt techniques from microenterprise development guidelines in Chapter 4. In Chapter 8, Wollenberg and Nawir build on methods for studying rural incomes. Fisher and Dechaineux explore evaluation theory in Chapter 9. In Chapter 10, Bennett develops his case from policy prescriptions for commercial timber management. Anderson in Chapter 6 borrows from population ecology and anthropological decision models. De Jong and Utama use elements of project planning theory in Chapter 7.

Despite some of the unique characteristics of forest products, it is not the intention of this book to suggest that there is a distinctive set of methods for forest products. On the contrary, users need to be entrepreneurial in identifying appropriate methods and learning how to adapt them. In some cases the differences among forest products may require more adaptation to the special features of the product than the difference between forest products as a group and other types of development activities. The chapters in this book provide examples and insights about how to approach such adaptation.

### The need to use many, diverse methods

A second issue emerging from the review of available methods is the abundance of information required and the corresponding number and variety of techniques needed

in any development and conservation endeavour. This raises issues of how to select and prioritise methods, combine techniques efficiently, and integrate and aggregate findings that result from their use.

Usually, distinct approaches are required for collecting social, ecological and economic or financial information (see chapters by Lecup *et al.* and Anderson). Techniques from multiple fields require corresponding experience or training and the capacity to bridge disciplines. Capacity to deal with diverse groups of stakeholders such as traders, development workers and biologists is necessary. Methods from different fields are often implemented on different scales and their results need to be integrated. Criteria for assessing feasibility or impacts may vary, which can result in long lists of attributes to measure and the need to set priorities across the different fields.

Forest products can also be highly diverse in their ecology, management, use and marketing. Consider, for example, the differences between a fruit harvested for processing into edible oils, a porcupine harvested for the medicinal properties of its gallstones, and the collection of wild honey for a 'green' market. Individual products such as these require methods tailored to their particular features. Judgement will need to be made about how much to invest in developing techniques and for how many products.

In addition, methods are often applied iteratively in an attempt to adapt to changing levels of information and shifting conditions. Workable options for forest product development are sought through a process of exploration, trial and implementation. Practitioners need to have access to a range of tools and to be able to maintain flexibility in their applications. Methods themselves need to be adaptable and able to cope with changes. The necessity for iterative decision making and information collection was a theme that emerged clearly from the experience of the participants in the Cianjur workshop and is discussed in the chapters by Fisher and Dechaineux and de Jong and Utama.

The same technique may need to be applied at several scales of analysis. For example, market demand often needs to be analysed at several levels; local, national and international. Issues related to scale emerge in the analysis of social and ecological impacts as well. Benefits may accrue to individuals, households, groups of households, communities or regions. Impacts on the forest can occur at the level of individual products, populations of a given species, habitats, forests or larger landscapes of mixed land uses.

Forest product conservation and development initiatives therefore often require diverse disciplinary skills and adaptations of methods to specific products, stages of decision making or scales of analysis. The methods analysed in the following chapters have been selected explicitly to illustrate this breadth and diversity of approach. They remain only a sample of those actually in use and potentially applicable.

There is still much to learn about how to bring the approaches together into a coherent package. The challenge in any local setting will be to: (1) ensure that the scale of analysis and resulting information or activity are compatible; (2) effectively coordinate the schedules for collection of data or carrying out activities to avoid

excessive delays; (3) ensure an appropriate mix of technical skills within the implementing team or access to help (i.e., consultant inputs) and capabilities for interacting with diverse audiences; (4) identify ways of integrating economic, social and ecological information; and (5) set priorities among assessment criteria. Priorities can be established by comparing methods in terms of their cost relative to outcomes, their practicality in specific forest or social contexts, the skills and knowledge required for implementation, their flexibility to be adapted or replicated, and who are the users and beneficiaries. All these factors need to be considered in the context of how the information is to be used or what kinds of outcomes are likely to result.

Given such issues, what can this book contribute to the discussion of methods for forest product conservation and development? As outlined in the opening paragraphs of this chapter, the book aims to provide an overview of the lessons of current experiences. The reader is able to learn how methods can be adapted and developed for forest products and specific contexts. The analyses offered in these chapters is intended to equip users with a basis for interpreting, selecting or adapting methods for their own work.

## Organisation of the Book

This volume was designed to reflect two of the central methodological concerns of people working on forest product conservation and development: the need for better methods of (1) planning and assessing the feasibility of forest product activities (the first part), and (2) monitoring and evaluation of the impacts of these activities (the second part). The chapters roughly follow the steps that might be taken in a forest product initiative: methods related to planning, market analysis, assessing the feasibility of an enterprise, profitability analysis, assessment of sustainable harvest potential, assessment of household income, evaluation of social impacts, and policies for monitoring the outcomes of forest management. They reflect a cross-section of practitioner- and research-oriented approaches. The set of methods is not intended to be comprehensive, so much as to stimulate new thinking. Although there is a tendency for authors to write about their approaches as if they are broadly generaliseable, their experiences are nevertheless based in particular places, times and peoples. Any use of the methods described should always be done with care to adapt the approach to new circumstances.

The book begins with a critical essay by J.E.M. Arnold and Manuel Ruiz Pérez in which the assumptions underlying NTFP-based approaches are discussed. The authors suggest that more attention should be given to understanding the limitations on NTFP conservation and development, including the effects of market fluctuations and the tendency for many NTFPs to encounter boom-bust cycles. They urge that the evaluation of income generation options for forest dwellers should consider not only NTFPs, but other products, enterprises or employment opportunities. Arnold and Ruiz Pérez conclude that there is a need to analyse NTFP initiatives on a case-by-case basis because of the variable conservation or development potential associated with non-timber forest products. With this observation, the authors establish the

rationale for the remaining chapters that focus on methods to assess feasibility and monitor outcomes.

In the next five chapters, the authors present techniques for planning and assessing the feasibility of forest product-based enterprises. Wil de Jong and Rudijanta Utama discuss issues confronting the manager planning an NTFP initiative, highlighting three essential elements: the involvement of stakeholders, the need for good information and the need for biological monitoring. They then consider the problems and opportunities in applying these planning principles to forest-based income activities in a GTZ-supported Social Forestry Development Project in Indonesia. Ways are suggested to undertake projects in a step-wise fashion in order to match decisions with information as it becomes available. The authors also make the point that in some cases NTFPs may not be the most appropriate products for development. However, the interests of funders often inappropriately constrain the possibilities for working with agricultural products with greater potential.

Brian Belcher reviews common approaches to analysing market and processing structures such as market chain and subsector analysis. He identifies additional information necessary to diagnose interventions. This includes understanding horizontal linkages among actors in a market chain (e.g., farmers' cooperatives or industry associations that affect power relations and mobilisation of resources), vertical linkages (e.g., mechanisms such as contracts between buyers and sellers that influence people's motivations to participate in the chain), and intensity of use of labour or capital in each stage of production, which has direct implications for forest conservation. The methods are discussed in the context of action research conducted by the International Network for Bamboo and Rattan (INBAR).

Isabel Lecup, Kenneth Nicholson, Hardjono Purwandono and Sameer Karki add to this general framework for diagnosis by discussing methods for assessing the feasibility of different forest-based enterprise options. Their chapter represents an effort to build upon methods used in training courses by the Regional Center for Community Forestry (RECOFTC) in Bangkok (see Lecup *et al.* 1995), as well as to capture the authors' individual experiences in developing NTFP-based enterprises with different organisations in Vietnam, Nepal and Indonesia. They explain how the methods for assessing NTFPs differ from more conventional business planning or enterprise development by having a stronger emphasis on environmental and social sustainability. A two-stage procedure for collecting financial, social and ecological information to assess NTFP options is suggested.

Among the procedures suggested by Lecup *et al.* is the need to assess costs and benefits related to different enterprise options. The chapter by Mary Ames focuses on this need by examining profitability as a robust indicator of enterprise viability. She reports on a range of methods used in her own analysis of four income-generating initiatives in forest communities in the Philippines and Indonesia. In discussion, Ames outlines simple-to-follow steps for identifying costs and benefits and highlights more general features of forest-based enterprises that may affect their profitability and conservation potential. The analysis of multiple products receives special attention and how trade-offs occur in profitability at the product and enterprise levels are

examined. These studies suggest that the forest products with the highest levels of profitability tend to be those with high value as raw materials, rather than those that gain value through processing.

The assessment of sustainable harvesting levels for a given product is central to any forest product endeavour. Patti Anderson's chapter takes on the challenge of showing how ecological and economic information can be used together to assess the sustainability of harvesting for a single species. She examines the case of a single, widely used palm species, *Iriartea deltoidea,* in Ecuador. Based on field measurements Anderson constructs a matrix model of the demography of the palm's population in different habitats. The model shows the levels of removal possible to maintain a stable population. She then examines how local harvesters and traders decide to increase, decrease or maintain removal levels. The results of this analysis can be used to inform policies about safe minimum standards of harvesting for *Iriartea.* Anderson's analysis indicates some of the technical complexities of assessing ecological sustainability and the difficulties in predicting demand. As part of a formal research project, it is a more detailed analysis than is often feasible in many development project contexts.

Methods related to monitoring and evaluation are central to the book's thesis that the development and conservation potential of forest-based activities needs to be assessed on a case-by-case basis. The next three chapters discuss methods to assess the outcomes of forest-based conservation and development initiatives. Measuring income is essential to determine the benefits resulting from forest-based income activities. Eva Wollenberg and Ani Septiani Nawir review methods for measuring the income of people living in forest areas. They summarise the methodologies used in case studies and use these cases, as well as insights from their own research in Indonesia, to suggest ways of overcoming the logistics of collecting income information related to possibly hundreds of products. Attention is also drawn to the difficulties of assigning values to forest products where such products are not sold. One conclusion is that the methods currently in use for accurately estimating income are costly and probably not possible or appropriate for many development efforts, especially where long-term monitoring is required.

Robert Fisher and Rachel Dechaineux describe approaches for assessing and evaluating the social impacts of NTFP projects, which resulted from work conducted in Laos. They stress the need for ongoing evaluations that can feed into adaptive planning and decision making and suggest a framework for conducting cost-effective assessment of social impact approaches. The framework differentiates between information that needs to be collected by specialists and that which can be collected by field staff. It also identifies well being, equity and risk as the three dimensions of most importance for understanding social impacts. Fisher and Dechaineux make the important point that the acceptability of social impacts ultimately needs to be judged by the communities themselves. They argue that, for example, if women's workloads have increased as the result of a project intervention, and the women affected find that increase acceptable, then the overall impact should be judged as acceptable.

The book concludes with Chris Bennett's chapter on the role of government in promoting and assessing sustainability. Bennett critically reviews the experience of prescriptive policies in Indonesia as a tool for promoting sustainable forest use by communities and suggests the need for alternatives that are less costly and more effective. His work is based on extensive discussions with the Indonesian Ministry of Forestry about transparent, reliable and low-cost ways of assessing community-based forest management. He argues that prescriptions present requirements that might not be appropriate for all sites. By specifying personnel and equipment requirements, budget allocations and strict harvesting guidelines, these prescriptions reduce incentives and capacities for innovation. In some cases they even encourage wasteful harvesting. One alternative is to use outcome-based indicators that should be simpler to implement, encourage more efficient use of resources, involve lower bureaucratic costs and enable more innovative adaptation to site-specific conditions. There may be ways of involving communities themselves in the assessment process. Bennett concludes that these cost-saving alternative approaches will be necessary to enable governments to support community-based management at a large scale.

These chapters provide only a sample of the rich diversity of methods available and in use. They emphasise the necessity for careful assessment and monitoring to determine the potential benefits from forest-based income activities, as well as the actual impacts. With a range of tools in hand and a spirit of innovation, it is hoped that the readers of this book will be able to develop methods appropriate to their own circumstances, as well as use such methods to engage in a learning process of development. Whether driven by interest in NTFPs, community-based logging, ICDPs, microenterprises, community-based forest management or pure scientific inquiry, the enthusiasm for improving sustainable incomes from forests has so far vastly outweighed the methods available. Even where methods exist, it seems there will always be a never-ending quest for additional tools that are less expensive, more reliable, faster or more revealing.

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Chapter Two

# The Role of Non-timber Forest Products in Conservation and Development

J.E.M. Arnold and Manuel Ruiz Pérez

The interest in non-timber forest products (NTFPs) that has built up over recent decades in conservation and development circles has its origins in a number of propositions:

- NTFPs, much more than timber, contribute in important ways to the livelihoods and welfare of populations living in and adjacent to forests; providing them with food, medicines, other material inputs, and a source of employment and income, particularly in hard times.
- Exploitation of NTFPs is less ecologically destructive than timber harvesting and therefore provides a more sound basis for sustainable forest management.
- Increased commercial harvest of NTFPs should add to the perceived value of the tropical forest, at both the local and national levels, thereby increasing the incentive to retain the forest resource, rather than conversion of the land for use for agriculture or livestock.

The interest aroused by such arguments has been considerably enhanced by the apparent coincidence of conservation and development objectives that they provide (see for example Myers 1988; Panayotou and Ashton 1992; Plotkin and Famolare 1992).

Valuations of forest sites have been interpreted to indicate that the potential income from sustainable harvesting of NTFPs could be considerably higher than timber income, as well as income from agricultural or plantation uses of the forest sites (e.g., Peters *et al*. 1989b). This has led to initiatives to expand and provide markets for more locally produced NTFPs, in order to tap an increasing share of this apparent cornucopia of sustainably harvestable wealth in tropical forests. This is the basis of the 'conservation by commercialisation' hypothesis (Evans 1993).

Attention has also been drawn to the advantages to be gained by drawing on indigenous knowledge of the forests and forest products, and building on the sustainable systems of use that local people often seemed to have created (Posey 1982; Prance 1990; Stiles 1994; Redford and Mansour 1996). It has been proposed that this can only be possible if people have recognised and legally secured rights to manage their forest resources. Another component of the heightened attention to NTFPs has consequently been linked to possibilities for empowering local people.

> The ancient practice of extracting economically valuable, non-timber forest products (NTFPs), leaving the forests structurally and functionally intact, has emerged as a possible means of reconciling the conflicting roles of tropical forests. This practice ... captured the attention of defenders and developers of tropical forests around the world in the late 1980s when a grass-roots movement of autonomous forest rubber tappers fought to protect their lands from encroaching cattle ranchers (Nepstad and Schwartzman 1992).

In this chapter we review the evolution of the debate on these propositions and the lessons that appear to be emerging in practice. In the first part we examine the conservation dimensions, highlighting the differences in perceptions among different stakeholder groups about what should be conserved. The second part looks at development issues – the evolution of the role of NTFPs in meeting cultural and subsistence needs, and in enabling people to deal with increasing integration into market systems. This is followed by examination of the institutional frameworks that influence pursuit of both conservation and development objectives. In a final section, issues are raised that are likely to be relevant to design and implementation of initiatives to expand or support NTFP activities.

## Conservation

### The ecological perspective

The propositions outlined in the first section, and the ways in which they have been interpreted, have given rise to concern among ecologists that arguments about the relatively benign impact of harvesting for NTFPs have been overstated or misunderstood. Considerable effort has been consequently devoted to ensuring that the nature and impact of harvesting on forest ecosystems is better understood.



Rubber tapper (photo by Edward Parker - WWF).

> A forest exploited for fruits and latex, unlike a logged-over forest, maintains the appearance of being undisturbed. It is easy to overlook the subtle impacts of NTFP harvest and to assume *a priori* that this activity is something that can be done repeatedly, year after year, on a sustainable basis. This ubiquitous idea, or some variant of it, has appeared in books, scientific papers, conference proceedings, grant proposals, magazine articles, newspaper stories... Unfortunately, in the great majority of cases, this assumption is patently incorrect (Peters 1996).

Ecologists point out that most plant species occur at low densities in tropical forests, and require the presence of animals to pollinate their flowers and disperse their seeds. Removal of excessive quantities of the seeds, or their failure to disperse or establish themselves, can rapidly alter the composition of the forest and the frequency of occurrence of particular species. Although the exploitation of some plant parts is less damaging than others, almost any form of resource harvest produces an impact on the structure and function of tropical plant populations. If nothing is done to mitigate these impacts, continued harvesting will deplete the resource, although some species are better able to sustain continuous offtake than others (e.g., in the case of plants, those exhibiting abundant and frequent regeneration and rapid growth) (Cunningham and Mbenkum 1993; Peters 1994).

Similar considerations apply to the animal constituents of tropical forests. In addition to their critical role as pollinators and dispersers of economically important plant species, animal populations are important as predators, regulators of pest populations and providers of other ecological services. Though animal populations show different abilities to withstand pressure according to taxonomic groups, animals that tend to be most heavily affected by hunting and other human activities include the most important predators and seed dispersers. Their depletion or removal also can rapidly influence such forest characteristics as composition and structure of vegetation (Bodmer *et al*. 1988; Redford 1992, 1996; Fa *et al*. 1995; Fitzgibbon *et al.* 1995).

Unless harvesting is controlled, some species will therefore become depleted much more rapidly than others. It is argued (Peters 1994) that managing tropical forests to meet an objective of maintaining biodiversity will require a monitoring and control system that provides a constant flow of information about the ecological response of species to varying degrees of exploitation. This would allow a continual process of adjustment in which any change in seedling establishment or population structure results in a corresponding change in harvest level.

### The impact of market forces

On the assumption that the main pressures on forest resources are brought to bear through commercial (rather than subsistence) demand for particular NTFPs, a number of researchers have been developing and testing models and hypotheses to assist in predicting how market forces are likely to have an influence on forest structures (Vasquez and Gentry 1989; Homma 1992; Godoy and Bawa 1993; Wilkie and Godoy 1996).

In one such model Wilkie and Godoy (1996) argue that, with increased exposure to trade and markets, per capita incomes rise, imported goods are substituted for some NTFPs and others are exploited primarily for sale. As alternative uses of labour become more attractive, utilisation of the forest is increasingly concentrated on higher-value NTFPs. In another influential model based on Brazilian experience, Homma (1992, 1996) postulates that as commercial demand for a forest product emerges, output first expands then, as quantities and quality from wild sources decline, prices will rise. Inelasticities of the supply of naturally occurring products then lead to development of domesticated sources and synthetic alternatives that replace the natural source.

Both of these models point to selective harvesting of those species that are more valued by the marketplace. It is argued that this implies that over time the composition of the remaining forest stock shifts to less desired species. In practice, these unidirectional evolutionary paths are not inevitable. Shifts in demand for forest products, for example, could reduce pressure on the resource or transfer it to another resource. Institutional measures to control the way in which the forest is used would also modify the impact of harvesting.

Forest management interventions, for instance by increasing the productivity of the NTFP species, could prove to be an alternative to domestication, or could delay or modify the progression towards domestication. As Balée (1989) and Dufour (1990) have argued, the limits between wild and domesticated are not clear cut, giving ample room for a large variety of systems with good conservation potential. These range from agroforestry (see for example Michon and de Foresta 1995) to islands of high productivity in a matrix of little-disturbed forest (Kageyama, cited in CNS-IEA-FF 1991). Prance (1992) also argues that well-planned domestication integrated with extractive activities might help to curb the classical boom-and-bust cycles of extractive economies, contributing to their long-term maintenance.

Nevertheless, it is clear that market demand is selective, and therefore works against the ecological objective of conserving the profile of biological diversity present in the untouched forest. Moreover, as market prices seldom reflect the values of environmental and other 'external' costs and benefits, market demand may lead to short-term overexploitation and even to local extinction of some plants and animals that provide highly desired products. This divergence between market and real economic and societal values must cast doubt on the argument that the increased values attributable to tropical forests as a result of higher commercial demand for NTFPs necessarily encourage conservation of the resource.

### Perspectives of local users

Grenand and Grenand (1996) have pointed out that, in connection with a stable subsistence system in the Amazon, 'Amerindians from the Amazon basin are no protectors of nature, in the sense understood today, because the concept itself is completely foreign to them'. Rather their system is based on the abundance and diversity of the resource, and its ability to renew itself. Therefore, even in indigenous systems where harvests do not result in destruction of the resource, use can be heavy.

Similarly, Falconer (1996), writing about West African experience, has pointed out that the level of exploitation for subsistence use should not be underestimated. 'While many foresters see subsistence exploitation as harmless and commercial exploitation as destructive, it is evident that the forest and fallows are intensively and extensively used to meet domestic needs.'

The reference to fallow underlines a very important factor – namely that much use of forests for NTFPs is in forest systems that have in the past already been disturbed by human use to a greater or lesser degree. Most collecting and harvesting of NTFPs is by populations who combine this with some form of agriculture. It is therefore taking place not in pristine forest, but largely in secondary forests, bush fallow or farm bush.

This is partly explained by the proximity of these areas to the user communities and households, but also reflects the fact that in a number of respects such formations are more productive sources of desired species and products. In an area in Sierra Leone, for instance, where only 14 per cent of all hunted or collected foodstuffs and 32 per cent of the medicinal plants collected were found to come from the forest itself, the four tree species used most frequently for construction were all fallow not forest species, and the most used bushmeat species, the rodent 'grasscutter', is found only under open tree cover, not in the closed forest (Davies and Richards 1991). Similar observations were made by Kainer and Duryea (1992) with respect to rubber tapper communities in the Brazilian Amazon where, of the 150 plants collected by women, only 35 per cent came from the forest. Posey (1982) had also earlier indicated the importance of fallow lands showing that the conventional Western view of fallows as abandoned lands did not correspond with the long-term tending efforts made by the indigenous populations, and the importance that they paid to them as a major supply of resources.

As is pointed out in the discussion of the situation in Sierra Leone outlined above, this has important implications for conservation.

> (I)t is clear that [Mende villagers] look at, and place values on, these resources in ways that differ significantly from the valuations of outsiders interested in conservation. In particular (and crucially) it would seem that high forest is seen to have little value in and of itself. In practical terms, the bulk of subsistence-oriented forest products derives from secondary successions, not from high forest. This orientation towards the boundary between forest and farm, as distinct from a concern for the forest itself ... has a most important consequence for forest conservation. The priority area of attention for a conservation strategy sensitive to local interests and concerns should be the bush fallow system, and not, in the first instance, the forest itself (Davies and Richards 1991).

In many situations, fallow land, farm bush and even the forest itself have in fact been found to be actively managed by local users to conserve or encourage species of value. The babaçu palm (*Orbygnia phalerata*) in northeast Brazil has long been integrated into local farmers' shifting cultivation systems (May *et al*. 1985), and farmers in the flood-plain forests of the Amazon area manage them to favour the

economically more valuable species they contain (Anderson and Ioris 1992). Rattan and fruit gardens are examples of enriched forest management systems in Kalimantan (Peluso and Padoch 1996).

Much harvesting of NTFPs from natural forests tends to be in locations that have relatively high densities of the valued species and products. If these species are dominant, the forests may be biologically poor (Peters *et al.* 1989a; Browder 1992) – and therefore probably of less interest as targets for biodiversity conservation. It can be argued that such patterns of concentration support the contention that NTFP use is relatively benign in terms of the objectives of such conservation.

There are also important differences between short-term and long-term impacts of forest use and management. As has been shown repeatedly in studies on the impact of timber harvesting, tropical forests can and do recover from even heavy use if allowed the time to do so without further disturbance. But this does not happen if there is repeated harvesting at short intervals relative to the forest's regeneration cycle (Poore *et al*. 1989).

There are, of course, many other patterns of use associated with NTFPs. These frequently reflect important cultural, spiritual and social considerations, in addition to the satisfaction of material needs. Given this, and the frequently emphasised fact that tropical forests are characterised by multiple users pursuing multiple objectives, it is clearly unwise to expect much in the way of generally applicable conclusions. For conservation, though, two conclusions do emerge. The first is that all harvesting of NTFPs does have an ecological impact, and that much use can significantly change the composition and structure of the forest. The second is that different stakeholders can have quite different interests in what should be conserved. This has been summarised by Leach and Mearns (1996):

> ... foresters and ecologists in Africa have conventionally valued closed-canopy or gallery forest – almost defining 'forest' in these terms – so that any conversion of such a vegetation community is seen to constitute 'degradation'. Yet such conversion may be viewed positively by local inhabitants, for whom the resulting bush fallow vegetation provides a greater range of gathered plant products and more productive agricultural land... Thus the same landscape changes can be perceived and valued in different ways by different groups; what is 'degraded and degrading' for some may for others be merely transformed or even improved.

## Household Livelihoods

Forests are the source of a variety of foods that supplement and complement what rural households obtain from agriculture, and of a wide range of medicines and other products that contribute to health and hygiene. Supplies of wood fuels influence nutrition through their impact on the availability of cooked food, and ready accessibility can affect the time available for food production. Gathering and sale of NTFPs can provide income to households.

NTFPs are generally most extensively used to supplement household income during particular seasons in the year and to help meet dietary shortfalls. Many agricultural communities suffer from seasonal food shortages, which commonly occur at the time of year when stored food supplies have dwindled and new crops are only just being harvested. During this period the consumption of forest and tree foods increases. Similarly, income-earning activities based on marketable forest products may be seasonal or year-round, or may be occasional when supplementary cash income is needed. Seasonality may reflect availability, needs for additional cash at particular points in the annual cycle (e.g., to purchase seed) or seasonal fluctuations in demand (e.g., for baskets for crop harvesting). The importance of forest foods and incomes thus often lies more in its timing than in its magnitude as a share of total household inputs (Box 2.1). NTFPs are also widely important as a subsistence and economic buffer in hard times (Chambers and Leach 1987; de Beer and McDermott 1989; Falconer and Arnold 1989; Scoones *et al.* 1992; FAO 1995; Townson 1995).

**Box 2.1** Examples of the role of NTFP income in household systems

- A study in Sierra Leone found that fuelwood selling provided the first cash income from land cleared for rice production. Subsequently fuelwood collection for the market was concentrated during the off-peak agricultural period, providing cash income in a period when food supplies were generally at their lowest (Kamara 1986).
- Income from the collection and processing of babaçu palm kernels in northeast Brazil has been shown to account for 39 per cent of cash income and 34 per cent of total household income during the seasonal slack period in agriculture. Many of the poorer farmers were dependent on this cash for purchasing seed and other inputs for the new season's planting (May *et al*. 1985).
- A study in the forest-savanna zone of Guinea found that needs for fuelwood and poles were mainly met from by-products of the agricultural cycle, and that farmers sequence their wild plant collection and trading incomes with seasonal needs, e.g., to purchase seeds, hire labour for cultivation, and buy food at harvest to be processed and sold during the dry season. Many women traders generated their working capital from cropping, gathering and processing, within sequences in which one activity's output becomes another's input (Leach and Fairhead 1994).
- In western Niger it was found that income from forest products from the commons rose as a share of household income from 2 per cent in the harvest season to 9 per cent in the hot and rainy seasons and 11 per cent in the cold season. Cash income from these sources was sufficient to purchase between 9 and 28 per cent of a household's annual caloric needs; the lower tercile income group was more dependent on this source of income than the highest tercile, and women (27 per cent of their income) were more dependent than men (10 per cent) (Hopkins *et al.* 1994).

Medicinal usage of NTFPs tends to overlap with that of forest foods; indeed particular items added to foods serve both to improve palatability and act as a health tonic or prophylactic. There are also often strong links between medicinal use and cultural values. For example, where illnesses are thought to be due to the spirits, or

plants have acquired symbolic importance as treatments. Such values often underlie the division between use of traditional and modern medicines that is widely observed at the present time (Falconer 1994).

In the rest of this section we look first at the main changes and causes of change currently taking place that affect the role of NTFPs in household systems. We then examine how use and access to benefits vary within and between communities and households, and the implications in terms of dependency and equity.

### Changes over time

Some studies indicate that uses of forest foods are dwindling as people gain more access to purchased foods, as famine relief programmes become more effective, or as improved supplies of food crops have diminished the need to depend on forest foods. In Vanuatu, for instance, the introduction of the sweet potato, which could be planted at any time and produce an edible crop within three months, and manioc, which can be left unharvested for up to two years, has made the traditional emergency foods of wild taro, arrowroot, wild yams and sago virtually obsolete (Olsson 1991).

Other changes that reduce the role of forest food and other NTFPs in household nutrition may reflect penetration of rural markets by new products, changing tastes or decreased availability. However, the latter may be a result of changes in the availability or allocation of a household's supply of labour rather than physical shortage of the product. As the value of labour rises with increasing wealth, the opportunity cost of gathering rather than purchasing foods or medicines, fuelwood, etc. becomes higher.

A decline in use of forest food can also reflect reduced knowledge. As children spend more time in school than in the fields and the bush, the opportunity to learn about which plants can be consumed, and which cannot, is reduced. Settlement in a fixed location is another widespread change that distances people from previously familiar food sources, constraining people's use of these foods even when they are still available and important for dietary balance (Melnyk 1993).

Another cause of reduced subsistence use is likely to be shortage in the forest supply. These may be physical shortages due to over-use, shortages created by reduced access to the resource, or shortages induced by competition for supplies available from markets.

Many farm households sell NTFPs on a part-time basis to raise enough to be food self-sufficient year round, and for whom this is one of the few income-generating opportunities available. However, the dependence of the poor on income from forest food products, and competition from urban traders, can result in reduced own consumption (Falconer 1996; Ogle 1996). A recent study of forest products use in mountain communities in an area of north Vietnam, for instance, found that the forest vegetables, bamboo shoots and mushrooms collected were eaten in richer households, but in poorer households these forest foods were sold to buy rice (Nguyen Thi Yen *et al*. 1994).

The role of forest products in household livelihood systems also changes, often rapidly, with changes in the demand for these products. Some forest products are

goods that fall out of consumption patterns as incomes rise, e.g., those forest foods displaced by more convenient purchased foods. Others, such as mats, are vulnerable to competition from factory-made alternatives as improved transport infrastructure opens up rural areas to outside supplies (FAO 1987). But demand for products, such as wooden furniture, rises with prosperity. Some products have large, diversified and stable markets; others face highly volatile, often 'boom-and-bust', markets (e.g., extractives displaced by synthetic or domesticated alternatives) – or demand that is seasonal and subject to sharp price fluctuations. While some products thus can provide a strong basis for livelihood systems, a number provide at best short-term opportunities, or generate only marginal returns to those engaged in their harvest (Box 2.2). Where producers have abandoned other activities to become involved in NTFP activities, there is the risk that decline or collapse of the latter may leave them even worse off than they were before (Browder 1992).

**Box 2.2** Classifying NTFP activities in Africa by growth potential

Many of the activities ... appear to represent options that people resort to when there is no alternative source of income ... They include the simplest gathering and trading forest products activities, some of the simple processing activities ... and some trading. Such activities are characterised by ease of access and low capital or skill thresholds to entry. Participants in such activities are consequently likely to find themselves in over-saturated markets, offering very low returns to labour. Few are able to expand beyond the single-person (or at best family-based) operation, operating from the homestead. They are thus activities that those involved in them are likely to abandon if more attractive options become available. In addition, the products are often ones that are displaced by alternatives – woven mats by plastic mats, for example – as improved rural infrastructure opens up rural markets, and as incomes rise.

A smaller group of activities appear to form more viable and sustainable sources of livelihood ... These activities are characterised by capital and skill requirements, that *inter alia* establish conditions of entry, and expansion, that limit participation in them. Those running such businesses are likely to be in them because of the good market and profitable prospects they offer, and not because they had no better alternative. Markets tend to be large, urban as well as rural, and demand exhibits positive (though usually declining) elasticities with rising income. This group includes products and processes, such as those involved in the manufacture of furniture, that involve technologies that enable businesses to evolve and improve so that they can compete with modern sector counterparts and products. Others, such as carving and some traditional medicines, are able to maintain market share because there are not modern sector equivalents.

*Source*: Arnold and Townson (1995)

As the opening up of rural areas expands the range of employment options open to the people, they are likely to move out of the less attractive forest product activities. Additional factors that can contribute to household decisions to discontinue particular NTFP activities include poor working conditions, a weak marketing position, exploitative patron/labour relationships, and lack of access to inputs of capital or

technology to overcome constraints of labour shortage or work stress (Browder 1992; Pendelton 1992; Townson 1995).

### Dependency and equity issues

A feature of most detailed local-level studies is the variety of needs met in part through NTFPs. Patterns of use are likely to differ among groups or households, and within households by gender and age. One relationship that has been widely observed is that where people have had relatively unrestricted access to forests, forest foods and forest products income are particularly important for poorer groups within the community. For instance, the share of household inputs obtained from NTFPs has been shown to be related to size of landholdings in Orissa, India (Fernandes and Menon 1987) and in Brazil (Hecht *et al*. 1988), to family incomes in Sri Lanka (Gunatilake *et al*. 1993), and to levels of household rice self-sufficiency in the Philippines (Siebert and Belsky 1985).

However, some of the changes that are taking place are tending to limit the ability of the poor to exploit the opportunities available from forest-based activities. The poor may not have access to the skills, technology or capital necessary to be able to benefit from the opportunities presented by markets. They may be dependent on traders or other intermediaries for access to those markets. Thus the benefits from NTFPs, and sometimes control, then accrue to outsiders (Dove 1993, 1995).

Similar shifts are also often taking place within communities (Box 2.3), which result in control over these opportunities, and over the resource, being captured by the wealthier and more powerful, and the households with the most labour, at the expense of the poorer within the community.

**Box 2.3** Differential interests in NTFPs within rural communities

[V]illages are often politically fractured and socially differentiated in complex ways. Fractures in the local community may run along gender, class, age, or ethnic lines of identity... Lines of differential access and ownership between men and women may be drawn depending upon the type of activity, type of product, the species, the location or the intended use of the product. It is quite possible that men and women make conflicting claims on NTFPs. In such a situation, interventions for conservation and community development may favour one group over another and exacerbate inter-gender conflicts.

... Pronounced socio-economic stratification within communities can lead to the formation of class interests which may conflict on the question of NTFP use. Conflict may be particularly strong in cases where NTFP extraction for market sales is being promoted as a sustainable development alternative. In such a situation, profits may flow to the wealthy who have the capital, knowledge, and resources to mobilize labor and transport products to market. In effect, where patron-client relations exist, sustainable development projects based on NTFP extraction can serve to perpetuate or reinforce those relations without substantially improving the livelihoods of the 'local people', with the exception of a very few individuals.

*Source*: Neumann (1996)

In reporting on the results of a series of research studies into dependence on access to forest outputs, Ogle (1996) has commented:

> In situations where agricultural productivity is low, better-off households may use forests and forest products to complement and improve the household economy, while poorer households, who find livelihoods difficult to sustain, may rely on the forests as the primary means of survival or in crisis situations. In many areas, as pressures on the forests increase, more products are extracted, consumed or sold, more encroachment takes place and the depletion of forest resources can be rapid. The poor, more forest-dependent households will then find livelihoods even more difficult to sustain.

To summarise the discussion on household livelihoods, it is clear that in many situations, NTFPs continue to be very widely used. However, it is also evident that the situation is often changing – sometimes very substantially – in ways that have important implications for NTFP intervention programmes and research. Three aspects in particular warrant attention:

- Growing demand for NTFPs will tend to be concentrated on a declining number of products of commercial value, and access to their production and marketing is likely to be increasingly limited to those with particular resources and skills;
- Many NTFPs are facing, or are likely to face, declining market opportunities and/or decreasing competitive improvement, and so could be of much less value in the future; and
- Decline in the position of NTFPs, concentration of control in the hands of local elites and outsiders, and the impact of overuse on the resource could have serious impacts on those categories of users who are most dependent upon NTFPs to help meet their subsistence and income needs.

These issues are examined further in the final section of this chapter.

## Institutional and Policy Context

Many of the features and trends noted in the previous discussion have their origins in national policies. In most countries the frameworks within which sustainable management of forests for NTFPs has to operate have been heavily influenced by the following political trends:

- The widespread assertion of tenure by governments over forest lands, restricting or removing local rights;
- The intrusion of the authority of the central state at the expense of local systems of leadership, control and management of forest lands; and
- The more recent thrust towards structural adjustment, land titling, debt reduction and free trade.

Policies that assert government control over the forest resource, or that override local rights, undermine the authority and effectiveness of community-level institutions to control and manage forest use. They therefore act forcefully against the empowerment of local user communities that, it is argued, is a precondition for

effective commitment to conservation and sustainable management and use of natural resources (Jodha 1990; Shepherd 1992; Davis and Wali 1993; Lynch and Talbott 1995).

Given that so much NTFP use is based on resources that are held in overlapping combinations of private, state, common property and open access tenure regimes, the current drive towards altering land tenure could also have major implications. Land titling in Africa, for instance, can 'transform flexible, multidimensional rights to forest resources into rigidly circumscribed rights to land' (Neumann 1996). The insecurity of tenure that such change, or threat of change, induces is likely to favour short-term activities, such as destructive harvesting and slash-and-burn agriculture, that assure more certain though lower returns than might be obtained from forest conservation and management.

The increasing effect of market forces introduces another dimension that can weaken the institutional capacity to manage forest resources locally. Although market demand for its products can give added value to a resource, which could increase the incentive for conservation in order to secure its future availability, it can equally subject the local control and management systems to increased use pressures such as those outlined in Box 2.4.

**Box 2.4** Commercialisation pressures on NTFP resource management systems

- Simple rules are unlikely to be workable if a commodity has high value. Incentives for appropriating the commodity and not cooperating are correspondingly high.
- Enforcement of rules is likely to be complicated by high-value items, especially if the item is wanted by elites. Bribes and coercion to escape enforcement are more likely when high values bring in cash. Even outside observers can be bribed.
- Many organizations may not be flexible enough to adapt to rapid changes induced by commercialization. There may be no current rules on commercial products and there may be no past rules to learn from.
- High value ... commercialized products create incentives for outsiders and the state to appropriate the land and dispute legal claims.
- Legitimacy of [resource] use is contested by regional, national, or international organizations who see their interest at stake in use of a resource or commodity.

*Source*: McElwee (1994)

As NTFPs become increasingly important commercially, local efforts to take advantage of the opportunities they present can be complicated or frustrated by forest policies. Because they give high priority to conservation objectives, many governments have set in place forest and environmental policies and regulations designed to limit rather than encourage production and sale of NTFPs (Dewees and Scherr 1995).

One widespread result of such features of the changing policy and institutional situation is ineffective local control of NTFP resources, and an environment in which household decision making and market forces fail to generate sustainable use of local forest resources. Moreover, it is often unclear which institutional models might be appropriate at present in situations marked by increasing conflict and lower

commonality of purpose, and increasingly ineffective conflict resolution mechanisms that such policies and practices engender (Neumann 1996).

Alternative institutional models have been proposed, and a number of them are being implemented. They include Joint Forest Management in India, extractive reserves in Brazil, communal reserves in Peru, Indian reserves for indigenous people in several Amazonian countries, the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) in Zimbabwe and the Household Responsibility System in China. Box 2.5 summarises some of the lessons that have been emerging about criteria to assess the effectiveness of such institutions for communal management of natural resources. However, more work is needed in order to refine these and better understand their application to institutional models specifically for management of forest resources (Gibbs and Bromley 1989, McKean and Ostrom 1995; Hobley 1996; Rasmussen and Meinzen-Dick 1996; Arnold 1998).

**Box 2.5** Criteria for effective collective management of natural resources

- User groups need the right to organise their activities, or at least a guarantee of no interference.
- The boundaries of the resource must be clear.
- The criteria for membership in the group of eligible users of the resource must be clear.
- Users must have the rights to modify their use rules over time.
- Use rules must correspond to what the system can tolerate and should be environmentally conservative to allow a margin for error.
- Use rules need to be clear and easily enforceable.
- Infractions of use rules must be monitored and punished.
- Distribution of decision-making rights and use rights to co-owners of the commons need not be egalitarian, but must be viewed as 'fair'.
- Inexpensive and rapid methods of resolving minor conflicts need to be devised.
- Institutions for managing very large systems need to be layered, with considerable authority devolved to small components.

*Source*: McKean and Ostrom (1995)

## Discussion

The previous section has emphasised the extent to which NTFP activities are determined by policy, legal and other macro-level institutional and economic factors. Consideration of the potential and impact of NTFPs in a particular situation therefore needs to be as much concerned with whether there is a policy and legislative framework that is supportive, or at least tolerant, of what is being considered, as with the resource and other factors that are specific to that situation (Ruiz Pérez and Byron in press). In this final section we discuss two other broad aspects of the subject.

### The role of NTFPs in conservation and development

The earlier discussion on conservation perspectives suggests that the proposition that management for NTFPs is congruent with conservation needs to be qualified

and elaborated. In practice, the different stakeholders with an interest in a forest and the NTFPs it can yield are unlikely to share the same developmental or conservation objectives. For instance, it is highly unlikely that the economic goals of local users will coincide with the conservation goals of those concerned with preserving biodiversity.

It is important to recognise that such divergence of interests between development and conservation does not necessarily mean that one is less or more 'sustainable' than the other. Rather it is a recognition that sustainability has a number of different dimensions. The objective of ecological sustainability is usually expressed in terms of maintaining biodiversity. The goal of sustainable forest management has usually focussed on maintaining a continuous flow of stated outputs, while retaining the productive capacity of the forest intact. Economists, on the other hand, tend to focus on the sustainability of economic benefits (see Anderson this volume). As the benefits people seek to obtain from the forests change over time, pursuit of this objective is likely to entail changes to the resources. Essentially local management systems that alter the structure of the forest resource in favour of particular outputs can be seen to be giving priority to this economic objective.

The nature of and underlying reasons for differences in interests between stakeholder groups have been widely discussed (see for example COICA 1989; González 1992; Conklin and Graham 1995; Grenand and Grenand 1996). It has been pointed out (Almeida 1996) that the fact that extractive NTFP harvesting ever came to be seen as congruent with conservation is in a sense paradoxical, given the emphasis that had previously been placed on the negative and degrading aspects of such systems, like the impoverishment of natural resources, economic stagnation and the brutal treatment of native or migrant workers (Bunker 1985). Almeida identifies two extractive paradigms. An 'old extractivism' syndrome, characterised by open access areas that are overexploited and depleted by coerced, underpaid and unqualified workers to feed external and volatile markets by means of a stagnant technology. In contrast to this, a 'good extractivism' paradigm represents extractive economies as preserving natural resources and obtaining a reasonable income with the support of cooperatives and democratic associations.

Some have argued that the thesis that there is a commonality of interest can arise from misunderstandings by local and environmental interest groups about each other (Box 2.6). It has also been suggested that conservation groups have on occasion sought to ally themselves with local development goals that are at variance with their interests as a way of 'buying time' until a better way is found of achieving conservation aims (Redford and Stearman 1993). Similarly forest dwellers may seek a common cause with conservationists where this can help them secure land titles and other guarantees.

Another factor in shaping the initial proposition, and in explaining the strength of the support it received, can now be seen to be a measure of misunderstanding or misinterpretation of some of the data on which they were based. Certain exercises in valuation of the estimated potential harvest of NTFPs in selected areas of tropical forest arrived at very high values of sustainable offtake (Peters *et al.* 1989b; Balick

**Box 2.6** Misunderstandings that can arise between indigenous groups and environmental NGOs

Some conservation NGO misconceptions about indigenous organisations

- *The main objective of indigenous organisations is the conservation of biodiversity in some abstract sense*: In reality, indigenous organisations exist to defend the rights of the group, and their priorities are legal land rights, political and cultural autonomy, health and education services, etc.
- *Indigenous organisations are similar to conservation organisations in their structure and function*: In practice, there are several important differences related to their function, the issue of leadership and delegation, their relationship with their members, administrative capacity, etc.
- *Indigenous organisations have no reason to be suspicious of the relationship between conservation NGOs and the State*: As indigenous groups perceive the State as a competitor for land rights, and liable to be in collusion with logging and mining interests, they often do have strong reasons not to trust NGO links with the State.

Some misconceptions by indigenous groups about conservation organisations

- *Conservation NGOs are similar to the organisations with which they have had dealings in the past (commercial, service, religious, etc.)*: In reality, the NGOs are different because they do not have commercial interests, and do not provide a service.
- *Conservation NGOs will provide assistance in meeting a variety of community needs*: In many societies an organisation that is perceived to have the resources to do so and does not provide such support is considered to be selfish, and failing in its reciprocal duties.
- *NGOs use resources that could have been made available to the local community*: In practice, fund management and donor regulations rule out the possibility of using such financial resources to directly fund indigenous organisations.

*Source*: Based on Stocks (1996)

and Mendelsohn 1992). In extrapolating from the results, and arriving at conclusions about commercial revenues that might be generated, some of the features characterising the situations to which the original point estimates referred were overlooked or lost sight of.

One feature is the high degree of variability within tropical forests, so that even areas adjacent to the original sites could contain a much lower content of marketable NTFPs (Pinedo-Vasquez *et al.* 1990). A second characteristic that needs to be taken into account is that of the unit values used. These were often based on prices in an adjacent market. In scaling up to larger areas and quantities, these need to be adjusted to take account of the impact on demand of large additional quantities of supply and hence on price,[1] and of the higher costs of transport and storage involved in harvesting

[1] In one exercise to examine the implications of accessing much larger areas and quantities of natural products for potential pharmaceutical use, Simpson *et al.* (1996) argued that the value to the pharmaceutical industry of a 'marginal species' (as defined by its incremental contribution to the probability of making a commercial discovery), and by extension the 'marginal hectare of threatened habitat', is likely to be very small.

from areas further away from the market. A third feature concerns the decision making context facing the producers. This will often be strongly influenced by concerns about security of access to income, which are likely to favour options that assure income in the short term over options that would generate possibly higher, but less certain, income in the future. Also, most forest-dwelling producers are likely to opt for activities that maximise returns to labour, which is limited, rather than activities that maximise returns to a unit of land, which tends to be abundant.

As one subsequent group of analysts has noted: 'Regrettably, enthusiasts have neglected to keep these limitations in mind as they have advocated the establishment of extractive reserves as a means to save rainforests' (Southgate *et al*. 1994). The result has sometimes been to raise expectations beyond what can realistically be achieved.

In brief, it is now clear that strategies based on the assumption that developmental and conservation interests in NTFPs coincide are unlikely to be successful. Attention is likely to be more effectively focussed on understanding the areas in which they concur, those in which they are in conflict, and in determining what balance between development and conservation is desirable and achievable. In doing so, it will be necessary to take account of the strong public, media and action-group interest and support that was generated by the concept that increased marketing of NTFPs should be promoted as a way of both conserving the forest and contributing to the livelihoods of rural people in forest areas. It may be difficult to present a more realistic assessment without provoking the risk of a reduction or withdrawal of such support. However, a number of groups that have become aware of the limitations of the earlier approach are beginning to successfully develop more realistic strategies that focus on identifying the conditions and limitations to conservation in conjunction with NTFP development (see for example Freese 1996; BCN 1997).

## Identifying NTFP intervention strategies

The conclusion that we need to be flexible and case-specific in approaching a situation that combines conservation and NTFP development means that it is difficult to identify general guidelines for the design of strategies for intervention. Nevertheless, some points that emerge from recent experience and literature may be quite widely applicable.

A first point is that the focus on developing market outlets for NTFPs needs to be kept in balance with consideration of the huge, and usually very important, continuing use of NTFPs to meet subsistence needs. As was noted earlier, even where use has become heavily market oriented, subsistence use often continues to be significant. It is important to understand and take account of interactions between the two of the kind discussed earlier in the chapter.

A second consideration concerns the importance of correctly targeting and understanding the characteristics and dynamics of different market and product situations. A great deal of the attention that has been given to the role of NTFPs at the interface between conservation and development has been on products for markets in developed countries, and on ways of making trade in these products more

remunerative and stable to producers. However, these are trade flows that are very susceptible to changes in market requirements, to domination by intermediaries, and to shifts to domesticated or synthetic sources of supply. Although the typical boom-and-bust sequence that is characteristic may provide significant employment and income initially, in the longer term it can be very disruptive for rural economies, particularly where the trade has encouraged people to move away from more diversified and less risky agriculture-based livelihoods (Afsah 1992; Browder 1992; Homma 1996). Some of those commenting on cases where these impacts have been very pronounced, have even argued that efforts to support development by promoting NTFP markets without securing the appropriate conditions (notably tenure and political rights) can be counter-productive (see for example Gray 1990; Dove 1993, 1995).

Domestic markets for NTFPs may provide more easily realised avenues for development. In many countries these trades are much larger, involve many more people, and are likely to evolve in less disruptive ways (see for example Padoch 1992; Townson 1995; Ndoye *et al*. 1997). However, a number of important factors need to be taken into account if initiatives are to correctly target those components of domestic markets that are growing, or able to grow.

- The market prospects for NTFPs will be different depending on whether demand for them rises or falls with changes in income; and will also differ according to characteristics of the market (local, urban, industrial, export); and depending on whether the market is in the emergent, expansion, mature or declining phase of its development cycle.
- The large component of forest product activities in the rural sector reflects the size of rural markets for these products, and the dispersion of these markets across large areas with a relatively poor transport infrastructure, so that they are more effectively supplied locally. Those that are likely to continue to be viable as improvement in rural infrastructure exposes rural producers to competition from urban producers are likely to be those with characteristics that favour local processing. Examples are those based on dispersed raw materials, local markets where small quantities are traded or there are high transport costs; those where there are economies of small scale, such as in handicraft production; or those where subcontracting is more efficient than are integrated operations (FAO 1987).



Local vegetal leather processing by a rubber tapper in Alto Juruá, Brazil. Local processing is often more viable where the raw material is highly dispersed, as in the case of natural rubber (photo by Manuel Ruiz Pérez).

- In situations where population is growing faster than per capita incomes, NTFP activities emerge largely to absorb people unable to obtain employment, or sufficient employment, in agriculture. Instead they turn to income from labour-intensive, low-return, typically household-based activities such as collecting and mat making. In situations where per capita incomes are rising, such low-return, labour-intensive activities tend to give way to more productive and remunerative activities such as vending, trading and activities to meet growing and diversifying rural demands. At that stage, involvement in NTFPs increasingly shifts from a part-time activity by very large numbers of people to more specialised year-round operations, and from household to workshop scale, and from rural to small settlement and urban locations (Haggblade and Liedholm 1991).
- An important influence in shaping NTFP activity is usually the agricultural situation – activities tend to reflect the pattern of resources on-farm, the products that can be generated as a by-product of the agricultural cycle (e.g., production of wood fuels where land clearance is taking place), and the availability of labour and the alternatives to which available labour can be deployed (Arnold and Townson 1995).

It therefore becomes important to be able to understand which of these product, market and employment options are present, or could be developed in a particular situation. Different situations thus have different potentials, and limitations, that call for different possible responses (Ruiz Pérez and Byron in press). People searching for activities with which they can economically sustain themselves face different needs than those who are responding to market opportunities. The existence in many poor and stagnant situations of huge numbers of people still engaged in low-return NTFP activities, which have little prospect of other than short-term existence, presents particular issues. Support to low-return NTFP activities once higher-return or less arduous alternatives emerge could impede the emergence of better livelihood systems. It may be more fruitful to help people move into other more rewarding fields of endeavour rather than seeking to raise their productivity in their current line of work. Care needs to be taken in such a case to ensure that future growth prospects are indeed better in the alternative product lines to which people are being encouraged to move (Liedholm and Mead 1993; Arnold *et al*. 1994). It may be necessary to plan separately for those among the very poor and disadvantaged who continue to rely on such NTFPs for survival, and for those engaged in NTFP activities that form part of the process of growth and development. In other words, it may often be necessary in designing and implementing policy and other institutional interventions to distinguish between those who can improve their livelihoods through NTFP activities, and those who have no other option but to gather NTFPs in order to survive.

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Chapter Three

# Turning Ideas into Action: Planning for Non-timber Forest Product Development and Conservation

Wil de Jong and Rudijanta Utama

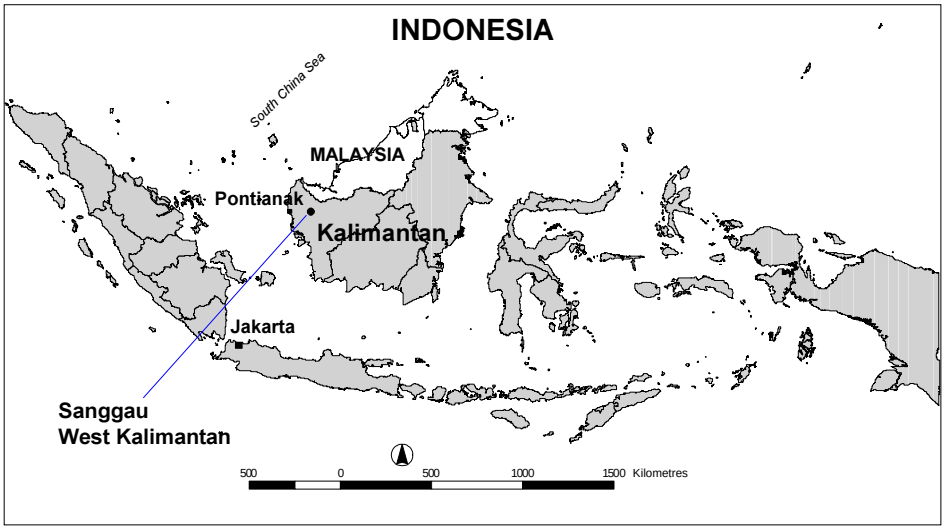
Effective *planning* for non-timber forest product (NTFP) development and conservation will ensure the most effective use of scarce resources and maximise the likelihood that the objective is attained. NTFP development and conservation is usually a long-term activity – over several years at least – and involves the collaboration of a number of different, quite independent parties. This has implications for the kind of planning that needs to be undertaken.

This chapter will review three issues: (1) involvement of local stakeholders in planning NTFP development and conservation; (2) the constraints that availability of information places on planning; and (3) the difficulties of planning appropriate biological monitoring. We argue that planning for these three concerns in NTFP development and conservation requires a special approach because of the nature of such initiatives. To demonstrate these points, examples are used from the NTFP enterprise development effort in which Yayasan Dian Tama, a local NGO, has been engaged. This NTFP enterprise development is part of the Social Forestry Development Project, located in the district of Sanggau, West Kalimantan. It is a collaboration between the governments of Indonesia and Germany to achieve communal sustainable forest management in a pilot forest area in West Kalimantan, Indonesia.

Yayasan Dian Tama (YDT) is based in Pontianak, West Kalimantan, and its objectives are to develop appropriate technology to increase the effectiveness of existing traditional economic activities, and thus contribute to socioeconomic development of the province (see also Chapter Six). Since 1991 YDT has been a main collaborator in the Social Forestry Development Project. The group has been in charge of market development and commercialisation of commodities produced in the Participatory Forest Management Area – a model concession for participatory forest management on state forest land in the north of Sanggau district in West Kalimantan. It covers an area of about 102 250 hectares and has about 17 000 inhabitants. The main activities focus on reforestation of areas under grassland or swidden fallows, the improvement and commercialisation of existing agricultural and agroforestry systems, and sustainable harvesting and sale of forest products (Yayasan Dian Tama 1995).

Yayasan Dian Tama has been responsible for the development of a manufacturing chain for bamboo and rattan products, and for the exploitation and sales of damar, or

**Figure 3.1** Location of the Social Forestry Development Project




resins, that are harvested from dipterocarp and other trees. Bamboo and rattan are being harvested and manufactured into mats and baskets, using traditional weaving techniques and designs. These mats and baskets are sold to a Jakarta-based company that makes them into fashion bags to be sold at department store outlets, inside and outside Indonesia. The production of fashion bags was preferred as locally produced traditional handicrafts face strong competition in national markets. Damar is to be sold to the varnish and lacquer-producing industry.

## Planning for projects

Mintzberg, in his book on strategic planning (1994: 12), defines planning as '..a formalized procedure to produce an articulated result, in the form of an integrated system of decisions'. Steiner (1971 cited in Mintzberg 1994) argues that 'plans can and should be to the fullest possible extent objective, factual, logical, and realistic in establishing objectives and devising means to obtain them'. The normalisation of the planning process is our particular concern here. The kind of planning appropriate in NTFP development and conservation is *development project planning.* Such projects are operations designed to achieve a social or economic development goal. Usually, development projects affect several thousand people, include a number of core participants (project staff), involve other institutions and their personnel, span several years, and have budgets above US$100 000.

Recent development project literature has identified three formalised procedures that form part of project planning, and that are of interest for the following discussion. They are: (1) the need to include important stakeholders in the problem analysis and planning process; (2) the use of a logical framework procedure, currently considered the most adequate procedure to analyse the problems to be addressed, and subsequently construct a transparent plan; and (3) appropriate monitoring of progress and impact.

In modern development efforts problem analysis is considered necessary before project planning can even begin. Once a thorough problem analysis has been completed, the project goals can be identified and defined (MDF 1997). Additionally the importance of participation of the directly affected stakeholders in the project execution is considered vital to ensure success. The initial problem analysis that is to precede the actual planning of a development intervention should involve all important stakeholders, even at this stage. Based on such multi-stakeholder problem analysis, a plan for the intervention can be designed. For stakeholders to accept such a plan, they have to agree on what the problems are, what the possible solutions are for the problems and how they are to be implemented. It is believed that only when all the stakeholders agree on the underlying problems to be solved and the solutions, will they be committed to the implementation of the development intervention.

An analysis of problems will logically lead to a formulation of intervention objectives, based on which the planning can be conducted. For each objective the expected outcomes or results of the intervention are defined. For each result, the required activities to be undertaken are identified, as well as the resources needed, the means to verify success, and the assumptions that have to be met for an activity to achieve its intended result. A logical framework is constructed in which each objective and its related outcomes, activities and assumptions are detailed and recorded (MDF 1997).

In addition to this formalised planning procedure, increased importance has been given to project monitoring. Such monitoring is important at all phases of a project, so that progress can be continuously reviewed and appropriate feedback given. The monitoring process needs to be set up at the beginning of the intervention and thus requires planning.

Development planning for NTFPs does have special features that should be considered when applying a logical framework. Attention needs to be given to the issues of involving local stakeholders, conflict resulting from decisions, availability of information and biological monitoring.

## Planning and Participation: Some Problems

When planning an NTFP development and conservation initiative, relevant stakeholders should be collaboratively involved in the design of activities as much as possible. The relevant stakeholders will most likely vary among cases. In general, NTFP development and conservation efforts will concern: (1) local people, also identified as the *active stakeholders* (Beckley *et al.* 1997) or as the *micro-level stakeholders* (FM/CD 1996); and (2) *managers* or *stewards* (Beckley *et al.* 1997) or the *macro-level stakeholders* (FM/CD 1996). This last group of stakeholders will most likely include some kind of government officials, as well as representatives of conservation organisations who may actively participate in the effort.

In both the Social Forestry Development Project (SFDP), as well as in Yayasan Dian Tama's NTFP enterprise development, full participation by the relevant stakeholders was a goal from the outset of the interventions. Those whose demands

on the forest needed to be considered were the inhabitants of the Participatory Forest Management Area, the Ministry of Forestry, the District Government, as well as the SFDP staff. In hindsight, the participation of the Participatory Forest Management Area inhabitants especially has only been partly successful. Two reasons for this shortcoming can be identified. First, the agenda of the involved state forestry agencies and funding agency was largely defined before the project began. Secondly, there was no existing organised body that could represent the local stakeholders in the negotiation and the execution of future forest management. Both of these conditions are common in other situations where NTFP development and conservation is planned.

### Pursuing whose agenda?

As the Social Forestry Development Project is a GTZ-sponsored effort, extensive Goal Oriented Project Planning (also known by the German acronym ZOPP from Zielorientierte Projektplanung) exercises were conducted in a number of villages in the Participatory Forest Management Area as soon as the project was operating. These exercises established very good rapport between project staff and villagers. Problem trees were constructed, which are graphic displays of all the problems identified by the participants in the ZOPP, and these are then linked to the most important underlying causes. Village development plans were next designed to address the underlying causes. The SFDP organised meetings in which interested parties, village representatives, government officials from different levels, forestry officials, collaborating scientists, and project staff participated to plan the following phases of the project, again using ZOPP methodologies. These last exercises were used to define the complete set of actions of the entire project.

Several of the activities that finally were decided as priorities for the Social Forestry Development Project were not outcomes from the village participatory planning meetings. The reforestation programme that was launched in 1994 and the NTFP development efforts lacked genuine co-decision among all the involved stakeholders. The reforestation plan was a direct outcome of financial input from Indonesia's Reforestation Fund from which one billion Rupiah (then about US$500 000) were made available to the project, partly to be used for reforestation purposes. This contribution was only made available after persistent lobbying by the SFDP to obtain a host country contribution to the project. Initially NTFP development was to address the problems of increasing villagers' incomes. Much of the way the NTFP development activities were carried out was determined by the agenda of the funding agency, the Biodiversity Conservation Network, which had to meet its own objectives. The interests of the funding agency, for instance, led to the decision to work with NTFPs, rather than developing 'agricultural' commodities even though the latter appeared to be the better candidates to increase local incomes (see also below). At a later stage, SFDP did begin activities directed at improving agricultural production.

### Representing local stakeholders

The Social Forestry Development Project has consistently addressed the issue of representation of the inhabitants in its target area. The project perceived that forest-



Representation of local stakeholders who have a very different cultural background than developing agencies is a major challenge (photo by Wil de Jong).

related problems were the result of poor communication between the three directly involved stakeholders: the local people, the local and regional governments, and the state forestry representatives. Initially many efforts were directed at setting up one representative body. This *Lembaga Pengelolaan Hutan Partisipatif* or the Social Forest Management Institution was created to represent the village inhabitants in the target area. Initially this *Lembaga* was intended eventually to be the sole responsible organisation for the sustainable management of the natural resources, following guidelines laid down in a management plan for the area. Under Indonesian law a *Lembaga* does not have the authority to be commercially active. Hence, under a revised scheme there will be two representative bodies. One is the *Lembaga* but it will be renamed *Lembaga Kerja Antara Desa* (or the Intervillage Collaboration Institution) and a Cooperative. The new *Lembaga* will be responsible for the implementation of the *Tata Guna Lahan Desa Kesepakatan* or the participatory land use planning that was conducted in the area, conflict resolution, enforcement of *adat* (traditional laws) and representation of the population's interest to outside parties. The Cooperative will be responsible for commercial activities, including management of 12 000 ha of primary forest for timber harvesting.

At the time this chapter was written, the *Lembaga* was in operation and the Cooperative had just been installed. They receive much advisory input from the SFDP and other partners. Eventually it is expected that the *Lembaga* and the Cooperative will become independent organisations in charge of the 102 250 ha of state forest land (only half of which is currently under forest), but has to comply with the agreed management plan. They will be accountable to the Ministry of Forestry. This process has taken more than four years. Any new intervention in the target area in theory will have to be discussed and decided in collaboration with the *Lembaga,* and this institution will theoretically have the power to stop activities it considers inappropriate.

The way SFDP has proceeded with involving local stakeholders, specifically organising the *Lembaga* and the Cooperative, demonstrates issues that are more generally of concern in involving local stakeholders in NTFP development and conservation projects. Such involvement of local stakeholders is not easy to achieve. Representatives have to be identified that legitimately and genuinely can speak for the local stakeholders, and through them a process of true representation has to be initiated. Introduction, coordination and negotiations may be scheduled through village meetings, and village leaders may become the local stakeholder representatives.

Alternatively, existing farmers, ethnic or other representative organisations may exist and may be approached. In many situations, however, some kind of organisational structure has to be set up that can represent local stakeholders. This organisation not only has to be established, but its functioning has to be facilitated, through provision of training and advisory services for its members. Achieving a true participation of local stakeholders is an extremely difficult task, but arguably the most important, as its success is not only a prerequisite for the success of the NTFP development and conservation effort, but it will ensure that activities can be continued beyond the exercise.

## Planning and Information Needs

NTFP development and conservation is often undertaken in circumstances where little information is available, especially information specific to NTFPs. When planning concerns long time horizons, as in NTFP development and conservation initiatives, high levels of uncertainty affect the capacity to make informed decisions. As information collection is costly and time consuming, an iterative decision making and information collecting process should be used. Some decisions consciously have to be based on the availability of information. Collection of information also has to be planned as repeated distinct activities.

### Selecting NTFP target species

The need to allow for such a stepwise progress of planning can be demonstrated with the examples of Yayasan Dian Tama's NTFP Enterprise Development initiative. Undoubtedly one of the most important decisions that had to be taken in this initiative was the selection of NTFPs for development. This decision was taken over a period of almost two years in a sequence of iterative stages.

The decision to generate or increase incomes from NTFP sales was taken early in the life of the Social Forestry Development Project. In January 1993, a preliminary selection was made of candidate products, using the matrix analysis as presented in Table 3.1. Information relied largely on the expert knowledge of people who participated in this exercise. The criteria used for selecting products included the current use of commodities in the target area, and their importance in local, national and international markets. The commodities that were sold inside and outside Indonesia were given preference, as the existence of markets was considered the principal constraint to promoting sales of any commodity. At this time there was almost no information available on either the forests and prevailing resources, the economics of the people living in that area, or the market opportunities of any of the commodities that could become NTFP development candidates.

At an evaluation/planning meeting in May 1993, both the Social Forestry Development Project and Yayasan Dian Tama decided it was necessary to develop a detailed market and business plan for the commercialisation of NTFPs. At the same time it was decided that Yayasan Dian Tama would attempt to obtain additional

**Table 3.1** Initial matrix analysis to select NTFPs for development

| | Marketing scope | | |
|---|---|---|---|
| Local importance | Inside Kalimantan | Inside Kalimantan and other islands in Indonesia | Inside and outside Indonesia |
| Commodity used and sold in target area | rubber | — | — |
| Commodity used and not sold in target area but sold elsewhere | honey | honey | — |
| Commodity not used and not sold in target area, but sold elsewhere | — | ironwood, resins, bamboo/rattan | ironwood, resins, bamboo/rattan |

funding. At this point a new assessment had to be made of possible candidate species. Already much more information had been collected on natural resources in the Participatory Forest Management Area. The SFDP had also finished its forestry inventories (Ramon 1993) and a GTZ-funded Junior Project Officer had collaborated with Yayasan Dian Tama for one year in conducting studies on potential NTFP commodities (Grossman 1993). Several scientists had conducted studies in the area on forest utilisation (e.g., Peters 1992; de Jong 1993). Using this information Yayasan Dian Tama prepared a funding proposal to the Biodiversity Conservation Network that identified illipe nut, resins, wild fruits, rattan and rubber as candidate products for development.

The final selection of the target products – rattan, bamboo and damar – was made in April 1994, using a valuation and ranking exercise (e.g., Franzel *et al*. 1996). A total of 14 commodities were compared at this meeting, using five ecological, five socioeconomic and five enterprise-related criteria. Each commodity was given a value between 1 and 3 for each criterion, and these values were totalled for each commodity and recorded in a matrix (Table 3.2). The SFDP had also conducted a detailed study on potential NTFP from the Participatory Forest Management Area (Graefen and Syafrudin 1994), and Yayasan Dian Tama had carried out more market studies. This information was used to support the ranking exercise. Two agricultural commodities, rubber and domesticated pigs, received the highest scores, and would have been the better candidates for income generation according to the selection criteria used. However, these choices were not compatible with the requirements of the funding agencies.

### Enterprise orientation

The proposal to the Biodiversity Conservation Network could only be prepared after the three products were selected. This proposal had to include business plans for each product, describing the expected costs of operation, as well as the expected benefits for the duration of the funding. This required additional information specific to the selected species that was too costly to collect during previous surveys and inventories. Once

**Table 3.2** Ranking of 14 NTFP target commodities

| COMMODITY | Bamboo | Rattan | Damar | Illipe Nut | Honey | Luffa | Petai | Rubber | Pigs | Fish | Horticultural | Medicinals | Cocoa | Mushrooms | Fern |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRITERIA | | | | | | | | | | | | | | | |
| Ecological | | | | | | | | | | | | | | | |
| • Availability in time | 3 | 3 | 3 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 1 |
| • Availability in space | 3 | 1 | 2 | 2 | 1 | 3 | 1 | 3 | 3 | 2 | 2 | 3 | 1 | 2 | 2 |
| • Harvest time | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 2 |
| • Harvesting impact | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 3 | 1 | 2 |
| • Regeneration potential | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 1 | 2 | 3 | 2 | 2 |
| Subtotal I | 14 | 9 | 13 | 10 | 8 | 12 | 9 | 12 | 13 | 11 | 9 | 12 | 12 | 9 | 9 |
| Socioeconomic | | | | | | | | | | | | | | | |
| • Part used | 2 | 2 | 2 | 2 | 1 | 3 | 1 | 3 | 3 | 1 | 2 | 3 | 2 | 2 | 1 |
| • Income contribution | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 3 | 3 | 1 | 2 | 1 | 2 | 1 | 1 |
| • Sociocultural compatibility | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 1 | 3 | 1 | 3 | 3 |
| • Employment creation potential | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| • Impact on gender | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 3 |
| Subtotal II | 12 | 11 | 11 | 10 | 7 | 10 | 8 | 14 | 14 | 9 | 9 | 11 | 9 | 10 | 9 |
| Enterprise orientation | | | | | | | | | | | | | | | |
| • Market potential | 3 | 3 | 2 | 2 | 3 | 1 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 1 | 1 |
| • Competition | 2 | 3 | 2 | 2 | 1 | 1 | 2 | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 2 |
| • Market entry constraint | 1 | 2 | 2 | 1 | 2 | 1 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 1 |
| • Profit/margin benefits | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| • Processing technology place | 2 | 3 | 3 | 2 | 2 | 1 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 3 |
| Subtotal III | 10 | 13 | 11 | 9 | 10 | 5 | 13 | 14 | 11 | 11 | 11 | 10 | 10 | 9 | 9 |
| TOTAL SCORE | 36 | 33 | 35 | 29 | 25 | 27 | 30 | 40 | 38 | 31 | 29 | 33 | 31 | 28 | 27 |

funding was secured, a subsector analysis was conducted for each of the targeted commodities, which involved preparing a model (subsector map) that included all current participants, activities, infrastructure and policy measures relating to the targeted commodity (see Belcher, this volume). A precise identification of the required



Developing NTFPs (such as this wild pig) or agricultural products is a planning question that needs to be answered (photo by Wil de Jong).

intervention can thus be accomplished and planned for. Such a subsector analysis also requires information that is again very commodity specific, and cannot be conducted unless it is very clear that the commodity is worth developing (Haggblade and Gamser 1991).

### Allowing for iterative planning

The Yayasan Dian Tama NTFP enterprise development had little existing information available and had to develop its own methods to rationally determine which commodities to work with. Several of the steps followed may be typical for NTFP development and conservation efforts. In most cases where NTFP development initiatives are conducted, little information is available on the forest and its commodities, on the economy of the people who live in the region, or on market opportunities for commodities found in the area. Collection of information has to be economical and thus conducted as a function of decisions taken in the course of planning the NTFP development effort. Possible target NTFP commodities have to be chosen before collecting information to assess profitability of the development of these commodities. Such a financial analysis precedes preparation of a subsector analysis. In addition, an accurate subsector analysis requires updating as interventions are carried out to modify subsequent activities. This means that information has to be collected regularly, and planning decisions adjusted accordingly.

Therefore, one of the major conclusions of the Yayasan Dian Tama experience is that NTFP development and conservation planning should be an iterative processes, because of the need for information that is generally not available, is costly to collect, and has to be gathered in response to specific needs as they arise. The collection of this information should be part of the planned activities.

## Planning and Biological Monitoring

Monitoring in a development project usually concerns reviewing implementation of activities, expenditure of resources and impacts, according to the original objectives of the project. NTFP development and conservation interventions need an additional type of monitoring related to the products harvested and the habitats from which they are collected. Whether the intervention aims to increase NTFP harvesting to generate incomes or to conserve NTFPs that are already being harvested, monitoring is needed to assess the impact on the natural resource. Such biological monitoring can require sophisticated data collection and analysis. To date this work has been possible only with trained experts and is expensive to carry out. Biological monitoring is one of the most difficult challenges for NTFP development and conservation planning.

In this context, biological monitoring aims to determine whether NTFPs are harvested in a sustainable fashion. This means not only the collection of information after interventions have occurred, but also conducting initial baseline studies to assess the impact of the intervention. Additionally, some mechanisms have to be set up to adjust harvesting to the appropriate sustainable levels.

### Biological monitoring principles

An assessment of the sustainability of harvesting requires an adequate understanding of the demography of the targeted species. The principle of sustainability suggests that the condition of the population does not change as a consequence of harvesting. Studies are therefore necessary that produce an initial estimate of possible harvesting levels, as well as to provide a reference for the assessment of harvesting impacts.

Densities and size class distributions are the two main features of a species population. They are indicators of the current population structure, of the harvestable individuals per hectare and can be used to provide a preliminary assessment of the regeneration status of the species (Peters 1996a). Growth and yield studies provide more accurate estimates of sustainable harvesting levels, although usually at greater costs. Density and size class distribution can also be used to assess harvesting impact. Frequent measurement of these characteristics will reveal changes that indicate overharvesting and adjustments can be made. If total or relative densities of some of the size classes are diminishing, the species is being overharvested. Impacts can also be assessed by observing the vigour of harvested individuals (Peters 1996a).

### Planning biological monitoring

Biological monitoring present three main difficulties. First, specialised skills for data collection and especially data analysis are required. Secondly, the time horizon for monitoring some products can be extremely long. Peters (1996b) suggests intervals of five years between regeneration surveys for some species. In some cases, the impact of harvesting will only be noticeable after even longer periods. Thirdly, if conducted strictly according to accepted methods, biological monitoring may become

very expensive; so expensive that its cost outweighs the economic benefits of the harvesting and sales, with or without added value, of the targeted species.

Training of local forest stewards may be one way to reduce costs, but so far there is little experience with this approach. Data analysis and assessment of the results and adjusting harvesting levels should necessarily be the task of an impartial party, as it may be difficult for harvesters to reduce activity levels based on their own assessment of a negative impact. In practice, solutions have to be found that allow some kind of biological monitoring but that do not place pressures on budgets and personnel, as 'by the book' monitoring would require.

### Devolving biological monitoring

In the NTFP enterprise development in Sanggau, biological monitoring has proved to be a major difficulty. Although the project initially aimed to contract the work to the local university, it appeared that the skills required to design the monitoring were too specialised, and an international expert had to be hired. The current plans are that this expert will help with the required species inventories and yield studies. Forest stewards are to be trained to conduct the required regeneration inventories and analyse the data to measure the harvesting impact. Very specialised skills have to be taught to these people who are entirely unfamiliar with such analysis. A mechanism also has to be put in place that allows for an independent analysis of harvesting impacts and the possibility to adjust harvesting levels accordingly. The costs of this whole exercise have to be kept within allowable limits, such that NTFP harvesting still remains a beneficial activity that can compete with other income-generating options.

It is most likely that the *Lembaga* will have to play an important role in coordinating the biological monitoring, including the collection of the required data and organising the appropriate analysis. Forest stewards in the Participatory Forest Management Area report only to the *Lembaga*. The biological monitoring plan will be a collaborative effort between the *Lembaga*, the Social Forestry Development Project, Yayasan Dian Tama and the foreign consultant. A precise regeneration survey programme will have to be planned, and it will be the *Lembaga*'s responsibility to carry out this programme. Subsequent data analysis and evaluation of the data, however, will most likely have to be conducted with the help of an expert for some time.

Biological monitoring in NTFP development and conservation initiatives is not yet a resolved issue. The relative high cost, duration, need for experts to set up and train local stewards all remain challenges in planning biological monitoring.

## Conclusions

In this chapter planning of three main aspects of NTFP development and conservation initiatives have been discussed: participation of local stakeholders; the need for iterative decisions as a function of the availability of information; and the difficulties encountered with planning for biological monitoring.

These three issues make NTFP development and conservation planning different from other 'typical' development intervention planning. Such issues arise because of the remote settings in which interventions usually operate, and because of the difference in priorities among different stakeholders. Broad participation is now widely considered a prerequisite for successful development initiatives. However, where NTFP development planning is pursued, local stakeholders are often dispersed, have weak organisations if they have them at all, and have little experience with language and culture of the other non-local stakeholders. NTFP development projects have a special handicap because, as a rule, the main agenda is often defined without consultation with the local stakeholders. In many situations where participatory decision making is pursued, insufficient attention is given to the difficulties that genuine involvement of local stakeholders entails.

In many development efforts, much needs to be planned in advance to satisfy the requirements of the donors or the executing agencies that have to transfer money in agreement with annual budgets and disbursement schedules. This forces many interventions to define programmes of activities without allowing adjustments based on the outcome of previous practices. In the case of NTFP development and conservation efforts, such limited opportunity for adjustment may have very negative effects on the outcome. Iterative decision making and information collection is necessary because little off-the-shelf information is usually available. Plans need to be made for the collection of information and subsequent decision making.

In conclusion, much more thought, and probably experimentation, is needed with the appropriate approach of biological monitoring in NTFP development and conservation initiatives. Approaches suggested by specialists (e.g., Peters 1996a, b) appear to be much too difficult and too expensive for NTFPs where profit margins are often minimal. Simplified methods need to be developed that cost little and are easy to execute, while providing the minimum amount of information to accurately assess harvesting and to make necessary adjustments.

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Chapter Four

# A Production-to-Consumption Systems Approach: Lessons from the Bamboo and Rattan Sectors in Asia

Brian M. Belcher

Non-timber forest products (NTFPs) have attracted attention in recent years for their potential to generate income through added-value processing and innovative marketing. There is a need for a systematic approach to assessing NTFPs as a basis for sustainable development. Such an approach must begin by recognising that a forest product is a commodity that may change hands many times and go through a series of processes before it reaches the final consumer. Demand for the raw forest product depends on demand for the final product, and therefore upon the organisation and efficiency of the whole system. In this respect forest products are very much like agricultural commodities, and there are lessons to be drawn from the agricultural sector that can be modified and applied to the NTFP sector. There are also important differences between forest products and agricultural commodities in the nature of the products themselves, in the systems used to produce raw materials and even in the development goals.

This chapter reviews some important concepts from agricultural and institutional economics and applies them to NTFPs. The paper focuses on the 'Production-to-Consumption Systems (PCS) Approach' used by the International Network for Bamboo and Rattan (INBAR). The PCS approach provides a framework within which to assess the opportunities and constraints in existing NTFP systems and to draw lessons from present practices that can be applied to other new or evolving systems. The discussion considers the production, processing and marketing of biological products according to three dimensions: vertical coordination, horizontal linkages and the intensity of the activity. These three aspects are addressed by considering experience from the agricultural sector and building on it to incorporate the different characteristics of NTFPs and the varied goals of NTFP development. The PCS approach has much in common with and draws on other analytical tools such as market chain analysis and subsector analysis, both of which have been employed in analysing NTFP markets. However, the PCS approach adds two important elements. First, there is a stronger emphasis on the linkages among the actors in the system (both vertically and horizontally). Secondly, the PCS approach introduces the element of intensity to deal with the changes in the level of activity that occur as a sector develops.

This conceptual discussion is followed by an overview of a practical approach to using the PCS method, and a summary of the lessons learned in applying the approach

in studies undertaken by the International Network for Bamboo and Rattan (INBAR). Changes to encourage development in a particular PCS are identified and the conclusion provides a review of the PCS approach, the INBAR experience and possible contributions to policy making.

## International Network for Bamboo and Rattan

Bamboo and rattan are widely regarded as the most important of the 'non-timber' forest products in Asia (de Beer and McDermott 1996). They have high value in a wide range of applications as structural material, fibre and food. In effect they represent not one or two commodities, but dozens. For many reasons both of these plant groups are important to poor and disadvantaged people. In subsistence use, as utility items, tools and agricultural stakes, in housing and in handicrafts, bamboo and rattan are essential resources in everyday rural life. At the same time, these resources provide the basis for an expanding small- and medium-scale enterprise sector in most Asian countries, and in some parts of Africa and Latin America. They offer significant and increasing employment and income generating opportunities, foreign exchange earnings and highly valued products. As a result, both bamboo and rattan provide excellent points of entry for sustainable development that will benefit poor people.

The International Network for Bamboo and Rattan (INBAR) was established with support from the International Development Research Centre of Canada (IDRC), and the International Fund for Agricultural Development (IFAD). It has a mandate to consolidate, support and coordinate strategic research on bamboo and rattan to improve the well being of small-scale producers and users of these commodities. The technical research programmes emphasise genetic resources characterisation and conservation, raw material production and post-harvest processing. Socio-economic research is used as a tool to identify technical research and extension requirements, and to prioritise research and development interventions. There is a multiplicity of production, processing and marketing systems that are used for bamboo and rattan. It is vital for INBAR to have a systematic approach to draw out the common elements and the general principles and to make recommendations as to how to apply those principles in designing development interventions.

The PCS approach described in this chapter has been developed within this context. There is, therefore, an emphasis on bamboo and rattan in the examples chosen and in the conceptual thinking behind the discussion. This may introduce some biases into the discussion – some of the characteristics of bamboo and rattan systems may be different from those of other NTFPs. In particular, there is a strong market orientation and regeneration or domestication is fairly straightforward and common. However, in terms of their accessibility (they are often available on common lands and many processing technologies are simple and affordable) they resemble a number of other NTFPs. Hopefully, the concepts developed to deal with bamboo and rattan may have useful application in other areas of NTFP development, especially as they are commercialised.

## The Production-to-Consumption Systems Approach

A Production-to-Consumption System (PCS) is defined here as the entire set of actors, materials, activities and institutions involved in growing and harvesting a particular raw material, transforming the raw material into higher-value products and marketing the final products. The system includes the technologies used to grow and process the material, as well as the social, institutional and economic environments in which these processes operate.

The approach has its roots in agricultural systems research, where various systems approaches have been developed to accommodate consideration and analysis of a range of physical, biological and social factors. Sellen *et al.* (1993) describe the components of a PCS:

> Agricultural marketing decisions are made by participants throughout the commodity system. Producers decide which crop, with what technology, how much, and when to produce based on market conditions and signals. Consumers decide what to buy, in what form, and in what quantity. Processors, retailers, and wholesalers decide what to buy and sell, where to locate, what type of processing and packaging to use, and how to promote or advertise the product. Governments decide whether or not they should intervene in marketing and in what manner, including regulation of markets, grading, market information, and formulation of indirect policies.

The same kinds of actors and processes are equally important in the forest products sector.

## Dimensions of a Production-to-Consumption System

A Production-to-Consumption System can be considered in three dimensions. The first, the vertical dimension, refers to the flow of material from its production in a biological system, through the various transactions and processes, to the final consumer. The second, the horizontal dimension, concerns the set of individual firms operating at a particular point in the market chain and the scale of activity and relationships among them. The third dimension is that of intensity. It relates to the amount of labour and capital that is used to carry out a particular function.

### The vertical dimension

*Vertical product flow*

A series of basic functions must be performed to take any natural product from its origin as a plant (or animal) to the market and the final consumer. The biological material must grow and be harvested, whether in the wild or cultivated. This must then be processed to refine it, prevent spoilage, separate valuable components or remove waste, and to make the product more useful and attractive. The processed product may then be consumed or marketed for direct consumption, or it may be used as an input to a manufactured commodity. Each activity that physically modifies

## Glossary

- **Capital** is wealth used to produce more wealth.
- **Commodity** is something that can be bought and sold.
- **Extraction** is harvesting of biological products from wild sources.
- **Horizontal linkages** are communications and other links between different firms within a single industry.
- **Horizontal integration** is the ownership/control of more than one firm in a single industry as a means to gain advantages of scale or other competitive advantage.
- **Industry** is a set of firms selling products or services that are close substitutes in a common market.
- **Intensity** is the quality and quantity of inputs at a particular point in the PCS.
- **Market** is the trading opportunities provided by a particular group of people; the organisation of activities for the purpose of buying and selling commodities.
- **Production-to-Consumption System (PCS)** is the entire set of actors, materials, activities and institutions involved in growing and harvesting a particular raw material, transforming the raw material into higher-value products and marketing the final products. The system includes the technologies used to grow and process the material, as well as the social, institutional and economic environment in which these processes operate.
- **Transformation** is an activity that physically modifies a product (transformation in form), changes the ownership of the product (transformation in ownership), moves the product from one place to another (transformation in space), or stores the product (transformation in time).
- **Vertical coordination** is the organisation of the trade and movement of materials and other inputs between consecutive stages of processing in a PCS.
- **Vertical integration** is the linking of a range of transformation activities under the control of a single company or owner as a means to ensure supplies of inputs of the desired quality, quantity and time and to gain other competitive advantages.

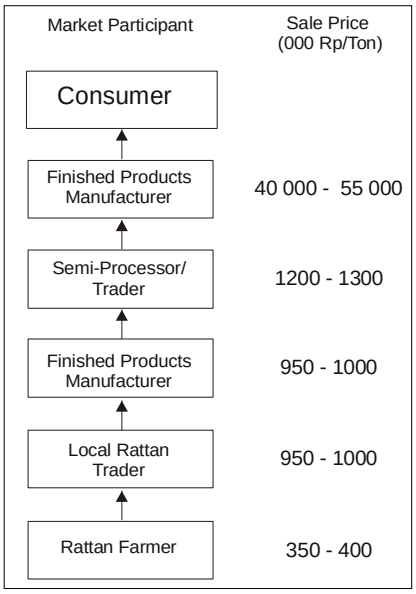
the product can be called a 'transformation in form'. Along the way the product is bought and sold (transformed in ownership), transported from place to place (transformed in space) and stored (transformed in time). The actors or participants involved in these transformations in a typical forest product PCS include input suppliers (where they exist), forest collectors or farmers, intermediate and wholesale traders, sorters, processors, retailers and consumers.

Figure 4.1 shows a simple product flow diagram, illustrating the vertical dimension of a PCS. The various actors (or transformation points) are linked by arrows showing the flow of material through the system. Additional information can also be included, such as marketing profits or other indications of the prices of the material as value is added through the various transformations. If production costs are determined (or estimated) at each transformation point, it is possible to calculate the benefits and costs to the various actors of their participation in the system.

### *Vertical linkages*

Product flow diagrams have been used as a tool for analysis in many marketing studies (e.g., Boen *et al.* 1993). However, the diagram represents just a part of the

**Figure 4.1** Rattan market chain




story. It has become increasingly apparent, with more sophisticated understanding of the role of institutions, that the organisation and coordination among the various actors in a PCS can be at least as important as the physical processing activities themselves.

Each person involved in the PCS must buy (or collect) and sell material. However, several characteristics of biological materials can cause problems with this trade. There are sharp seasonal fluctuations in supply owing to the phenology of plants, migration patterns of animals and climatic conditions that inhibit gathering or harvesting (e.g., rainy seasons). Biological products require time to grow, are often perishable, vary in quality and are geographically dispersed (Minot 1986). For forest products in particular, information is imperfect, resources are not mobile, transactions costs are high (especially transportation costs), and social, economic and political power over the products not distributed equally (Sellen *et al.* 1993). Competitive markets do not function well under these conditions. Other kinds of mechanisms are needed to help match demand and supply without excessive price fluctuations and to facilitate the specification of quality expectations and requirements.

Contracts, whether formal or informal, are one means of ensuring a better match of the flow of material between buyers and sellers. There are several different types of contracts between farmers and commodity buyers: 1) market specification contracts, which establish the terms (quality, quantity, price) of a future transaction; 2) resource-providing contracts, which involve the provision of inputs or services to the grower as well as market specifications; and 3) production-management contracts, which involve technical assistance for the grower as well as market specifications. Other mechanisms used in agriculture to coordinate the flow of goods among buyers and sellers include cooperatives, bargaining associations, market orders, information systems (including grades and standards), transportation services, credit services, government programmes, trade practices and trade associations.

Mechanisms such as these are also used in the forest products sector. For example, forest product traders (middlemen) commonly advance money and supplies to the collectors who go to the forest, with an implicit or explicit obligation on the part of the collectors to sell to that trader, and only that trader (INBAR studies, see Annex 4.1; Padoch 1992; Peluso 1992). Traders in many PCSs use some form of grading as a basis for setting prices. In the bamboo sector in Zhejiang Province, China, traders provide transportation from the farm, and often have pre-arranged the sale with the farmer well before harvest time (INBAR participant interviews). In Assam, the Hindustan Paper Mill at Nagaon has initiated a programme to provide bamboo planting

material and technical assistance, along with financial incentives, to encourage farmers in the area to grow bamboo for sale to the mill (INBAR participant interviews).

In these contractual relationships, there is a continuum of control possible, from informal associations to detailed arrangements that specify all aspects of production. Suppliers forfeit independence in their production and marketing decisions, in return for security in terms of market access, security of prices and technical and logistical assistance (depending on the nature of the contract). The stronger and more binding contracts effectively concentrate decision making, usually in the hands of the buyer. At the extreme, a single company (a 'firm' in economics terminology) can take over a range of functions themselves as a means to ensure supplies of inputs at the desired quality, quantity and time. This is known as true vertical integration, though in fact there are varying degrees of vertical integration, depending on the strength of the contracts between buyers and sellers.

The details and value of mechanisms of vertical coordination in forest product markets are frequently misunderstood. This can lead to mistaken conclusions. For example, it is common for forest product market studies to conclude that middlemen are taking excessive profits (Gray 1990; Padoch 1992). Looking at only a market chain diagram it is easy to reach the same conclusion. Traders often appropriate a fairly high value (sometimes 100% or more of the buying price), apparently just by buying and selling the raw material. However, it is critical in such cases to consider what services are provided and what costs are borne by the traders. What are the terms of the contract?

As Padoch (1992) notes, the myth of the exploitative middleman emerges from a misunderstanding of the services typically provided. In the INBAR studies it was found to be a common practice for traders to advance credit and/or supplies to rattan gatherers. Without this provision many of the collectors would be unable to mount their collecting expeditions. Traders often arrange both the buying and the selling of the material and organise its transport, and assume all of the associated search and transactions costs. They also assume the risk of lost or damaged goods en route (and still more risk where they are trading illegally harvested materials, a not uncommon situation) and absorb the costs of quality deterioration in perishable goods.

One rattan trader in Kalimantan reported that during periods of low prevailing prices he will pay rattan collectors a price higher than his own break-even price. His motivation is rational – he feels that if the collectors switch occupations it will be hard to get them to return to rattan collecting, even if prices rise. The result of this informal contract is beneficial to the collectors as it absorbs the shock of fluctuating raw material prices.

This is not to deny that exploitative relationships exist. The intention is to focus attention on the actual and potential role of the vertical linkage mechanisms to understand why the traders may wield stronger bargaining power and to understand how to design interventions in a system. 'Eliminating the middleman' must be compensated for by supplying the services currently provided by the traders, or the system may break down, and the collectors may in fact be made worse off. Efforts

to improve quantity or quality of production must ensure that the system in place will absorb the increased production and will reward investments in quality.

### *Multiple market channels*

The product flow diagram also fails to capture the reality that the markets themselves are not homogeneous. Bottema and Ferrari (1992), looking at agricultural markets, observe that a large variety of markets and phases in market development coexist in the same areas in rural Asia. Local markets for food and perishables operate side by side with extensive collection markets in raw materials for large-scale industry and for export. The same heterogeneity is found in forest products markets. For example, bamboo from the same forest might be harvested and used for domestic consumption, for baskets for sale in a regional market, or sold to a pulp mill. Medicinal plants may be sold in small local markets in the same area where large-scale, urban-based traders collect supplies for export.

### *Subsector analysis*

A more sophisticated approach was developed by agricultural economists at Michigan State University in the 1970s and early 1980s to help deal with the need for attention to vertical linkages and with the fact of multiple market channels. Sellen *et al.* (1993) provide a brief history of the development of the approach.

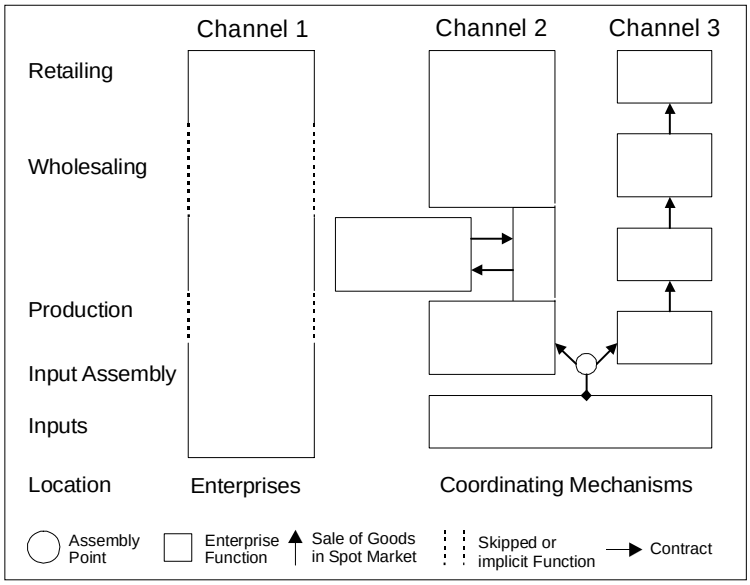
Subsector analysis (SSA) is commodity based. A subsector is defined as 'an aggregation of alternative channels through the production/distribution system for one or a group of closely related products (Boomgard *et al.* 1986). It is characterised in terms of a key raw material, with the analysis focussing on the transformation and distribution of products from that raw material. The subsector can be viewed as 'a network of firms that supply raw materials, transform them, and distribute finished goods to a particular consumer market' (Haggblade and Gamser 1991).

The central analytical tool of subsector analysis is a subsector map (Figure 4.2), that identifies the principal functions (the transformations that take place), participants (who performs the transformations) and channels (how products flow, who buys from whom, and how the network holds together). Mapping conventions have been developed to represent various kinds of enterprises and transactions or coordinating mechanisms, and 'overlays' can be used to indicate the number of firms, sales, employment, volume traded, etc., at a particular transformation point.

A subsector map emphasises physical flows, but mapping conventions permit representations of vertical integration, and horizontal mechanisms such as subcontracting and horizontal integration (represented as scale of operation). The details of other vertical linkage mechanisms cannot be captured in the diagram. These issues must be kept in mind, and addressed in an accompanying narrative.

The subsector analysis approach is prescriptive; it seeks to identify constraints and to indicate appropriate interventions to overcome them. The concept of leveraged intervention is important in this respect. Leverage is defined as 'the ability to reach large numbers of micro- and small-scale enterprises at a single stroke' and can be achieved '(a) through large firms that supply inputs or market output to many small

**Figure 4.2** Subsector mapping conventions (from Haggblade and Gamser 1991)




firms; (b) geographic clustering, which allows you to contact numerous small firms at a single location; and (c) policies that influence a multitude of small businesses at the stroke of a pen' (Haggblade and Gamser 1991).

This is a practical approach. It has been used by a number of applied studies including several on NTFPs. For example, Appropriate Technology International (ATI) supported a subsector analysis of rattan in the Philippines (Kilmer 1994) and CARE Bangladesh did an SSA of bamboo in Bangladesh (Johnson and Ritchie 1994). The GEMINI Report 'A Field Manual for Subsector Practitioners' (Haggblade and Gamser 1991) provides a good set of guidelines for researchers and development practitioners alike.

### Horizontal linkages

Firms within an industry, defined as a set of firms selling products or services that are close substitutes in a common market (modified from Haggblade 1984), have a range of options available for interacting within the industry. It is common to have informal relationships and some shared information about others' activities at all levels.

At the raw material producer level, news about prices and quality requirements from other villagers may be the only source of information other than the trader. At higher levels in a system, industry organisations offer more formalised fora for interaction, and often take on an advocacy role as well. These kinds of horizontal linkages are important as means for information sharing, to consolidate power in buying and selling, and to mobilise political support in lobbying for policy change.

Some of the stronger associations can act as cartels, and affect supply management through collective production restrictions (Boen *et al.* 1996).

At the extreme, firms within an industry can be integrated, where one firm assumes control over other firms in the same industry to increase buying power, to assume greater influence over the marketing of products and generally to take advantage of economies of scale.

### Intensity

Intensity refers here to the quality and quantity of inputs at a particular point in the PCS. Discussions in economics of 'capital intensity' or 'labour intensity' typically refer to trade-offs between capital and labour. Where labour costs are low, it is often advantageous to substitute labour for capital and adopt a low capital intensity approach to production, and vice versa, with implications in terms of the requirements for skilled workers, capital costs and financing requirements, and infrastructure. (Gregersen *et al.* 1986)

Here, rather than discussing the relative balance of capital and labour, we are more interested in the total level of investment in inputs (skills, specialisation, mechanisation, scale) as a basis for comparison among different options at any given stage in the PCS.

Investments in mechanised processing in the furniture industry, for example, may yield a higher volume of better quality, more uniform products (often critical for accessing larger markets), and increase processing efficiency. Important gains might also be realised through the adoption of better quality tools and increased skills and design inputs in a more labour intensive operation. Either of these options falls within the definition of intensification used here. The implications of and requirements for increasing the intensity of inputs are important in terms of income and employment generation, and also in terms of quality management. There is considerable scope for research to help design appropriate strategies for intensification as a contribution to small enterprise development in the forest products sector. There are many lessons to be learned from progress in other sectors.

Attention also needs to be directed to the opportunities for and implications of intensification (including planting and management inputs, increased planting density, improved harvesting techniques) at the raw material production stage. This is one of the distinguishing features of the PCS approach as developed at INBAR. Attempts to alleviate poverty (through income and employment generation) and improve environmental sustainability need to take a broad view. While bamboo and rattan and other biological resources have the potential for sustainable development it cannot be taken for granted. Care needs to be taken to understand the systems and their dynamics.

Subsector analysis and other approaches developed in the agricultural economics field tend to begin their inquiries at the point at which the raw material is supplied. The focus is on enterprise development. Even the Production-to-Consumption Systems research approach described by Sellen *et al.* (1993) has an 'emphasis on post-farm issues'. Such approaches assume a degree of uniformity of inputs, and so

treat the raw material as a more or less homogeneous input to the production systems, where production system refers to the manufacture of semi-processed or finished consumer goods.

In the forest products sector, with attention to the sustainability of the raw material production and the associated ecosystem health, 'production system' refers to agroecological production of the biological raw material. The intensity of production has important environmental implications.

In agriculture, it is possible to intensify production through inputs such as improved planting materials, fertilisers, pesticides, irrigation and mechanised tillage, and planting and harvesting methods. Large-scale mechanised farming practices are at the upper end of this scale, while low-intensity mixed farming systems represent the low end of the scale. However, intensification of production on permanent agricultural land has limited direct impact on genetic diversity.

For the production of forest products the range of options is wider. Forest products may grow within natural forest ecosystems that are, with the exception of occasional low-intensity harvesting operations, virtually undisturbed. Alternatively, the system may be managed at a range of intensities, including high-intensity plantation-based production systems. The production intensity selected for raw material production in the forest sector has enormous conservation implications. Within low-intensity systems, such as extractive and complex agroforestry systems, ecosystem functions similar to those found in the undisturbed forest can be maintained (see for example Gouyon *et al.* 1993; Michon *et al.* 1994). High levels of biodiversity can be conserved and the requirements for pest control, soil maintenance and irrigation are low.

Increasing the production intensity for a particular crop involves environmental and biological manipulation and disturbance. As management inputs are increased the system becomes more like an agricultural system, with higher densities and higher proportion of total biomass of desired species, deliberate reduction of undesirable ('weed') species, and perhaps fertiliser and pesticide inputs. Higher production of desired species is achieved at the cost of reduced biodiversity and ecosystem functions within the growing area.

Some critiques of the extractive reserve concept developed in the Brazilian Amazon have identified pressures that may drive the intensification of production of a valuable commodity (Browder 1992; Homma 1992). Increased demand, signalled by higher prices, is likely to lead to increased harvesting pressure. This may lead to overexploitation and collapse. However, under the right conditions (high prices, security of tenure, available technology and labour) people may attempt to increase production through increased management.

Low-intensity sustainable commercial extraction of products from a diverse forest ecosystem as an income source for people living a relatively traditional lifestyle may be perfectly appropriate under some circumstances, and it should be encouraged in those cases. For example, one high-potential area for this kind of development is within buffer zones around national parks or protected areas (Gray 1992). However, whether from a project perspective or from a broader policy perspective in many cases it will be important to consider alternative raw material production opportunities.

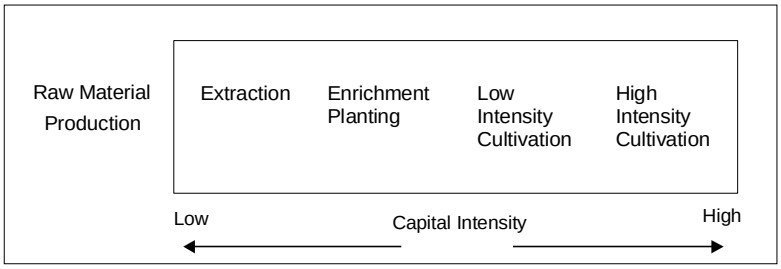
By manipulating the environment of the desired plant (or animal), or even the organism itself (selection, breeding, genetic engineering), it may be possible to increase production within a given area. A wide range of options is available. For example, it is possible to intensify the management of the raw material within the forest ecosystem. Forest product collectors might plant seeds, weed around desirable plants or clear trees to provide gaps in the forest canopy and the light needed by certain plants to become established. Indeed, some of these strategies are employed by rubber tappers in the Brazilian extractive reserves (Anderson 1992). There are also anecdotal reports that rattan harvesters in Sulawesi, Indonesia, and Manipur, India, sometimes move wild seedlings to more favourable sites.

For some forest products, it may be more appropriate to intensify the raw material production towards a plantation or agricultural model, especially if the product is rare or widely dispersed. Cultivation can be considered an option for enhancing the sustainability of the enterprise and maintaining the integrity of the forest. Even if forest product extraction from a wild source is the preferred strategy from a social and environmental perspective (e.g., in buffer zone management), competition from other cultivated products must be considered in a feasibility assessment, and steps should be taken to ensure the economic competitiveness of the extracted material. Cultivation can occur at a relatively low intensity, within an agroforestry system for example, where the plant in question is one of a number of desired species grown in a given area (examples of rattan-, rubber- and damar-based agroforestry systems are described by Gouyon *et al.* 1993; Michon *et al.* 1994), or on a more intensive basis, such as monoculture plantations. Many forest products have been domesticated in this way, including rubber, coconuts, pineapple, durian, the rosy periwinkle .... the list is long.

## Mapping Intensity of Inputs: Cash, Skills and Technology

A simple illustration helps to conceptualise the intensity dimension, showing the continuum of possible strategies along an axis from low to high intensity (Belcher 1997). The box in Figure 4.3 represents the range of possibilities for producing raw rattan. The left side of the continuum labelled 'extraction' represents production options that involve minimal management inputs. Moving right along the continuum, intensity increases with 'enrichment planting', 'low-intensity cultivation' and 'high-

**Figure 4.3** The production continuum





Home production of rattan baskets in Apau Ping, Kalimantan (photo by Eva Wollenberg).

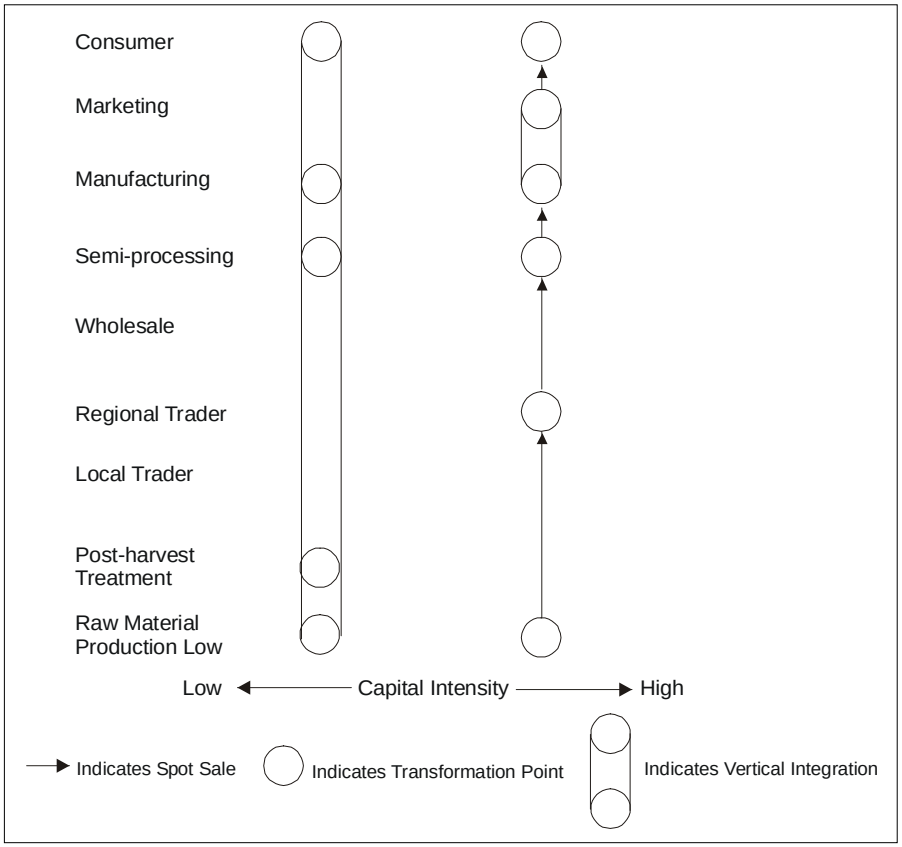


Sophisticated assembly-line processing of rattan furniture in Cirebon, Java (photo by Brian Belcher).

intensity cultivation'. A particular raw material production system can be placed on the continuum relative to other production systems based on the level of capital used.

As with the production of raw material, any single function in the PCS can be intensified to increase the quantity or quality of the output, or the efficiency of the transformation. To use a rattan example, raw material may be produced in an extractive system, with no management input. It is harvested using only a simple tool, and woven using a basic design to produce a functional but rustic product, say a basket, for household use. All functions are performed at a very low level of

**Figure 4.4** Extensive PCS (left side) and intensive PCS (right side)

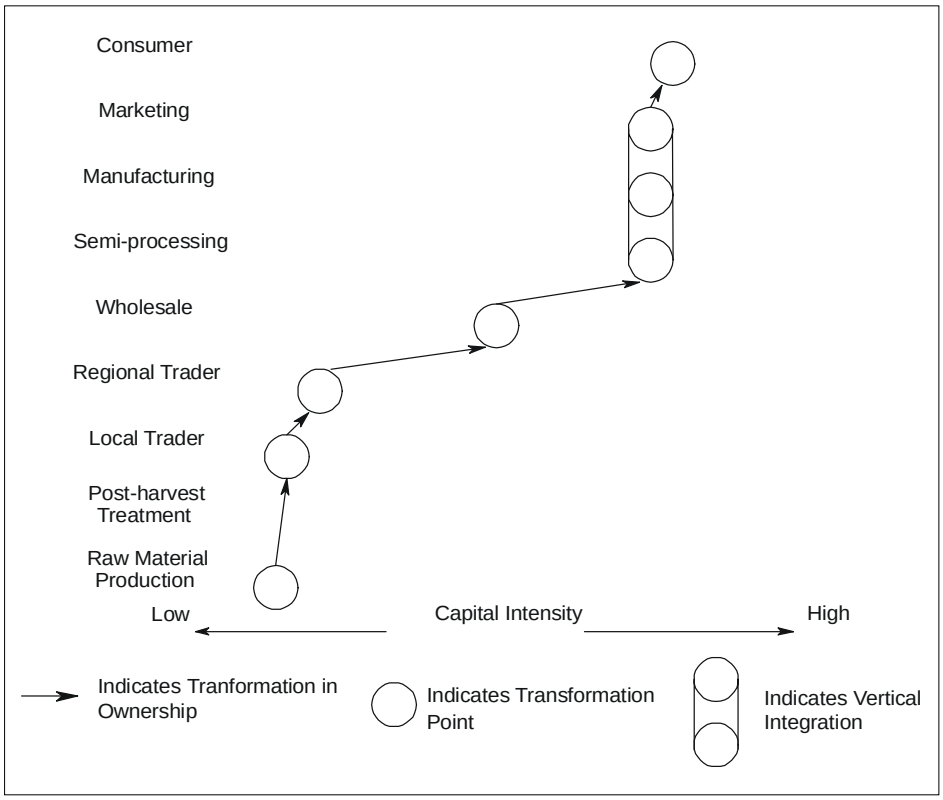



intensity. Such a low-intensity PCS is illustrated in Figure 4.4 as a series of connected circles along the left (low intensity) side of the diagram. The circles represent the individual functions performed by the basket maker. The envelope around the circles indicates that the whole process is under the control of a single decision maker, i.e., the system is vertically integrated.

Baskets may also be produced at a higher level of intensity. For example, the raw material may be grown in an intensively managed plantation and harvested using hired labour and mechanical aids. It is then transported via traders to a wholesaler, and on to a large factory where it is cored mechanically and then woven and finished on an assembly line with different workers each completing part of the weaving function. The resulting basket may then be sold in the high-priced export market.

This case is different from the previous one in three ways: 1) transformation stages have been added (i.e., transportation, storage, transformations in ownership, including export sales; 2) functions have been divided among actors (specialisation); and 3) all functions are performed at a higher level of intensity with increased levels of labour, capital (mechanisation), and even land (factory area) inputs to the process. This (hypothetical) case is also shown in Figure 4.4. It is illustrated as a series of

**Figure 4.5** The Philippine rattan PCS




circles joined by arrows representing sales, or enveloped representing a single owner in control of several functions, lying along the high-intensity side of the diagram.

A particular PCS, and the corresponding diagram, may have fewer transformations (drawn as circles) than shown (e.g., a person picks and eats a fruit on the spot) or many more. Circles toward the left side of the diagram represent relatively low-intensity transformations, while circles toward the right side of the diagram (at the same point on the vertical axis) represent similar functions performed using a more capital-intensive process.

The second example shown in Figure 4.4 is artificial. It is unlikely that all transformation functions will be performed at the same relative level of intensity. Products entering high-value markets are not necessarily manufactured from plantation-grown material. In fact, much of the rattan used in the high-quality furniture market is harvested from the wild, or from low-intensity cultivation systems. Figure 4.5 illustrates the actual case of the Philippine rattan PCS. Here, a relatively intensive export-oriented furniture industry is based on raw material produced in extractive systems. Similarly, material from intensive production systems may be used to manufacture low-value products. There is nothing inherently better in supplying one type of market versus another type. The main commercial objective is to supply

the market which will yield the highest profit. The price per unit of product may be much higher as export-quality furniture than as a basket or chair sold in a local market. However, the lower cost of inputs to manufacture and market the lower-value item, and adequate demand for such products, may make it more attractive to supply that market. In other cases there may be a high demand for a higher-quality product, or for a different type of product, or for the same product in a different market. These cases must be identified, along with the constraints that prevent entry to the higher value-added market.

## Applying the PCS Approach

### Selecting the PCS

The challenge from a development perspective is to use a natural resource PCS as a basis for increasing employment and income-generating opportunities for poor people, and to generally improve welfare within a context of sustainable raw material production. The discussion above attempts to capture the important elements that need to be considered in analysing a PCS.

It is possible to work at two different levels to apply the PCS approach. One way is to begin with a group of people and work with them to identify forest products that are relatively important (or potentially important) to them in economic or social terms. Products that provide an important source of subsistence, cash income, or that could supply an existing market are identified. The existing Production-to-Consumption System for the selected products is analysed to identify opportunities to improve it. This is the approach being used by numerous rural development projects, such as those undertaken by ATI, Biodiversity Conservation Network, as well as others.

Alternatively, the primary focus could be on a particular commodity. Priority target groups are selected based on the actual or potential importance of the selected commodity to that group, as well as equity or poverty concerns. Interventions are made to improve the efficiency, sustainability and equity of production, transformation and marketing of the resource in a way that will benefit the target group. INBAR, with its *a priori* focus on bamboo and rattan, follows this second approach. Bamboo and rattan are important to large numbers of poor people in developing countries and interventions are being targeted to improve bamboo and rattan PCSs as a means to achieve sustainable development.

Whichever starting point is used, once the PCS is selected, the analysis will follow the same general course. It will consider the whole PCS in terms of its structure and organisation, with a view to identifying opportunities for and constraints to improvements in the system. Based on that diagnosis, potential interventions can be proposed. The research should identify problems in the system and find ways to overcome them.

As discussed above, there is a large set of variables that needs to be considered. Research must blend methods from different disciplines as appropriate. Good rapid assessment methods will be necessary to capture the breadth of information required.

### The research approach

Once the PCS is selected, the first step is to describe the system in terms of the market participants and transformations (functions) performed. In practical terms this means starting at some point in the system (raw material producers, exporters of finished products, or anywhere in between) and tracing the physical movement of material forward to the final market and/or backwards to the origin. At each transformation point a variety of information collecting techniques is used, including rapid rural appraisal (RRA) methods, participant observation and key informant interviews, with reference to whatever secondary information is available.

As is normal in this kind of research, each new contact is likely to lead to other contacts. At a minimum the researcher should find out from each participant surveyed where they get their materials, what they do with them (transporting, sorting, processing, storing), and who they sell them to. Ideally, it will also be possible to probe a little deeper to learn more about how prices are set and other information on the nature of agreements (contracts) and the conditions of exchange between participants, both vertically and horizontally.

The researcher should also try to learn about costs (capital and labour costs). In the experience of the INBAR studies, people tend to be fairly forthcoming with this kind of information, especially those involved in smaller-scale enterprises. Often people will be willing to share some, but not all, cost information (e.g., buying costs, production costs or selling prices). Usually one can assemble a reasonably composite picture by talking to people at different points in the system, finding out the buying prices of some, the selling prices of others and making reasonable estimates on that basis. Sincere interest and a gentle, non-threatening manner are vital research tools. It is wise to expect some errors in people's responses. These may be deliberate or accidental, but it is always useful to ask important questions more than once, preferably in different ways, and to triangulate using other sources of information.

It is also important to try to develop a sense of trends in the system. Are prices stable or fluctuating, generally rising or generally declining? Is the quality or quantity of material available changing? Are buyers' tastes and preferences changing? Do people at different points in the system understand the changes or have interpretations and explanations for the changes?

The research process is by nature an iterative one. It is impossible to anticipate all questions that will need to be asked, but each new encounter raises new issues. The main objective is to get an overview and understanding of the vertical, horizontal and intensity dimensions of the existing PCS.

## INBAR Studies

Studies of five bamboo and four rattan Production-to-Consumption Systems have been undertaken by INBAR partners in India, China, Nepal and the Philippines, following the general approach outlined above. The different systems were selected to represent a range from extensive through to intensive systems. It is beyond the scope of this paper to describe the individual studies in detail (a list of the project

reports and their authors is included in Annex 4.1). However, a number of general findings are described. One of the most striking findings from an overview of different bamboo and rattan PCSs is the strong similarities in the way that the various systems are organised.

### Vertical coordination

In most of the cases studied, vertical coordination is achieved through strong personal and contractual arrangements. Price competition is less important than hierarchical forces. This tendency is much more marked at the early stages of the PCS, where raw material producers may have the option of selling to only one or very few buyers. A variety of informal contracts exists, with traders commonly advancing money or supplies to raw material harvesters. Even at higher levels in the system, long-term personal arrangements between business partners tend to be more important than 'spot sales'. Within these arrangements prices may be negotiated, but price is not necessarily the most important factor.

This can be explained, at least in part, by the nature of the material and its production. Raw material production is geographically dispersed, often in fairly remote areas (especially rattan). Quality is inconsistent. The size, density and other inherent characteristics important to users vary with species (many species are used), the particular variety, its age and growing conditions. It is not desirable for buyers to simply purchase raw or even semi-processed material sight unseen. Each and every consignment must be examined to determine the quality, and the price must be negotiated. This is a very costly approach. The alternative is for buyers to have longer-term relationships with sellers. Trust and longer-term (if informal) contractual agreements reduce the transactions costs of buying and selling.

The same logic applies at transformation points higher up the PCS. Local traders do not have the necessary business relationships with, and probably can't supply the volumes required by, the semi-processors or manufacturers. Many of these business relationships are based on family relations and ethnicity, so the barriers to entry may in practice be very high. In general, there are large inequalities in social, economic and political power that influence the market as well. So, the sellers must be satisfied with oligopsonistic buying arrangements.

Where quality is less important, such as in the bamboo-based pulp and paper industry in India, spot sales are much more common. The manufacturing industries need a large volume of bamboo raw material, but they care little about the size or quality. They purchase on a weight basis, at a fixed price, from anyone who will bring it to the factory. There is no real competition from other buyers, but the price is kept high enough to ensure an adequate supply.

### Horizontal organisation

In most of the systems studied, horizontal linkages at the early stages are relatively weak. Raw material producers are in contact with other producers from their village and from neighbouring areas, and they share information. Likewise, traders may

have some informal contact with other traders. However, at these stages in the system, the vertical links are stronger than the horizontal links.

The main exceptions are in the Philippines, where some regional manufacturers have attempted to use their collective bargaining power to get more favourable prices for raw material inputs and for sales. Also, gatherers' associations have been formed to apply for rattan cutting permits (Pabuayon *et al.* 1996). Some of these associations have taken on additional functions (storage, semi-processing), but others have merely replaced local traders.

In China, the influence of the collective farm tradition has led to much stronger coordination at the level of the raw material producers. Even though the land on which bamboo is grown in Anji County is managed on a private basis, many of the collective institutions remain in place (Zhong *et al.* 1996).

At later stages in the system the horizontal linkages are often stronger and more formalised. This is especially true where the final products have important export markets. In many of the cases there are manufacturers' associations and trade associations that provide services to the membership, and that consolidate political power. Perhaps the strongest association is ASMINDO (The Indonesian Furniture and Handicraft Manufacturers Association) which exerts influence on government policy and, with mandatory membership, wields considerable influence in and of itself. For instance, quality and volume restrictions set by ASMINDO on the export of *lampit* (rattan mat) have had a severe impact on the size of the manufacturing industry and so on demand and prices for raw and semi-processed rattan throughout the system (Boen *et al.* 1996; NRMP 1996).

In most other cases the associations are not so powerful, but they are an important tool for providing services for collective benefit and for lobbying for change. In the Chinese case, there is something of a reverse trend, with a breakdown of the monopoly position of the state-run Supply and Marketing Cooperative. Formerly prices were set by the state. Now, prices are negotiated, resulting in much higher earnings for farmers (Ruiz Pérez *et al.* 1996; Zhong *et al.* 1996).

### Intensification

In most of the cases studied, the main products were used to supply an expanding market. Yet there has been little or no recent effort on the part of raw material producers to intensify production, with two exceptions for bamboo in China and the Indonesian government-owned rattan plantations.

Most remarkable is that in the rattan sector, where raw material shortages are already being experienced, there has been so little effort to cultivate rattan. Experimental efforts were documented by Pabuayon *et al.* (1996) in the Philippines, but these attempts are unlikely to make a significant contribution to meeting the demand. The rattan plantation work in Java is somewhat more ambitious, but it is not being followed through (Haryatno *et al.* 1997). In most other rattan-producing countries efforts toward rattan cultivation are few and weak. In fact, the only country that is moving ahead strongly with rattan cultivation is Malaysia. A strong research programme in Malaysia in the 1980s has been followed up with the planting of rattan

as an intercrop in almost 20 000 ha of timber and rubber plantations, and more is planned (Lim and Nur Supardi 1995).

Where rattan cultivation is taking place it is mainly in the control of corporations or forest departments. Traditional rattan collectors are not intensifying to enhance productivity. Where prices are high enough they may extensify, moving farther into the forest to increase their harvest. Paradoxically, the traditional rattan cultivation system in Kalimantan appears to be under threat due to low prices for the main cultivated species and new, competing land-use opportunities.

At higher levels of transformation in the rattan PCS there has been some intensification in semi-processing and manufacturing, with more mechanisation and intensification of skill in terms of new designs and marketing. Labour costs and perhaps insecurity of raw material supply prevent further mechanisation, although there are numerous processes that could be mechanised.

In the bamboo sector the situation is different. The bamboo-processing industries are changing rapidly. Many new technologies that use bamboo as a raw material are being developed and commercialised. Bamboo mat board, produced primarily in India, uses hand-woven bamboo mats as the main raw material input. Most of the other production technologies, producing a range of panel products, laminated wood substitutes, numerous products woven from bamboo strips (mats, blinds), and of course pulp products, are highly mechanised. This permits high levels of throughput, and feeds back to increase demand and prices for raw material.

In several cases, smallholder gatherers are intensifying their bamboo production. This is true in the Nepal case (Karki *et al.* 1996), and especially in China (Zhong *et al.* 1996). Some of the industrial raw material users have begun to introduce incentive programmes to encourage farm production of bamboo (e.g., Hindustan Paper Nagaon in India, participant interview). Again, however, the main trend in raw material cultivation is in the corporate sector, with companies establishing large-scale plantations.

## Targeting Interventions

The theoretical framework, and the empirical experience provided by the INBAR studies, underline the importance of taking a systems view in the diagnosis phase, and in the design of interventions for increasing benefits from NTFPs. The next step is to identify specific targets for intervention within the system (alternatively, the target group may have been identified prior to selecting the target forest product). Selection criteria include: level of poverty; the number of people involved in the PCS; degree of importance of the selected forest product to the group; importance of the product to particularly disadvantaged groups (women, children); potential conservation impact; and feasibility.

Improvements in employment and income opportunities within a PCS can be achieved in several ways. Change can be implemented at the level of an individual, company or group of companies in terms of the intensity at which a function is

performed. For example, assistance can be provided to help people manage their raw material production more intensively, use improved technology in their processing or market their product more effectively. In this way a target group (whether a group of forest product collectors, an individual company or a group of companies) can be assisted to increase the volume of production (increase throughput), increase the quality of the product (increase the value of each unit of output), or increase the efficiency of production/transformation (increase profit per unit of output). By applying an increased combination of capital, labour, land or knowledge, the quality or quantity of material processed can be increased. Assuming the market exists to absorb increased quantity or reward increased quality, the improvements will leave the target group better off. However, as discussed above, intensification of forest product production may have important trade-offs in conservation terms. In all cases the opportunity cost of intensification must be carefully considered.

Changes can also be made in the way that people or companies (firms) are organised within an industry horizontally, or in the way that firms are linked within a PCS vertically. Improved horizontal linkages can give participating firms a better bargaining position through increased buying and selling power. Horizontal linkages (e.g., cooperatives) can also facilitate cost-sharing for expensive equipment; this is especially important for small-scale, capital-limited enterprises. In Manipur, India, the Manipur Crafts Society has brought together a number of rattan craftspeople. The association buys raw material in bulk on behalf of the group, and is thereby able to get better prices and better quality than if the individual craftspeople negotiated the sales individually. The Society also bids collectively for large-scale furniture orders that would be far beyond the capacity of individual furniture manufacturers to supply. The Society is now working to purchase some machinery that will be used for peeling and splitting rattan. These machines will yield better-quality material for making furniture and handicrafts and will reduce the drudgery involved in hand scraping and splitting. Such industry associations can also facilitate access to information, lobby for policy changes and facilitate market access. Efforts to encourage these kinds of horizontal linkages can be very effective in helping people to create and capture more value in their forest product enterprises.

The efficiency of vertical linkages is important in determining transactions costs and risk to the firm. Many of the green marketing and fair trade initiatives encourage stronger vertical linkages, facilitating direct relationships especially between raw material producers and buyers. These deals are sometimes arranged by a third party serving as an 'honest broker' or by the buyer themselves (the Body Shop model) seeking to capitalise on the 'green premium' afforded by such socially attractive arrangements. The essence of the idea is to displace exploitative relationships, or relationships that are perceived to be exploitative, with more benign arrangements.

While this approach clearly has merit in individual cases, it is likely to be insufficient to bring about widespread change. The INBAR studies, for example, show that vertical linkages in the bamboo and rattan sectors are already very strong in many cases. The raw material suppliers have weak bargaining positions precisely because they are dependent on one or very few buyers. While more advantageous

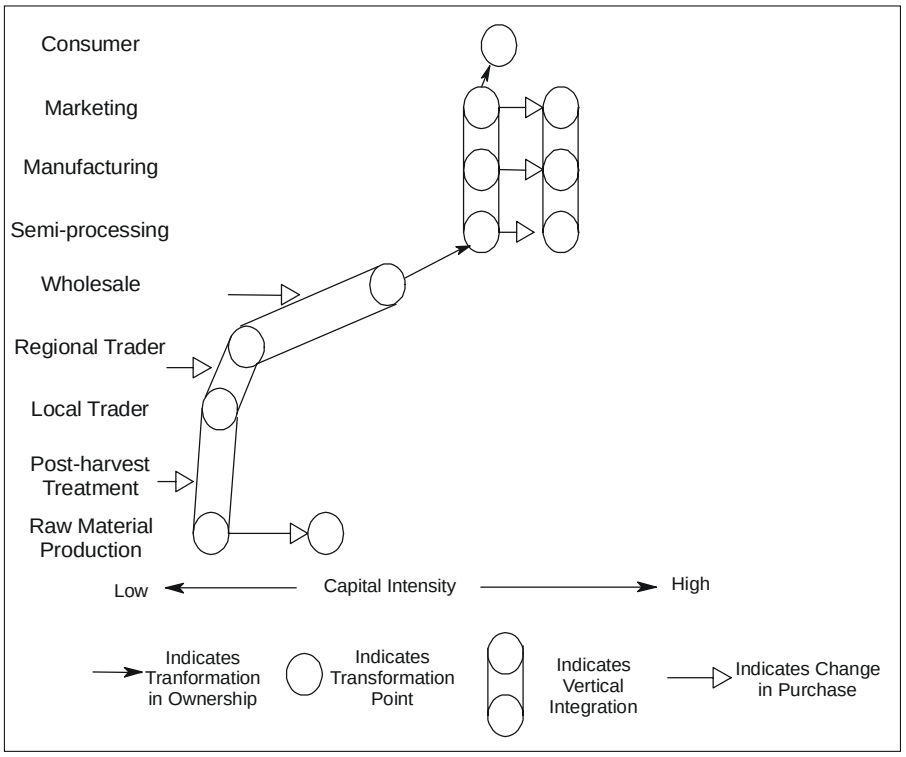
market arrangements will be very welcome, it seems unlikely that goodwill and a sense of fairness will replace the bottom line as the dominant criterion in trade. The 'fair trade' model is difficult to replicate widely as it involves relatively high transactions costs to establish and enforce. The middlemen in most systems do not receive exorbitant profits because of the costs associated with the many functions they perform. Moreover, the 'green market' and 'fair trade' approaches can only be expected to reach a small audience of producers. Elsewhere, market pressures will continue to drive prices down.

An alternative to the project-level 'fair trade' type of arrangement is to use policy-level interventions to encourage stronger competition in NTFP markets. While strong vertical linkages help to bring about efficiency in the market by reducing transactions costs, such linkages do little to encourage equity in the market. Indeed, they tend to be based on inequitable power relations. Raw material suppliers and traders at the early stages in a PCS seldom have much choice in terms of their buyers, and have limited ability to strike better bargains. Their bargaining situation could be improved by making market information more easily available, and making investments that will reduce marketing risk (better storage technology, clear grading standards), transportation and other transactions costs. For example, Boen *et al.* (1996) have proposed the establishment of a rattan auction market in Kalimantan. This would introduce more competition and break the monopsony power of the traders. In practice, collectors might still have to rely on traders to take their material to market, but the auction mechanism would help effectively move the price and quality criteria into the public view.

Of course, interventions designed to change relative intensity of production or processing, or the nature of horizontal or vertical linkages, are unlikely to be undertaken in isolation. It is possible that someone may be manufacturing a good quality product but not getting a good price because the present market is saturated. By searching out a new market for their existing product they may be able to increase their earnings. However, it is more likely that a number of changes will need to be made to gain access to the new market. In bamboo and rattan products markets for example, producers may have to incorporate modified designs, better finishing details, or improvements to overall quality. One of the biggest and most difficult shifts for producers trying to enter more intensive markets is to develop the capacity to deliver large volumes of finished product within a short time frame.

Consider a group of people who collect rattan and sell it in an unprocessed form to local traders, who transport the material downriver and out of the forest for sale to wholesalers and on to the furniture industry (as in the Philippines case illustrated in Figure 4.5). Opportunities for increasing revenue by the rattan collectors include: 1) increasing the volume of sustainable production (increase labour and skill input – move to the right on the intensity diagram); 2) improving the quality of material produced (increase management input and sell into a higher-quality market – move right); and 3) taking over transportation, wholesaling or other downstream activities (vertical integration – link upward with transformation points) (see Figure 4.6).

**Figure 4.6** Options to modify the Philippine rattan PCS




Small-scale, urban-based furniture manufacturers in the same PCS might also be targeted because they are a high-priority group themselves or because increased demand at the manufacturing stage will translate into increased demand and, under the right conditions, higher prices to raw material producers. Options to increase their income include: 1) increasing quantity produced (improve management, increase capital invested – move right on the diagram); 2) improving quality (gain entry into a higher value market – move right); and 3) form a partnership or take over raw material supply and/or furniture marketing (vertical integration – expand vertically downward on the diagram) (see also Figure 4.6).

Many of the INBAR studies investigated cases where there was apparent scope for increasing the intensity of raw material production. The constraints preventing intensification are more often social, biophysical and economic (lack of secure tenure, long rotation periods, low raw material prices) rather than technical. In a few places efforts are under way to improve horizontal linkages and increase the range of functions performed by a single group. Technical issues remain important however. There are few traditional cultivation models for rattan, and little research has been done on small-scale cultivation of rattan. Bamboo cultivation techniques are better known and researched, but there is also a need for further research and improved extension.

Likewise, there is much scope for improvements in small-scale processing of both bamboo and rattan. Home-based microenterprises are important employment and income generators in many of the PCS studies, but they are limited by poor quality products and weak markets.

Improvements in one part of the PCS may also lead to developments in other parts of the system. For example, as an industry develops, increased opportunities will arise for providing supplies and services. In the bamboo and rattan sectors, and in some other NTFP sectors (e.g., medicinal plants), there is a nascent but potentially large market developing for production inputs. To date input requirements have mainly been limited to low-skill labour. There has been some marketing of planting material, but only on a small scale. With the establishment of larger-scale plantations, or other forms of intensification (i.e., enrichment planting), there is a need for quality planting material, agricultural chemicals and management skills. Armed with the appropriate knowledge, resources and incentives, poor people may be able to gain entry to this market.

Much of the non-timber forest products literature concerns target groups engaged in extensive raw material production feeding into low value-added markets. Development strategies based on NTFPs have used a combination of approaches, but they have tended to place the strongest emphasis on improving marketing and increasing value addition (i.e., improving vertical links, sometimes with a degree of vertical integration). Increased processing intensity is also often recommended. Generally though, projects pursuing an objective of biodiversity conservation through biological resource utilisation have tended to avoid efforts to increase the intensity of raw material production (i.e., cultivation). The idea of the extractive reserve seems to have a very strong appeal. However, where technically feasible, intensified raw material production may make economic sense, and conservation objectives may be rapidly overwhelmed by an economic imperative, whether or not development planners intend it.

## Conclusions

The Production-to-Consumption Systems approach provides a framework within which to organise the many issues that need to be considered in developing a forest product. It focuses attention on the market, with emphasis on the linkages *between* transformation points and *among* firms at any particular transformation point. This emphasis on institutions distinguishes the PCS approach from other analytical tools such as Market Chain Analysis and Subsector Analysis. The PCS approach also introduces the intensity dimension as a way to deal with changing levels of scale and investment as a system develops. The intensity dimension is particularly important in forest products development, especially for the analysis of the raw material production stage. Intensification can create conservation trade-offs. Increased production of a forest product within a forest ecosystem is likely to result in disturbance to the ecosystem and possibly to reduced conservation value. Conversely, increased

production of a forest product outside of a forest may relieve pressure for use of the forest. The strong conservation goal built into many NTFP development initiatives underlines the importance of giving attention to this issue.

The discussion draws on relevant concepts from the agriculture sector and from the institutional economics literature as they apply to NTFPs, with special reference to the bamboo and rattan sectors. The PCS approach considers the participants in the system and the functions that they perform in three dimensions; vertical linkages, horizontal linkages and intensity. A simple diagrammatic representation can be used to illustrate the three dimensions of a PCS.

An overview of the general findings from a series of PCS studies conducted on a range of bamboo and rattan systems illustrates the utility of the approach. The INBAR studies revealed that competitive market mechanisms are relatively unimportant in most bamboo and rattan PCSs studied; formal and informal contracts and personal relationships are much more significant. These contract arrangements are particularly important in raw material trading. Collectors and even growers of bamboo and rattan tend to have weak bargaining positions. This weakness at the producer level is compounded by the relatively weak horizontal organisation at that stage and stronger horizontal organisation at higher levels in the system.

These conditions conspire to limit the incentives for sustainable resource management. The studies showed very little effort to intensify management practices at the raw material production stage among current gatherers. Existing traditional rattan cultivation systems are threatened due to declining prices and, in some areas, increased opportunity costs of land and labour. Plantation development for both bamboo and rattan is more likely under private management, and by companies that have the capacity to do so on a larger scale. However, under conditions of expanding market opportunity, such as in the China study, small-scale farmers respond with increased raw material production through intensification.

Generally speaking, there is a need to improve the bargaining power of raw material producers. Market information is poorly available to participants in most of the PCSs studied. One mechanism to improve this for bamboo and rattan would be to include the prices with other agricultural commodity price broadcasts and publications. To be effective this kind of market information would have to be based on recognised grading standards. Work is needed to develop practical standards that are widely understood and accepted. Another possible approach would be to create auction markets for raw materials.

Stronger horizontal linkages at the early stages in a PCS could also help to increase the bargaining power of producers and local traders. Project or policy interventions could seek to encourage associations at this level. The experience of the rattan gatherers' associations in the Philippines provides a useful model. Some of these associations have been effective in consolidating their bargaining power and also in taking on extra functions, and so capturing more value added.

Of course, the issue of property rights always emerges. Without secure tenure for producers of raw materials there is no incentive for sustainable resource management or for resource enhancement.

There is also room for technical interventions. In many cases there is need for improved planting material and planting models that are suitable for smallholders. The models need not be plantation-based. In the rattan sector there is scope for enrichment planting within natural forest or agroforest settings.

The PCS approach facilitates an holistic analysis, including the full range of actors and functions that are involved in growing, processing and marketing a forest product. It encourages development of a basic understanding of the system and helps to identify the most important stakeholders and their constraints and opportunities. Application of the PCS approach in the INBAR studies has helped to draw attention to issues that might otherwise have been overlooked. The analyses from the bamboo and rattan production-to-consumption systems are contributing to the design of interventions at case level and strategic planning and policy making at the regional and international levels. The lessons learned from these cases will hopefully act as a guide for interventions in other places and for other NTFPs, thereby contributing to enhanced economic opportunities for the people who depend on such products.

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# Annex 4.1
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**Bamboo**

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**Rattan**

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Chapter Five

# Methods for Assessing the Feasibility of Sustainable Non-timber Forest Product-based Enterprises

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A variety of approaches has been used for assessing forest product-based enterprises. These approaches vary in the extent to which they address conservation and development concerns, as well as income-generation effectiveness. This chapter reviews three common approaches for assessing NTFP enterprises: business planning, enterprise development and market analysis and development.

Business planning is the approach conventionally used in the formal, commercial sector. Having its origins in the private industrial sector, it is the oldest and most well developed of the three approaches. Business planning focuses strictly on determining the profitability of a firm's operations. The enterprise development approach was proposed initially in the 1970s and 1980s as an adaptation of business planning to serve the needs of smaller and more informal 'microenterprises'. It also focuses on financial viability, but uses methods and tools more appropriate to small-scale, low-capital, low-skills enterprises. Financial objectives are linked with the social objective of improving economic opportunities for disadvantaged groups. The newest approach is market analysis and development (MA&D) which brings together the lessons learned from 20 years of experience in enterprise development and applies them to small, natural resource-based enterprises (Lecup 1996). It has been driven by the recent interest in marketing of NTFPs, especially in the Asian context. Because of its focus on ecological sustainability, in addition to social and financial objectives, MA&D is especially applicable to enterprises based on resources that need to be protected or conserved.

The purpose of this review is therefore to examine these approaches, to discuss their relevance for assessing NTFP enterprises and to recommend a framework of methods for future action. The review is based on the authors' collective experience with NTFP-based enterprise development in Nepal, Vietnam and Indonesia.

## Glossary

- **Non-timber forest product** (NTFP) encompasses all biological materials other than timber which are extracted from natural forests for human use. These include foods, medicines, ornamental plants, wildlife, fuelwood and raw materials, notably rattan, bamboo, small wood and fibres, as well as animal products from the mangrove and marine ecosystems (de Beer and McDermott 1996).
- **Market chain** is the sequence of stages through which a product is bought and sold. An analysis of the market chain follows the product from the harvesters, processors, traders, up to the final consumers.
- **Direct actors** are the individuals or institutions participating in the market chain, i.e., producers, processors, traders and final consumers.
- **Indirect actors** are the individuals or institutions having influence on the products and processes at any step in the market chain.
- **Producer** can be a *harvester* collecting the forest products from the wild, as well as a farmer growing the forest products in a plantation or garden.
- **NTFP enterprise** refers to any production, processing, transporting and/or marketing initiative, action or activities by a direct actor to generate income from NTFPs, whatever the size and legal structure within which it is undertaken. For instance, a harvester of rattan is considered a *rattan production enterprise* and a manufacturer of rattan furniture as a *rattan-processing enterprise.*
- **Sustainable NTFP-based enterprises** are those, unlike other enterprises, that increase the welfare of the local people (social sustainability), by creating sustainable economic activities (economic sustainability) and safeguarding the environment in the long run (ecological sustainability). They may differ from others in features such as seasonal nature of production, dependence on ecological integrity of forest, remote location, high dependence of the users on those resources, low socioeconomic and education levels of the producers, manufacturers or traders and long marketing channels.
- **Enterprise strategy** is the long-term vision designed by the entrepreneur after an in-depth analysis of the existing situation. The enterprise strategy includes substrategies to ensure a successful sale of the products, i.e., financial, production/manufacturing, marketing and organisational, social and resource management. To be implemented, the strategy is translated into an action plan, the *business plan*.
- **Business plan** clearly states goals for a specified period and objectives for each of the substrategies. To reach these stated specific objectives, action plans (financial, production/manufacturing, marketing and organisational) are formulated and tasks designed to implement them. It quantifies and provides time schedules for mobilising the human and material resources and for performing the activities needed to best *market* the products. The business plan components are used as tools for monitoring the enterprise's progress towards its stated goals, and for planning readjustment if necessary.
- **Sustainable business plan** includes environmental and social plans in addition to the financial, production/manufacturing, marketing and organisational plans.
- **Market analysis** and **marketing** are the processes of seeking those products potential customers will purchase and then producing, processing, promoting and distributing them at a profit. The marketing process identifies possible demand for a product, and how to improve the product to meet the requirements of current demand or new markets.

**The NTFP entrepreneur**

The term 'entrepreneur' is used in this chapter as a generic term for the actors who will benefit directly from the sale of an NTFP. This includes producers, manufacturers (primary processing of semi-finished products and secondary processing of finished products), and traders. An entrepreneur can undertake one function, such as production of forest nuts or manufacture of medicinal plants, or several functions, such as manufacture and trade of rattan furniture.

For a number of reasons (e.g., poor access to information, low education), entrepreneurs may not be familiar with the data-gathering and review process of assessing and planning NTFP enterprises. In such cases, external facilitators, such as governmental extension officers, NGO staff or private company professionals, can assist. Close collaboration in deciding which products are marketable will enhance the entrepreneur's capacity from the outset. Ready-made conclusions presented by the facilitator will not improve the entrepreneur's understanding of the process or about market channels. Working in this way will enable the entrepreneur to carry out future reviews if conditions change and new products or channels need to be developed, even if the facilitator is no longer involved.

The framework presented in this chapter will enable an entrepreneur with limited funds to plan an NTFP enterprise economically. Much of the information can be obtained by local staff, particularly in the case of a small enterprise. Technical assistance can be brought in through strategic alliances for those components which require a higher level of expertise. The methods described are based on certain assumptions about the entrepreneur (Box 5.1).

**Box 5.1** The assumptions

Each of the methodologies evaluated in this chapter are based on the following assumptions:

- Improving methodologies for planning sustainable NTFP-based enterprises becomes a necessity for all levels of entrepreneur, from producer to manufacturer or trader, since an increasing number of households are producing for the market.
- NTFP entrepreneurs all have a right to improve their economic standard of living, but they are also facing increasing constraints due to degradation of the environment, and therefore need a method for selecting NTFPs which can be harvested over the long term.
- Involving entrepreneurs in using the methodology for planning sustainable NTFP enterprises ensures that they will understand its value to themselves, and thus will be encouraged to follow ecofriendly practices.

## Comparing Existing Approaches

A simple comparison of the three existing approaches used to plan NTFP enterprises, business planning, enterprise and marketing development and market analysis and development, is presented in Table 5.1. The descriptions attempt to capture the essence of each method while recognising that, in practice, there are no such definite

**Table 5.1** Comparison of three approaches to assess NTFP enterprise feasibility

| Approaches/Methodologies | | | |
|---|---|---|---|
| | Business planning | Enterprise and marketing development | Market analysis and development |
| Users/ Stakeholders | Conventional private sector businesses. Often interest is located outside or far from rural resources. | Development agencies, government agencies, NGOs. Some rural producers and manufacturers, but natural resource users not a major focus. | Development agencies, government agencies, NGOs. Rural entrepreneurs close to resource. |
| Characteristics | Primary aim is to maximise profits. Emphasises financial, technical and organisational planning. Driven by demand for the product or service. Often large-scale, capital-intensive activities. | Social development through enterprises. Enhances entrepreneur's capacity to develop and maintain micro, small and medium enterprises. May involve financial training, provision of capital through credit programmes, marketing assistance or other business support. Emphasis on social organisation and financial tools. Variable in extent to which technical business planning is applied. | Focus on sustainable development of benefits from NTFPs. Identifies feasibility of marketing NTFPs from social, ecological and financial perspective. Usually applied to micro and small enterprises.<br>Promotes alliances of actors participating or influencing the enterprise. |
| Differences | Top-down, technical. No focus on resource management or social concerns. | May or may not be participatory. Often not site specific. Does not consider NTFPs and NTFP users specifically.<br>No focus on resource management. | Considers NTFPs and NTFP users. Participatory. Site specific. Social and ecological concerns integrated in the financial and economic/profit objectives. |
| Strengths | Low cost, analysis possible. Efficient time-tested management tools. Finance and product oriented. | Entrepreneur capacity development. Strengthening of credit and marketing. | Knowledge of the site and actors emphasised for better adoption of enterprise options.<br>Stresses interrelationships and linkages of social, ecological, economic and technology factors. |
| Weaknesses | No strong social and resource management components.<br>Not accessible as such to the non-technician. | Not oriented towards forest dwellers where market and credit constraints may be severe. No ecological analysis. | No tools to make it available directly to NTFP users.<br>Information requirements may be complex, time consuming and expensive. Low financial management focus. |

distinctions. In both their development and application, each approach borrows from and builds on tools of the others.

Business planning is borrowed from the 'conventional' approach to enterprise planning, as practised in the private sector. Its orientation is towards maximising profitability, often for very large-scale, capital-intensive operations. It does not address social and ecological issues. A business plan is mainly concerned with returns on investment, and may include sales projections and sales expense budgets which conform to management's financial objectives. This approach is not appropriate for planning NTFP development and conservation because of its lack of attention to social and environmental needs, benefits and costs. It also tends to use analyses oriented towards enterprises with high capital investments, which may not be appropriate for small-scale entrepreneurs. Many of the principles, however, of calculating profitability and developing marketing strategies are shared with the other approaches.

Enterprise and marketing development is the commonly used approach of business planning adapted by development cooperation agencies for training and serving micro- and small-scale enterprises. It emphasises strengthening small entrepreneurship. This approach does not incorporate issues of sustainable resource management and is oriented to improve technical enterprise management skills of selected individuals. It is not specific to NTFPs. Emphasis is usually placed on technological improvement, better access to capital and the ability to elaborate financial and production plans. Less attention is given to the integration of environmental protection concerns, marketing improvement and efficient management plans. For these reasons, enterprise and marketing development is in itself not well-adapted to NTFP-based enterprise planning.

Market analysis and development (MA&D) was developed as the basis for a training module for NTFP marketing. This approach aims to expand the skills of facilitating agencies (such as development project personnel) to identify and develop products (existing or new) that can be ecologically harvested, processed and marketed in order to provide an acceptable income for NTFP entrepreneurs. It is a strategy for enhancing ideal incomes and encouraging local people to manage their natural resources. MA&D describes concepts and major issues to be understood by the planner of NTFP enterprises. It specifies those components generally neglected in the other approaches, such as social and environmental issues. A field manual for these methods is being developed by FAO to share them more widely (Lecup and Nicholson in press).

MA&D is a general process that consists of four phases. The first phase, *Assessment of the Existing Situation* or *Diagnosis of Needs and Resources*, seeks to identify existing NTFPs and their marketing systems, and eliminate those that are non-viable. Next, *Identification of Products, Markets and Means of Marketing* selects the most promising existing and potential products to be further studied. Data is gathered for the elaboration of the third phase, the *Development of an Enterprise Strategy and a Sustainable Business Plan*, which includes guidelines for developing marketing strategies and preparing the business plan. Finally, the last phase in this process is *Implementation of the Sustainable Business Plan*. For each of these phases,

analysis is made of the market, environment, social/institutional and technological aspects of the selected NTFP at local, national and international levels, if necessary.

The strength of MA&D (Lecup *et al.* 1995) in incorporating social and ecological concerns makes it the most relevant methodology for NTFPs. Any weaknesses can be minimised by developing a simple, field-oriented application technique and through a more systematic integration of some management and financial tools borrowed from the other approaches of business planning and enterprise and marketing development. In the following section, MA&D is taken as a point of departure for developing a framework of methods appropriate to assessing the feasibility of sustainable NTFP enterprises. In the course of presenting the methods, comparisons will be drawn between the three approaches in their relevance to NTFPs.

## Framework for Assessing the Feasibility of Sustainable NTFP-based Enterprises

### Users and beneficiaries

In each of the three approaches the entrepreneurs are individuals or group of individuals at commune, district/provincial or national levels. NTFP assessment is not directed to the local community, because the local community as a whole in itself is rarely an NTFP enterprise. However, if a significant number of community members are NTFP entrepreneurs (individually or as producer groups), the local community may support them and it also may benefit from their activity. The direct user of the framework is assumed to be a facilitator.

### Characteristics of the approach

NTFP assessment can be seen as a form of action research that focuses on addressing real problem situations in the field. The proposed approach draws upon the techniques and tools of the three assessment methodologies to monitor and evaluate progress through a step-by-step process. Knowledge gathered about opportunities and constraints leads to the formulation of a hypothesis about the costs and benefits of a product. This proposal can be tested and conclusions and recommendations made about the viability of a product. A process-oriented approach is necessary to accommodate a continually changing context of the enterprise. Constraints are thus identified early in the process to avoid wasting investment of time and money on the wrong product.

Involving entrepreneurs from the first phase helps to ensure that people will respect rules and decisions, as they will recognise the scale of problems and that they are a part of the decision making process about solutions. Participation does not just mean the local community, but can include concerned NTFP actors within or outside the local area.

### Importance of strategic alliances: potential partners

By nature, NTFP enterprises cannot be undertaken by a single actor since the flow of goods and information between actors is critical to the process. If one of the parties within an alliance is weak, the whole NTFP venture may be affected or even collapse.

It is therefore a key issue on which to focus from the first phase, assessment of the existing situation. One of the objectives of MA&D is to develop a strategy for which a sustainable business plan is required. For that, strategic alliances of key partners are identified; who will participate in the successful sustainable NTFP-based enterprise with the aim of providing income to the entrepreneurs without degrading the resource base.

A market chain starts with the producer and ends with the consumer. Between these points there are two types of participants: direct actors who are the members of the market chain through which the product moves (harvesters, traders, manufacturers, consumers); and indirect actors who have an influence on the marketing of the product (e.g., policy makers, technical researchers, environmental advocacy groups). These include both private and public sector companies and agencies.

The challenge is to identify the optimum combination of these actors in order to achieve the objective of a sustainable NTFP enterprise. Alliances may need to be built to develop relations to reinforce or provide support for enterprise activities. This does not necessarily mean that all activities and support links should be directed to the producers. In many cases, activities and links directed to a higher level in the market chain, e.g., trader or manufacturer, will have positive impacts on conservation of the resource and increasing income. Involving actors apart from the producers can increase the possibility of managing larger areas of forest and reaching more producers.

Strategic alliances can be created by:

- Identifying the key actors involved in the market chain; and
- Assessing the main constraints faced by key actors for developing NTFP enterprises.

The areas where external assistance is most critical are then listed:

- Selecting key direct actors in the chain, so that all benefit from the alliance;
- Identifying other direct and indirect actors in each of the target areas likely to assist in overcoming constraints, e.g., those who can help to develop institutional structures or assist in providing environmental awareness-raising materials for the harvesters;
- Assessing the nature of existing relationships and how they need to be changed;
- Developing linkages with selected key actors by negotiating technical assistance or maintenance contracts (indirect actors), purchase contracts between harvesters and manufacturers (direct actors), financial support contracts/short-term loans for working capital with the local bank, training session agreements with an environmental advocacy organisation, or business literacy programme with a development NGO; and
- Eliminating or giving lower priority to actors with whom a relationship is not necessary.

Business planning and enterprise and marketing development methodologies are generally strong in assessing technical and financial requirements and, as a consequence, in forging alliances with technical partners and investors for the proposed enterprises. MA&D, unlike the two other approaches, is not just 'profit'-oriented since it includes consideration of environmental and social aspects. Thus, it is partly

a conventional profit-oriented approach and partly developmental. The latter is generally characterised by a lack of financial rigour since the inputs are usually subsidies or grants, contributing to the common weakness of MA&D in acquiring adequate financial support. Strategies for procuring finance for the enterprise will need to assess potential sources of credit and venture capital, thus using the more rigorous financial methods from the 'business planning' approach.

Specific marketing and programme opportunities need to be seen as the focus for links with local producers, NGOs and businesses (Fricke 1994). The facilitator, and later the entrepreneur, will need to consider ways of minimising financial risk, develop methods to attract investors and devise creative financing opportunities. These alliances can be used to facilitate the market links between remote-area entrepreneurs and markets, assist with capacity building for entrepreneurial development through training (the transformation of a village producer from selling to marketing) and provide potential sources of financing. Alliances can also facilitate donor grants for technical assistance and training, low-interest loans for start up (fixed costs), credit from suppliers of required raw materials, investment capital, etc. Common ways to attract money from outside sources include the offer of equity (ownership) in an enterprise through partnerships or formation of a corporation which offers stocks.

## Assessment of the existing situation or diagnosis of needs and resources

Assessment of the existing situation for NTFPs is an exploratory phase aimed at understanding key constraints and possibilities of the context and actors. This dictates the broad limits of future intervention in terms of possible scale of enterprise, potential NTFPs on which to focus and potential partners to involve. The same method is used whatever the context, the target actors and the facilitators. Only the amount and level of detail of the data (therefore the time and human resources needed) depend on the size and expectations of the enterprise or of the facilitator, individual or organisation representing their interest. Information collected during assessment of the existing situation is general. Of the three approaches, MA&D gives most emphasis to the importance of such an assessment to identify socially and environmentally appropriate options. The preliminary study undertaken under the other two approaches tends to focus more on financial feasibility.

Assessment of the existing situation includes the following steps:

### *(1) Macro-situation analysis*

At this stage, only broad understanding of the following aspects is required: national sociopolitical context; legislation and policies controlling extraction, production, processing and marketing of NTFPs in the country; NTFP-related experiences of other entrepreneurs; policies and practices regarding business, industries and the foreign investment sector for those concerned with exports; and the main participants and key NTFP actors in the public and private sectors at local, national and international levels.

*(2) Identification of entrepreneurs and their economic objectives*

Several key questions need to be answered at this stage. 'Who are the entrepreneurs and what are their needs and capacities?' 'Are they members of a remote community?' 'Are they a group of producers already supported by outside agencies?' 'Are they an existing NTFP enterprise?' The existing needs and capacities should be compared with those seen as desirable by the actors themselves, in order to determine the scale of the intervention. For example, if a group of bamboo weavers currently earns enough income to provide their families with food for only nine months and has the economic objective of producing enough for twelve months of food and to send their children to school, the required increase in yearly income can be calculated.

*(3) Inventory of existing resource and products*

Using observation and direct questioning of local people, a broad picture of the range of existing natural resources and products is obtained. Much of the data should be available from local statistics, forestry, agriculture and development offices of the area, but the best informants are the forest product users. The data collected should focus on NTFPs and their users only. This appraisal can include tools such as resource mapping, trend lines, ranking, seasonal calendars and socioeconomic diagrams. The output is a comprehensive list of resources or products available at the site used by the community members for consumption or cash income.

*(4) Assessment of extraction and processing skills and marketing channels*

An evaluation of these capacities can include information on the distance and problems faced in getting to the market, state of infrastructure and adequacy of sources of fuel or electricity. These are key elements that can define the future scale and geographical coverage of the enterprise. Entrepreneurs from a remote village far from the market will have to focus on lightweight products and, if the product cannot be sold in the local market, the enterprise will have to look for national-level outlets.

*(5) Elimination of non-viable products*

Products that do not meet minimum conditions for viability should be eliminated. The key parameters for assessing viability (Box 5.2) can be conducted as a participatory exercise with representatives of different stakeholders. Not all the parameters will be relevant in every situation. The use of terms such as sufficient, rare, low or scarce is intentional to enable the user to judge conditions relative to the objectives and local conditions.

The combination of the limits indicated by the macro-situation, the characteristics and expectations of the entrepreneurs, the existing resources and products, and the status of the market system will indicate the scale of intervention on which to act. This may range from the simple to more complex, thus defining the duration and degree of complexity (therefore time and human resource needs) of the next phase in the planning process. The results from assessment of the existing situation will indicate the scale of intervention/enterprise and a short-list of products on which to focus during identification of products, markets and means of marketing.

**Box 5.2** Criteria for eliminating a product

**Market**

- **Supply/quantity**
  NTFP supply is inadequate and cannot be expanded (e.g., legal restriction to access for the resource, overexploitation).
- **Level of demand**
  Demand is low or the product cannot be improved to market demand standards (e.g., too complex, time consuming or costly).
- **Quality requirements**
  NTFP quality cannot satisfy the customer within the site context (e.g., lack of education, skills, training opportunities, access to packaging materials) or the required improvements are too time consuming and/or expensive.
- **Production cost**
  Production costs are higher than comparable goods produced elsewhere (e.g., because of remote locations, high transport costs, lack of low cost source of energy, high labour costs) and costs cannot be reduced significantly without threat to quantity or quality.
- **Accessibility to credit**
  No easily accessible source of credit to NTFP producers.
- **Market information access**
  Poor availability of price information because of physical isolation, monopoly by other market actors.

**Ecology/Environment**

- **Spatial distribution and density**
  The product is rare or scarce (e.g., due to biological cycle, overexploitation, changes in the ecosystem).
- **Impact of harvesting on survival of species**
  Ecological impacts of harvesting are unknown or are too expensive or time consuming to assess. Domestication may be an option.
- **Lack of domestication possibilities**
  Domestication is not possible, too time consuming, costly or complicated.
- **Regenerative potential**
  The regenerative potential of the product is very low or uncertain.

**Technology/Science**

- **Human resources/expertise**

  Lack of knowledge and expertise for extraction, processing, marketing and development and improvement is too time consuming and expensive relative to expected benefits.
- **Physical infrastructure**

  The physical infrastructure (roads, rivers) restricts transport of NTFPs and so potential for marketing.
- **Communication network**

  Lack of basic communication network to successfully respond to buyers' demands. Poor market information system to link producers to buyers, transporters, technical assistance. (i.e., other direct and indirect actors).

**Box 5.2** (continued) Criteria for eliminating a product

**Social/Institutional Setting**

- **Policy/access constraints**
  Legal restrictions on collection or cultivation.
- **Support by local rules**
  Poor legal support from the local authorities and relevant technical offices for enforcement of agreed communal management rules to prevent outsiders from stealing products.
- **Willingness to participate**
  Unwillingness to develop the marketing of the product. NTFP entrepreneurs should have the 'initiative' and show willingness to act as an 'economically responsible actor', not just as a 'beneficiary'.

### Identification of products, markets and means of marketing

The identification of products, markets and means of marketing further investigates the development potential of products selected in the preliminary diagnostic study, and also initiates the development of new products and/or new markets. It aims to reduce the risk of failure of the NTFP business by ensuring the following conditions are met:

- Key issues for success of the NTFP business are identified;
- Specific opportunities and constraints are understood;
- Objectives and an action plan are agreed between all relevant stakeholders;
- Potential partners for business alliances are identified; and
- Required financial support from investors, donors or institutions is identified.

This phase only gathers data needed for the elaboration of the 'sustainable business plan'. The business and enterprise approaches usually begin with this step. The sustainable business plan also comprises production/manufacturing, marketing, organisational and financial plans, but in addition includes resource management and social impact plans. It is used to decide if the product concept is worth developing further for implementation, and thus for approaching potential investors or grant donors if necessary. The sustainable business plan describes the goals of the enterprise, formulates objectives for each of the specialisations needed for its development and specifies required activities to achieve the objectives. An action plan, which consists of tasks assigned to organisations or individuals for implementing these objectives is constructed.

During its preparation the sustainable business plan may have to be re-evaluated in relation to costs, assumptions and the product's potential market share. It also serves as an operating tool to properly manage the enterprise.

The sustainable business plan includes provisions for managing worst-case scenarios that may arise in the market environment (price fluctuations, inflation, new competition from other regions, changes in customer interest, lost, damaged or stolen shipments), from environmental natural hazards (earthquakes, forest fires, wildlife degradation, natural cycles reducing yield such as pollination of bamboo

plants) or from social disturbances (unexpected immigration). There may be changes in legislation (restricted access to forest, timber or mineral extraction concessions given to industry, import/export laws and duties) and conflicts among local forest institutions. Corrective measures can be designed for mitigating the impact of these circumstances which include insurance coverage and a diversified product base.

As with assessment of the existing situation, information is gathered to determine enterprise feasibility in terms of the market, environment, social/institutional context and the available technology to identify opportunities and constraints. The technological, environmental and social/institutional areas should be reviewed first, as the costs of marketing will largely depend on these conditions.

### *Skills, materials and technology*

In the preliminary phase, products were eliminated that required high labour inputs, yet could only command a low price to the producer or could be produced at a low volume. The costs of new technology and training to remove the constraints were considered too high. One objective of the identification of products, markets and means of marketing is to specify the interventions and expenses associated with making improvements in skills and materials technology. At this step, the main issue is improvement of these skills, materials and technology for extraction/cultivation and processing to meet the requirements of new markets. This analysis could indicate that the costs of proposed technology or skill training to produce a competitive product are too great in relation to the value of the product. In such cases, the product should either be eliminated or an altered product design considered and studied for feasibility.

The output is a plan describing the proposed technological improvements and related inputs or training. Data required as input for this plan would include:

- Current skill levels for resource extraction and primary or secondary processing and marketing;
- Ways to improve present skills to meet the requirements of the enterprise;
- Availability of skilled individuals who can act as trainers;
- Labour requirements;
- Samples of previous products and their characteristics;
- Traditional tools;
- Tools, buildings, machinery or equipment required;
- Details of production process;
- Raw material needs, sources where sustainable resource use is possible;
- Raw material supply-related problems (seasonal variations, heavy rain);
- Production fluctuations during the year;
- Projection of production capacity based on available equipment and labour;
- Quality control procedures;
- Storage facilities between production and sale; and
- Infrastructure and possible transportation facilities.

These data should indicate the level of improvement required and also provide details on necessary inputs (e.g., buildings, equipment, labour requirements). Technologies are needed to improve production and integrate environmentally friendly

methods into the production process. The entrepreneur's ability to use these improved technologies will need to be developed.

When the required technical improvements have been defined and their related costs integrated into the production and financial plans, a trial sale survey of the enterprise's products is conducted and its results used for reevaluating the feasibility of the sustainable business plan. Any negative information means that the preceding plans should be reconsidered. The samples that are produced for a trial sale survey must be the same as those considered for future development as products. In the processing of NTFPs for oil extraction, samples sent to prospective buyers for yield analysis should be selected from the actual strain of the plant *in situ* (i.e., similar growing conditions). The entrepreneur or a facilitator should identify those indirect actors who can assist to improve skills, inputs or technologies and then the technical strategic alliances to be established.

If the information collected about skills/materials/technology is not adequate or accurate, inappropriate actions may follow. One common source of deficient data is underestimating the costs and difficulties of repair and maintenance. This could lead to the introduction of equipment that cannot be maintained in the local situation. Techniques may be adopted which are unsuitable for the product or local capacities.

### *Social/institutional setting*

The social component of the identification of products, markets and means of marketing seeks to gather detailed information about potential entrepreneurs, and the possible level of involvement of the community and other NTFP actors in the enterprise activities (particularly with respect to decision making and management of the enterprise). It also highlights external factors, such as cultural, institutional or gender issues, that may impede or assist the NTFP-based enterprise development. In addition, assessment of the potential direct and indirect impacts of the proposed enterprise will enable the design of socially sensitive actions and minimise (or eliminate) negative impacts. The output is a description of the measures that should be undertaken by the enterprise to facilitate the social integration of its activities.

An important part of the social analysis is to examine the strengths and opportunities of a product with respect to existing local management structures and policies, such as community forests and user groups. If those structures do not exist, they have to be included in the planning and budget as a necessary supporting intervention. Previous experience has shown that once a resource becomes a commodity in high demand, conflicts can arise between neighbouring communities who have to share the same resource. For example, in Nepal communities gathering the Himalayan nettle *allo* (*Girardinia diversifolia*) for production of yarn to be woven into cloth have had to receive assistance in conflict resolution because of the increased demands on the resource in their locality.

If provisions for improved marketing and development of new markets are successful, they will lead to greater pressure for overexploitation. The NTFP entrepreneurs will then certainly face shortages unless these provisions are matched with measures to control exploitation, increase the productivity of NTFPs through

improved natural forest management and supplement natural production with cultivation (de Beer and McDermott 1996).

Another key element of the social analysis is a mechanism to facilitate disbursement of profits from the enterprise to local-level communities or institutions for distribution or investment of the funds. These can be local associations of community members that decide how to use the funds for improving basic services or savings or loans groups who assist with individual emergency needs or start-up capital for new small enterprises.

Tools for gathering these data include review of records concerning the registration of the groups and institutions, observation, direct interviews and secondary sources. Types of information sought include:

- Land tenure and rights of access to the resource;
- Legislation relevant to selling the product in its raw or semi-processed form – some NTFPs are subject to special royalties or retributions, thereby reducing the potential income;
- Important individuals, existing social and economic groups and local authorities and their fields of influence, for potential strategic alliance;
- Role of women in NTFP work or distribution of benefits and status in the community;
- Existing legal means for creating producer groups and individual or joint enterprises;
- Capacity to form associations, e.g., for making decisions on distribution of profits;
- Cost analysis of producers' labour by assessing collection conditions through interviews of several gatherers in each community about distance to resource, seasonal variation and quantity gathered;
- Existence and frequency of law evasion;
- Laws concerning the relevant forms of industry, e.g., from cottage to medium scale; and
- Trade laws, export licensing laws, foreign currency laws, import laws of target countries.

A thorough understanding of the social/institutional situation will help to avoid problems in developing an NTFP enterprise. The importance of courtesy calls to the local authorities including both the traditional and government authorities to invite their support should not be underestimated. Regular interaction with other NTFP entrepreneurs should be maintained. A detailed knowledge of the social/cultural situation will avoid violation of local tradition, religion or unwritten laws, or the use of property whose ownership is in dispute. A common problem is underestimating the period and costs to obtain important legal documents such as an operation licence (to work, sell or even export some NTFPs). A key to developing an accepted and successful enterprise is to share the benefits with the local people.

### *Resource management*

The objectives of the environmental component of the identification of products, markets and means of marketing are to assess the adequacy of the current stock of targeted NTFPs to meet production goals of the enterprise, to estimate the potential of long-term extraction of a projected volume including the regeneration capacity of the

product, and to provide a baseline for monitoring and evaluation. Forest inventories and yield studies are common methods used for an ecological survey. Using the two sets of data, estimates can be made of the amount of NTFPs an area can produce, the extent of the resource responsible for the largest percentage of production, and which types of resource provide the highest yields (Peters 1996).

The outcome of the environmental study is a resource management plan for determining which areas to harvest, how and where to establish access routes and collection centres, and for evaluating costs and benefits of different harvest strategies. This component of the study will require input from local forest dwellers, the local forest extension officer and sometimes a specific product expert for larger-scale interventions. Local forestry offices, protected area institutions, individual scientists, universities or NGOs working in the area may have already conducted partial inventories that can be used as a reference. Information needed will include data on:

- The density of the resource within the forest;
- The spatial distribution of the resource;
- Resource population structure and dynamics; and
- The ecological impact of different harvest levels.

A survey will usually begin with the selection of products that have the highest potential for sustainable exploitation based on data such as life cycle characteristics and type of resources produced (e.g., leaves or roots, fur or horns, minerals). Next an inventory is conducted that includes the most important data required for management, such as the location of the greatest abundance of the product species, its distribution within that area, the number of species producing the resource, the existing level of extraction, any previous inventory and maps of the region. The third step is a yield study to identify production levels of the desired resource by the natural population.

NTFP assessment differs from both the business planning and enterprise and marketing development approaches by considering environmental concerns as critical in the following ways:

- Choice of the product: only products whose raw materials stock is sustainable will be promoted – this is assessed through the use of forest inventories or yield studies;
- Deciding the maximum scale of the proposed enterprise: an available and easily regenerated NTFP allows a larger scale of production than a resource that is rare or hard to regenerate;
- Identifying alternative supplies of the resource: cultivation, different area of supply;
- As an important factor in the choice of the marketing strategy: products contributing to the conservation of the environment and produced in an ecofriendly manner (such as free of chemical pesticides or fertilisers) potentially gain an added value – this environmental value added can be integrated into the production costs and recognised by consumers interested in environmentally and socially sustainable products by payment of 'green premiums' by the customer (Fricke 1994).

A careful environmental assessment will promote products that are sustainable. Mismanagement of the resource and the use of destructive harvesting practices can occur if the calendar cycles of the product or necessary growth periods are not anticipated, or the biological regeneration cycle is not understood. Provisions for

pests and diseases, or other calamities, are also necessary to avoid shortages of the resource.

## The development of an enterprise strategy and a sustainable business plan

The sustainable business plan needs to include information about opportunities and constraints in the market chain and the market environment for existing and new products. The business component of the plan is critical to the success of every other part of the enterprise. In MA&D this data is collected as part of a third phase of analysis called the *Development of an Enterprise Strategy and a Sustainable Business Plan*. In NTFP assessment market information is used in conjunction with technical, social and environmental feasibility data.

NTFP assessment aims to apply the same management and financial rigour used in the business approach. The elaboration of the financial, production/manufacturing, marketing and organisational components of the common business plan is therefore also a critical part of the sustainable business plan since it ensures the economic viability of the enterprise. A sustainable NTFP-based enterprise developed without this would be very risky.

There are at least three reasons to write a business plan. First, it forces objective and critical evaluation of the economic viability of the proposed enterprise. Secondly, it is a tool for improved planning of the enterprise by defining feasible objectives and how to accomplish them. The plan will forecast future performance. Thirdly, a business plan helps to communicate with others about the enterprise by providing information to indirect actors who may need to know its potential degree of self-sufficiency and the scale of the enterprise in order to judge their level of investment.

## Production and manufacturing plan

The production and manufacturing plan assesses the inputs identified by the technical study and places a cost on these technical options. These costs are included in the cost/benefit analysis of the enterprise. Proposed technological improvements that appear too high in the cost analysis, will need to be reconsidered for less costly solutions.

### *Marketing plan*

An enterprise marketing strategy is used to develop a marketing plan from a series of short-term specific objectives for reaching its goals. The plan is helpful to estimate the costs of meeting the projected demand and the profits that the enterprise can yield.

Marketing activities by an NTFP business are the main means of reaching customers, penetrating prospective markets, obtaining orders, delivering goods and retaining profits from the revenues earned. The marketing plan is usually reassessed on a regular basis to keep the enterprise customer-oriented and competitive. It is dependent on the other business plan components (financial, production/manufacturing, management plans), and is linked with the environmental and social plans.

Data used for preparing the marketing plan include:

- Description of the existing and/or proposed products, including unique features such as high quality, raw materials, on-time delivery, chemical-free or cultural value. The related problems and their potential solutions should also be highlighted, e.g., a declining supply trend for raw materials. A continuous decline is a warning signal for the enterprise. If substitutes for the product exist, they may compete with the NTFP. The analyst should carefully examine the relative advantages of the substitute product. An inferior NTFP is also a threat to the enterprise's viability.
- Prediction of potential and existing demand for the product(s) through identification of actors in the market chains and potential customers. Some NTFPs are consumed because of their high quality, regardless of relatively high prices, others for their low prices.
- The current methods of advertising or promoting the products. Identification of promotional methods used elsewhere that could be adapted.
- The price structure for the product along each stage of the market chain, from harvester to consumer. Price fluctuations should be noted, so that adverse impacts on the NTFP enterprise can be minimised. This will be used for defining the pricing policy of the enterprise.
- List of possible distribution channels. Some NTFP products are controlled by big trading companies that dictate terms and conditions. There might be opportunities to penetrate the market through other channels that provide better terms and conditions. Information will be needed about the usual marketing channels for similar products (private enterprises, cooperatives, state trading corporations, marketing boards or international trading corporations) and the type of transportation required. Description of the conditions for storage and transport is also needed.
- List of market leaders in the target markets. The strongest competitors will dictate the way their products are sold in the market, prices, discounts, etc. To compete, an NTFP enterprise must find a niche in the marketplace to attract some of the market share. The strengths and weaknesses of the product mix, price, promotion and location approaches of the competitors can be compared to the enterprise marketing plan. This way, the project's position among the competitors is clear.
- Strategic alliances are necessary. Even if all marketing data indicate a strong product, market conditions may change quickly to weaken the business plan or a new, stronger competitor may arise. Strategic alliances can be arranged with other stakeholders to minimise the risks for an enterprise.
- Forecasting sales is most difficult. One approach is to conduct a sales survey of prospective buyers to ascertain potential interest and to gather information on quality of product available to the buyer from competitors. The responses from the sales survey may indicate in which month/period the customer is most ready to purchase the product. This will help to forecast sales variations.

Conventional marketing strategies have treated marketing as selling what is produced. Because of highly competitive markets, today's marketing focuses on the needs of buyers rather than the needs of sellers. Market planning ensures a competitive

end-product. The enterprise must continually ask itself what changes are needed in its marketing mix to stay focussed and flexible, to cope with changing circumstances and to stay in harmony with customers' perceptions of what they need or want. The development and implementation of a marketing plan can be adversely affected by overoptimistic price and sales forecasting, overestimation of raw material supplies, underestimation of competitors' strengths, unreliable collection by buyers of perishable goods, inferior products and late delivery.

### *Organisational plan*

The organisational plan of an enterprise includes a number of elements. The ownership structure/profit-sharing arrangements consider results from the socio-institutional data on the legal status of the enterprise, the owners and how decisions will be made about sharing or using the profits. A management structure describes the levels of decision making within the enterprise and the major management positions. Responsibility of management is to ensure that: supplies are available on time; funds are spent efficiently and effectively; marketing strategies are appropriate; allocation of responsibility in the enterprise is effective; early warning signals for the enterprise are detected; and the business plan is coordinated, understood and properly implemented.

The management body should work closely with other activities (personnel training, producers support activities, market research, product development, promotion, sales, raw materials inventory). It should keep close contact with the stakeholders and indirect actors responsible for fulfilling the objectives in the four broad areas of market, environment, social/institutional and technology.

Clearly stated management goals should be defined for a specified period with objectives and tasks for each of the plan components (environmental, social, financial, production/manufacturing and marketing). Tasks should be assigned to individuals in the enterprise or in the participating organisations with a clear division of labour. Objectives pertaining to producers, such as management of forest resources, should be developed in a participatory way to ensure local involvement and input in the completion of the objectives.

The following information should appear in the management plan:

- A personnel plan with a summary of qualifications of the key personnel. It includes how the enterprise hires and trains its staff and workers, their salaries and allowances, and labour, machinery and equipment requirements.
- List of major activities to be undertaken. The more complex the activities to be managed, the higher the qualifications required of key personnel. A schedule of implementation may show just a few activities, or tens of major activities awaiting completion to a tight schedule. The latter needs a project manager with appropriate capabilities.
- Processing flow of the product and any possible seasonality. The processing schedule will indicate the number of operations to be managed. Seasonal variation could make coordination more difficult.

- List and composition of all direct and indirect materials**,** their sources and costs. These data are needed to calculate the financial projections and to determine inventory stocks and flows.

Common problems that arise in the absence of an adequate marketing and organisational plan include delay in project completion, misallocation of limited funding, absence of a full-time manager and management fraud.

### *Financial plan*

Financial projections are based on the data gathered in the other areas of the study. A financial plan integrates the technical, environmental, social, organisational and marketing analyses, with the financial analysis of the business plan. It is a long-range financial forecast for the enterprise dealing with future direction and growth.

The financial study is a quantitative study that produces financial indicators on the basis of a particular production decision, fixed assets and working capital investment, and a defined marketing operation for the business. The output is the financial plan which analyses the sources of financing that may have to be obtained in order to ensure that the capital needs of operating the enterprise are adequately met. The objectives of the financial study are to ensure that:

- Stakeholders are able to complete the project (entirely or in stages) with the funds available;
- NTFP production and marketing will be profitable;
- Critical areas to be monitored are indicated;
- Financial support is obtained if required; and
- Cash needs are assessed and the cash reserves managed.

A number of financial technical tools are used to compile a plan, e.g., the 'break-even point', the 'cash flow' calculation and the 'profit and loss statement'. These are briefly presented below.

- Total costs: based on the total production costs obtained from the production plan, depreciation is calculated, and yearly maintenance and repair expenses are estimated.
- Composition of direct and indirect materials requirements and their costs per unit NTFP: the figures are needed to calculate the cost directly related to the production of a single product which is itself used for the calculation of the break-even point (BEP) of the enterprise, i.e., the level of revenue at which fixed costs have been recovered.
- The composition of the debt fund, loan period, grace period and the amount of equity: this will be needed to make the cash flow projection for the debt repayment. This information is usually available on the project's opening balance sheets.
- Data on the applicable interest rate for the loan outstanding: this is needed to calculate the interest expenses to be paid to banks and other creditors.
- Results of trial sales survey is required to make price forecasts for projections of sales revenue, as well as to estimate all marketing expenses.

These data are then used in calculation of the following:

- Project cost estimates and sources of funding
  Underestimation of certain cost components will result in a project cost overrun,

while over-priced costs tend to reduce production efficiency. The sources of funding will show the amount of equity to be committed by the enterprise promoters – the bigger their commitment, the smaller the loan needed. The equity portion is also an indication of a promoter's resolve to make the enterprise a success. Grant funding can also be considered as equity participation of a donor. In many cases, the debt funding is yet to be committed, so a conservative scenario on the interest and period of repayment of the loan should be applied.

- Projection of profit and loss statement
  This statement will show the return on investment for future investors. In many cases investors will be satisfied with a 'most-likely scenario'. They may conduct their own sensitivity analysis. Most investors will only consider a return on equity that is higher than the interest to be earned from a term deposit investment (after correction for inflation). A first year loss is likely to be acceptable, but longer-term losses will concern investors.
- Projection of cash flow
  The cash flow projection is important for forecasting the capability of a business to repay its bank loan, and inform the investor of when to expect dividends from the enterprise. The bank will always be concerned about the cash balance at the beginning and end of each period, because the figures indicate cushions or reserve for enduring adverse conditions.
- Projection of balance sheet
  The balance sheet is a portrait of an enterprise at a glance. A banker will always be concerned with the working capital ratios in the balance sheets, because strong and liquid current assets are the mainstay of a business operation.

A financial plan can be inadequate for a number of reasons which can all lead to failure of an enterprise. The project cost estimate may not include enough contingencies or the whole project concept may be changed during implementation without an associated readjustment of the business plan. Misallocation of limited available funds will clearly have a severe impact on an enterprise. In the business/financial plan, underestimation of production costs of materials and overestimation of selling price and volume of the product, as well as yield potential for the NTFP production system, will produce inflated projections of profitability. Possible delays in project completion and full accounting for inflation are also important issues to address accurately.

Once the business plan for the prospective enterprise has been completed, the next stage is to identify the organisations or individuals that can be potential sources of financing. Their interests need to be assessed and the business plan adapted to reflect their particular concerns.

## Conclusion

The profit-oriented business planning approach is an integral part of the proposed methodology for NTFP assessment. However, it lacks a focus on social and ecological issues, and thereby neglects the knowledge of the actors, their context and the

environmental problems they may face. The NTFP assessment technique presented here is largely an adaptation of the MA&D approach. Assessment of the existing situation aims to identify the NTFP entrepreneurs, their current standards of living and their expectations concerning the enterprise. The difference between what they want and their present position is an indicator of the importance of the expected improvement. Desirable levels of economic improvement, combined with the assessment of the existing market systems, resources and products, contribute to define the scale of the future enterprise. Long-term development will only occur if the enterprise meets the needs of the actors, if they have the required capacities and if it is adapted to their environment. Early assessment of needs and expectations reduces the risk of developing an overly complex product, e.g., rattan furniture for the international market, when the same objective could be achieved through a more simple approach such as the production of dried mushrooms for the local market.

The different scales of intervention defined as a result of assessment of the existing situation influence the enterprise strategy, especially the level and complexity of the identification of products, markets and means of marketing, and information needed to plan the strategy. Often, but not always, the difficulty for the entrepreneur to handle and develop the product in the long-term increases with distance from markets and with the novelty of the product. The aim of the identification of products, markets and means of marketing is to select the strategy that is sustainable and least risky over the long term.

The final planning phase is to therefore determine which combination of activities will most simply meet the needs of local entrepreneurs, while also meeting financial, social and environmental goals of sustainability. One of the most important decisions in this regard is determining whether the economic objectives set by the entrepreneurs can be met in the local market. If these interventions are sufficient, it is not necessary to look for a more complex strategy and collect information related to national or international geographical levels of intervention.

However, if these steps are not sufficient to reach the economic objectives set by the local entrepreneurs, the research and study should be expanded to contribute to development of a more complex strategy, e.g., producing an existing product for the national or international market, or a new product for local, national or international markets.

Usually a combination of these options is best because it decreases the risk of dependency of the entrepreneur on one product or one type of buyer. It also enables the entrepreneur to optimise the potential value of the product. The entrepreneur can develop 80 per cent of the product for the local market and have 20 per cent for a more upmarket (packing, quality standard) product for export. The latter share will usually yield more value than that from the local market.

The basic strategy should always be based on a solution that:

- Meets locally expressed needs and expectations;
- Is technically, environmentally, socially and financially feasible;
- Will be safe for the environment – will not threaten the stock of resources for this product or have otherwise adverse effects on the ecosystem;

- Does not have socially negative impacts – child labour, denied access to land or income by other disadvantaged community members;
- Can be mastered by the entrepreneurs themselves in the long run;
- Gives the most economic independence by not binding the entrepreneur to one buyer or to one product; and
- Does not depend on non-accessible market information or sources of credit.

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Chapter Six

# Assessing the Profitability of Forest-based Enterprises

Mary Ames

Local people receive substantial benefits from producing commercial forest products. By understanding these benefits and comparing their economic value with other local income-earning opportunities, analysts can help enterprises to develop informed business strategies and optimise the returns from forest resources. This chapter reviews methods for assessing the value of traded forest products to local communities. The methods are based on analytic tools used by the private sector in competitive markets, and were further developed at four sites in Southeast Asia where local forest commodities are traded. These sites include three start-up enterprises supported by the Biodiversity Conservation Network,[1] and a group of local timber traders. The methodology is used to calculate the profit earned by forest dwellers from harvesting, processing and selling local products.

## Background

Communities in tropical forest areas often rely heavily on locally available products for subsistence and cash income. CIFOR estimates that timber and other forest products provide 350 million people living in or around tropical forests with 50 per cent or more of their household needs and also directly provide 10 per cent of jobs in developing countries.[2] While exact statistics are not available, a number of studies suggest that the majority of forest dwellers are critically dependent on forest resources for their livelihoods (de Beer and McDermott 1989; Arnold 1994; Townson 1994; Lynch and Talbott 1995). In Southeast Asia, de Beer and McDermott (1989) estimate that 27 million people rely on the use of non-timber forest products. Forest communities in the region have traditionally valued these products not only for food security and other

[1] BCN is a USAID-funded grants programme, which was established by a consortium of the World Wildlife Fund, The Nature Conservancy and The World Resources Institute.

[2] J. Sayer, quoted in CGIAR press report, 5 August 1996.

direct uses, but also as a source of cash income. Local trade in the region has taken place for at least two millennia, and export trade began before the sixth century with merchants from western Indonesia selling resins and oils to China (Wolters 1967; Iqbal 1995).

More recently, cash sales of forest resources have increased with the growing commercialisation of rural economies in Southeast Asia (de Beer and McDermott 1989; Panayotou and Ashton 1992). For forest communities, two important results of this trend are that cash is becoming the primary medium of exchange and market channels are increasing in forest areas. For these reasons, forest species with commercial potential are growing in value to local communities. Evidence of this can be found in the increase in income earned, and labour invested by forest dwellers who harvest, process and trade local species (de Beer and McDermott 1989; Balick and Mendelsohn 1992; Iqbal 1995). Furthermore, selling forest products has become an important source of livelihood for those who are restricted by geography, tribal affiliation, capital requirements or gender roles, and therefore cannot participate in other cash-generating activities (Iqbal 1995; Nair 1995).

## Application of profitability analysis

While forest communities are dependent on income from processing and selling natural resources, not all of these products and enterprise activities are commercially viable. The ability to earn significant income from trading forest species depends, as in any business venture, on the economic factors relating to the product and the region. These include the demand for the product from local traders and end-users, raw material quality, processing quality, efficiency and reliability of production and distribution, as well as the existence of competing products. Earnings also depend on the supply of inputs, such as raw materials, labour and transportation. If these are plentiful, readily accessible and can be substantially processed on-site, the producers' costs are lower and net earnings to the local community can be greater. Supply and demand factors determine costs of and revenue from producing a product. They can be quantified to find the profit earned by participating villagers from selling forest products.

Calculating the profitability of harvesting, processing and distributing forest species not only shows the local benefits of these activities, but also can be an important tool for determining, maintaining or improving a product's commercial viability. Producers can achieve long-term success by finding and retaining competitive positions, in other words by securing sustainable profitability. They can gain a comparative advantage over competitors either by having lower costs or receiving higher prices. In forest enterprises, lower costs may result from more efficient production systems based on a traditional skill-set, for example, or lower distribution costs, perhaps due to geographic location. Unique, traditional skills can also increase the market value of a product, raising its price above comparable items. Species with desirable and unusual qualities may also be a source of market advantage for producers.

In addition to indicating commercial viability, profitability is a sign that an enterprise is internally healthy or 'operationally efficient'. Profitability allows an enterprise to reinvest capital in developing new products, improving existing ones or expanding the business. These steps not only reduce market risks, but also attract new investors, further increasing the enterprise's chances of long-term viability. Profit analysis is also an important strategic tool for firms incurring losses. A detailed examination of itemised expenses and different sources of revenue can identify opportunities for cutting costs and increasing sales. Without such analyses managers may be unaware that the causes of low profitability may be high overhead expenses, inefficient transportation systems or depreciation of valuable equipment, rather than high production costs.

A number of assessment tools should be used to evaluate local benefits, commercial viability and operational efficiency of small-scale enterprises. One of the most common tools for measuring the local impact of forest enterprises is cost-benefit analysis. This is similar to profitability analysis in that it compares costs and benefits. The method goes beyond profitability, however, in that it attempts to quantify non-financial impacts of a project such as health improvements and institutional strengthening in economic terms. It is often used for assessing public policy options. Profit analysis only captures narrowly defined costs and benefits, namely operational expenses and sales revenue, and therefore does not require complex assumptions and mechanisms for converting non-financial project results into cash values. Cost-benefit analysis does not specifically measure the commercial viability of an enterprise, and therefore cannot be used to measure its long-term benefits. An enterprise can only be commercially viable if it can generate enough revenue to pay for its operational costs, thereby achieving profitability, and only with commercial viability can it generate sustainable benefits for participants.

Profit analysis is not only a useful tool in evaluating different aspects of enterprise viability, but is particularly appropriate for analysing small-scale enterprises because it can be applied to any commercial venture, regardless of size, organisation or market sector. In addition to being applicable to small-scale enterprises generally, profit analysis can also capture unique characteristics of forest enterprises in particular. For example, forests are characterised by poor roads and limited accessibility. This usually means high transport costs for supplies, raw materials and finished products, and limited access to skilled labour markets. In addition, since products are often located in isolated areas, far from the homes of collectors, this has a significant impact on the labour patterns of harvesters. The distance they must travel to find the products may require collectors to go to the forest for days, sometimes weeks, at a time. Collectors are therefore restricted from other non-forest activities during this period, which will increase their opportunity costs if they normally engage in several non-forest income-earning activities. Since harvesters have to support themselves and their families while they are away, they often require cash advances from traders and may have difficulty repaying debts later.

The seasonality of many forest species also differentiates forest enterprises from some other rural occupations. For example, many non-timber forest products with high market value have short or infrequent harvest seasons. Labourers, therefore,

discontinue other activities for these periods. This requires a flexible work schedule and leads to the high opportunity costs mentioned above. Seasonal forest production means that while there are periods of high cash flow, there are periods of low income as well.

Because forest-based enterprises have unusual characteristics and complexities, calculating profit with back-of-the-envelope techniques, or by making assumptions based on similar situations is risky. While profitability analysis does not capture all the social and environmental implications of these activities, it can reflect the magnitude of monetary costs and benefits to participants if performed with accuracy. Using this approach, analysts can reach reliable results that will allow them to assess and compare the economic value of harvesting, processing and trading different forest resources.

## Case Studies

Profitability analysis was used to test the viability of four forest enterprises. Profit analyses were conducted in Krui, Lampung,[3] Kalahan Educational Foundation (KEF) and Natripal in the Philippines, and Yayasan Dian Tama (YDT) in Indonesia.[4] These sites produce distinctive products and have different organisational structure and operational systems. Land tenure and security and conservation issues also vary (Table 6.1).

**Figure 6.1** Location of case study sites




[3] Supported by a research grant from the Center for International Forestry Research.

[4] Analyses of KEF, Natripal and YDT sites were part of the Biodiversity Conservation Network (BCN) studies to support and advise on community-based enterprises that depend on conservation of local biodiversity.

**Table 6.1** Description of the study sites (1995)

| | KEF | YDT | Natripal | Krui |
|---|---|---|---|---|
| Location | Imugan, Luzon, Philippines | Pontianak, West Kalimantan, Indonesia | Palawan, Philippines | Lampung Province, Sumatra, Indonesia |
| Products | Jams and jellies made from wild plants and berries | Woven rattan and bamboo products, resin (damar) from *Shorea* trees | Rattan, honey and resin (almaciga) from the *Agathis celebica* tree | *Shorea javanica* (damar) timber |
| Approximate annual sales | US$25 000 (1996) | US$25 000 (1997) | US$120 000 (Year 1) | US$10 000 (1996) |
| Management and position in the market chain | Central office at production site manages all administrative activities (purchasing, finance, human resources) | Central office of enterprise manages purchasing, village-based production and finished product sales | Decentralised management: trading posts organise purchases and sales, main office handles administration. Enterprise supplies raw commodities | Individual entrepreneurs supply semiprocessed commodity |
| Participation from local community | All participants are local community members: harvesters, processors, administrative and management staff, board of directors | Harvesters and processors; administrative and management staff are from outside | Harvesters, processors, local traders and board of directors; most administrative and management staff are from outside | All participants are from local community: farmers lumberjacks, chainsaw owners and traders |
| Land tenure situation | State forest managed by indigenous group under communal stewardship agreement with the government | State forest managed under a community-based forest concession (Participatory Forest Management Area) | State forest, managed jointly by concessionaires, and indigenous groups through Certificates of Ancestral Domain Claim (CADCs) | State forest and private unregistered land[5] |
| Threats to land tenure security | Use rights granted by government are revocable | Use rights granted by government are revocable | Use rights granted by government are revocable; rattan concessionaires hold land-use rights | Private lands are unregistered, no formal rights to state forest land; pressures for oil palm conversion |

[5] In 1998, 28 000 hectares were assigned by ministerial decree a special tenure status as Kawasan Hutan Dengan Tujuan Istimewa (KDTI), which granted farmers use rights on designated forest lands.

**Table 6.1** (continued) Description of the study sites (1995)

| | KEF | YDT | Natripal | Krui |
|---|---|---|---|---|
| Threats to conservation | Overharvesting of certain NTFPs, road building and commercial development | Unsustainable hunting, shifting agriculture and commercialisat-ion of forest resources | Destructive logging, fishing and mining; encroachment of immigrants from neighbouring islands | Plans for oil palm plantation, substitution by more economically attractive species; migrants with preferences for other land uses |

### Kalahan Educational Foundation (KEF)

The Ikalahan tribe inhabits 15 000 ha of ancestral domain land in Imugan, Northern Luzon, which it manages under an agreement with the Philippine government. One of the Ikalahan's uses for this land, which includes important tracts of primary and secondary rainforest, is sustainable collection of forest resources such as flowers, fruit, mushrooms and secondary-growth timber. The Kalahan Educational Foundation (KEF), a community-based NGO, purchases, processes and sells these products through its enterprise division.

The enterprise sales are mostly jams and jellies, marketed under the brand name 'Mountain Fresh'. Collectors harvest natural raw forest fruits and flowers and deliver them to the small production plant in Imugan, the local village. Three women process the raw materials into juice mixtures, out of which they make 17 flavours of jams and jellies. They then bottle, label and package the products at the same location. The equipment and tools, including stove, aluminium kettles and hairdryers, are low-technology and require almost no electricity. Other community members conduct research on existing and potential product flavours to improve taste, consistency, shelf-life and other qualities to increase their commercial appeal.

While the bulk of the supplies and materials required to make Mountain Fresh products comes from the local area, the enterprise must purchase some goods in Manila, such as sugar, bottles and jars. Marketing and sales of these products are handled in Manila by an NGO called the Upland Marketing Team and a KEF sales office. Customers are primarily high-end retail outlets in Metro Manila, such as specialty food stores and supermarkets that sell imported products. In addition to domestic sales, KEF sells Mountain Fresh products to international customers in Germany and England.[6]

### Yayasan Dian Tama (YDT)

Yayasan Dian Tama (YDT) is a foundation based in Pontianak, West Kalimantan, (see also Chapter 3) whose mission is to improve the sustainable well being of forest dwellers in the Sanggau Reserve through enterprise operations, community

[6] For further information about the Ikalahan experience see Rice (1994) and the BCN 1996 Annual Report.

development and promotion of biodiversity conservation. YDT's many activities include coordinating the sales of two lines of forest products. First, with its affiliate PD Dian Niaga, YDT organises weaver training and production, purchase, shipment, and sales of woven bamboo and rattan mats and baskets. These products are either sold directly to local and regional end-users, or they are shipped to PT Piluss, a manufacturing firm in Jakarta, which produces handbags. The final product is sold to high-end retail outlets in Indonesian cities. YDT is actively pursuing export markets for their handbags, and has found customers in Europe, Japan and the United States.

The second non-timber forest product (NTFP) that YDT markets is damar resin, which is tapped from *Shorea* spp., a dipterocarp tree species. YDT recently trained local villagers to tap and collect damar, which they also sort and clean. The resin will then be sold by Dian Niaga to regional and export traders.[7] Damar resin has many local uses, as a caulking agent, an adhesive, in batik production, and as a base material in paints and varnishes. The biggest market for damar resin, however, is industrial. Materials research firms and large manufacturers use damar as an ingredient in specialty coatings, printing inks, paints, lacquers, varnishes and cleansing products. Export traders in Singapore sell high-quality damar resin to these buyers for up to US$900 per ton.[8]

### Natripal

On the island of Palawan in the western Philippines, Natripal, the United Tribes of Palawan, is currently launching a biodiversity conservation and economic development project. As part of this project Natripal established two trading posts, one in Rizal, South Palawan, and one in Cayasan, Central Palawan.[9] Traders at these stations, or Area Service Units (ASUs), pay gatherers to collect rattan, almaciga (a resin from the *Agathis celebica* tree) and wild honey from local forests. The ASU staff then removes low-quality items and transfers the remainder to the enterprise's central office in Puerto Princesa, the provincial capital. Here a small amount of processing is performed on the products, such as rattan stripping, preliminary honey purification and almaciga sorting. The central office also acts as the next step in the trading chain, selling products mostly to wholesalers in Manila and a small amount locally.[10]

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[7] Damar resin sales to traders have not yet begun since the Indonesian government has not granted PD Dian Niaga the appropriate permits. The analysis calculates the profits from expected sales once Dian Niaga has secured permits and begun selling.

[8] For more information about YDT see the BCN 1996 Annual Report

[9] Analysis examines Natripal's two BCN-funded sites only (Rizal and Cayasan). In addition to these, Natripal manages forest product trading posts in eight other locations on Palawan.

[10] The Philippine Government recently granted Certificates of Ancestral Domain Claim to Natripal for the two sites mentioned here. While this gives Natripal the authority to design land management plans, member tribes have not yet acquired full access rights to forest resources. The CADC stipulates that all licences and permits for resource use will be transferred to Natripal as soon as they expire, but this has not yet happened, or not been enforced. This study analyses Natripal's expected enterprise viability once it is operating with full access rights to rattan, almaciga and honey. For more information about Natripal see Pinto (1996).

### Krui, Sumatra

The case study of the damar timber trade in Central and South Pesisir subdistricts of southern Sumatra is not that of a single forest enterprise, but of entrepreneurs who independently buy, process and trade *Shorea javanica*, or damar timber. Unlike Natripal, Kalahan and YDT, there is no central office in Pesisir for coordinating enterprise activities and recording timber harvests and sales. Instead, entrepreneurs operate as links in a supply chain, which starts with farmers who grow damar trees in agroforestry gardens. These trees have been widely cultivated in Pesisir for over 50 years. They produce damar resin that farmers can harvest and sell year-round through local traders to industries or materials dealers in Jakarta or Singapore. Once the tree no longer produces satisfactory levels of resin, it falls or the owner has it felled with the help of a chainsaw owner. The chainsaw owner will arrange for the tree to be cut into planks and beams on-site by a lumberjack. The farmer can then choose to pay the chainsaw owner for this service and keep the cut timber, or sell it to the chainsaw owner, who will transport and sell it to local end-users or traders. Chainsaw owners therefore operate a microenterprise; they buy equipment, supplies and raw materials, pay for processing and transport the product to customers. Profit from these activities, leading to the sale of cut timber to local traders, is the focus of this case study.



Woman carrying damar back to the village (photo by Eva Wollenberg).

Chainsaw owners operate timber microenterprises in many villages in the Krui region, but only two were selected for this case study: Ngaras, about 45 km south of



Damar tree that has been tapped numerous times for resin and will be cut for timber (photo by Eva Wollenberg).

Krui, the capital and main market town of the Central Pesisir subdistrict, and Penengahan, about 5 km east of Krui. While the timber trading systems are slightly different in these two villages, overall they are comparable and typical of others in the region.[11]

### Structure and operations of the forest enterprises

Although the four groups in these case studies have different organisational structures and operational systems, they are all referred to as *forest-based enterprises* because their activities include processing and selling forest materials. Furthermore, despite the structural and functional differences among these groups, their operations can be analysed using similar mechanisms, since their differences only distinguish the enterprises along a set of dimensions. One aspect where these enterprises vary is the extent to which they are centrally managed. Two enterprises (KEF and YDT) have a local management unit, which is responsible for coordinating purchasing, processing, transportation and sales. The other two operate as decentralised suppliers of bulk commodities, by purchasing and preprocessing raw materials locally, and then selling to traders within the region (Table 6.1). The enterprises that conduct more processing activities locally, or are more vertically integrated, tend to use more centralised management structures.

The four enterprises also vary in the level and degree of product preparation and finishing they perform or directly supervise (Table 6.2). Pesisir and Natripal, for example, are the least vertically integrated enterprises because they purchase raw, bulk materials, minimally process them and sell to traders. KEF and YDT on the other hand are either directly or indirectly involved in all four stages of the process.

The extent of local processing that forest enterprises perform depends on the demands of specific product markets, and the availability of technology and skilled labour. For example, while almaciga and damar resins can be sorted easily by local users, industrial customers often require a high level of purification, which can only be achieved using sophisticated equipment. If local processing is feasible, enterprises will be motivated to do so if it increases local earnings. A BCN-supported enterprise in Humla, Nepal, formerly sold raw, bulk jatamansi (*Nardostachys grandiflora*) roots from the area to distant essential oil producers. After acquiring distillation equipment and training workers to use it, the enterprise is now selling jatamansi oil directly to perfume and cosmetic manufacturers. By adding value on-site, enterprise participants earn greater income per forest species sold, both because transportation costs are lower and product sales are higher. Increasing local processing may also improve producer earnings if it allows the enterprise to sell products directly to end-users. Direct sales will bypass local traders who often operate monopsonies and are thereby able to capture the majority of the sales price to end-users for themselves (Lecup 1994). An additional benefit of increasing local processing, if it achieves higher

[11] For more information about timber harvesting in Pesisir, see de Foresta and Michon (1990).

**Table 6.2** Levels of vertical integration of the four case study enterprises (who performs production steps and relationship to the enterprise)

| Stage | KEF | YDT | Natripal | Pesisir |
|---|---|---|---|---|
| Harvesting/ Collection | Gatherers sell fruit to enterprise, *Stakeholder* | Gatherers collect damar, bamboo and rattan, *Stakeholder* | Gatherers sell rattan, almaciga and honey to enterprise, sometimes through local traders, *Stakeholder* | Farmers sell timber to enterprise, lumberjacks fell timber, *Stakeholder* |
| Pre-processing | Workers prepare juice from fruit, *Participant* | Gatherers and their families prepare rattan and bamboo, sort damar resin, *Stakeholder* | Workers strip rattan, sort almaciga resin and prepare honey, *Participant* | Lumberjacks cut timber into planks, beams, etc., *Stakeholder* |
| Processing | Workers produce jams and jellies, *Participant* | Weavers make baskets and mats, no damar resin processing, *Stakeholder* | None | None |
| Finishing | Workers bottle and package jams and jellies, *Participant* | Weavers finish a few woven products only, *Stakeholder* | None | None |

Note: *Participants* are direct enterprise operators or employees, *stakeholders* are non-employees who are closely affiliated with the enterprise.

earnings for participants per unit of forest species sold, is that this may also increase incentives to harvest the species sustainably (Hyman 1996).

## Methodology

### Defining the level of analysis

While the methodology of subtracting total costs from total revenue to find profit is straightforward, it is more complex to determine the type of profit that specifically best represents the enterprise's viability or is most useful for designing production and marketing strategies. The two parameters for defining profitability are the level of profit and the unit of analysis. First, level of profit refers to which costs are subtracted from total revenue. For example, one common calculation of profit, *net profit*, refers to total earnings minus all enterprise-related costs. This is smaller than *gross profit*, which equals revenue minus costs related to making and distributing products or services only, and therefore does not incorporate administrative and other overhead expenses. Finding levels of profit and how they are used is described in more detail in the following section.

The second parameter in defining profit is selecting the unit, organisation or producer group whose profitability is to be calculated. Profitability analysis has the flexibility to be conducted on a wide variety of units, including a single producer, a unit of land or a set of unrelated producers in one industry or location. Typically, however, profit refers to an enterprise's net earnings over a period of time, generally one year. For this analysis, the gross or net profit for all business activities over that period is calculated. Another unit of analysis that is useful for businesses is the annual net or gross earnings of one or more product lines only. Costs and revenue dedicated to the other products are therefore excluded, and shared costs are allocated between the target products and the remainder.

A third kind of profit that a business commonly calculates is for a single, specified product type. This analysis does not show the profit over a period of time but for selling one unit. If an enterprise manufactures a variety of products, per unit calculations show the profitability of selling a single product through a single channel. A per unit profit analysis could focus, for example, on one cubic metre of 12 x 3 cm planks of damar timber sold from village A to a trader in village B. For a single product unit, the characteristics, such as size, materials, quality and distribution channel, are fixed and known. Some costs may be the same regardless of a product's characteristics; a trader's expense for transporting a cubic metre of timber from point A to point B will be same whether or not the timber is hardwood. In general, however, costs will differ from product to product. It will take longer to cut timber into 2 x 3 cm rods than 25 x 25 cm beams, for instance, and cost more to dye a basket four colours than one.

Net profits differ substantially depending on whether they are calculated at the level of the enterprise, product line or specific product (Table 6.3). The difference between gross and net profits is also substantial. Depending on which level of analysis is used, the profitability of an activity can be assessed and its contribution to the health (or otherwise) of an enterprise evaluated.

Although per unit profitability can be useful in comparing the advantages of selling certain products over others, it does not reflect the overall health of the business. Since an enterprise may sell many products, or several variations of one product, its viability is usually not reflected by profitability of a single product, or single distribution pattern. For example, Natripal grade B almaciga is unprofitable when sold to traders in Puerto Princesa City (-8 per cent net profit). Overall, however, the almaciga product line is profitable (21 per cent net profit) (Table 6.3).

A better way to capture enterprise viability is to analyse its investment or inputs and returns over a unit of time, generally one year, to account for seasonal supply and market fluctuations. The results of this analysis can help managers plan overall business strategy. For example, an enterprise may decide to sell unprofitable products to secure a position in a valuable market segment, or to establish a relationship with an important client. An analysis of the enterprise's overall net earnings will show whether these losses can be sustained by the sales of other profitable products or whether this decision would lead to unviability.

**Table 6.3** Selected Natripal profitability analyses *(all enterprise sales, all almaciga sales and the sale of one almaciga unit)*

| | Enterprise<br>Profit from All NTFP Sales<br>000 Pesos/Year | Product Line<br>Profit from All Almaciga Sales<br>000 Pesos/Year | Product<br>Per Unit Profit of Almaciga*<br>Pesos/Kilogram |
|---|---|---|---|
| Revenue | 3 142 | 1 452 | 11.35 |
| Costs | | | |
| Raw materials | 538 | 242 | 3.13 |
| Labour | 1 535 | 506 | 5.93 |
| Supplies | 25 | 16 | 0.19 |
| Equipment | 16 | 4 | 0.05 |
| Total Production | 2 114 | 768 | 9.30 |
| Transportation | 466 | 227 | 1.16 |
| Storage | 87 | 2 | 0.03 |
| Total Distribution | 553 | 229 | 1.19 |
| Gross Profit | 475 | 455 | 0.86 |
| Gross Profit (%) | 15 | 31 | 8 |
| Overheads | 334 | 154 | 1.81 |
| Total Costs | 3 001 | 1 151 | 12.29 |
| Net Profit | 141 | 301 | -0.94 |
| Net Profit (%) | 4 | 21 | -8 |

*Grade B, sold to traders in Puerto Princesa City.
Exchange rate: US$1=26.2 Philippine Pesos.

It is generally necessary to calculate profits at a more detailed level to determine product-level strategies. Using average product costs and revenues, instead of quantifying them separately, can lead to false conclusions and unsound strategies. KEF initially calculated the price for its jams and jellies based on the average cost to make all thirteen flavours. A more precise calculation of individual costs for each flavour revealed that the price for guava jelly, KEF's most popular product, was significantly below its total cost. Because guava jelly accounted for over half of total sales, the enterprise lost approximately P9000 (about US$340) from sales of this flavour alone in 1995. This amount was equal to about two-thirds of KEF's total losses that year.

Calculating the profit (or loss) of selling a single product unit, rather than that of operating an enterprise, is useful for many reasons. The first is that the analysis is limited to a defined set of scenarios and therefore there are fewer data requirements. This is an important consideration if research will be conducted in remote forests

where documentation is limited or difficult to interpret. Furthermore, collecting, verifying and analysing all the information on a product line, such as woven baskets, including prices for various sizes of rattan poles, the time required for all processing steps, materials and supplies for each product, sales prices of different product designs to various traders and end-users, would be very time consuming. This research may also be unnecessary and misleading if it analyses uncommon product sales scenarios, which do not accurately reflect the enterprise's most frequent activities. Instead, selecting one product unit with familiar characteristics, including size, design and sales channels, will simplify the analysis. For example, if the focus is on undyed woven baskets sold within the local community, then there is no need to consider the cost of dye, extra supplies, dyers' labour or transportation to distant markets.

Focussing the study on the profitability of a defined unit will not only simplify the analytical process, but can also yield strategic insights. A comparative per unit profit analysis can show how net profit differs between products with different characteristics, or ones sold through separate distribution channels, while keeping other variables such as volume and market price constant. This comparison may reveal, for example, that selling to a distant industrial customer is more profitable than to a local trader, or that high-quality products are more profitable than those of low quality. While the product or sales options that account for the largest portion of enterprise revenue may be clear, which ones earn the highest net profit may not be obvious without performing comparative per unit analyses. With these results, enterprise managers are better prepared to make decisions about which products to offer and where to focus sales.

The individual cost and revenue analyses that lead to this result can also point to useful strategic recommendations. For example, an analysis of transportation costs shows not only the portion of a product's cost structure devoted to transportation, but also may reveal that some distribution channels are more profitable than others. Similarly, revenue analyses may indicate that the enterprise earns more profit from selling to certain customers, and not necessarily those that pay higher prices.

## Cost Analysis

There are three main categories of enterprise cost: *production*, *distribution* and *overhead costs*. For a forest enterprise, production costs are those that relate directly to harvesting and production. These typically fall into four subcategories: raw materials, direct labour, production supplies and equipment. Distribution costs are not directly related to the harvesting or production of the product, but instead to its distribution, mainly transportation and storage costs. Finally, overhead costs include administrative expenses associated with running a business and selling products, and cannot be attributed to a specific product. While overhead costs differ considerably from one enterprise to another, they typically include administrative salaries, office expenses (including building and furniture), taxes and fees, advertising, travel, promotion and communication. Table 6.4 shows a sample cost structure of a forest product enterprise, broken down into these cost categories.

**Table 6.4** Yayasan Dian Tama, projected 1997 cost structure (*thousand rupiah per year)*

| Costs | Woven Products | | Damar | | Total | |
|---|---|---|---|---|---|---|
| PRODUCTION *(all variable)* | Rp | % | Rp | % | Rp | % |
| Labour | 16 400 | 30 | 17 550 | 43 | 33 950 | 36 |
| Raw Materials | 3 780 | 7 | 1 004 | 2 | 4 784 | 5 |
| Supplies/Other | 6 520 | 12 | 0 | 0 | 6 520 | 7 |
| Subtotal | 26 700 | 49 | 18 554 | 45 | 45 255 | 47 |
| DISTRIBUTION | | | | | | |
| Transport *(variable)* | 810 | 1 | 3 960 | 10 | 4 770 | 5 |
| Transport *(fixed)* | 4 315 | 8 | | 0 | 4 315 | 5 |
| Storage *(fixed)* | 408 | 1 | 328 | 1 | 736 | 1 |
| Subtotal | 5 533 | 10 | 4 288 | 11 | 9 821 | 11 |
| OVERHEAD *(all fixed)* | | | | | | |
| Salaries | 15 124 | 28 | 12 134 | 30 | 27 258 | 29 |
| Office Admin | 2 761 | 5 | 2 215 | 5 | 4 975 | 5 |
| Field Costs Travel | 4 367 | 8 | 3 804 | 9 | 8 171 | 9 |
| Subtotal | 22 252 | 41 | 18 153 | 44 | 40 404 | 42 |
| TOTAL | 54 485 | 100 | 40 995 | 100 | 95 480 | 100 |

Exchange rate: US$1=Rp2340.
Note: column totals and percentages may not add up because of rounding.

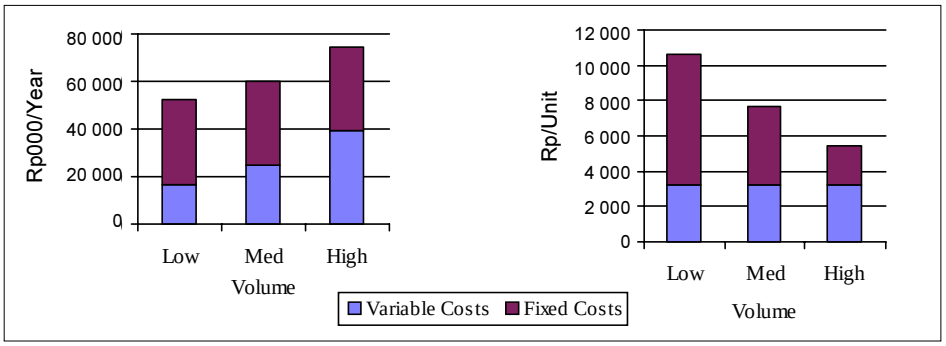
Enterprise costs can also be defined by their relationship to an enterprise's production volume. Costs that increase with each unit of output are called *variable costs*, and include raw materials, labour for production and sometimes transportation and storage. *Fixed costs*, which do not change with moderate variations in production, include administrative expenses, such as staff salaries and office furnishings. Some transportation and storage costs may also be fixed.

Fixed and variable costs have different impacts as volumes increase depending on whether aggregate enterprise costs or per unit costs are being analysed. Since variable costs increase with production output, they therefore comprise a larger proportion of total annual enterprise costs as volumes increase, while the fixed proportion of cost shrinks. Fixed costs per unit decrease with greater volumes because annual fixed costs are spread across a wider base, while variable costs per unit are constant regardless of production volume (Figure 6.2). As producers increase output, and thereby reduce fixed costs per unit sold, they will earn a greater profit (assuming the price per unit remains the same). This is one of many benefits to an enterprise of increasing its volume, also called an 'advantage or economy of scale'. Disadvantages of scale also exist, especially for enterprises that depend on natural resources, which is discussed in more detail below.

### Production costs

These are expenses for producing output, including buying, cultivating and harvesting raw materials, as well as adding value to them. Since these costs are incurred early

**Figure 6.2** The effect of production volumes on fixed and variable costs. *YDT costs to sell all woven products and one rattan basket in different volume scenarios*




in the production process, product losses due to raw material deterioration or poor processing, for example, have a greater impact on these costs than others. Specifically, if half of the raw materials collected cannot be processed because they are of poor quality, the raw materials cost for each unit sold is double the cost of its raw material content. Distribution costs, on the other hand, such as transportation and storage, which are incurred after processing will not be affected by raw materials or production losses.

### *Raw materials*

Raw materials include both forest and non-forest inputs. The cost is for pre-processed forest species. In three of the case studies these species grow in protected forests, and the raw materials cost consists of government charges for extracting them. In the Pesisir case, however, the forest is privately owned and the raw materials cost is paid to the landowner.

Depending on the structure of the enterprise, forest products may be purchased directly from gatherers, in which case raw materials cost would include their labour costs and expenses in addition to the forest charges. Natripal's annual and per unit expenditure for raw rattan, including gatherers' labour cost were calculated (Table 6.5). While enterprises like Natripal pay raw materials and gatherer wages separately, others such as YDT do not distinguish these costs. Natripal's raw materials cost for rattan therefore appears to be much smaller than YDT's: US$0.08 (P1.92) vs. US$0.64 (Rp 1540) per pole harvested.

The raw materials cost of the six NTFPs analysed in these case studies is low compared to other costs. As a proportion of total variable cost, NTFP species costs range from 4 to 26 per cent. Such low costs may be typical of forest-based enterprises elsewhere. Enterprise viability seems to be more dependent on the market value of the raw forest species chosen rather than on labour inputs. In other words, increasing labour to process forest products may not have as strong an impact on raising the enterprise's gross profits as selecting valuable raw materials. Evidence for this hypothesis can be found in the rough correlation between gross profit and raw material

**Table 6.5** Calculation of Natripal's cost for raw rattan

| Gatherer and Forest Materials Costs | *A* Cost per Pole Harvested Pesos | *B* Annual Volume Harvested Poles | *C* Annual Cost 000 Pesos *(A*B)* | *D* Annual Volume Sold Poles | *E* Cost per Pole Sold Pesos *(C/D)* |
|---|---|---|---|---|---|
| Gatherer labour cost | 6.75 | 127 641 | 862 | 122 578 | 7.03 |
| Forest charges: | | | | | |
| -Thick pole | 2.40 | 53 673 | 129 | 49 345 | 2.61 |
| -Thin pole | 1.50 | 73 968 | 111 | 73 233 | 1.52 |
| Subtotal/Average | 1.95 | 127 641 | 240 | 122 578 | 2.07 |
| Other charges | 0.20 | 127 641 | 26 | 122 578 | 0.21 |
| Total forest materials | 2.15 | 127 641 | 266 | 122 578 | 2.28 |
| Gatherer and materials | 8.90 | 127 641 | 1 128 | 122 578 | 9.31 |

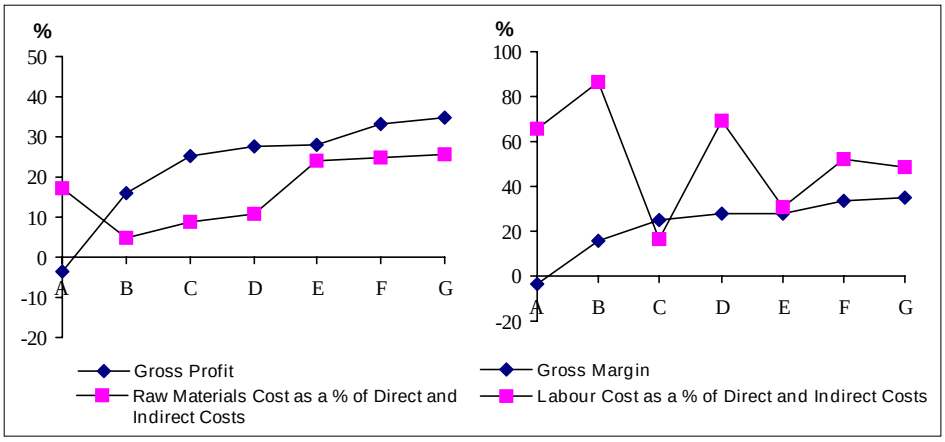
Notes: Rattan poles are 3 metres in length; thick poles are more than 2 cm in diameter and thin poles are less than 2 cm in diameter. Exchange rate: US$1=P26.2

percentage of variable costs for seven NTFPs analysed (Figure 6.3). The greater the share of costs devoted to raw materials, the greater the gross profit. In contrast, the relationship between labour cost and gross profit is a weak one. This suggests that the competitive advantage of forest enterprises, or the ability to achieve higher prices at lower cost than competitors, may be more closely related to raw material inputs than labour input.

If the raw forest material is responsible for the enterprise's comparative advantage, this may be because it is scarce and/or demand is high. Both conditions may lead to unsustainable harvest of valuable species (Peters 1996). Overexploiting forest materials will not only jeopardise the viability of the enterprise, but may degrade the resource base, thereby threatening other local sources of income and sustenance. To avoid these consequences, some enterprises choose to plant and cultivate the raw materials instead of collecting wild species. For example, in response to a rattan shortage, YDT will cultivate rattan gardens. KEF has relied on agroforestry to meet product demands, as an alternative to overexploitation of wild fruits.

The contribution (by volume) of forest species to the final product is generally greater than that of other raw materials, but the cost of non-forest materials may be greater. Forest commodities are generally inexpensive for local enterprises, so they depend on their use as much as possible. As an example, over 95 per cent of the raw material volume in KEF jams and jellies comes from local sources and the remaining 5 per cent is mostly sugar. Sugar, which KEF must purchase in Manila, accounts for over 65 per cent of the raw materials cost. Recognising this, KEF's managers invested in equipment to produce glucose locally. Despite the capital investment and training required, this alternative is more cost effective than purchasing sugar.

**Figure 6.3** Raw materials value and labour cost, and gross profit, of seven categories of forest products, sold by four enterprises




### *Labour*

Production labour includes both harvesting and processing. While it is sometimes useful to distinguish costs for harvesting labour from the costs of forest materials, this is difficult if the enterprise purchases raw or semi-processed materials from gatherers rather than paying employees to collect them.

A second complication in calculating labour cost is finding hourly wages for discrete activities. Since workers are often engaged irregularly and only part-time in any one income-generating activity, tracking the time they spend on one enterprise or one product is difficult. For this reason, and to increase incentives to work efficiently, labourers are often paid on the basis of output rather than time. For example, lumberjacks in Pesisir earn wages for each cubic metre of timber they cut. Because they need more time to cut a cubic metre of timber into small pieces, some chainsaw owners pay according to the size of the output.

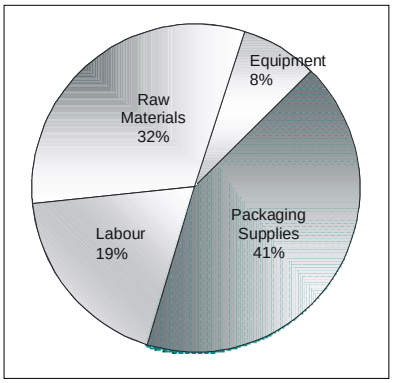
While time spent in production and sale of forest products is generally lengthy and burdensome, this proportion of forest enterprise costs is often quite small. In the sample, those enterprises that spend the smallest share on wages, KEF and Krui, are arguably the most labour-intensive. In the damar timber trade in Krui, labour consists of operating a heavy chainsaw for up to 11 hours per day. Despite the fact that this is hard work and requires skill and training, chainsaw owners spend only 30 per cent of their variable costs on chainsaw operator wages. KEF spends even less on labour, only 17 per cent of its variable expenses, even though it is the most vertically integrated enterprise in this set. In contrast, of the four producer groups analysed, those whose labour costs constitute a high proportion of direct costs have low processing requirements and few other inputs. For example, Natripal's labour accounts for 65 per cent of variable costs, which includes labour for collection and minor processing of raw materials. Similarly, YDT's damar operation spends about 86 per cent of variable costs on labour, even though it consists only of harvesting and sorting resin.

### *Supplies*

Supplies required for forest-based industries mostly include containers, packaging, collection sacks and baskets. Although these costs are variable, many are not directly related to a single unit of output. To find the per unit cost, the total cost should be calculated and divided by annual output.

Expenditure on supplies can be significant. Forest enterprises often must purchase these from distant towns or cities, where prices are higher than locally, and which entails additional transportation costs. For example, KEF's highest direct cost after labour, equipment and raw materials, is for packaging supplies that are bought in Manila. Excluding the expense for transportation to Imugan, packaging supplies account for 40 per cent of KEF's production cost (Figure 6.4).

**Figure 6.4** KEF 1995 production costs, by major component




### *Equipment*

The cost for equipment refers to the purchase and maintenance of machinery used to collect, prepare and manufacture products only. This category does not include office equipment such as computers and copiers, which are overhead expenditures. It also does not include minor tools used in any step of product finishing, such as collection baskets or bamboo stripping knives. Costs for these items are included in the supplies category because they are consumable. Since these tools have to be replaced regularly, their entire cost is accounted for at one time. Heavy production equipment, however, such as an oil distiller or honey dryer, is a major expense and can be used for many years. The enterprise's annual profit is obviously misrepresented if the entire cost of purchasing a piece of equipment is subtracted from total enterprise revenue the year it was purchased. One way of avoiding this problem is to divide the equipment's purchase price by its remaining useful life. This will yield the annual cost, also called annual depreciation, which can be divided by volume of units processed by the equipment to find per unit cost.

Depreciation can refer not only to production equipment costs, but also to other capital investments that benefit the enterprise in the long term. These include vehicles, land, buildings, furniture and office equipment. For tax purposes, accountants apply standard life spans to many assets to find their depreciation value, e.g., cars are depreciated over 5 years, land over 15 years, etc. The actual length of time that these investments fulfil their function may vary, and so an assets' functional life is applied to find annual cost.

In addition to the charge for depreciation of equipment, related costs such as maintenance and spare parts should be included as equipment costs. These can be calculated in the same way as supply costs: the yearly expenditure is divided by annual volume to find per unit cost. Some equipment expenses are a function of

**Table 6.6** 1996 Equipment costs of a chainsaw owner in Pesisir, Sumatra

| Chainsaw Costs | Cost (Rp) | Period/ Unit | Annual Cost (Rp) | Cost per Unit (Rp) |
|---|---|---|---|---|
| Depreciation | 2 500 000 | 5 years | 500 000 | 2 778 |
| Repair | 500 000 | 1 year | 500 000 | 2 778 |
| Chains | 42 500 | 10 $m^3$ | 765 000 | 4 250 |
| Sharpening | 3 000 | 4 $m^3$ | 135 000 | 750 |
| Volume per Year 180 $m^3$ | | | | |

Exchange rate: US$1=Rp2340

units produced, such as the chains for chainsaws used in Pesisir (Table 6.6). These chains are estimated to need replacing after cutting 10 $m^3$ of timber. In this case, the cost per unit is multiplied by volume of timber cut to find annual expenditure. As this example demonstrates, while equipment purchase can have the greatest impact on cash flow, it is not always the greatest component of equipment cost. This chainsaw owner's 1996 equipment depreciation cost was equal to his repair expenditures and less than his cost to purchase replacement chains.

While advanced processing of forest products locally is impossible for many small-scale enterprises because of electricity, labour, supplies or training requirements, the use of even some simple kinds of processing equipment may significantly increase net earnings from forest products, as in the case of the Humla, Nepal, jatamansi enterprise already mentioned. However, the high cost of purchasing some equipment, in addition to associated training and supply needs, often prevents small-scale producers from adding value to forest products, thereby reducing their potential total income from commercial sales. Technology costs may also create a barrier to entering other, potentially larger markets, specifically those that demand high volumes and high product quality. Equipment limitations can prevent local producers from meeting these standards (Hyman 1996). In this case, low technology levels limit a product's profitability, since increases in volume can reduce per product costs, and better quality earns higher prices. Improving technology can lower costs, thereby increasing profitability, as KEF achieved by purchasing sugar-making equipment. A comparison of equipment depreciation to increased earnings and lower costs from using the equipment will show whether the improved profitability will compensate for the capital expenditure.

### Distribution costs

While production costs are incurred for obtaining and processing raw forest materials, distribution costs are for transferring finished products to the customer. These activities, including mainly transportation and storage, are neither value-added nor administrative costs. While production costs (except depreciation) are mostly variable, distribution activities can involve many durable assets, such as vehicles and warehouse space, and therefore comprise largely fixed costs.

### *Transportation*

Transportation costs can be fixed or variable. If an enterprise uses its own vehicle to transport products, then the vehicle's depreciation is considered a fixed cost. No matter what the volume of product shipped, the price for the vehicle remains the same. However, a higher production volume generally means more trips, which will require more gas and maintenance costs. Transportation costs that do not involve an enterprise-owned vehicle are also variable, such as per kilogram payments to a shipping company to transport goods.

For forest-based enterprises located in difficult-to-access areas, transportation can be a significant cost. It is sometimes more expensive to get products out of the forest than to ship them by air to cities that are hundreds of kilometres away. For example, YDT transports products five hours by car from the Sanggau area to Pontianak, the capital of West Kalimantan, for about US$1800 per year. About four-fifths of these products are then transported to Jakarta by plane for US$280 per year. The variability in the cost and revenue of different distribution channels may mean that some are significantly less profitable than others. If Natripal sells its three products in Manila, rather than the local city of Puerto Princesa, it earns a higher profit on each of them (Table 6.7). In the case of almaciga, transportation raises the per unit cost by 10 per cent, but the price is 62 per cent higher in Manila, producing a profit of 22 per cent compared with a loss of 15 per cent by selling locally. If Natripal sells rattan and honey in Manila instead of Puerto Princesa, the results are similar.

**Table 6.7** Natripal per unit profitability for rattan, almaciga and honey sold to Puerto Princesa City vs. Manila (Philippine Pesos Per Unit)

| | Rattan (Pole) | | Almaciga (Kilogram) | | Honey (Gallon) | |
|---|---|---|---|---|---|---|
| Market | Puerto Princesa | Manila | Puerto Princesa | Manila | Puerto Princesa | Manila |
| Price | 8.42 | 11.21 | 10.70 | 17.40 | 230 | 400 |
| Costs per Unit | | | | | | |
| Direct | 9.30 | 9.83 | 9.29 | 9.29 | 168 | 168 |
| Indirect | 0.80 | 2.11 | 1.19 | 2.46 | 43 | 50 |
| Overhead | 1.18 | 1.18 | 1.81 | 1.81 | 35 | 35 |
| Total | 11.27 | 13.11 | 12.29 | 13.56 | 246 | 253 |
| Profit/(Loss) | (2.85) | (1.91) | (1.59) | 3.84 | (16) | 147 |
| Profit/(Loss) | (34%) | (17%) | (15%) | 22% | (7%) | 37% |

Exchange rate: US$1=P26.2

### *Storage*

Storage is also a distribution cost that can be fixed or variable. If the enterprise owns a storage facility, or leases it under a long-term contract, this cost will be the same regardless of whether one kilogram or 1000 tons are kept in the warehouse each year. On the other hand, if space were rented on the basis of volume used at a rate per kilogram or square metre, this would be a variable cost.

Although storage does not add value to a forest product, like transportation it can have a significant impact on profitability. Improved techniques for storing products can prevent deterioration or losses from pests. Enterprises with access to warehouses can also accumulate a large volume of products over a long period of time. This allows the enterprise to sell to customers who demand high volumes and may pay higher prices. YDT's preliminary market research found that export buyers in Singapore will pay significantly more for damar than local traders, if YDT can supply shipments of 15 tons or more. Since this is over 50 per cent of YDT's projected annual volume, a warehouse is necessary to meet this demand. The benefit of selling damar to a high-volume buyer far outweighs the cost of renting storage space.

### Overheads

Quantifying the cost of one unit of output is more complex if the costs are not directly related to harvesting, making or distributing the product. First, it is easier to allocate variable costs, such as raw materials and labour, to a single product unit than fixed costs, such as for accountants and office furniture, which do not have a clear relationship to the units of output. Secondly, it is common for forest-based enterprises to share the administrative burden between enterprise and non-enterprise activities. This is especially true for non-governmental organisations engaged in forest product sales. Yayasan Dian Tama, for example, is involved in several community activities apart from its non-timber forest product enterprise, including environmental education, skills training, coordinating women's groups and developing environmentally friendly products. YDT staff devotes substantial time to administering these projects and managing grant funding from a variety of sources. Since the costs and income generated by these activities are not connected to selling NTFP products, a mechanism is needed to allocate overhead expenses appropriately.

One method of allocating administrative staff costs to distinct activities, both enterprise-related and others, is by determining the amount of time employees spend on each activity. Since the YDT accountant spends about 25 per cent of his time on NTFP sales, that proportion of his annual cost is assigned to the NTFP division. This technique can be expanded to allocate non-personnel costs such as paper or electricity because their rate of use is a function of personnel activity. The more time staff spends on NTFP activities, it is more likely that telephone calls, electricity, computers, office furniture and faxes are being used for NTFP administrative activities. At YDT, overall staff time devoted to NTFPs is 37 per cent, so that percentage of all personnel-related overhead costs were allocated to the NTFP cost structure.

Once the enterprise's annual overhead expenditure is calculated, the per unit cost can be determined. Overhead costs are divided among all product lines and then by product within each line. Since high-price or high-cost products require more administrative activities (e.g., purchasing more supplies, paying more labourers, accounting for more costs, etc.), overhead expenses can be allocated on the basis of sales or variable costs. In YDT's case (Table 6.8), the breakdown of total variable costs between damar products and woven products was approximately 45 and 55 per cent, respectively. Annual shared overhead expenses were then divided between the

**Table 6.8** YDT enterprise overhead costs shared by product lines

| | Woven Products | Damar | Total |
|---|---|---|---|
| Projected Annual Variable Costs (Rupiah) | 24 595 000 | 20 354 000 | 44 949 000 |
| Per cent of Total (%) | 55 | 45 | 100 |
| Allocation of Shared Overheads (Rupiah) | 21 944 000 | 18 161 000 | 40 105 000 |
| Units Sold per Year | 1 593 kg | 36 tons | |
| Shared Overhead Cost per Unit Sold (Rupiah) | 13 775 | 504 | |

two product lines in the same ratio. To find per unit overhead cost, each product line's annual overhead cost was divided by number of respective units sold per year.

The overall level of overhead expenditure depends largely on the organisational structure of the business and its production volume. Centrally managed, small-scale businesses like KEF and Yayasan Dian Tama have overhead charges of 30 per cent and 42 per cent of total costs respectively since these groups handle administration and finance internally. At the other end of the spectrum are individual entrepreneurs, suppliers or traders who perform only one or two functions in the value-added chain. Chainsaw owners in Krui, for example, do not support a large staff or handle complex transactions and therefore have minimal administrative expenses. Their single overhead cost is for fees paid to government officials. These vary from case to case and can be as high as 15 per cent of a chainsaw operator's total costs.

## Revenue Analysis

In the same way that cost data can reveal insights about the dynamics of a forest enterprise, so can revenue analysis. Although revenue does not have as many components or complexities as cost, small fluctuations in a product's price can have greater impacts on profitability, and therefore on the viability of the enterprise. These price variations are generally the result of external influences over which an individual business has little control, such as the emergence of a less expensive substitute product. While it is important to analyse the impacts of these changes, an enterprise can also proactively seek sales channels that offer higher revenue, or more importantly seek higher profits to offset risks posed by external changes. For instance, Natripal's decision to sell to buyers in Manila, a distant market compared to local markets in Puerto Princesa, was based on an analysis of the revenue and costs associated with each distribution channel.

Revenue variations depend not only on where a product is sold, but the product itself, how it is processed and to whom it is sold. Enterprises can change their profit margin by choosing to add more or less value to their products locally. While more processing will increase the price of the product, it will also require further investment

in equipment, materials, supplies, labour, etc. Certain costs may also decline with increased processing, such as transportation costs. Processing can reduce a large, bulky product like rattan poles to a lighter, compact product such as baskets woven from rattan. Enterprises can also seek higher prices by specialising in high quality products, such as grade A versus grade C resins or carefully hand-made products. The additional revenue may or may not compensate for the extra cost of spending more time to find and produce these products.

Higher profits may also be gained by selling to certain customers. There are instances of large industrial buyers paying higher prices than local or regional traders for forest products. In Krui, for example, local villagers have negotiated with an international furniture company who has discussed paying two to five times the price that regional traders pay for damar timber. Generally, offers such as these are contingent on high volume commitments. If YDT damar gatherers could harvest significantly higher volumes than currently, they could earn at least 50 per cent more by selling to an international buyer in Singapore. These commitments, however, are often infeasible for forest enterprises because of constraints such as seasonality, labour supply and other variabilities in the harvesting of forest products. Even if they could guarantee high-volume orders, this rate of production may be environmentally unsustainable and compromise the enterprise's long-term viability. The lack of flexibility in increasing sales volume is a significant limitation for enterprises in natural forest areas where conservation is an objective.

Since an enterprise may be unprofitable at low volumes and profitable at higher volumes, it is useful to find the exact output that an enterprise must produce in order to cover its costs. This 'break-even analysis' pinpoints an enterprise's break-even volumes, where costs are exactly covered and profits are zero. If the enterprise produces one product only, the analysis is straightforward. Profit equals revenue minus costs for a given time period, or

Profit = Revenue - (Variable Costs + Fixed Costs)

Substituting 0 for profit, and assuming the enterprise produces only one product, x:

$$0 = P_x * V_x - (V_x * C_{vx} + C_F);$$

where $P_x$ is the price of x

$V_x$ is the break-even volume

$C_{vx}$ is the variable cost for one unit of x

$C_F$ is the total fixed cost to run the enterprise

Break-even volume is therefore found by the equation

$$V_x = C_F / (P_x - C_{vx})$$

Typically, however, an enterprise produces more than a single product type. The thirteen different flavours of jam and jelly produced by KEF all have different prices, costs and profit margins. Finding the break-even volume in this case is more complex.

**Table 6.9** Results of Kalahan Educational Foundation break-even analysis (1996 break-even volumes under three product-mix assumptions)

| | Product-mix scenarios | | |
|---|---|---|---|
| | Likely Sales Mix | Low Proportion of Profitable Products | High Proportion of Profitable Products |
| Break-even Volume, Jars | 18 536 | 19 154 | 17 519 |
| Revenue (000 Pesos) | 603 | 612 | 601 |
| Fixed Cost (000 Pesos) | 250 | 250 | 250 |
| Variable Cost (000 Pesos) | 353 | 362 | 351 |
| Total Cost (000 Pesos) | 603 | 612 | 601 |
| Net Profit (000 Pesos) | 0 | 0 | 0 |

One approach is to assume one or several possible sales combinations. Three product mixes were chosen for the KEF analysis (Table 6.9). The first, or likely, scenario assumes KEF will continue selling its current mix of products. The second scenario assumes a higher proportion of profitable products and lower proportion of unprofitable products. The third option reverses this mix. By testing different product combinations, KEF knows the minimum number of jars it needs to sell, even if the sales mix is not the most favourable one.

## Limitations to Profitability Analysis

Using profit analysis may not always be appropriate to predict or determine the viability of a forest enterprise. An enterprise or product that is currently profitable may not be viable in the long run because market factors such as supply of inputs and demand for products are unpredictable. Small forest enterprises are particularly at risk of facing a raw materials shortage since cash needs in poor areas or high market demand could encourage harvesters to over-extract local species. Degrading or depleting the supply will threaten not only the long-term sustainability of the resource but also the viability of the enterprise and the income security of participants. These impacts are less likely to happen if the products are relatively abundant, are easily renewable and provide significant income to a large number of forest dwellers (Hyman 1996; Peters 1996). Other input shortages, such as labour, can also limit the success of a potentially profitable business. Local villagers may not be able to integrate enterprise activities into their current work patterns or labourers may choose not to participate if they conflict with other duties.

In addition to unforeseen limits in the supply of inputs, the market demand for certain forest products may also be inadequate or inconsistent. Competition from cheaper substitute products or a change in consumer preferences may suddenly reduce the market size and price for a product, which would not be reflected in an earlier profit analysis. For example, based on profitability alone, cloves grown in Pesisir,

Sumatra, in 1980 were more commercially viable than damar resin harvested in the same area. At Rp 6500/kg, the price of cloves was high in 1980, while the price for resin, at Rp 600/kg, was low and dropping.[12] In response to this trend, many farmers cleared their agroforest gardens, including a diverse assortment of damar and fruit trees, to plant a monocrop of cloves. In the early 1980s, however, Sumatra Disease infected clove trees in Pesisir and the demand for cloves ceased. Farmers cleared their clove plantations and replanted with damar and other less risky tree crops. The loss they incurred from this conversion was enormous, since newly planted damar trees do not produce resin for at least 20 years. Due to the risks involved, some presently profitable products may be unviable in the long run.

If these risks can be anticipated, profitability analysis can show the impact of fluctuations in supply and demand. Comparative calculations, also called sensitivity analyses, show the difference in profitability resulting from changes in business conditions, such as price variations, supply or demand changes, foreign exchange fluctuations or a rise in taxes. These analyses may show that minor changes in the condition or variable being examined will have a significant impact on the viability of the enterprise, such as the effect of volume changes on YDT profitability mentioned above.

Even if an enterprise continues to be economically viable, it may not significantly increase the well being of local participants. Successful enterprises may attract the attention of local or non-local elites who take control of operations for their own benefit (Nair 1995). In this case, the enterprise will not improve the well being of the most disadvantaged groups. Excluding them from income-generating activities may even reduce their leverage in the community. Profitable commercial activities also frequently attract attention from local officials who can levy substantial formal or informal fees, thereby cutting into business profits and other income. Even if cash benefits to the target groups are significant, they may experience non-cash disadvantages from the enterprise, which cannot be captured in a profit analysis. In one BCN-supported project in the Solomon Islands, for example, successful commercialisation of *ngali* nuts decreased local consumption of the nuts, which had been a primary source of protein for many villagers.

In addition to branding unviable or less beneficial enterprises a success, profit analysis can also mislabel an enterprise a failure in the long term. An enterprise that shows no possibility of viability on paper may improve quickly. This could happen because of sudden changes in market features discussed earlier, or under the direction of an insightful, energetic or well-connected manager. In small businesses, where one individual can have a significant impact on operations, a new manager may be a determining factor.

In some cases an unprofitable enterprise may be considered a worthwhile investment for a development organisation if it distributes substantial non-cash benefits to local participants, such as improving the sustainability of the forest or offering

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[12] The price ratio of one kilogram of damar resin to one kilogram of rice had been 1:1 from 1964-1980, but fell to 0.8:1 in 1984 (Bruenig and Poker 1989; Michon 1991).

safer, healthier working conditions than previous income-generating options. Forest enterprises may also be a mechanism for preserving local skills and culture by expanding the market for traditional products. The costs may be considered acceptable insofar as they are viewed as the cost of providing a public good.

Unprofitable enterprises may also be successful at generating cash income for participants indirectly. Even though these earnings may compensate for business losses, they are not reflected in profitability analysis. For instance, many forest enterprises include credit and savings mechanisms that allow stakeholders to draw loans or collect interest from deposited earnings. Community groups established by the enterprise to facilitate production and sales may also increase the income or efficiency of other cash-generating activities. In the Arfak Mountains Nature Reserve of Irian Jaya, for example, Yayasan Bina Lestari Bumi Cenderawasih supervises a geographically dispersed network of butterfly farmers through an organisation of over 80 stakeholder groups.[13] Although initially group representatives met regularly to discuss enterprise issues only, they now coordinate regional farming activities as well. Through this mechanism, farmers determine which crops each group will grow and where they will be sold, thereby reducing local competition and increasing their revenue. Participants also benefit financially by cooperating in purchasing seeds and selling produce.

## Conclusions

Profitability analysis can be applied to small forest-based enterprises to determine the viability of a potential product or the health of the enterprise. It can also be used to reveal strategic interventions that might increase benefits to the enterprise operators or indicate environmentally unsound operations. The calculations are relatively straightforward and simple, thereby lending themselves to a wide range of applications. Box 6.1 provides a summary of the key elements of profit analysis.

Many of the features of the profit analysis of the case studies may be characteristic of other forest-based enterprises.

- A tendency towards centralised management where processing of the forest product is required.
- High levels of threat to land tenure security as well as conservation of the forest coexisting with the operation of currently profitable enterprises.
- Low raw materials and labour costs.
- High-value raw materials seem to have a greater impact on profitability than amount of labour used to process products. Competitive advantage may lie in identifying these high-value materials.
- Domestication of forest products is used to ensure sustainable supplies of raw materials.
- Non-forest supplies may be expensive due to lack of local availability and high transportation costs.

[13] Project supported by BCN.

**Box 6.1** Summary of profit analysis for forest-based enterprises

**1. Profit analysis can be done for:**

- Whole enterprise;
- Product line (set of goods related to a forest product); or
- Per unit of product.

**2. Cost analysis**

**Production costs** – expenses directly related to buying, cultivating and harvesting raw materials, as well as processing or adding value. Most costs are variable, i.e., depend on the level of production. Difficult to separate costs for harvesting labour from the cost of forest materials if the enterprise purchases raw or semi-processed materials from gatherers. Direct costs include:

- Raw materials – both forest and non-forest inputs used to make the final product.; raw forest materials cost is for pre-processed forest species;
- Labour – harvesting and processing;
- Production supplies - mostly containers, packaging, collection sacks and baskets, minor 'consumable' tools used in any step of product finishing, such as bamboo stripping knives;
- Equipment – purchase and maintenance of machinery used to collect, prepare, manufacture and distribute products only; includes maintenance and spare parts (does not include consumable tools); and
- Depreciation – applied to equipment costs and other capital investments such as vehicles, land, buildings, furniture and office equipment; the total cost of an asset is divided by its standard life span to determine its annual cost.

**Distribution costs** – expenses related to transferring finished products to the customer. May be fixed or variable and include:

- Transportation;
- Labour – distributing products, e.g., loading, transporting and storing; and
- Storage costs.

**Overhead costs** – administrative expenses associated with running a business and selling products. Not directly related to harvesting, making or distributing the product. Usually all fixed costs. Costs can be calculated for different activities. Overhead costs include:

- Administrative salaries;
- Office expenses – building, furniture, equipment such as computers and copiers;
- Taxes and fees;
- Advertising;
- Travel;
- Promotion; and
- Communication.

**3. Revenue analysis**

**Revenues** – the gross returns or income earned by the enterprise. May often be increased by improving the quality of product, finding new markets or customers, or increasing the scale of production.

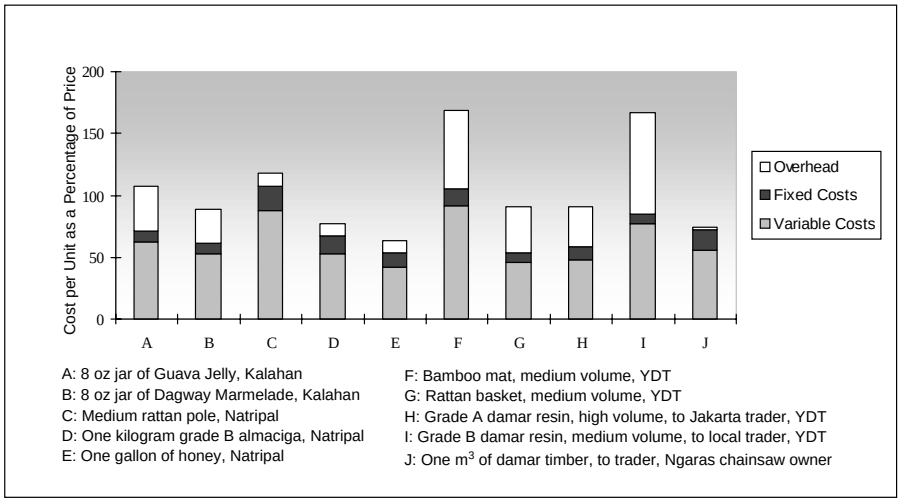
**Profit** - Net revenue, or revenue less all costs.

- Advanced processing of forest products may not be possible because of a lack of electricity, training, supplies or labour.
- Transportation of final products to market may be expensive.
- Profitability does not necessarily predict biological sustainability or economic viability.
- Sustainable supplies of raw materials are more likely to be maintained where supplies are abundant, easily renewable and where significant numbers of local people benefit from the income.

Although profitability analysis is not consistently able to predict or determine the success of an enterprise, it is a useful tool for both measuring and improving the chance of viability for a forest enterprise or product. For the four producer groups studied in this chapter, the profit analysis results identified opportunities for more effective production and sales methods. As a summary comparison of these enterprises shows (Figure 6.5) an analysis of costs can offer insight into the capacity to generate benefits and how it can be improved. For example, while cutting overhead costs may improve the profitability of YDT's grade B damar (I), overhead reduction will not have the same impact on Natripal's rattan profit (C). Similarly, an increase in volumes may significantly lower costs and improve profit of several products sampled (those with high fixed costs per unit) but products whose costs are primarily production-based (C, F), will have to target raw materials, labour and other variable cost reductions in order to improve profitability.

By quantifying the impacts of operational adjustments, profit analysis can reveal opportunities for cutting costs and improving revenue. The results show not only the source of problems (e.g., high transportation costs), but also offer a mechanism for comparing possible solutions (increasing local processing vs. switching sales channels) to make informed strategic decisions. Profit analysis not only measures the success of a viable enterprise by calculating its overall net profit, but also can identify its

**Figure 6.5** Comparative profitability of selected forest products



source of viability by revealing a comparative advantage in raw materials or a favourable market selection. Insights such as these can improve the selection, production and sales of NTFPs, in order to optimise the sustained benefits they provide for local communities.

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Chapter Seven

# Using Ecological and Economic Information to Determine Sustainable Harvest Levels of a Plant Population

Patti J. Anderson

Both ecological and economic data are important inputs when ascertaining sustainable levels of harvesting for forest products. This chapter focuses on methods for determining the potential for sustainable harvesting of the palm *Iriartea deltoidea* Ruíz and Pavon (*pambíl* or *chonta de pambíl* in Spanish). Studies of the plant's demography and reproduction as well as simulations of future harvesting regimes are used for determining ecologically sustainable populations of the palm in Ecuador. Ethnographic fieldwork about market patterns and decision making among harvesters indicate the harvest pressures influencing *Iriartea* demography. The methods demonstrate an approach for assessing ecological and economic influences on the sustainability of a particular species or set of species. They also demonstrate the interlinked nature of ecological approaches and economic factors in this process.

## Determining Sustainable Harvest Levels

Stocks and flows can be used to determine the sustainable harvest of a species by calculating appropriate flow levels, i.e., evaluating the trade-off between using resources now and conserving enough of the stock to ensure that benefits may pass to future generations. The stock of a resource is the quantity available for exploitation. The flow of a resource is the quantity entering or leaving a system and depends both on the time needed for extraction (travel and harvesting time) and the demand for the product. A forest may have thousands of dollars worth of harvestable resources, but if no one harvests or is willing to pay for the resource it remains part of the forest stock. Inventories of tropical forests may provide estimates of the net present value of available resources from one hectare over the course of 50 years (e.g., Peters *et al*. 1989; Balick and Mendelsohn 1992) but, as Browder (1992) notes, the flow of goods from one day's labour to an actual market may be more meaningful as a measure of potential sustainability.

The effects of harvesting can be understood in terms of changes in the ability of the species to replace itself and maintain a given level of stock. Maintaining the current stock of natural capital requires that the flow out of the system (harvesting or deaths) is no greater than the flow into the system (births or seedling recruitment); these flows are understood in large part by studying reproduction and growth. Declines in reproductive potential can occur if too many adults are harvested to produce

sufficient replacements (which is a danger in extracting palm hearts or rattans when the plant is killed in harvesting) or if not enough young live to become reproductive adults. Growth rates are important for understanding how often the resource can be harvested without damage to reproduction or future growth. For example, if the leaves of a plant are collected for thatch or fibre, collecting too many leaves from an individual can reduce the number of new ones, and perhaps flowers and fruits, produced. Experiments to determine the effects of removing leaves, tapping latex or digging up roots can help determine if harvesting these NTFPs changes the growth or reproductive potential of the local population.

More complex relationships between growth and reproduction and ecosystem changes may also affect the stocks and flows of a resource. Changes in soil nutrient content, water availability and light, or in plant pollinators or seed dispersers, can be important influences on flows of the resource. Understanding changes in the soil when leaves or fruits no longer decompose within the forest and return their nutrients can be important, although time constraints often make this kind of experimentation impractical.

Matrix models offer an efficient method for describing the potential effects of harvesting on a population (Peters 1994). These models are a common and well-understood approach to assessing the demographic characteristics of a population (Getz and Haight 1989; Pinard and Putz 1992), as well as the risk associated with population change (Burgman *et al*. 1993). They provide a means of easily manipulating demographic data – birth rates, death rates and growth rates. When birth rates equal death rates, a population is stable. The growth rates determine how quickly individuals make the transition from one stage to another and are important for determining recovery time after harvesting. The use of matrix models in population biology has a long history (e.g., Leslie 1945; Lefkovitch 1965). Peters (1994, 1996) provides an excellent explanation of methods for using matrix models to determine which species found within a given area might be harvested sustainably.

Using matrix models to estimate the effects of harvesting on future populations is like using a computer model to test the weight a bridge can carry without collapsing. Information is produced without the need to build a structure or, in the case of populations, without the risk of harvesting and producing undesired biological consequences. On the other hand, the model is only as good as the information on which it is based and no model can be expected to fully describe the expected behaviour of the system. Projections using matrix models can form the basis for estimating the number and size of individuals that may be harvested without endangering the continued existence of a species. Some studies have used population parameters either to determine the ages or stages of a species that can be harvested with least damage to the population's future reproduction or to direct our attention to classes within the population that are likely to be vulnerable to unsustainable harvesting practices (e.g., Peters 1990). Demographic data from harvested and unharvested populations can also be compared. Hall and Bawa (1993) suggest that careful comparative studies of population structure in optimal and marginal habitats can be useful in determining the potential range of population growth.

The usefulness of model manipulations for understanding population stability or the consequences of harvesting depends on recognising how the assumptions and constraints of the model relate to the biology of the population to be studied. Ideally, an analysis of the life history of an organism would be based on following a cohort of individuals through their entire life cycle; unfortunately, with slow-growing, perennial plant species, this ideal is much more difficult to attain than with populations of short-lived animals, annual plants or bacteria. Large perennial plants such as trees are often better characterised by size (or stage) than by age for both reproductive and survival parameters (e.g., Burgman *et al*. 1993). The choice of using age- or stage-based models depends on the organism to be studied; for many species, reaching the appropriate size to reproduce is more important than living a particular number of years (Caswell 1989).

Flows and the ability of a species to replace itself will be strongly influenced by harvesting pressure. This pressure can be understood by analysing decisions and behaviour of local harvesters. Information is needed about who harvests, at what rate and under what conditions. Land use maps and interviews with people involved in market sales can help answer these questions. Community maps can be drawn in collaboration with villagers to identify the practical range of harvesting given current access to transportation and to determine the placement of transects across social gradients. Knowing the number of harvesters and the flow of goods from one person's labour for one day with a given technology (e.g., using chainsaws) can be used to calculate flows. Where goods are sold, there is a need to know the current demand in terms of local sales at the forest gate (or market sales if more distant markets exist) to understand pressures on the possible flow of NTFPs.

Decision-tree models (Gladwin 1989) can be used to clarify the norms, values and criteria influencing decisions by individuals, households or the community. For example, individual actors in an open-access resource system make harvesting decisions; the likelihood of sustainable harvesting might be quite different from that of locales where groups make decisions about the use of a restricted, common property resource (Bromley 1989). External authorities may impose rules for resource use or local resource users may develop rules for management (Ostrom *et al*. 1994). Harvesting decisions may also vary among different groups because of cultural or political influences. For example, people might decide to plant food crops for family subsistence rather than cash crops that could leave them better off financially, surprising experts from outside the culture who predict behaviour based on profit maximisation motives (Gladwin 1983). Knowing the local rules for decision making and the units (individuals or communities) by which decisions are made are necessary for predicting pressures for overharvesting.

For *Iriartea* few rules restrict harvesting because the species is often so abundant in areas where it grows. It is considered to be a weed by some local people. Respect for traditional property boundaries generally prevents neighbours from harvesting the palm on another person's property, but this is a general prohibition unrelated to the scarcity or abundance of this species. Some adult palms are usually spared when pastures or agricultural plots are cleared and the palms are left standing to meet

future needs. The expectation is that they will be harvested at a later time, not that they are being saved for future regeneration.

In this study, access to transportation was found to be a major factor in the decision to harvest *Iriartea*. Local transportation options are linked to political decisions about road building at the national level and to development funding at the international level. Given the lack of traditional constraints on harvesting *Iriartea* and its current abundance, increasing demand or higher prices could lead to overharvesting unless new rules are made and followed.

By combining information about economic stocks and flows with an analysis of a plant's population dynamics, we can make better predictions about whether current harvest levels could continue without changing the growth and reproductive potential of the NTFP. If demand is high enough, the potential supply can be depleted before sufficient time passes for growth and replacement of the outward flow.

## *Iriartea deltoidea* in Ecuador

### Why this species?

*Iriartea* was chosen for this study because of its current and potential economic usefulness and its abundance in lowland Ecuador. *Iriartea deltoidea* (hereafter *Iriartea*) is among the most common palms in Amazonian and coastal Ecuador (Balslev *et al*. 1987). Its uses include construction, furniture, marimbas, banana tree props, handicrafts, blowguns and harpoons (Kahn and de Granville 1993). Although abundant now, the palm's usefulness may eventually pose a threat to the resource because it is killed when harvested (Pinard 1993). As with other NTFPs, increased trade in products made from palm stems may provide a useful economic alternative to the people of Ecuador, if sustainable harvesting levels can be determined and utilised.



The *Iriartea deltoidea* palm (photo by Patti Anderson).

### Country setting

Construction of roads and the trans-Ecuadorian oil pipeline has turned eastern Ecuador into one of the most intense centres of colonisation in the Amazon basin and has stimulated one of the highest rates of deforestation in the world (Peck 1990). Logging companies have built roads that provide entry points for settlers into forested areas, thereby increasing deforestation by colonists, land speculators and agribusiness interests (Rudel with Horowitz 1993; Pearce 1994). The effects of national policies related to transportation and economic development have been similar in many ways for both coastal and Amazonian Ecuador. In coastal Ecuador, agricultural policies

## Glossary

- **Fecundity** is the potential reproductive contribution of an individual and reflects both fertility and survival. In this study, annual fecundity rates were based on the number of seeds from an individual palm that could be expected to germinate within six months and survive as seedlings for the following six months.
- **Harvesting simulations** are used to understand the potential effects of harvesting, using matrix models. For example, the effects of harvesting at increasing intensities can be simulated by systematically reducing the survival probabilities for adult stages. Simulations of harvesting *Iriartea* monitored the effects of reducing the probability of survival in the last two stages by increments of 10 per cent up to a continuous harvest of 100 per cent. In a second test, the number of adults over 15 m tall was reduced from the observed frequencies to 0 (zero) to simulate a one-time total harvest in each forest type. By using simulations, managers can determine appropriate harvesting levels in a given setting, based on the distribution of stages observed. Peters (1992) used similar techniques to simulate the effects of fruit harvesting.
- **Lignified** refers to the hardening of the outer fibres of *Iriartea* through the deposit of lignin, a carbon-based substance responsible for much of the tensile strength of vascular plants.
- **Matrix models** provide a means for easily manipulating demographic data, such as birth, death and growth rates. (The importance of these rates for estimating population dynamics is clear from the actuarial tables of life insurance companies as well as from the life history tables of population biologists.) When birth rates equal death rates, a population is stable (the number of individuals in the population remains constant). Growth rates are important for determining recovery time after harvesting. Comparative studies can be useful in determining the potential range of growth rates among different populations of a given species.
- **Stable stage distribution** refers to the point at which a population settles into a constant proportion of individuals in each stage. This distribution indicates the long-term population structure if current growth, reproduction and mortality rates remain constant. Although natural populations are unlikely to match the stable stage distribution, comparing the observed distributions of size classes with the calculated stable stage distribution allows an analysis of the deviation of the observed population from stability.
- **Transition matrices** represent the structure of a population grouped by age or size. This model of the population allows the definition of the probability of movement from one life cycle stage to another in a given time period. In transition matrices, rows and columns equal the number of life cycle stages or ages used in the analysis. The top row of the matrix gives fecundity rates for adult size classes. The major diagonal provides the probability of an individual surviving and remaining in a size class. The subdiagonal shows the probability of surviving and growing into the next class. These transitions are based on the time period used for the matrix. The assumptions made by the model include stable environmental conditions and equal growth, survival and fecundity among members of a given class, as well as the absence of density-dependent effects on population dynamics.

intended to promote exports have encouraged the replacement of forests with banana, coffee, cacao and oil palm plantations.

Faced with increasing colonisation in the 1960s and the possibility that colonists might take control of traditional tribal territories, many indigenous groups formed organisations to deal with the national government (e.g., Federación Shuar, Federación de Organizaciones Indígenas de Napo or FOIN, and Confederación de Nacionalidades Indígenas de la Amazonia Ecuatoriana or CONFENIAE). The Instituto Ecuatoriano de Reforma Agrica (IERAC), the government agency responsible for granting land titles and dividing land into 50 ha parcels for each family, is not surprisingly often slow and subject to bureaucratic delays and frequently changing, sometimes contradictory, regulations. The Shuar Federation came to an agreement with IERAC to speed up the process of granting land tenure by awarding land titles to *centro*s or communities, rather than to each nuclear family. The *centro* then gives plots (30-70 ha) to each family. The family retains all rights to the land (forever) except that sales must be approved by the community to prevent transfer of the land to colonists (Salazar 1981; Trujillo León 1996).

## Biology

Stems of mature individuals of *Iriartea* are 10 - 30 m tall, up to 30 cm in diameter, solitary and unbranched. The palm is found from Nicaragua to Bolivia at elevations between sea level and 1300 m (Henderson 1990). It is abundant along ridges (Parker and Carr 1992) and streams (Balslev *et al*. 1987). Numerous dense, stilt roots form a cone at the base of the stem of this palm and provide secure anchoring in the unstable soils found where the palm is abundant – both on steep slopes in the lower Andes and along streams in flat terrain.



Traditional house built by Shuar people in Amazonian Ecuador. The posts are whole stems of *Iriartea*; the walls are made of stems that have been split into narrow strips. The roof was made of thatch from a different palm species (photo by Patti Anderson).

## Use and management

The hardness of the outer stem is the reason for the economic value of the palm. The fibres of the outer stem are often lignified, while the centre is quite soft (Rich 1987). In her study of *Iriartea* in Acre, Brazil, Pinard (1993) reported that flooring made from the palm lasted up to 25 years. The outer parts of the stems are split into planks for use in construction while the soft inner core is generally discarded. Tannins darken the lignified outer fibres, adding to the beauty of the wood and increasing its value for handicrafts and furniture.

The growth and life history of this species have been studied in Costa Rica (Rich 1987) and Brazil (Pinard 1993). Pinard used matrix models to investigate the sustainability of harvesting practices and the contribution of various size classes to population stability. From this work she concluded that *Iriartea* could be harvested sustainably if individuals in only the most mature life stage of the palm were felled.

## Research objectives

The study reported here was conducted in 1994-96 on the stocks and flows of *Iriartea* in order to determine the effects of harvesting on the population found in Amazonian Ecuador. The questions of where it is found, how much exists and how it is likely to change over time were addressed through a combination of ecological and economic methods.

## Field sites

The ecological research was conducted in lowland Ecuador at Jatun Sacha Biological Research Station (01° 04´ S, 77° 36´ W) and the surrounding community in Napo province of Amazonian Ecuador. Jatun Sacha is located on the Napo river at an elevation of about 450 m and has an annual rainfall of 3500-4000 mm. The station contains areas of primary and secondary forest. The surrounding community consists of colonists and lowland Quechua people who own small farms (about 50 ha per family), most of which includes pastures cleared for cattle grazing. Members of both groups of farmers provided information about uses of *Iriartea*.

At Jatun Sacha Biological Reserve, three permanent plots of one hectare were established and inventoried. In these plots, *Iriartea* was among the 20 most frequently encountered tree species with diameter at breast height (dbh) greater than 10 cm. In the upland site, 107 individuals were found, 44 in a stream valley plot and 13 in the alluvial plain plot (Neill *et al*. 1993). In the plot where *Iriartea* was most abundant, it met the minimum distribution (100 individuals per ha) to be defined as an oligarchic forest[1] and, therefore, to be considered a likely candidate for economically sustainable extraction. Studies were also carried out with an indigenous group of Shuar people in the Pastaza Province of Amazonian Ecuador, in the communities of Pritirishka and Centro Consuela. In these areas *Iriartea* was under private land tenure.

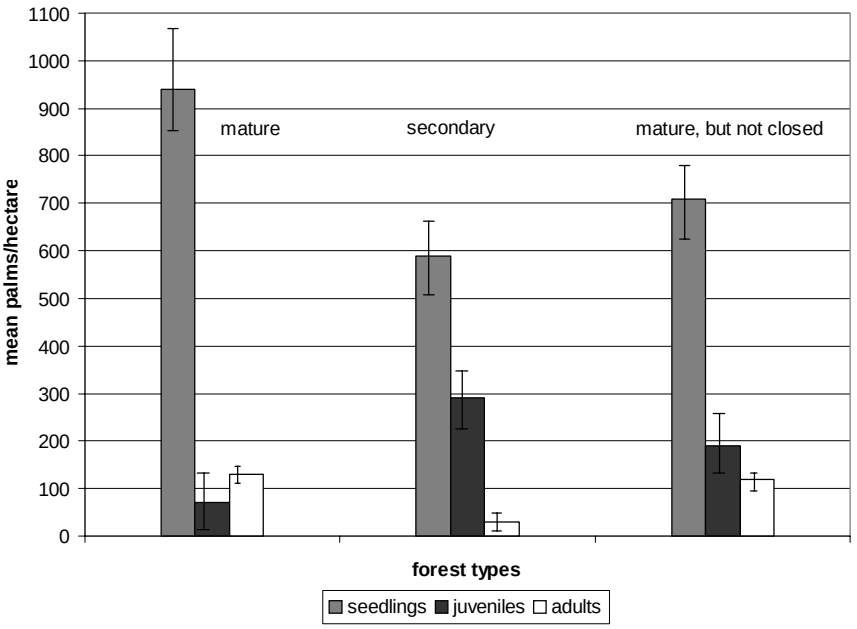
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[1] Defined as a forest in which one species is represented by 100-300 individuals per hectare (see Peters 1992).

## The Demographic Model

Plots were established on the basis of available information about the distribution and density of this species from the permanent plots within the research station. Demographic data were collected from five plots (20 x 50 m) in each of three different forest types to identify the ecological variables critical for population stability ( Figure 7.1). The forests included secondary forest (areas that had been cropland 30 years ago), mature forest and mature forest with steep slopes or streams that created a more open canopy. Matrix models were used to determine the finite rate of population increase (lambda) with data from these 15 plots (transformed to a per hectare basis). A population can be expected to grow if lambda > 1.0, decline if lambda < 1.0, and remain constant if lambda = 1.0. Harvest simulations were then conducted to identify sustainable levels of removal of *Iriartea*.

**Figure 7.1** Distribution of *Iriartea* by life stages in three forest types




In addition to the forest plots, information was collected from agricultural fields and pastures where *Iriartea* had been left standing. Because there were no individuals less than 12 m tall in the pastures, meaningful matrix analysis was not possible on these plots because the probability of survival was zero for all stages less than 10 m tall. Moreover, no seedlings survived in these pasture plots although the adults produced fruits and some seeds germinated near the adult. Given these conditions, in a mathematical model, the population inevitably disappears because of multiplication by zero. Biologically, the population could die out if the last adult

were to die before conditions change (e.g., elimination of pasture grasses) to allow survival of seedlings.

While past work suggests that *Iriartea* can be harvested sustainably (Pinard 1993), several population-level questions about the palm remain unanswered. For example, will harvesting the stems change the parameters of the model related to fecundity, seed germination and growth? The necessary conditions for seedling establishment may be altered if harvesting increases dramatically, and these changes may not be reflected in the projections of a model based on successive iterations with biological variables held constant. Although basic matrix models assume that transition probabilities[2] remain constant and that environmental fluctuations, including those based on population density, do not affect the outcome of the analysis, the problem of stability inherent in matrix models can be addressed by increasing their complexity (Menges 1990; McDonald and Caswell 1993; Alvarez-Buylla 1994).

Increasing the complexity of the matrix model may not always be possible because of a lack of adequate data. McDonald and Caswell (1993) suggest that the trade-offs required to use the matrix method with less than ideal data are nevertheless worth making because of the insights to be gained from this approach. Although their study focussed on bird populations, their techniques can be generalised to include categories that are meaningful for *Iriartea*. They suggest that with four critical pieces of information, a reasonable model of a population's dynamics can be made; this information includes age of first reproduction, survival rate of juveniles to reproductive age, fertility of adults and annual survival rate of adults. The age of first reproduction in *Iriartea* occurs when the palm reaches about 10 m in height (personal observation). Pinard and Putz (1992) reported not only high seedling mortality but also low adult mortality in their review of palm population studies.

To calculate survival probabilities, mortality among marked individuals in the study plots was observed and incorporated into records from 5-year inventories in three of Jatun Sacha's 1 ha permanent plots. Growth rates were based on a sample of individuals (n = 60) observed for one or two years. Reproductive rates were inferred from fruiting, germination and seedling observations from the number of mature infructescences on individuals within the 15 study plots (total individuals sampled = 270; adults with mature infructescences sampled = 65), with the number of fruits from an infructescence based on a sample of 10 harvested *Iriartea* individuals. Germination experiments indicated the percentage of fruits likely to produce seedlings. Survival of seedlings was monitored in a nursery for six months to determine the fecundity rate used in the matrix models. The reproductive rate of the palms was based on an estimate of the number of seedlings expected to survive within forest plots, by reference to the nursery experiments. All the rates were calculated on a per hectare basis. (See Table 7.1 for an example of the matrix constructed from this information). While nursery- and forest-growing conditions are unlikely to be the

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[2] The probability of moving from one stage to the next or of remaining in the same stage during a specified time period, often one year.

same, Pinard and Putz (1992) found 'errors in estimating sexual reproductive output have only a minor effect on lambda values relative to survival and growth parameters'.

The sample transition matrix is based on the proportion of individuals in each life-cycle stage remaining in that stage (upper diagonal) or moving on to the next stage (lower diagonal) each year. These two proportions sum to less than 1.0 because mortality is subtracted. The top row provides fecundity values for adult stages. Solving for lambda of this matrix provides an estimate of future population growth or decline, assuming conditions remain constant. The stable stage distribution indicates the proportion of the population in each stage over time (scaled with the first stage = 1). The column labelled 'n per hectare' provides the observed distribution of stages on a hectare basis for this forest type.

Using the mean growth rate, lambda was found to be greater than 1.0 in all forest types. In other words, the *Iriartea* population is expected to increase, regardless of forest type. The distribution of juveniles and adults was significantly different ($p = .05$) in secondary forests compared with the two mature forest types. The two mature forest types did not differ significantly from each other. The distribution of seedlings did not differ significantly among the three forest types. Observations suggest that seedlings survive to become juveniles more often in secondary forests than under a closed canopy. In mature, but not closed, forests where streams or steep slopes change light levels, juveniles survive to become adults more often than in closed forests. The stilt roots of the palm would seem to provide an advantage in this forest type where it is found abundantly along stream edges and ridges where soils may be subject to erosion pressures.

Although matrix models in this analysis provide estimates of the finite rate of population increase under the assumption that growth, mortality and fecundity remain constant, the finding that lambda is greater than 1.0 in three different growing conditions suggests that *Iriartea* is likely to be able to recover from strong harvesting pressures. Despite this robustness under forest conditions, observations indicate that seedlings do not survive on pastures where grasses are dominant, even after cattle no longer graze. Although the natural rate of replacement in secondary forests suggests harvesting could be sustainable given sufficient time for regeneration, pastures where regeneration does not occur, hold little hope for maintaining stocks of this resource.

## Harvesting simulation

Two kinds of tests using the matrix model were carried out to understand the potential impacts of harvesting. First, effects of harvesting at increasing intensities were simulated by systematically reducing the survival probabilities for adult stages with individuals greater than 15 m tall. Although stem harvesters usually target palms of at least 20 m in height, shorter individuals of 18-20 m are sometimes cut, and increased harvesting might encourage cutting of smaller trees. In this simulation, the proportion of individuals remaining in the last two life stages was reduced by 10 per cent, 20 per cent, 30 per cent and 40 per cent. In the mature forest model, increased harvesting of individuals over 20 m reduced lambda from 1.009 in the unmodified matrix to 0.996 with a 10 per cent reduction in individuals, 0.991 with 20 per cent, 0.988 with 30 per

**Table 7.1** Sample transition matrix

*Examples of transition matrices using mean growth rate: $M_a$ based on secondary forest data; $M_b$ based on mature forest data. The top row of each matrix shows fecundity rates for adult palms; the major diagonal shows the probability of surviving and remaining in the same size class; the subsdiagonal gives the probability of surviving and growing to the next size class.*

## a. Secondary Forest

| Size class | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| | Seedling | 0.2 - 0.5 m | 0.5 - 5 m | 5 - 10 m | 10 - 15 m | 15 - 20 m | > 20 m |
| | 0.02231 | 0 | 0 | 0 | 253 | 253 | 285 |
| | 0.00069 | 0.8439 | 0 | 0 | 0 | 0 | 0 |
| $M_a$ | 0 | 0.1261 | 0.9215 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0.0485 | 0.8827 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0.0873 | 0.819 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0.156 | 0.8775 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0.0975 | 0.9555 |

lambda = 1.014
lambda = maximum real eigenvalue

| Size class | Height (m) | N per hectare | Stable distribution |
|---|---|---|---|
| 1 | Seedling | 588 | 1 |
| 2 | 0.2 - 0.5 | 224 | 0.004 |
| 3 | 0.5 - 5 | 64 | 0.006 |
| 4 | 5 - 10 | 6 | 0.002 |
| 5 | 10 - 15 | 6 | $9.141.10^{4}$ |
| 6 | 15 - 20 | 14 | 0.001 |
| 7 | > 20 | 4 | 0.002 |

## b. Mature Forest

| Size class | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| | Seedling | 0.2 - 0.5 m | 0.5 - 5 m | 5 - 10 m | 10 - 15 m | 15 - 20 m | > 20 m |
| | 0.02231 | 0 | 0 | 0 | 136 | 139 | 289 |
| | 0.00069 | 0.8439 | 0 | 0 | 0 | 0 | 0 |
| $M_b$ | 0 | 0.1261 | 0.9215 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0.0485 | 0.8827 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0.0873 | 0.819 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0.156 | 0.8775 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0.0975 | 0.9555 |

lambda = Re(max(EV))
lambda = 1.009

| Size class | Height (m) | N per hectare | Stable distribution |
|---|---|---|---|
| 1 | Seedling | 942 | 1 |
| 2 | 0.2 - 0.5 | 16 | 0.004 |
| 3 | 0.5 - 5 | 20 | 0.006 |
| 4 | 5 - 10 | 28 | 0.002 |
| 5 | 10 - 15 | 14 | 0.001 |
| 6 | 15 - 20 | 60 | 0.001 |
| 7 | > 20 | 54 | 0.002 |

Note: “Stable distribution” refers to “Population rate increase at which population in this size class is stable”.

cent and 0.986 with 40 per cent. Increased harvesting of individuals 15-20 m similarly decreased lambda from 1.009 to 1.001, 0.995, 0.992 and 0.989 for the same rates. In the secondary forest models, a lambda of 1.014 fell to 1.004, 1.001, 1.000 and 0.999 when adults over 20 m were harvested, and to 1.006, 1.001, 0.997 and 0.995 when the 15-20 m stage was harvested.

The second test, reduced the number of adults over 15 m tall from the observed frequencies to zero to simulate a harvest of the entire economically useful population in each forest type. The revised distribution was repeatedly multiplied by the transition matrix until the original number of adults over 15 m returned. Using this technique, managers can determine appropriate harvesting levels in a given setting. In the mature forest plots, 114 individuals (over 15 m tall) per hectare were observed. If all these individuals were cut, the forest would return to the observed values after 220 years with no further harvesting. In the secondary forest plots, 18 individuals of this size were observed per hectare. If all these individuals were cut, the recovery time is 15 years. As demonstrated earlier, the change in lambda for harvesting secondary forests is less than that in mature forests.

Clearly the recovery time differences between mature and secondary forest involve more than simply the numbers of individuals cut. In the mature forest, relatively few individuals are available in the smaller stages to grow and replace the harvested adults. Recalling the distribution in secondary forests, many more small palms are available to grow and replace the lower number of harvested adults. If the growth continued in the secondary forest for 100 years, 120 adults per hectare would be predicted. However, environmental factors are unlikely to remain unchanged over that 100 years even if the area could be set aside and protected from harvesting.

Unfortunately, there are no convenient rules of thumb for stem harvesting (e.g., 'cutting up to 10 per cent of mature individuals is sustainable'). In this case, if 10 per cent of the mature forest adults over 15 m were cut, the estimated recovery time would be 80 years. Recovery times and shifts in rates of population change can be useful for informing management decisions, but both require an understanding of the population dynamics and also the current population structure of the area to be harvested. Using these techniques, managers can estimate appropriate harvesting levels in a given setting, based on careful observation of the distribution of sizes as well as rates of growth, mortality and fecundity.

## Economic Considerations

Knowing the theoretically sustainable level of harvesting from an ecological perspective is necessary, but not sufficient, information for assessing the sustainability of a species. Economic influences on harvesting must be examined as well. To better understand the economic influences on *Iriartea* stocks and flows, studies were conducted of households in indigenous communities who participate in markets for palm stems or who harvest palms for their own use. The focus of this work was to understand the stock likely to be harvested in relation to market and transportation systems, and the market forces encouraging expanded harvesting of *Iriartea*. This

information was integrated into a decision making model that shows those conditions where people are likely to harvest more or less *Iriartea*.

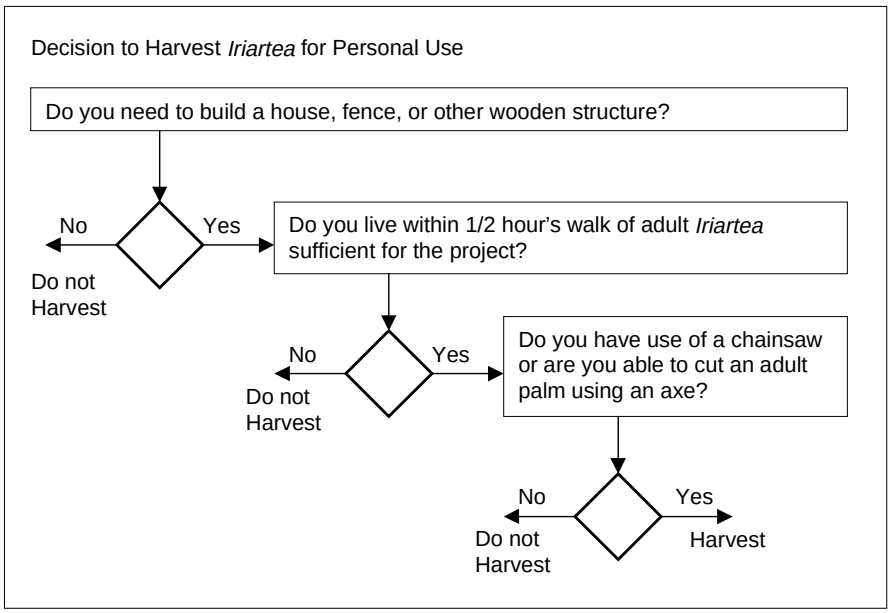
The sample of harvesters was selected by consulting accessible actors in the market, including carpenters in Puyo, the capital of Pastaza Province, who purchase palm stems as raw materials for furniture, and shopkeepers who sell handicrafts made of *Iriartea* to tourists. Six of the eight carpenters who sell *Iriartea* furniture or household items and the owner of a parquet flooring factory were interviewed. Foresters, an agronomist and Peace Corps volunteers in the area also provided information. Fourteen households and six nursery workers were surveyed and four harvesters discussed harvesting the palms and allowed measurement of felled trees.

Patterns of current demand in the marketplace for *Iriartea* were identified. The carpenters explained the quantities of stems purchased and the expected prices. The owners or managers of four stores that specialise in tourist items in Puyo provided information, and the quantities and prices of all *Iriartea* products sold in the largest store during July and November 1996 were recorded. Merchants in tourist stores in Tena and three other towns along the Napo river in eastern Ecuador provided a general picture of the source of harvesting pressures. For example, new demand for *Iriartea* arose when a major chicken purveyor decided to build chicken houses from the stems. Men with trucks and cash visited villages and offered prices that were slightly less than could be found in Puyo, but transportation was provided and the price was guaranteed. Residents thought that if another round of chicken house construction occurs, most adult *Iriartea* within carrying distance of the road could be harvested.

To analyse the harvest decision making process, structured interviews were held with harvesters and users of palm stems. Interviews provided information about different uses for the palm by men and women; whether personal use depends on distance of the household from *Iriartea* in the forest; and whether harvesting for sale depends on access to transportation, prices or distance to the resource in the forest. These data contributed to understanding how people decide to harvest the palm for construction or other household uses and for market-oriented, income-producing activities. The prices received for palms by harvesters, as well as the prices for palm products sold in markets were determined to establish a range of values for forest products made from *Iriartea*. By combining an analysis of the decision making process with an analysis of prices (one of the major variables in the decision to harvest), the effects of changing prices on the decision to harvest can be estimated. An example of part of the decision model is given in Figure 7.2.

The methods used in this study helped to demonstrate that proximity to the resource, access to transportation and confidence about sales at an acceptable price are key factors influencing harvesting of *Iriartea* for the market. Harvesting levels for personal use depend more on the need for construction materials and the choice to clear land for agriculture as well as proximity to adult *Iriartea*. If harvesting requires carrying stems out of the forest (not on mule or horseback) for more than one hour, harvesting becomes much less likely. Key decisions of harvesters include: Is the price high enough? Is the market reliable enough? Can the stems be transported? Can equipment (such as chainsaws) be repaired if damaged while harvesting?

**Figure 7.2** Sample decision making process for harvesting *Iriartea*




Conditions that affect the stock of the resource include the forest type and its history of use, the distance to roads to transport stems, and proximity of the resource to settlements.

The effects of other variables on decision making about harvesting can also be included in the analysis. For example, analysis could include the conditions under which current harvesters increase their harvesting efforts or current non-harvesters are likely to begin harvesting. In Pastaza Province, the sales to chicken growers brought new actors into the market for *Iriartea*. The success of a few carpenters in Puyo led other carpenters who already had the necessary equipment to begin making items from *Iriartea*.

Problems arose with constructing the decision making model for *Iriartea* because harvesting is often an intermittent activity, and interview questions were necessarily retrospective in most cases. The primary reasons given for harvesting were either to clear agricultural plots or to supply a customer who had placed an order for stems. The decision was then quite simple, and the model would add little information to that acquired from simply interviewing respondents. With other products, especially ones with a more regular market or a seasonal market that could be observed, a decision making model is likely to be more complex and may provide additional insights.

## Linking Ecological and Economic Information

Demographic and harvesting information can be linked to better understand the likelihood of sustainability of a species. The economic information suggests that

traditional uses are limited (people do not need a new house every year) and trends towards modernisation make substitute construction materials like concrete and sawn boards appealing to some people who once lived in traditional houses. The constraints of expensive transportation and the need for special equipment (because the stems are heavy and very hard) make a large increase in harvesting seem unlikely, unless the prices paid become very high or demand increases from outside the local area. On the other hand, this optimum could be short-lived in the context of a region where markets might not expand rapidly, but where improved roads and population pressures can bring new colonists and fresh conversion of forests to pastures.

The demographic information indicates that the resource can be harvested sustainably within the bounds of natural replacement rates. Nevertheless, a resource that can take 100 or more years to reach harvestable size could become vulnerable to overharvesting if demand increases for new uses like chicken houses or electric power poles as modernisation occurs in remote areas of the country. Little is known about the potential for plantations or agroforestry projects as an alternative to forest extraction for production of this species, and the biological constraints on the growth of new seedlings make the species an unlikely candidate for reforestation efforts in abandoned pastures.

Economic and ecological information can be integrated in the policy arena by determining safe minimum standards for harvesting *Iriartea* from a given land area. A safe minimum standard can be set for the stock of each species to address the risk of irreversible change to an ecosystem and the cost of extraction (e.g., Tisdell 1988; Toman 1992; Turner *et al.* 1993). Setting and applying such standards relies on social processes of determining an acceptable level of potential risk of loss and taking steps to develop standards and protection against practices with unacceptable levels of risk. Monitoring is necessary to assess the adequacy of the standards (Gunderson *et al*. 1995).

The analysis of *Iriartea* above indicates that the palm is abundant and of high fecundity, so it can tolerate a relatively high level of use. Traditional uses and harvesting methods among sparsely populated communities are very likely to be at the 'reversible' or low end of the risk continuum. On the other hand, the species can be wiped out when land is converted to pasture because it cannot reproduce in the pasture environment. However, if reproductive individuals have been spared during clearing and subsequent secondary forests are managed for *Iriartea* regeneration, the effects of converting forest land to pastures can be reversed. Safe minimum standards can be set by local policy makers who assess the risks of losing *Iriartea* in a given area and weigh those risks against the possible gains from alternative activities. Improved transportation and increased colonisation with associated land clearing could push the resource off the landscape of the future. Some regions in Ecuador have seen *Iriartea* virtually disappear in one human generation; former residents of Santo Domingo de los Colorados said they feared the palm would be gone from eastern Ecuador within ten years, just as they had seen it disappear as the forest was converted into pasture land in western Ecuador. Should future generations be

guaranteed access to a house with a floor made of *Iriartea* or is a concrete floor an acceptable substitute?

Should future generations be entitled to a forest with agoutis, monkeys, bats, tapirs and other animals that depend on the fruits of *Iriartea* for at least some of their food? Or will these animals be long gone because of hunting pressures before the loss of *Iriartea* threatens them? Perhaps the standard for sustainable harvesting might well be to ensure that enough forest remains to protect as yet unstudied processes. In the meantime, the people of Ecuador might want to decide that even if ecosystems are not lost when this particular palm is overharvested, clearing land for individuals increases the level of risk to the forest heritage for the country's future generations. It is up to them to take action when risk becomes unacceptable. The demographic and harvesting information presented here can help provide a clearer picture of the risk and provide a basis for determining standards.

## Conclusion

This research focuses on one economically important species with a wide distribution in the neotropics and provides an example of methods for using ecological and economic information to assess the sustainability of that species. By studying the life history and population biology of a species, it is possible to determine if current harvesting levels threaten the future of this abundant resource. The techniques of population ecology and demography can answer the questions: Where is the resource and how much is there? Matrix models can be used to analyse the effects of change if harvesting increases. Ethnographic interviews can help to answer these questions with regard to markets and transportation, as well as to understand more about the pressures for change in the practices of the harvesters, artisans and carpenters who depend on this palm for at least some of their livelihood.

Several methodological lessons can be drawn from this experience. First, the interpretation of sustainability used here emphasises maintaining current levels of the resource and understanding pressures affecting its density and distribution. The population levels we find now might represent a major loss of the species if we had comparative information about distribution from one or two generations ago. Sustainability inevitably involves a decision to choose some point in time as a standard to preserve. Because the ecological research was conducted for a limited time and within the bounds of a research station, current levels reported may not represent the full biological potential of the species.

Secondly, the concept of stocks and flows provided the opportunity to discover that while measuring stocks is not without difficulties, it is much easier than measuring flows. Because harvesting and sales are intermittent activities, it is difficult to observe the market. Information about harvesting, purchasing stems or sales of furniture is almost always retrospective.

Finally, integrating demographic, harvesting and demand information provides a basis for understanding the interplay between stocks and harvest decisions, which

may be missed by focussing on only biological or economic influences on sustainability.

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Chapter Eight

# Estimating the Incomes of People who Depend on Forests

Eva Wollenberg and Ani Septiani Nawir

Estimating the incomes of people whose livelihoods depend on forests is key to understanding their well being and use of the forest. Yet there has been little agreement about the methods to undertake such assessment. Although much has been written about methods for assessing the value of non-timber forest products (de Beer and McDermott 1989; Godoy and Lubowski 1992; Kengen 1997) and about the income of rural producers (see Cornell Working Papers Series in Agricultural Economics, especially Leones and Rozelle 1991; World Bank Living Standard Measurement Studies, especially Grootaert 1986, Vijerberg 1991, Ravallion 1992), these conventional income assessment methods are not easily applied to the estimation of forest incomes. The remoteness, diversity and number of forest products make applications of these methods too costly for many research projects.

The aim of this chapter is therefore to review the strengths and weaknesses of the methods available for determining forest people's incomes. Ten case studies are examined to demonstrate methods used for quantifying household income. Attention is given to how the case study researchers address two challenges characteristic of forest-based incomes. First, the large numbers of forest products, the irregularity or unpredictability of their collection and their geographical dispersion make data collection unusually time consuming and costly. Second, as forest communities tend to be remote and far from markets, there is a higher likelihood that the value villagers assign to products reflects a mix of value systems, including market exchange, monetary transfer, barter, use and reciprocity potential (Campbell *et al.* 1995). There is thus no simple way to sum the values of products along one dimension or to provide monetary values for comparison with other studies.

## Why Estimate Incomes? The Policy Context

Income is an important indicator of forest villagers' well being. Analysis of the forest-based portion of villagers' income can provide insights about people's resource management and livelihood strategies (Mary and Michon 1987; Falconer and Arnold 1989; Malhotra *et al*. 1991; Anderson 1992; Peluso 1992; Emerton 1996). Income can also be used to assess the impacts of programmes on community forestry, enterprise and market development, extractive reserves and integrated conservation and development areas intended to improve local villagers' livelihoods (Wells and

Brandon 1992; Fisher 1995; Lynch and Talbott 1995). The economic impacts of these programmes, either on people or the forest, are rarely examined and therefore not well understood (World Bank 1997).

Income, either potential or real, has also been used as a measure of the value of the forest and people's dependence on it (Peters *et al*. 1989; Godoy and Bawa 1993; Gunatilake *et al.* 1993; Melnyk and Bell 1996; Kengen 1997, Colfer *et al.* 1997). Calculation of that value has been used to yield insights about people's incentives for engaging in certain uses of the forest (Clay and Clement 1993; Gunatilake *et al.* 1993) and to assess the trade-offs among different possible land uses (Rose 1988; Peters *et al*. 1989; Hecht 1992; Grimes *et al.* 1994). Trade-offs between the value of non-timber forest products (NTFPs) compared to other, presumably more destructive uses of the forest such as logging have been the focus of most of this work (Peters *et al*. 1989; Gunatilake *et al.* 1993; Godoy *et al.* 1995; Melnyk and Bell 1996).

Despite the importance of such information, a review of income and livelihood studies shows that the methods used to determine income or economic value are rarely described in sufficient detail to allow others to replicate the results or even undertake comparative studies (Flohrshutz 1983 cited in Anderson and Ioris 1992; May 1986 cited in Anderson *et al.* 1991; Heinsman and Reining 1988; Alcorn 1989; Anderson 1992; Falconer 1992; Godoy and Lubowski 1992; Peluso 1992; Reining *et al.* 1992; Sellato 1994; Godoy *et al.* 1995; Rajan 1995; Cavendish 1996; Dury *et al.* 1996; Emperaire 1996; Schreckenberg 1996; Almeida 1997; Lim 1997; Puri 1997). Where methods are described, they usually differ among studies. This chapter provides a closer look at the methods used in selected cases and compares their strengths and weaknesses. The review and discussion should enable researchers to make more informed choices about which methods to use and encourage them to be transparent in reporting about them.

## Defining Income

When selecting assessment methods, it is necessary to define what kind of income is of interest. Income is defined here as total revenues less total costs (Leones and Rozelle 1991). When reporting income it is necessary to clarify whether one is referring to gross income (revenues less cash costs) or net income (revenues less cash and imputed costs such as depreciation or the opportunity costs of inputs). Total income is used here to refer to cash income plus the value of consumed items. For forest dwellers, the non-cash or in-kind income, usually forest and agricultural products, is often a significant portion of incomes. In the ten cases reviewed here, most authors used income to mean gross income. Cash costs and especially imputed costs were inconsistently handled. Income-in-kind was included for only a limited number of studies and the breakdown between cash and non-cash income was usually not specified.

Forest villagers' incomes are reported relative to the receiving social entity (income per household, per capita or for an enterprise) or inputs (income per hectare of forest,

per productive member of a household, per tree). The former is useful for understanding well being and social status. The latter helps to assess the returns to labour, land or other production inputs.

Quantifying forest incomes raises the question of how to define forest income and forests in a standard, generaliseable way. Forest income is defined here as that derived directly from forest products. It is distinguished from wage- or trade-derived income that may be related to forests. The FAO (1993:10) defines forests as 'ecosystems with a minimum of 10 per cent crown cover of trees and/or bamboos, generally associated with wild flora, fauna and natural soil conditions, and not subject to agricultural practices'. It includes open and closed forest, as well as long fallows (presumably some agriculture is acceptable if fallows are included). Forest is distinguished from 'other wooded land' (shrubs and short fallows), plantations and non-wooded areas. 'Notified forest' refers to land that has been gazetted or demarcated as forest land, but which may or may not have any forest vegetation.

**Glossary**

- **Income** is total revenues less total costs associated with an economic activity such as a forest product enterprise.
- **Revenue** is usually cash received from the exchange of forest products in the marketplace. Costs are not subtracted. May also be used to describe in-kind benefits received where specified.
- **Gross income** is revenues less cash costs.
- **Net income** is revenues less cash and imputed costs such as depreciation or the opportunity costs of inputs.
- **Total income** is cash income plus the value of consumed or stored items intended for consumption.
- **Income-in-kind** is non-cash income such as gifts, food items intended for home consumption, or timber intended for home use.
- **Costs** are outlays associated with an economic activity. May include cash costs and imputed costs.
- **Imputed costs** are costs that reflect losses to income but do not take the form of cash expenses for a given time period. May include the depreciation of equipment, the value of unpaid labour or the opportunity cost of production materials.
- **Valuation** is the assignment of a value or ranking of preferences to an item. Money is probably the most common standard used to describe value. Monetary valuation is the assignment of currency-based values. Value may also be assigned using other standards such as energy use, calories provided or social status.
- **Imputed value** is estimated monetary values not derived from direct exchanges of cash.
- **Marketed products** are products exchanged between a buyer and a seller involving money or barter transaction and a price (or price equivalent) for the product.
- **Potentially marketed products** are products that have been or could plausibly be sold, purchased or bartered, but that have been used (or are intended to be used) for home consumption.
- **Non-marketed products** are products that have never been exchanged for money and are not likely to be.

Although the FAO definition provides a useful starting point, any application will yield its own ambiguities and require site-specific interpretation. How should forest animals that have been hunted on agricultural lands be classified? It may be useful to give a breakdown of products by the land type from which they were collected, e.g., long fallow, short fallow, primary forest, river edge or agricultural land planted to perennials.

## Methods for Estimating Levels of Income

The methods here focus on collecting primary information. While secondary income data are available from government census information and national income accounts,[1] such figures are a poor estimate of most forest dwellers' actual incomes. The products accounted for in government surveys are openly traded and cultivated products rather than consumed, forest-based or illegal. It is precisely the lack of reliable information that has led to the need for collection of primary income data and corresponding research methods.

The sensitivity of forest income information may be heightened in forest situations where villagers are considered illegal occupants of the forest (Gunatilake *et al.* 1993). Researchers can act to reduce sensitivities by building trust and rapport with people. Income questions can be asked last in an interview. Questions can focus on the income-earning activities and the itemisation of revenues and costs, rather than the specific income figures. Answers can be reported as income ranges. Although difficult in many village contexts, anonymity of data results can be attempted. To guard against the biases due to under-reporting, the researcher can check reported totals against the detailed breakdown of an economic activity. The difficulty of acquiring income information has led some researchers to rely on expenditures as a proxy for income. Where household savings are low or non-existent, expenditures can closely approximate income (Peters 1996).

In addition to income from forest products, villagers may rely on income from: agricultural production; livestock; wage labour; full-time employment; sale of items produced in the home such as tools, alcohol and snacks; trading; remittances; rental income; interest on loans; gifts; government assistance; 'mortgage' payments; or yields from sharecropping arrangements. Preliminary studies can help determine the patterns of each income activity and kind of information needed about each. For example, income from livestock sold can be estimated according to payment received, while income from livestock used as draft animals may be approximated by the fee paid for the use of animals by others (Gunatilake *et al.* 1993). Where questionnaires

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[1] National income accounts refer to calculations of gross domestic product (total value of goods and services produced annually) based on industry reports, trade association production information, government statistics and other formal records about economic production. Government statistics offices often use GDP to calculate household income by taking the income for a region and dividing by its population (Chandrasekharan 1995; Jose Garcia-Garcia, World Bank, Indonesia Mission, personal communication).

are used, a supplementary page may be created for different income activities to reflect these variations (Leones and Rozelle 1991).

## Estimating income in practice: ten cases

To examine the range of methods used for measuring household income among forest dwellers, ten cases are reviewed (Table 8.1). The cases were selected based on meeting at least three out of four criteria: (1) frequency of their citation in the literature; (2) inclusion of sufficient detail reported about methods used; (3) their contribution of additional methodological insight; and (4) geographic distribution. All studies quantified income, although some used incomes to calculate forest value rather than household income.

The cases demonstrate methodological insights and innovations in practice that might be useful to other researchers. They show the suitability of different techniques for different purposes, each with its own trade-offs. While readers might be tempted to conclude that the method with the most comprehensive and detailed information collected through direct observation is 'best', the table shows that, for any research effort, there are trade-offs among the quantity of information collected, the way it is collected, the sample size and the resulting accuracy, precision and generaliseability. The ten cases are therefore not necessarily exemplary and no one case's methods are necessarily recommended. The purpose of the discussion and guidelines is help to make these trade-offs more transparent and explicit.

In addition to information available from the case studies, the authors illustrate several points with their experiences from studying income and livelihoods among forest villagers in Krui, Sumatra, and Bulungan, Kalimantan, Indonesia between 1994 and 1997.

## Challenge One: Capturing abundant information from remote areas

The first issue facing researchers is how to simplify information needs to make the data feasible to collect. Villagers may collect anywhere from one to hundreds of products from the forest and depend on ten or more sources of non-forest income. Each income source might differ significantly in terms of labour use, technology, seasonality, transportation costs and revenues. Some income sources may be far from the village.

The research challenge arises when the abundance or complexity of economic activities and the remoteness or irregularity of their occurrence make reliable techniques prohibitively expensive. Even interviews based on recall information can become costly and unreliable because of the difficulty respondents may have in remembering details. Schreckenberg (1996) found that it took an average of 12 weekly meetings with village women's groups to elicit all major NTFPs and the details of their use. Godoy *et al.* (1995) reports using interviews averaging four to six hours to survey Sumu villagers about their incomes and wages. Interviews of Kenyah, Punan and Lundaye villagers in Kalimantan about all sources of income and expenditures ranged from two to five hours per household (Wollenberg *et al.* forthcoming).

**Table 8.1** Summary of income data and methods reported for forest dwellers income

| Type of Income Described | Location | Sample | Identification of Products Used or Collected | Determination of Value | Costs and their Calculation | Reference |
|---|---|---|---|---|---|---|
| Monetary and non-monetary household income, NTFP focus | Bocay river and eastern territory of Sumu, Nicaragua | 1-5 households from each of 11 Sumu communities | Recall interviews of male household heads, with lists of products collected, hunted, cultivated or raised (except medicinal plants and construction materials). Villagers were asked to recall estimates of goods extracted or produced. | Combination of either village retail price of the good, or asking 'how many pounds of beans 'respondent willing to exchange'. Fuelwood valued according to labour used to cut and transport wood. Wages calculated from actual value. | *Labour:* nominal wage determined by calculating the sum of typical local wages and food, cigarettes and drinks provided, collection times not reported. *Other:* no transport costs. | Godoy *et al.* 1995 |
| Monetary and non-monetary household income, NTFP focus | Knuckles National Wilderness Area, Sri Lanka | 60 households, stratified random sampling | Structured questionnaire and checklist for prompting. | Combination: Farm and forest gate prices used; where no local price available, used price from nearest market centre and deducted transportation costs; where no market price available, used price of substitutes; where neither possible, used willingness-to-pay. Animals used for draft purposes valued by daily payment for use. | *Labour:* not deducted. *Other:* transportation costs, where market price used. | Gunatilake *et al.* 1993 |
| Monetary household income from açai, cacao and rubber | Combu Island, Brazil (Amazon estuary) | 5 households over 5 years (1984-88), 87 households from community of 98 | Production records of landowner (half of all production given to landowner by users). General questionnaire. | Market price: Monthly revenues from sales, based on production records of landowner. | Not reported. | Anderson and Ioris 1992 |
| Monetary household income, forest and fallow goods | Iquitos market area, Peru (Amazon) | 13 villages surveyed, 5-10 households in each | Recall interviews Products classified by origin from forest/fallow. | Market price: Income realised from sales. | *Labour:* not measured. *Other:* transport costs of goods. | Padoch 1988 |

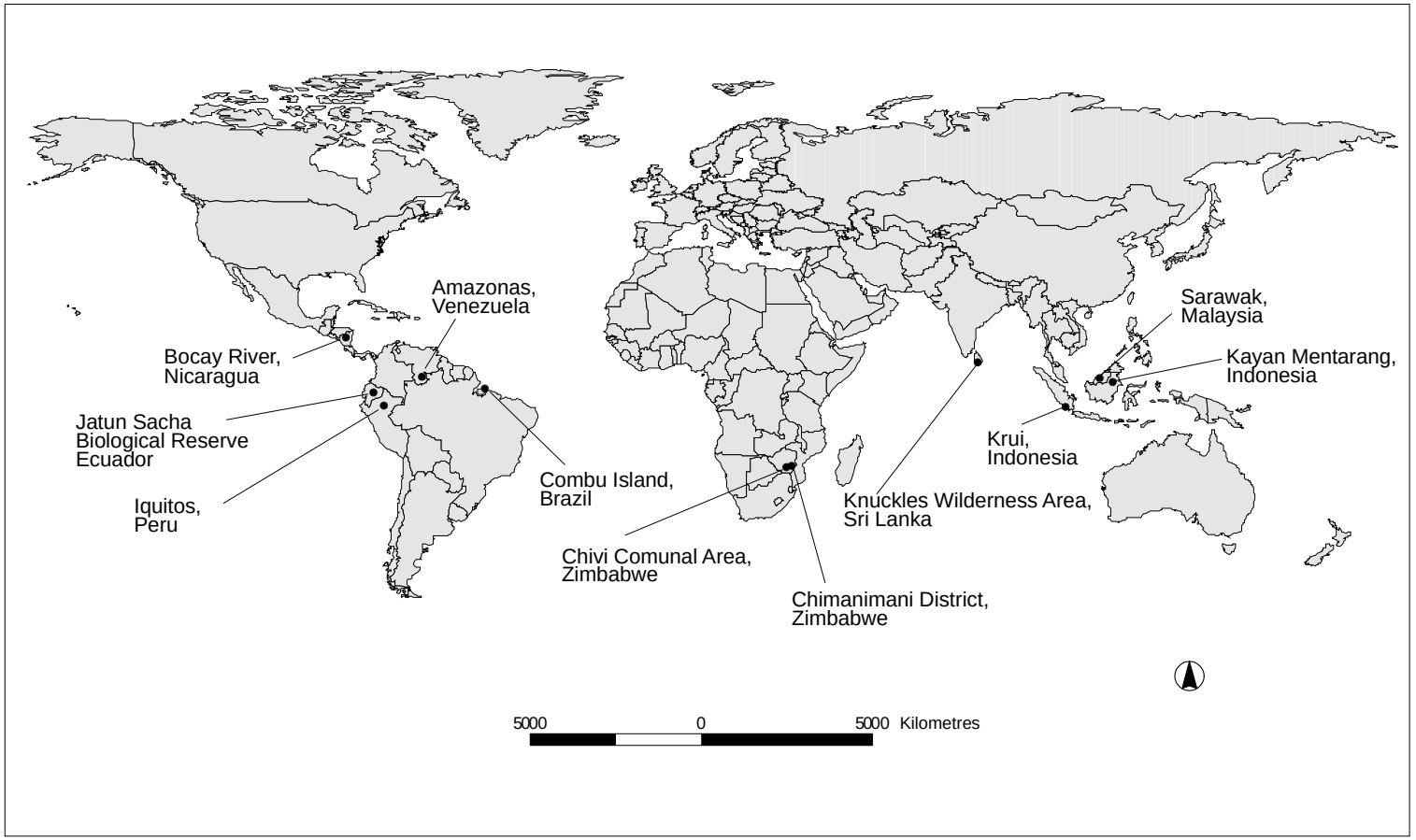
**Table 8.1** (continued) Summary of income data and methods reported for forest dwellers income

| Type of Income Described | Location | Sample | Identification of Products Used or Collected | Determination of Value | Costs and their Calculation | Reference |
|---|---|---|---|---|---|---|
| Use value of woodlands | Chivi Communal Area, Zimbabwe | 213 households from 29 Shindi villages, random sample | Quarterly recall interviews of income, consumption and expenditure on a quarterly basis, plus beginning- and end-of-period surveys over one year. | Combination: Market price from local trading price or household reported price; for products not marketed, used market prices of close substitutes; where no substitute, asked value of good in Zimbabwean dollars. | *Labour*: not measured.<br>*Other:* production inputs such as fertilisers, crop inputs, firewood, purchased goods. | Cavendish 1996 |
| Use value of wild foods to households | Amazonas State, Venezuela | 1 and 3 house-holds from two Huottuja villages: 100% and 10% sample, observed over 12 months | Direct observation of food products collected; alternated between villages; 3 weeks per village with 4-5 days with each household in second village. | Combination: Market prices from monthly market surveys; substitute prices for products not in market; products without market price or substitutes not included. Prices were applied on monthly basis to products collected. | *Labour:* collection and transportation time, using local wage rate.<br>*Other:* Shot gun shells and fish hook costs, but not guns, machetes or fish lines. Transport cost not included since food is for consumption. | Melnyk and Bell 1996 |
| Value of woodland to households | Chimanimani District, Zimbabwe | 23 and 36 households from 2 villages; random sample stratified by wealth; 12 products | Identification by participatory mapping of land use types and products from land type. Recall interviews of households. | Combination: Market price from survey for 9 products; calculated product values in relation to range of labour and market prices. Use of role play and ranking of non-market values. | *Labour:* collection time, using range of local wages, constant of 5 km/hr used to determine travel times. Where times not available used 40% of market value (following Peters *et al.* 1989)<br>*Other:* tool costs not included; negligible. | Campbell *et al.* 1995 and Campbell *et al* 1997 |
| Value of marketable products from 1 hectare | Mishana, Peru (Amazon) | 7 edible fruits, 4 palms, rubber, 60 tree species in 1-hectare plot | Botanic inventory, market verification. | Market price: Average retail prices collected by monthly market surveys; information from bank for rubber prices; and 4 sawmills for timber prices. | *Labour:* collection time based on interviews and direct observation; used min. daily wage in Peru.<br>*Other:* Assumed transport costs of 30% total market value for fruit and latex; used estimate of 40% of timber value for timber extraction costs. | Peters *et al.* 1989 |

**Table 8.1** (continued) Summary of income data and methods reported for forest dwellers incomes

| Type of Income Described | Location | Sample | Identification of Products Used or Collected | Determination of Value | Costs and their Calculation | Reference |
|---|---|---|---|---|---|---|
| Value of marketable products from 3 hectares | Jatun Sacha Biological Station, Ecuador (Amazon) | 7 fruits, 3 medicinal barks and 1 resin species from 3 one-hectare plots | Botanic inventory, market verification; interviews in forest with 8 local collectors to estimate annual yield. | Market price: observations, interviews with buyers and sellers; visits to 4 markets over 2 years. | *Labour:* estimated collection, transport and sales time from on-site interviews of collectors; examined as a function of harvest amounts; used local wages.<br>*Other:* processing and packaging costs. | Grimes *et al.* 1994 |
| Value of hunted wildlife for a region | Sarawak, Malaysia | 3 sources: (1) 220 communities; (2) 979 hunting trips; (3) hunting activity in 3 villages for 7-15 months | (1) Recall group interviews of community leader and experienced hunters; (2) recall interviews about individual hunting trips; (3) daily record keeping; (4) ammunition usage. | Market price: Current market price of equivalent food (e.g., mixed grade pork at M$9/kg). | *Labour:* collection time based on recall interviews about hunting trips; calculated average of 13.4 man hours per animal killed; assumed 30% wastage for bearded pig and 45% for other species. | Caldecott 1988 |

**Figure 8.1** Location of study sites from Table 8.1



The ten case studies provide insights about how this challenge has been met in practice. Three strategies are apparent. The authors of the case studies simplified the logistical burden by using: (1) small sample sizes; (2) a limited number of products; or (3) recall interviews, estimates or written records rather than direct observation. The strengths and weaknesses of each strategy are discussed below.

### *Small sample size*

Small sample size allows for collection of more detailed or accurate information. In Table 8.1, the case with the smallest sample (four households, Melnyk and Bell), is the only case where all information was collected through direct observation. About half the cases in Table 8.1 relied on relatively small samples of one to ten households, especially at the village level. Only three studies report using random sampling (Gunatilake *et al*., Campbell *et al.* and Cavendish). Other authors readily acknowledge that small sample sizes compromise the representativeness and generaliseability of the findings. Small samples represent a basic weakness in most studies of income and raise issues about the feasibility of monitoring large populations. Where generalisebility is important, it may be most efficient to use nested sampling techniques, where in-depth studies are conducted for small samples of the population and articulated with less time-consuming studies with larger samples.

Although the number of people or households sampled may be small, most studies seek income information for a period of at least one year. The one-year time frame is designed to capture seasonal variation. While one year may be adequate for agriculturally based incomes, it may not adequately capture the variability in productivity and collection of forest products from year to year (Godoy and Lubowski 1992). Dipterocarp species for example may fruit only once every two to five years. Among the case studies, only Anderson and Ioris looked at income for more than one year. Their five-year study was possible because of the availability of landowner records. Such information is not available at most sites, although traders' records might be used as an indicator of the multi-year trends for some products. Traders' records however give no indication of in-kind income or collectors' costs. The researcher must judge the possible biases in the data as well.

### *Limited number of products*

One of the most effective ways to focus studies of forest-based income is to limit the number of products investigated. The extent to which this is possible depends on the study's purpose. Focus is most accurate where there is already a clear prior understanding of overall income structure (sources, quantities, timing, distribution) and the role of the selected products. Most case studies in Table 8.1 focus on marketed products, which significantly reduced the numbers of items for which data had to be collected. It also reduced the need for collecting valuation data. Campbell *et al.* limited their study to 12 products not only marketed, but also regularly used. They selected the products on the basis of participatory rapid appraisal (PRA) exercises. Anderson and Ioris examined only three products because those were the ones for

which historical records were available. Melnyk and Bell looked only at food items and eliminated products for which adequate price information was unavailable. Since the amount of time spent in data collection and analysis is directly related to the number of products studied, the fewer the products (or income sources), the greater the opportunity for expanding the depth of the investigation. The way the products are selected, however, can introduce significant bias. To avoid such bias, it is necessary to consider relevant products from the perspective of different interests in the community, especially women or other poorly represented groups. Focus group discussions can be held among each interest group to discuss which products might be relevant to the study's purpose. Limiting the number of products to specialised categories also restricts the comparability of the research. One exception may be focussing on marketed products which, given the predominance of this focus in the literature, may actually increase the comparability of the research.

De Jong (personal communication) has suggested a practical approach for focussing information needs. Preliminary sampling or PRA exercises may be used to identify whether a smaller subset of products provides the majority of income. In-depth research would focus on this subsample. This technique can be an excellent shortcut for approximating overall income. It may be less useful where it is important to understand the impacts of people's activities, for example, on rare species. In these cases even if the quantities collected are small, their impact may be significant for understanding resource management.

#### *Use of interviews and record keeping*

Selecting efficient information collection techniques can reduce logistical costs. A review of the cases in Table 8.1 indicates that most researchers relied on interviews and recall information, often in combination with other techniques. Record keeping refers to the process of note taking by local informants to record their own behaviour. Sometimes a local informant or assistant keeps the records. PRA techniques (Campbell *et al.*) are often used, but are under-reported in the published literature. Only one case study (Melnyk and Bell) reviewed here used direct observation of incomes. Not coincidentally, it is the study with the smallest sample size. From the literature available, Melnyk and Bell's work is also the only work fully based on observation. Interview and recall data are obvious choices for costs. The research challenge with the use of these techniques is how to maximise the reliability of the information collected.

#### Getting the most from interviews

The quality of information acquired through interviews can be enhanced in several ways. Any information collected will depend on the relationship between interviewer and the person interviewed. Closer, more trusting relationships yield better information. Short, 'pop in' visits are likely to yield information of more variable quality. Careful selection of respondents is necessary to ensure that the person interviewed is also the person who knows most about the forest product or income

source in question. Sometimes respondents are also more willing to talk about the incomes of other people than about themselves. A preliminary study and villager participation in the research design can identify in advance any labour specialisation. In the authors' work in Kalimantan, women were more responsible for collection of fuelwood, dyes and spices, while men were more associated with the harvesting of timber and hunting. Older people were familiar with a wider range of forest products, while children knew more about the prices of some low-value fruits that were mostly sold or exchanged amongst themselves (Whittier 1973; Cavendish 1996).

Where interviews rely on recall information, prompts are an essential way to assist people's memories, especially when dealing with many products. Most of the case studies used a checklist of forest products as a prompt. Organising a product checklist by category of use (food, medicine, construction materials) is valuable for dealing with species used for more than one product. Care should be taken as local terms may differ from village to village, or the same term may be used to describe different products. Godoy and Lubowski (1992) suggest using cards with the name or a photo of each forest product as a prompt to avoid this problem. Because of a natural tendency for recall data to be biased towards prominent or regular sources of income (Padoch, Gunatilake *et al.*), it is necessary to assist people to remember minor, infrequent or sporadic sources of income. Prompts may refer to products, sources of income, locations, members of the household or times of year (Godoy and Lubowski 1992) and should be used consistently among respondents to avoid researcher-introduced biases. Group interviews can serve as a means of prompting responses from individuals as well as ensuring the quality of their responses (Caldecott). Group situations may however also inhibit frankness. Interviewing people in the forest, especially at a harvest site, can be an effective way of prompting the thoughts of both the interviewer and the respondent (Grimes *et al.*).

If interviews are used, the way in which questions are asked can also assist respondents' recall of events. People's memories seem better stimulated when events are recalled from the present back into the past, rather than from the past to present (Bradburn *et al.* 1987). Asking respondents to tell a story, for example about a collecting trip (Patrice Engle, personal communication cited in Godoy and Lubowski 1992) may help. Differentiating collection by season of collection or by land types such as fallow land, river edge and primary forest (Padoch, Campbell *et al.*; Wollenberg *et al.* forthcoming ) seems to also improve recall of harvesting details. Questionnaires can be designed to take advantage of 'best recall periods' for different income sources of products (Cavendish 1996).

### Getting the most from record keeping

Record keeping refers to note taking by local informants to record their own behaviour. Sometimes a local informant or assistant keeps records for others as well. Record keeping can be appealing because details about yields or income can be collected over long periods of time without the researcher's presence. Record keeping requires frequent intervention by the researcher, highly motivated record keepers and frequent

checking of results by the researcher (Godoy and Lubowski 1992). Bias may occur if only households that are literate and expected to keep the best records are selected. There is the risk of people filling in the data sheets with inaccurate information. Over time, as with monitoring practices, people tend to lose their motivation and there is drift in their interpretation of data categories. Some record keepers are likely even to drop out. Most researchers find they need to check data entries at least once or twice a week, provide motivational support to record keepers and cross-check some information with interviews or observations.

Record keeping requires even more care in the preliminary study than other techniques to determine which kinds of data are most important and how they should be recorded. There is a tendency to try to collect too much information through record keeping, which creates a burden on the record keeper as well as on the researcher trying to interpret the data. The information requirements need to be especially focussed to make sure that record keepers maintain their motivation and devote sufficient effort to provide high quality data.

Among the case studies in Table 8.1, only Caldecott reports the use of record keeping data. Caldecott employed a local informant in several communities to interview other people about their hunting activities each day. His approach reduces the need to train record keepers and check the data from many households. It also reduces the bias from selecting households with record keeping skills. On the other hand, the data depend more on the reliability of a single person.

A major concern with both interviews and record keeping is that it may be difficult for people to remember and describe quantities of forest products accurately and consistently. The usual recommendation for overcoming this problem is to use locally relevant units and terms (Godoy and Lubowski 1992). Although it may be possible to determine conversion factors for baskets or containers, there is often variation in the size of the container or the way in which it is filled for different products. It is useful to bring a sample of a 'standard' container and encourage villagers to refer to the sample when describing quantities. Record keepers can also be given standardised containers or scales. Local standard units can be identified in advance, and respondents encouraged to express quantities according to these units. However, it is unlikely that all products can be meaningfully standardised to any single unit. Different products will require different units, such as baskets, sacks, litres, bottles, headloads, kilograms, metres, numbers of animals. For animals, the product (meat, fur, horns, bones, organs) and its function should be noted. Some estimate of size or weight is usually necessary. If meat is harvested, estimates of the weight of useable meat should be recorded per animal (Caldecott 1988). In many cases the quality of the product will need to be recorded as well.

To further streamline data collection, interviews, record keeping and observation can be combined. Caldecott, for example, used three methods: (1) interviews of individuals about a single hunting trip they remember well (usually a trip within one week of the interview); and (2) group interviews in a village with the community leader and experienced hunters. With these first two approaches he acquired relatively

large samples of 979 hunting trips and 220 villages, with the latter representing 5 per cent of all rural villages in Sarawak. To complement this information, he also acquired comprehensive and longitudinal data about all hunting activity through (3) daily records kept by a village representative in each of three villages for 7-15 months. His conclusions were based on the three studies, using average results and cross-checking observed patterns. His approach is an example of nested sampling. The combination of methods and sampling sizes probably results in the most efficient collection of information for large sample sizes. One challenge is how to meaningfully link the findings from each method (e.g., in terms of seasonal and geographic sampling differences) and interpret conflicts of data.

To the extent the researcher uses interviews or record keeping, rather than observation, the efficiency of data collection increases at the expense of reliability. Researchers have to manage the logistics burden by finding the balance of efficiency, reliability, validity and generaliseability most suitable to their purpose. The three strategies described here – reducing sample size, limiting products and using interviews or record keeping – each involve compromises that can be best judged in the context of the needs and resources of the research.

### Challenge Two: Assigning monetary value to products

Income estimation requires the researcher to decide how to assign value to the income and whether to describe all income values along a single dimension. This decision will depend on the purpose of the research. If the purpose is to demonstrate villagers' valuation of forest products, there is ample evidence that forest products are valued along diverse dimensions, including nutritional value, economic security, environmental services or spiritual value that bear no relation to market prices (de Beer and McDermott 1989, Falconer 1990, Campbell *et al.* 1995; Lampietti and Dixon 1995). To facilitate comparison with values beyond a village, it has become common to quantify income in monetary terms based on market exchange value (Wilks 1990). Although this may disguise the true value of products to villagers, no convenient alternative exists for comparing income along a single dimension.

The challenge for valuation of forest incomes is therefore how researchers can assign meaningful monetary values. Scenarios are discussed below to show the strategies used for selecting values for marketed products, potentially marketed products and products not marketed. For each scenario, the key steps in valuation are determining: (1) the number of units sold or consumed; (2) the value of the good for a specific unit; and (3) an estimate of the costs. Monetary values of the good are identified using real prices from market or imputed values. Costs are assigned a monetary value according to actual cash outlays or imputed prices of inputs. The monetary value of the income from a given product is then equal to the quantity of the product multiplied by its value, less the costs.

For comparison across different time periods, inflation rates should be taken into account, and for comparison across different regions or countries, currency exchange rates or staple equivalencies (the price of a kilogram of rice) can be used to adjust values. Table 8.2 indicates the incomes reported for each of the case studies. The

**Table 8.2** Reported annual income – case studies from Table 8.1

| Case Study | Reported Annual Income |
|---|---|
| Godoy *et al.* 1995 | $95 to $820/person, average $411<br>NTFP value per household = $0.12 to $94.00 or average of 40% of total income |
| Gunatilake *et al.* 1993 | $31.80 to $745.60/family<br>63% of total income and 59% of cash income from forest resources; average NTFP income is 16% of total |
| Anderson and Ioris 1992 | Average gross income $3172 per household |
| Padoch 1988 | 2-85% of income from fallow or forest |
| Cavendish 1996 | $200 per household, 8.2% from woodlands |
| Melnyk and Bell 1996 | $4696 and $1902 per household in each of two villages respectively |
| Campbell *et al.* 1995 | $50-85 per household |
| Peters *et al.* 1989 | NTFP total $698/ha, net: $422/ha<br>Timber $310/ha per 20 yrs |
| Grimes *et al.* 1994 | Plot a = $147/ha, Plot b = 136/ha, Plot c = 63/ha |
| Caldecott 1988 | M$162 million per year for all of Sarawak for income related to hunting |

difficulties of interpreting such data without more contextual information about the value of the currency are readily apparent.

*Marketed Products*

The simplest way to value forest-based income is to focus only on incomes where cash transactions are involved, such as wages, paid services and marketed products, especially for products actually sold. This is the approach taken in most studies, including the case studies discussed in this chapter. For forest products, income is calculated in these cases as the sale price times the quantity of the product sold, less labour costs of collection and transportation and any associated expenses for fees or materials used. Care must be taken in accounting for variation in prices due to the unit or quantity sold. Reviewing the ten cases, only two use just revenue data from products actually brought to market and sold (Anderson and Ioris, Padoch). Observation of actual income received can be said to be the most reliable and valid approach to determining income. The shortcoming is that it is only applicable to a portion of forest dwellers' incomes. Other income sources require their own set of methods that may be less precise in their interpretation, but more accurate in terms of capturing more information. These may be products consumed or products potentially for sale. For such products, the researcher must identify an estimated market price and determine related costs.

*Potentially marketed products and their substitutes*

Assuming that market prices are accepted as an indicator of value, the next most reliable method is to use *an existing market price* for the product, less costs (Kramer

*et al.* 1992). Eight of the case studies used this approach (Peters *et al.*, Grimes *et al.*, Melnyk and Bell, Campbell *et al.*, Godoy, Gunatilake *et al.*, Caldecott, Cavendish). Methods for the valuation of potentially marketed forest products have been extensively described and debated elsewhere (de Beer and McDermott 1989; Wilks 1990; Godoy and Lubowski 1992; Kramer *et al.* 1992; Broekhaven 1993; Lampietti and Dixon 1995; Kengen 1997). Useful guidelines on economic valuation are provided in Godoy and Lubowski (1992) and Kengen (1997). The reliance on market prices assumes a competitive market, with prices undistorted by subsidies or taxes. It also assumes that the quality of the product in the market is similar to the one being valued, and that it is possible to account for volume-dependent pricing (see discussion of consumer surplus in Kramer *et al.* 1992). To most closely approximate potential income, it is important to identify prices in markets or from buyers that would actually be used (i.e., that are close to the resource or settlement). This strategy can be used to produce relatively reliable income information as it depends on real rather than theoretical prices. As above, however, it results in a trade-off between the validity of the data and the comprehensiveness of the villagers' incomes reported.

If the product is not available in the market, the second best option is to calculate an imputed revenue using the *price of a substitute for the product* or *the next best alternative product* that is in the market. The value of the good then becomes the price of the substitute plus transportation costs involved in buying it in the market. This reflects what the person would have to pay if he or she wanted to find a substitute for the item in question. Three of the case studies used prices of substitutes for valuing products (Melnyk and Bell, Gunatilake *et al.*, Cavendish). Cavendish found that certain standard prices were quoted for such things as green leafy vegetables or frequently used medicines; he applied these prices to unmarketed products falling into these categories. The authors of this chapter found that such standard prices were often quoted, but that the actual price asked and paid could vary substantially (see discussion below).

At least two case studies noted that marketed substitutes did not exist for some forest products (Melnyk and Bell, Cavendish). For some products they exist nominally, but may not be appropriate substitutes. For example, it might seem reasonable to compare herbal medicines with the value of commercial pharmaceutical drugs, yet the differences in effectiveness and dosage required are significant, and the conversion factors may be difficult to calculate (Cavendish 1996; Kengen 1997). In the authors' experience, when villagers were asked to identify substitutes, they found the question ambiguous. They were unsure whether a substitute should mean a product that looked the same, tasted the same or had roughly the same household utility. When urged to think about the value of the product to them, the notion of a single value was unfamiliar and inappropriate to their world view.

Getting price information may be problematic, especially when markets are distant. The researcher may not be able to readily visit these markets. Local people may also not know market prices. The author found that in a remote community in the Pujungan subdistrict of Kalimantan, only about 20 adults from a community of approximately 300 residents seemed comfortable articulating prices for forest products. Most

villagers said they were not used to discussing goods in terms of prices. Godoy reported the same observation for villages in the Bolivian Amazon (personal communication). The researcher's attempt to include more types of non-marketed forest income may be thus at the cost of using price proxies that are less valid. The use of proxies limits the value of including non-marketed products in an income study.

From the authors' experience, the villagers' willingness to suggest prices is highly dependent on the social context of the exchange. It was hard for villagers to assign a price in the abstract because the price or value associated a product reflected not only market exchange value, but also the economic status of the buyer and seller, the local value of money, the relations between buyer and seller, or the social value attached to exchange (Parry and Bloch 1989). In the Pujungan subdistrict, better-off families explained that they paid certain sellers higher prices than the going rate because the person was poor and they took pity on the seller. Vendors said that if they needed cash badly, they asked for higher prices and keep looking for a customer until they received that price. People frequently gave products as gifts to honoured guests of the village, but requested payment for the same product from unwelcome visitors. While people familiar with marketing might report a standard price for a good, the actual income received depended highly on the relationship between the buyer and seller and their current circumstances.

The complexity of assigning an accurate theoretical price under these conditions begs the question of whether the selected price and associated income value can be meaningful. Producing a single figure may be advantageous for comparison with other studies or calculating proportions, but if it is not possible to readily assign market prices to products, the interpretation of the value assigned becomes difficult and its validity questionable. Where price determination is complex, the researcher may find it more fruitful to invest in more detailed studies of multiple local values. Yet most studies opt to assign price values without further investigation of their validity. Among the cases Campbell *et al.* deal with the dilemma in part by complementing income figures with a study of the multiple qualitative values of each product.

### *Products not sold and not available in the market*

The discussion above suggests that identifying and assigning actual market prices is not only logistically difficult, but also conceptually problematic and inappropriate under some circumstances. In the past 20 years, a vast literature has emerged to deal with situations where market prices are not available (Mitchell and Carson 1986; Wilks 1990; Kramer *et al.* 1992). *Contingent valuation* (CV) is the most common technique that has been applied to forest products. While the technique relies on the concept of market price, it does not require information about prices from an actual marketplace. Contingent valuation requires asking a sample of people what they think a good is worth under specified conditions and then averaging the results (Kramer *et al.* 1992). A common, simple CV technique used for forest and agricultural products is to ask villagers about their willingness to pay for a product. The product is assigned

Valuation techniques vary by type of product. These common forest products from a Kenyah community in East Kalimantan demonstrate the need for different approaches to assigning monetary values (photos by Eva Wollenberg).



**a**. Cinnamon is marketed and prices are commonly known in the community.



**b**. The egg of the crested fireback pheasant, *Lapyra ignita*, can be valued using price of domestic chicken eggs, which is considered a close substitute.



**c**. The larvae of the beetle, *Rhychoporus ferriginious*, are not commonly exchanged, nor is there a close substitute. A monetary value is difficult to assign.

a value in terms of a common local item of value for which a market price is available; examples of items used include rice, beans and even castrated bullocks (Godoy *et al.* 1995; Emerton 1996). Four case studies estimated prices for products not sold in the market and all four used a form of CV (Campbell *et al.*, Gunatilake *et al.*, Godoy *et al.*, Cavendish).

CV techniques are controversial in their use and interpretation (Wilks 1990; Kramer *et al.* 1992; Broekhaven 1993; Diamond and Hausman 1994; Kengen 1997). The most common criticism has been that CV provides 'hypothetical answers to hypothetical questions' (Wilks 1990: 10). To make the best use of CV techniques and ensure their accuracy, a survey using an adequate sample size needs to be conducted, and respondents need to be provided with a full description of the good being valued and the scenario of exchange. The respondent also should be comfortable and acquainted with the exchange of the good in a market to be able to understand and engage in the simulation of a market exchange. From the experience of the authors (see above) and others (Gunatilake *et al.* 1993), the latter condition is clearly not the case for many forest products and villagers. The case studies that use CV do not state whether they provided these descriptions, nor whether respondents were familiar with markets, so it is difficult to assess the quality of the methods used and their results.

Examples of techniques for assigning non-monetary value include asking villagers to allocate a fixed quantity of beans (or other counting device) to indicate the relative values of different products across more than one value dimension (Reining *et al*. 1992; Campbell *et al*. 1995: 62). This technique is an excellent way to handle the many dimensions of a product's value, but it does not enable more detailed comparison with cash income. Another technique is to engage people in a ranking exercise of the value of products with similar economic functions (such as types of timber, vegetables and fruit). Even this technique may be difficult to interpret as many products have more than one use. One conclusion the authors have reached in their own work is that it may be more meaningful and accurate to describe cash incomes and income-in-kind as separate entities and not try to aggregate them. Income-in-kind can be described in terms of the functions of the different items and the quantities collected. One drawback of this approach is that the importance of the forest income is difficult to judge as a proportion of total income.

One way to guide choice of methods is to recognise that valuation techniques will be more valid in certain contexts than others (Hanemann 1994). Where market prices exist and people are familiar with exchanging the product in question for money, monetary valuation is likely to be a more valid reflection of income. Where these conditions do not exist, however, it is probably more reliable to report only cash income in monetary terms and other income in kind. Comparison of the value of the two income types can be qualitative.

### Calculating costs

For all the strategies described above, it is necessary to calculate costs to determine income. In the general literature, as among the ten cases reviewed here, costs are

consistently poorly handled. Most studies give greater attention to revenues, at the expense of reliable cost information. Among the case studies, the most commonly counted costs are labour and materials expenses associated with transportation of a product (six cases). Collection costs are slightly less often included (four cases). Materials, processing, packaging and sales costs are even less frequently noted (two cases), which may also reflect the type of product more than the accounting.

Determining labour costs is fundamental to the calculation of collection, transportation and processing expenses. The cost of labour is the product of the total time allocated to an activity and the value of that time. Godoy and Lubowski (1992) provide a useful overview of four methods for assessing time allocation. The most reliable method is direct observation of people engaged in the economic activity (Melnyk and Bell), yet only a limited number of individuals can usually be observed at one time. Johnson's (1975) random sampling technique can be used to increase the number of individuals sampled. His method requires visiting individuals at a random time of day and recording the activity they are undertaking at that moment. With a large enough sample of people and times of day, a picture emerges of a population's daily activities. Godoy and Lubowski (1992) note however that it is difficult to arrange random visits to people who are in the forest. None of the cases examined here used Johnson's technique.

The second method is to ask people to keep records of the type and duration of their activities. In addition to the general requirements of record keeping (see above), time allocation records require local people to use watches and pay attention to details of time, to which they may not be accustomed. A third technique is to interview people about their activities, ideally at the time of return from the forest or the end of a day (Wadley *et al.* 1997). A fourth method is to observe the time individuals leave and return to the village from their work, but as Godoy and Lubowski (1992) observe this gives little indication of the actual time associated with activities performed.

Depending on the purpose of the study, relevant categories of time allocation need to be identified. For forest-related activities, these may include searching, harvesting, pursuing (wildlife), killing, cleaning, processing, carrying, travelling and resting. It is useful to identify villagers' own categories to ensure that questions are later phrased in a way that evokes recognition and understanding.

Where people receive a wage, this figure can be taken as the value of their labour. Where no wage is exchanged, a value may be imputed. Value may be determined using national minimum wage rates (Peters *et al.*, Melnyk and Bell), local wage rates (Grimes *et al.*, Campbell *et al.*), or calculated as a nominal wage rate on the basis of any money, food, drink, cigarettes or accommodation provided (Godoy *et al.*). Variation in wage by season, education level, type of work, age or between men and women should be noted (Melnyk and Bell, Cavendish). Scholars of Chayanovian household economics might question whether a value should be assigned at all, as there is evidence to suggest that many rural households value their time relative to the work facing them, rather than according to the economic opportunity cost of their labour (Kerblay 1987). Some authors feel the difficulties of determining time allocation for all members of a household and of identifying satisfactory shadow

prices for wages are sufficient reason not to even try to value labour costs (Cavendish 1996).

Transportation costs may need to be adjusted to reflect actual volumes of goods sold, since the costs of transporting a single item, a sack, a truck load or canoe load are likely to be different. Separating transportation costs from other costs can also be problematic, especially in remote communities where trips are often multipurpose. In the authors' experience, villagers far from markets nearly always combined market trips with other activities. People often said they did not pay anything for transportation of a marketed product because they were going there anyway. Similarly, travel associated with collecting forest products is nearly always multipurpose. Assigning transportation costs proportionally to each activity or product in these cases may be an arbitrary exercise. There is no simple alternative. One possible way to handle the costs of multipurpose trips is to determine the villager's intentions to collect forest products before undertaking the trip and compare this with activities actually undertaken. Unplanned activities could be treated as no-cost 'bonuses', while other trip costs could be divided equally among the products concerned.

When collecting information about forest product prices, it is easy to overlook the details of whether and how a product has been processed. Processing may involve drying, cooking, soaking, skinning, pounding or peeling. Where processing has taken place, the related costs of labour, transportation and materials need to be subtracted from the revenue to determine income. For example, at several sites in Kalimantan, the authors observed that people reported timber prices per cubic metre. These prices described timber that had been harvested, sawn into boards and transported. In Sumatra, the authors recorded traders' reports of income based on sales of damar resin to wholesalers. These sales were based on damar that was first sorted by quality by hired workers. None of the case studies in Table 8.1 reported details about whether and how the labour costs associated with processing of forest products were taken into account.

The cost of tools and capital goods can be relevant. These costs are dealt with inconsistently in the literature. Among the case studies, only Melnyk and Bell explicitly accounted for tools. To decide which equipment or capital items are likely to represent significant costs, it may be helpful to distinguish between costs that vary with the amount of production, as opposed to fixed costs or investments (see Ames, this volume). Expenditures for variable costs such as shotgun shells, fish hooks or even chainsaws can be significant and should be counted (Melnyk and Bell; Godoy and Lubowski 1992), while the depreciation associated with fixed costs such as a machete or shotgun per unit output might be negligible (Campbell *et al.*).

In determining costs it is important to use a consistent physical location for assessing transportation costs. Unlike forest valuation exercises, which usually rely on forest gate values, the village gate is the relevant reference point for determining the flow of benefits to a household. The term village gate is used here to highlight that, for many forest dwellers, the point of their income sources in the forest and the market may require significant transport costs, and that these should be counted. The village gate can be used as a reference point to be able to compare incomes acquired from different sources.

Land costs are not addressed by any of the case studies, except indirectly in the study by Anderson and Ioris, where 50 per cent of the sharecropper's produce is paid to the landowners. This proportion can be seen as the cost of land to the sharecroppers. Land costs are consistently ignored in the forest product literature, probably because of the difficulty of calculating land costs where the forest is common property and where no obvious opportunity cost can be applied.

Expenses and prices are rarely stable, yet most of the case studies used a constant value for wages and prices. Two studies provide alternative approaches that more closely approximate real or potential fluctuations. Melnyk and Bell applied average monthly prices to quantities collected for that month. Campbell *et al.* investigated potential fluctuations by constructing a matrix in which they show how revenue might vary with changing prices and wage levels. A sample matrix (Table 8.3) demonstrates possible revenues to project the future value of a stream of income from selected forest products. One criticism of the work by Peters *et al.* has been that if all NTFPs from the site were indeed sold, the increased supply of the goods in the market would result in a decrease in the price of those goods.[2] With a matrix showing a range of revenues, a variety of price scenarios can be anticipated. Although fluctuation information should provide more accurate and precise cost data, it is gained at the cost of time and effort.

**Table 8.3** Fuelwood values ($/yr) in relation to labour and fuelwood prices, village of Jinga, in Zimbabwe

| Fuelwood prices ($ per cord of wood) | Labour prices ($ per day) | | | |
|---|---|---|---|---|
| | 5 | 10 | 15 | 20 |
| 10 | 555 | 0 | 0 | 0 |
| 20 | 6 009 | 1 111 | 218 | 0 |
| 30 | 12 546 | 5 636 | 1 667 | 437 |
| 40 | | 12 018 | 5 371 | 2 223 |
| 50 | | 18 553 | 11 553 | 5 307 |
| 60 | | | 18 027 | 11 272 |
| 70 | | | *24 560 | 17 562 |
| 80 | | | | 24 036 |
| 90 | | | | 30 567 |

Notes:
N = 25 households, all of which consumed fuelwood, out of a population of 102.
* Best estimates given knowledge of current fuelwood and labour prices.
*Source:* Campbell *et al.* 1995.

## Selecting appropriate methods

The ten case studies demonstrate well the real life practicalities of attempting to measure the incomes of people living in forest areas. The methods used reveal diverse

[2] Peters *et al.*'s work has also been criticised strongly for the use of inappropriate price and cost information.

approaches that reflect decisions to make trade-offs among the strengths and weaknesses or incompatibilities of different techniques. A number of these decisions are generaliseable. To help people identify the methods most appropriate to a particular purpose and site, the decisions that need to be made to select a method are outlined below (Box 8.1). Some decisions might require preliminary, exploratory studies or pre-testing of questionnaires before they can be answered satisfactorily. Some might need to be discussed with the users of the information or different interest groups to make appropriate decisions. The criteria highlighted in the guidelines should help researchers decide which methods to select and where compromises can be best tolerated. This in turn should assist readers to make more meaningful interpretations of findings and better comparisons across studies.

**Box 8.1** Designing a method for measuring forest-based incomes: key decisions

1. What is the purpose of the study? Purpose will determine the unit of reference, sample size, product focus, the need for observation or recall data and the extent to which monetary valuation techniques are needed.
   Common purposes:
   - To determine the value of forest income to villagers' livelihoods (need comparison in common units across households);
   - To identify trade-offs among alternative land-use systems (need income per hectare); and
   - To monitor income from a forest product, e.g., a newly developed product (need detailed accounting of costs and revenues for the enterprise unit).

   Is the information for a development project? (need readily available information).
   Is the information for a scholarly study? (need rigorous information).
   What role will forest dwelling people or other stakeholders take in defining, implementing, interpreting or using the research?
   Who is intended to benefit from the information?

2. Given the purpose, what is the focus of the information needed? These parameters will have to be selected with consideration of a sampling strategy and the amount of information possible to collect. The more income sources or products included, the more comprehensive but also more costly the research. The advantages of measuring income sources not exchanged in a market need to be weighed against the conceptual and logistical difficulties of valuation techniques.
   - The geographic area, forest area and population of interest?
   - The unit of income (individual, household, village, hectare)?
   - The type of income:
     - actual or potential income;
     - all income or only selected income sources;
     - major, continuous incomes and/or small and irregular incomes;
     - forest, NTFP, fallow;
     - which forest products; and
     - cash income or income-in-kind.
   - If forest-based incomes are to be included, how is forest defined?
   - Over what period in time will income be measured?
   - Will income be measured more than once and, if so, how frequently?

**Box 8.1** (continued) Designing a method for measuring forest-based incomes: key decisions

3. What kind of preliminary study and villager involvement is needed to identify relevant revenues and costs and levels of variation in people's forest use or other income activities?

4. How should revenue and cost data be collected? Record keeping, interviews or observation? What is the role of local people? Factors to take into consideration:
   - How long the researcher will be at the site and how frequently visits can be made;
   - Distance to markets, cost of travel to markets;
   - Presence of motivated, skilled informants for record keeping;
   - The period of time for which information is required; and
   - The accuracy, precision and detail of information required.

   While recall information from interviews is inherently weaker due to memory loss, interviews may allow a dialogue that can resolve differences of interpretation about meaningful categories. Trade-offs will be between the reliability and amount of information possible to collect. It may be possible to nest more intensive studies in more extensive surveys to combine in-depth information collection with representativeness.

5. What is the sample size needed? Does it need to be drawn in such a way as to be representative of a population? What kind of stratification (e.g., wealth) might reduce variation in the dimensions of interest? How does the sample size affect the amount of information possible to collect for each sample size?

6. Which units will be used to measure quantities of forest or agricultural products? Is there a need to standardise units or determine conversion factors?

7. Should all income be assigned a single monetary unit and aggregated according to that monetary unit? Probably yes, if it is:
   - Necessary to compare incomes with other studies or across communities with different sources of income;
   - Necessary to determine the proportion of forest income; and
   - Important to work with values that more closely match the perspectives of villagers.

8. If monetary valuation is applicable, which valuation technique should be applied?
   - How will price information be identified for marketed or marketable products (villagers' recall of products actually sold, market surveys);
   - What kind of sample of prices from the market or interviews will be necessary (frequency, number of markets, number of vendors interviewed, length of time of sample);
   - Which techniques will be used to identify prices or assign value to non-marketed items;
   - Where real prices are not available, should the prices of substitutes, alternatives or some form of contingent valuation be used;
   - If relevant, how should non-quantitative values be considered; and
   - The more theoretical the price the less validity the income value is likely to have.

The advantage of gaining more comprehensive information about all income sources is at the cost of that information having less validity.

**Box 8.1** (continued) Designing a method for measuring forest-based incomes: key decisions

9. Which costs will be included? Possibilities include labour (considering wages, bonuses, overtime, meals, drinks, cigarettes, accommodation) materials and equipment used in collection, processing, transporting, packaging, selling goods. Additional costs such as forest user fees or spoilage may also need to be considered. Efforts to derive a meaningful local value of labour and how that value varies will require more resources and ethnographic work to complement economic surveys.
10. Do fluctuations in revenues and costs need to be considered? How should these be estimated or described?
11. In what units should the income be reported? How should inflation (for incomes earned in previous years) and differences among currencies or staple values be taken into consideration in reporting?
12. Which aspects of local people's livelihoods are necessary to be understood to best interpret the income data (e.g., household consumption patterns and expenditures, calendar of economic activities, villagers' range of economic options, the distribution of benefits within a household, gender-based divisions of labour or benefit distribution, the security of the forest as an asset, forest productivity)?
13. How will results be shared with forest villagers themselves, as well as other stakeholders?

## Conclusion

Despite important needs for data, rigorous information on forest peoples' income is scarce. This review of the methods used to estimate income has indicated some of the reasons why good information remains unavailable.

First, the lack can be partly attributed to the time and cost involved in collecting accurate income information. Most studies have necessarily focussed their information collection needs to fit their specific purpose. Since these purposes vary, different kinds of information have been collected at different sites. The case studies reflect a natural bias towards that which is easily measured (Devereux 1993) by basing their studies on small sample sizes, marketed products and major sources of income. There is a consequent tendency for research projects to have selected logistically manageable, but potentially inaccurate or unreliable methods.

The user of income information needs to be informed about what kinds of income were included in the study to make an accurate interpretation of the results. Unfortunately, such details are rarely provided for non-forest based income. Although a number of studies claim to describe the proportional value of forest-based income to total income, closer examination reveals that what was calculated as all income is not complete. In the studies reviewed, only a portion of forest products used or sold were studied, suggesting that actual forest income is higher than reported figures. In addition, only a portion of all non-forest income was usually included. The proportion

and importance of forest income may thus have been overestimated to the extent the researchers were not able to capture the majority of the income.

Second, the lack of information available is also in part a reflection of weak application of methods. This is true especially for information based on questions such as 'how much would you be willing to pay for this product?' Although much lip service has been given to the use of contingent valuation, in practice the techniques have been used poorly and the results may therefore not have much meaning. Because of small samples and biased sampling techniques, the little information that is available is not necessarily representative of any larger population.

Third, comparison of income information among studies is problematic because of the inconsistency in the use of techniques, as well as the lack of transparency in reporting. Although different methods may be legitimate because of different theoretical assumptions and purposes, it is nevertheless essential for the methods to be reported to enable the research user to judge the basis of the figures. When comparing results from different studies or different time periods in terms of a single currency like the dollar, the user needs to take into account changing values of the dollar, especially *vis-à-vis* local currencies. The dollar equivalent in the local currency may also buy goods of widely different local values in specific country settings.

Aside from these three factors (expense of collecting information, weak application of methods and incomparable data), some basic economic concepts do not fit the values, perceptions or conditions of forest dwellers very well. Assigning a single value to a product, determining prices of products in locations far from the market, valuing labour, determining transportation costs when multiple activities have been undertaken are examples discussed in this chapter. There is a need to better address the multiple perspectives and values associated with forest incomes and to understand the limitations of some approaches to valuation.

The gaps in our understanding of forest dwellers' incomes have therefore resulted from logistical and conceptual inadequacies, in addition to different purposes of the research. The lack of clarity about research methods is a constraint that has prevented further development of the methods and more transparent discussion of their weaknesses. It has also inhibited comparisons and aggregation of data. The review and comparison of strategies employed by the case studies and the decision making guideline provided in this article should assist income researchers make more informed choices to overcome these difficulties. The burden of high research cost can be avoided by focussing information needs, especially the number of products studied. Weak application of methods and comparability of results can be overcome through more transparent reporting, a subsequent better understanding of the strengths and weaknesses of techniques available and more informed analysis of the trade-offs between them. Finally, the dilemma of valuation will depend on the study's purpose and context of the community studied. The assumptions underlying the determination of monetary values call into question the very possibility of using forest income data to inform some policy debates. Complementing income estimation techniques with more in-depth study of locally relevant values and categories would probably enhance much data collection.

The utility of income data will ultimately rest on the methods used and the ability of the user to make sense of such methods. As long as forest dwellers continue to be important in the policy arena, both for their impacts on forests and in terms of having to meet their own needs, there will continue to be an interest in income information and there will be a need for better methods to procure such information.

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Chapter Nine

# A Methodology for Assessing and Evaluating the Social Impacts of Non-timber Forest Product Projects

R.J. Fisher and Rachel Dechaineux

The underlying assumption behind the idea that non-timber forest product (NTFP) exploitation can promote biodiversity is that people will ensure the reproductive capacity of products that are valuable sources of income. Thus, managed exploitation of NTFPs is seen as a means of combining the objectives of biodiversity conservation and economic development.

The rationale for this paper is that if projects are based on the assumption that NTFP projects can be of benefit to rural people, then it is necessary to check continually whether these benefits actually exist.[1] Otherwise the claim that rural people are benefiting is no more than convenient rhetoric. Apart from the ethical need to assess the reality of benefits, there is also a need to 'test' the assumed linkage for the very practical reason that we are unlikely to achieve our biodiversity goals if the assumption on which they are based is flawed. Critical evaluation of socioeconomic impacts can be a useful management tool.

Dove (1993) has argued strongly that the NTFP approach is fundamentally flawed. He argues that deforestation has often been attributed to the poverty of forest dwellers, whereas it is more true to say that the poverty of forest dwellers is a result of their lack of control over forest resources. If forest resources are valuable they are usually appropriated by external actors at the expense of local people. Available NTFPs tend to be those products that are economically marginal. This argument may be an overgeneralisation, but it does draw attention to the fact that it cannot be assumed that exploitation of NTFPs will lead to substantial economic benefits to forest-dependent people. One serious potential unintended consequence of developing marketing chains for NTFPs is that external entrepreneurs will take over control.

Sponsored development activities, including NTFP projects,[2] sometimes lead to a general improvement in economic conditions, but at the cost of worsening the

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[1] We do not propose to explore the potential of NTFP exploitation to promote biodiversity goals; that is the subject of other papers in this book. We are concerned with developing methodologies that evaluate whether NTFP interventions can achieve their economic development goals.

[2] While most of the chapters in this book attempt to avoid too much focus on project activities, this chapter specifically deals with outside interventions, since a formal methodology is hardly necessary to deal with the social impacts of 'endogenous' NTFP activities. The word 'project' is used here in a broad sense to refer to any interventions by outside agencies or individuals.

conditions of some segments of the population, or at least of leading to some negative consequences. In northern Pakistan, for example,[3] the Aga Khan Rural Support Program (AKRSP) has been very successful in improving livestock productivity, partly by promoting the planting of fodder trees near villages. An unintended consequence of this was that the workloads of women increased since their traditional roles focussed on activities near their homes, rather than on managing herds grazing away from villages. Providing fodder closer to home improved fodder supply, but placed a new burden of labour on women. Interestingly, many women regard the increased labour as an acceptable cost of the overall improvement to the well being of their families.

The Pakistan example illustrates the way in which generally beneficial activities can lead to unintended negative consequences for some segments of the population and therefore the need for careful identification of the effects of intervention. A second important lesson can be drawn from the way in which the women assessed the importance of the changes. While the nature of the changes could be observed by project staff, it was really a matter for the women to decide whether the changes were acceptable.

We wish to stress the idea that identifying project impacts is both a responsibility of projects and practically important for project management, but that the evaluation of the acceptability of impacts is a matter for the people affected by them. In other words, the people affected ought to participate in the decision making aspect of project evaluation. Participation in the more mundane data collection phases of monitoring, evaluation and impact assessment is often unnecessary (and even burdensome), but participation in decision making is essential.

The term evaluation often makes people uncomfortable, with implications of sitting in judgement on the performances of others. It is, however, difficult to suggest a useful alternative term. Evaluation has the advantage that its roots emphasise the notion of attributing value to an activity or change or, in other words, of deciding what activities are important. Assessment tends to imply an objective process of measurement. While this may be appropriate to the process of identifying changes, it seems to miss the importance of value judgements in deciding what changes are important. The approach we are suggesting requires both the more objective process of assessment and participatory evaluation.

In this paper we propose a four-pronged approach to social impact assessment and evaluation:

- Collection of information for a baseline study by field staff;
- Continuing observation of social impacts by field staff;
- Village case studies; and
- External review.

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[3] This example is based on the personal observations of one of the authors (Fisher) during a consultancy with AKRSP in 1995.

The approach was initially developed to meet impact assessment and evaluation needs of the Non-Timber Forest Products Project in Laos.[4] While that project, like any other, had specific needs and operated in a specific context, the needs were similar to those of many other projects. It was a small project, without large personnel and financial resources and without staff with social science experience or training. A practical approach was needed that, at the same time, could make a meaningful attempt to deal with the complexities of change.

## Combining Impact Assessment and Evaluation for Project Management

A common approach to assessing socioeconomic changes is to obtain a set of information on conditions at the commencement of a project (a baseline survey) and then to measure the same indicators at the end of the project (or at some specified stage) to identify changes, including those arising from the project's activities. Typically the survey depends on relatively structured questions and quantitative data. This is a *summative* (end of project) approach – one that is concerned with assessing the final effects of a project. It is useful for donors who wish to see whether their investment has been worthwhile, and also as a way of generating lessons for new projects if cause and effect can be shown between project intervention and change. However, there are limitations with measuring indicators at the beginning and at the end of a period to identify changes:

- Detailed identification of data sets in advance of project activities assumes that all key issues are anticipated and makes it difficult to account for the unintended consequences of project activities;
- End of project surveys do not assist with the early recognition of problems, yet early recognition would enable a project to vary its approach during implementation to maximise benefits and minimise unintended and negative results; and
- Comparison of before and after conditions does not guarantee the identification of causal linkages between project activities and changes.

In addition, to the extent predetermined formal questionnaires are used, such surveys may be of value, but they also have major disadvantages. First, they are costly and time-consuming. Secondly, for a number of reasons, including the reluctance of people to give detailed information on household finances, they are often very inaccurate (Hill 1984). Thirdly, and perhaps most importantly, the very act of framing a questionnaire implies that the key issues and questions are already understood. This is not always the case. Questionnaire surveys are not always useful for understanding complexities.

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[4] A joint project of the Department of Forestry, Lao PDR and the World Conservation Union. This paper draws heavily on a report prepared for the project (Fisher *et al.* 1996). The authors of this current paper wish to thank Kheung Kham Keonuchan for his contribution to the fieldwork for the original study.

An alternative to summative evaluation is *formative* evaluation (continuing or feedback evaluation), which is concerned with identifying issues as they emerge and taking corrective or compensatory action (Box 9.1). Baseline survey information is most useful when it contributes to long-term assessment of project impacts while, at the same time, providing feedback that enables project management to amend activities to build on successes and to avoid or compensate for negative outcomes.

**Box 9.1** Two types of evaluation

Summative evaluation [final evaluation]:
- Takes place at the end of a project and sometimes at project mid-term;
- Aims to determine project success or failure (did the project 'pass the test'?);
- Determines whether expenditure on the project was justified by the results; and
- Asks whether there are any lessons that could be applied to future projects.

Formative evaluation [continuing evaluation]:
- Continues throughout a project;
- Aims to identify issues and problems;
- Enables corrective action to be implemented quickly if problems (or unintended consequences) are identified; and
- Enables the project to identify successes that it can build upon.

A useful example of the application of formative evaluation is the NTFP project in Palawan Province in the Philippines, where the project identified problems that were affecting NTFP activities in a pilot project area ( Box 9.2). The case study shows how recognition of an emerging problem helped the project to take remedial action to avoid a worsening situation. Although the policy changes that led to stress on the tribal Batak people were not a result of project activities, the case does demonstrate the value of continual monitoring of socioeconomic conditions and processes.

In this paper we present a methodology that combines an element of baseline study with a broader approach to socioeconomic evaluation. We believe that summative evaluation is relatively unhelpful unless it is combined with continuing formative evaluation. We therefore propose a combination of summative and formative evaluation. The underlying philosophy is compatible with a participatory learning and action approach, in which activities are amended as a result of continuous critical reflection on observed outcomes. The NTFP Project in Laos specifically adopted such an approach (Ingles 1996).

## Key Themes for Socioeconomic Impact Assessment and Evaluation

The idea of a baseline survey is to provide information that will be useful later in assessing the effects of a project. The first question is not what we need to know

**Box 9.2** Philippines-Palawan NTFP Project: a case study

The NTFP project in Palawan (an IUCN project that began in 1994) has two core sites:

- Near Calabayog where there is a large settlement of Batak (a tribe traditionally involved in hunting-gathering). This settlement is relatively isolated and the Batak are culturally and socially peripheral to the mainstream society and economy. They are usually illiterate and also suffer from numerical illiteracy, which makes them particularly susceptible to exploitation by traders.
- Near Manggapin where there is a settlement that consists predominantly of Tagbanua (a group of tribal people who are relatively acculturated, have intermarried and often converted to Christianity) mixed with a few Batak people and some lowland Filipinos (non-tribal people).

In late 1993, the City Mayor imposed a ban on *kaingin* (shifting cultivation) within the city limits of Puerto Princesa City, which extends through much of the province and covers both project sites. Shifting cultivation was practised widely in Palawan by both tribal people (mainly for upland rice, but also for a few tubers and vegetables) and 'lowlanders' (of whom most were immigrants to Palawan). The ban was strictly enforced and those who tried to practise shifting cultivation were thrown into jail.

By September-October 1994, the effects of the *kaingin* ban were noticeable in the project pilot sites. The Batak site in particular was suffering greatly: malnutrition increased, deaths from TB and malaria increased – people no longer had sufficient means to obtain medicines. Overharvesting of NTFPs – through increased bamboo, rattan and honey collection and *almaciga* (a high-grade resin) tapping – was occurring. The crisis led the Batak to become even more dependent on the traders and they went further into debt to purchase rice. The increased income from NTFPs was largely used to service this debt, so the expanded harvesting did not lead to increased benefits. The Tagbanua site was less affected by the ban as they had paddy plots which were producing good yields and large vegetable plots.

The problem of indebtedness of the Batak was severe and difficult to address directly (as the traders are 'part of the system', they cannot be eliminated). In late 1994, when it became evident that the Batak site was in a near-crisis state, discussions with the community on their development needs were intensified. The discussions led to the identification of a few activities to address the acute needs brought on by the ban:

- A controlled burning programme for a hybrid system of settled agriculture with some burning (no new land was used for the plots) for upland rice;
- Equipment and technical assistance were brought in for paddy plot establishment;
- A study was undertaken by two Filipino scientists on the issue of overharvesting of NTFPs (particularly resin tapping);
- A grant was requested for funds from the New Zealand Embassy to cover the costs of medical assistance, including acute care for malaria and TB, distribution of medication and a rotating vaccination programme;
- An anthropologist (with many years experience of Batak culture) was brought in to analyse the situation the Batak were facing; and
- The project provided basic training in numeracy.

Contributed by Jill Blockhus, IUCN Forest Conservation Programme, Gland, Switzerland

initially (project appraisal and RRA/PRA are concerned with that question), but what we would need to know later to assess the impacts of what we have been doing. It is impossible to predict all possible outcomes of a project, but we can think of some broad areas that will reflect the extent to which we have achieved our purpose.

The underlying concern, from the socioeconomic perspective, is that 'sustainable economic exploitation' improves or maintains the material well being and economic security of rural people in the long term. It is, therefore, reasonable to examine the effects the project has and will have on: (1) well being; (2) equity; and (3) risk.

Well being has two aspects. It refers to the quality of life, including such things as health, education and access to services. It also encompasses those economic factors that provide access to material goods – assets, capital, labour availability, credit and availability of cash. Access to goods may be through barter or other forms of exchange. It does not necessarily require the use of cash.

Equity refers to the extent to which well being is distributed fairly between different individuals and groups. It is important to stress here that equity involves fairness, not necessarily equality. Fairness must, to a large extent, be determined by the people whose lives are affected. It is possible (indeed, very common) for a project to improve the quality of life for some people, while others are disadvantaged. For example, village leaders may gain financially, while poorer people do not. Sometimes there is an overall gain, but at the cost of greatly increased labour for some people. It is common for projects to improve family income, but at the cost of increased labour for women. This is a particularly common source of gender inequity.

Risk is an important component of peasant life. People operating close to the minimum subsistence level are greatly concerned with 'subsistence risk' (Scott 1976). In such circumstances, it is quite rational to avoid potentially profitable changes if these changes involve risks of complete failure. For example, a particular NTFP may offer considerable returns but, if future prices are uncertain, subsistence farmers would be unlikely to invest labour and energy in production at the cost of their subsistence crop. Not only is risk a factor that is likely to affect the adoption of new activities, but promotion of income from NTFPs that increases exposure of farmers to risk could be a potentially negative indicator in a social impact assessment. Whether risk is an acceptable cost of potential benefits is a matter for the affected people to decide themselves.

These three aspects of impact may be closely related. Assessment of risk needs to take account of the possibility that different groups may be more affected by risk than others as a result of project-inspired change. It is important, therefore, to identify different interest groups or stakeholders, i.e., those likely to be affected differently by particular changes. Obviously the diverse effects of project interventions on women and men require particular attention.

Well being, equity and risk are broad areas of concern. When collecting baseline data, it is much easier to think in advance of indicators of well being than it is to think of indicators of equity and risk. Consequently, we propose to include indicators of well being in the baseline data collection, but see the identification of changes to

equity and risk as being likely to emerge from analysis conducted as part of the evaluation. We should stress the participatory nature of the evaluation process. People know what has changed in their lives and reliance on their understanding will be more useful than overdependence on 'objective' indicators.

One of the difficulties in constructing a baseline survey (either for summative or formative evaluation) is achieving a balance between the need for a process that is flexible enough to detect unintended consequences and the need to identify, in advance, the broad type of information which may be useful. The experience of many development projects suggests that unintended consequences often fall into one of these three themes. The fact that consequences are unintended does not mean that they are random or even unexpected. Certain types of unintended consequences are repeated often enough to cast doubt on the ability of project planners to learn from oft-repeated experiences.

## Context of Project Intervention

The evaluation of socioeconomic data requires specific conceptual skills and experience. Field staff employed by NTFP projects usually have skills and experience in areas such as forestry and agriculture, but often have limited skills in the social sciences. The methodology for socioeconomic evaluation must take account of these limitations. At the same time, efforts must be made to increase the ability of field staff to incorporate critical observation of and reflection on impacts in their normal activities.

### Principles

The following key principles underlie the development of the baseline survey and impact monitoring methodology proposed in this paper.

- The methodology should be useful both for summative and formative evaluation;
- There is a need to integrate the baseline survey as far as possible with continuing and routine evaluation of project activities which means that activities should be carried out as far as possible by project field staff as part of their normal activities. This does not preclude use of specialists or outsiders for specific tasks;
- The gathering of data for the baseline survey should use data already being collected (such as through RRA and PRA used for planning purposes), supplementing this where necessary. Collection of additional data should be limited to what is reasonably necessary;
- Field staff should be involved as far as possible in identifying and developing indicators of change that are relevant to project activities and about which information can be collected practically in village conditions; and
- While the broad dimensions (well being, equity and risk) can be explored as part of the processes of impact assessment and evaluation, judgement about the meaning or significance of changes along these dimensions must be made by the villagers. For example, it is possible to identify inequitable changes to women's workloads arising from collection of an NTFP (e.g., women working two extra hours a day

for six weeks during the harvesting period collecting a product), but the women themselves need to decide whether this is acceptable, perhaps as a trade-off for improved conditions.

## Elements of the proposed approach

*Collection of information for the baseline study by field staff*

We suggest that a Village Profile, which provides baseline information, be prepared for each selected pilot site once it has been identified and an agreement has been made with villagers. In the case of the NTFP Project in Laos it was possible for this document to be substantially completed from information collected during RRA and PRA as part of the process of identifying suitable pilot villages and participatory planning for pilot projects. The Village Profile should be completed by field staff. (A *pro forma* recommended for the documentation of baseline information in the Laos project and explanatory notes are included in Appendix 9.1).

The Village Profile format follows a list of topic headings. It is not a questionnaire, but rather a checklist of the minimum information needed. Field staff should feel free to include additional types of information and the format provides scope for inclusion of opinions about issues (and potential emergent issues) as well as factual information. The Village Profile is a written document, not a computer database and should be kept on a file together with field reports on village visits.

It is important to realise that the Village Profile will provide baseline information useful as background for ongoing evaluation. It is not primarily concerned with collecting quantitative data for direct comparison of quantitative changes later. The approach is a learning process approach, not a formal baseline survey approach. In fact, the main value of the collection of information for the Village Profiles is likely to be the familiarity it gives field staff with village conditions and the contribution it makes to communications between villagers and field staff.

*Continuing observation of social impacts by field staff*

In addition to collecting information for the Village Profile, field staff should make observations about socioeconomic changes and their documentation a routine part of all fieldwork. Throughout this process they will be contributing to a developing understanding of emerging issues and will be preparing the basis for more formal case studies. It is desirable for projects to provide training and ongoing support to assist staff to develop their skills and conceptual understanding during this process (Box 9.3). The continuing observation process should be carried out using methods similar to those which will be used in the case studies.

*Village Case Studies*

While it is important to maximise the role of field staff in all aspects of impact assessment, monitoring and evaluation, we recognise that they often do not have training or expertise in sociological or anthropological research. Understanding the subtleties of equity, risk, exchange relationships and their interactions may require a

**Box 9.3** Suggestions for continuing observation

- Information gathered through casual conversations (while walking through a village, while preparing or sharing a meal, etc.) is quite legitimate and often very useful. In fact, casual conversations are often the best way to understand the concerns of villagers – central to understanding project impacts.
- A limitation of RRA methodology is that it tends to depend on a few informants to provide information and often these are village elite. It is essential to understand the concerns of all interest groups, including both poorer and wealthier people (who may be particularly involved with or dependent on NTFPs). Informal conversations are an ideal way to communicate with these people. The wealth ranking activity is a useful way of initially identifying the poor.
- Discussion of economic activities (including those associated with agriculture and NTFPs) leads to the development of individual and family case studies. It is through this type of discussion that recognition of unintended consequences and specific relationships between project activities and changes can become evident.
- Important points from informal discussions should be documented and included on the village file. This will be useful later for Village Case Studies and External Review.

great deal of specialist expertise. There is often a role for a suitably trained and experienced person outside the field staff to carry out village-level case studies of socioeconomic changes in greater depth. During the study for the Laos Project, members of the field teams expressed the view that there was a need for an outside evaluator of their activities. This is specifically the summative aspect of social impact assessment.

These case studies could occur on an *ad hoc* basis where specific issues have been identified for further exploration and they could also occur on a scheduled basis. It is particularly useful for case studies to be carried out prior to formal external evaluations (mid-term or otherwise). In addition to the summative role of Village Case Studies, there is also a formative aspect. They should be carried out in close consultation with the field staff and should contribute to the development of staff skills and conceptual abilities.

We do not wish to prescribe a detailed methodology for Village Case Studies, because we believe that people carrying out the case studies ought to have substantial experience in field research in rural areas and would therefore be able to produce their own strategy appropriate to each situation. However, the methodology would be broadly based on anthropological techniques (essentially participant observation). Some general guidelines are provided in Box 9.4.

### *External Review*

A typical evaluation pattern for many projects is that they undergo an annual evaluation and formal mid-term and end of project reviews. The approach suggested here would provide all baseline data (Village Profiles and field reports) to the various review teams and would also provide Village Case Studies as detailed analyses of socioeconomic impacts.

**Box 9.4** Guidelines for Village Case Studies methodology

Each case study should involve approximately one week of village fieldwork. This should be treated flexibly and fieldwork could be spread over shorter visits.

The underlying approach consists of participant observation and informal interviews.

Case studies should involve participation by:

- Villagers, whose evaluation of the significance/acceptability of changes is actively sought; and
- Field staff. The research process and results should be actively discussed by the evaluator with field team members, both to incorporate their knowledge and insights in the case study and to enable them to develop their skills. (However, the evaluation is to be the responsibility of the evaluator and field team members will not be members of the case study team. The case studies are 'external' evaluations.)

The general focus of attention in the case studies will be changes to well being, equity and exposure to risk.

The case studies should pay particular attention to:

- Exploring the differing impacts of project activities on all stakeholder groups;
- Changes in gender roles and workloads; and
- Changes in tenure and exchange relations especially between traders (within village and external) and collectors.

Case study reports will make recommendations to the project on changes to activities as a response to undesirable project impacts.

## Conclusion

The methodology presented in this paper is developed from a proposal made to the Non-Timber Forest Products Project in Laos (Fisher *et al.* 1996). Obviously it would need to be adapted to fit the particular context of other projects. We believe, however, that the underlying principles are relevant in most contexts.

A key point is that the methodology is aimed at projects that have a commitment to a critical learning approach to implementation. While recognising the legitimacy of needs for summative assessment and evaluation, the methodology is based on a view that formative assessment and evaluation are crucial if projects are to identify emerging problems and adjust their activities accordingly.

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# Appendix 9.1
# Format for Village Profiles with Explanatory Notes[5]

- A *Village Profile* should be prepared for each selected pilot site once it has been identified and an agreement has been made with villagers. This document could be substantially completed from information collected during RRA and PRA as part of the process of identifying suitable pilot villages and participatory planning for pilot projects. It may also be necessary to collect some additional information in a separate visit. The *Village Profile* should be completed by the field staff.
- The *Village Profile* format follows a list of topic headings. It is not a questionnaire, but rather a checklist of the minimum information needed. Field staff should add any additional information they feel is relevant. They should include opinions about issues (and potential emergent issues) as well as factual information.
- The contents of the *Village Profile*, especially comments about emergent issues, should be discussed by field staff during preparation.
- The *Village Profile* is a written document, not a computer database. The document should be kept on a file on which field reports about village visits should also be kept. The file should be accessible to field staff.

## Village Profile

*Authors and Date of Completion of Village Profile*

*Village Name and Location*
Photographs, sketches or diagrams are also useful for later evaluation of changes.

*General Description*
Dates and reasons for establishment of the present village; access, political boundaries, distances to towns/villages; landforms and elevation; village maps (including field team's sketch map and participatory mapping); land use maps.

*Infrastructure and Development Projects*
Existing infrastructure and services (roads, lavatories, irrigation) villagers' expressed needs. Other development projects or assistance; implementing agencies.

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[5] This format was originally prepared for the NTFP project in Laos. It is taken with minor modifications from the report prepared for that project (Fisher *et al.* 1996).

### *Demography*

Population; number of households; names of resident ethnic groups; languages spoken; breakdown of population by gender/age. Any indications of the population trends and significant in- or out-migration.

### *Health*

Hygiene, sanitation practices, status of nutrition, common illnesses (e.g., malaria). Access to health services.

### *Education*

Access to education, distance to schools, grades available, numbers of students (female/male), numbers of teachers. Any other informal education activities.

### *Village Organisation*

Village organisation and leadership (including elected/appointed officials and other influential people). The process of decision making for village rules, regulations and activities.

### *Economic Activities*

- *Livestock*
  Types and numbers of village livestock, comments on management, marketing and consumption.
- *Agriculture*
  Types of crops, types and areas of land under cultivation, crop deficits or surpluses for sale.
- *Wage labour*
  Inside village, outside village.
- *NTFPs*
  Types of NTFPs, priority ranking for various stakeholders, including gender differences; use of NTFPs for subsistence or sale; proximity to forest; commercial or domestic collection.

### *Labour*

Availability of labour, major labour requirements, division of labour (note gender differences especially), seasonal calendar, labour exchange relationships. (Do some people repay loans by performing labour?)

> *Division of labour:* Understanding the division of labour, particularly as applied to various aspects of NTFPs (collection, processing and delivery to market), is a key to identifying equity impacts, especially in terms of gender.

### *Wealth Ranking*

Record results of wealth ranking exercises, including criteria used. Record results of separate wealth ranking exercises by women and men. Note who participated in ranking (village leaders, wealthier people, poor people).

### *Marketing Systems, Traders and Exchange Relationships*

Who are the traders who obtain various NTFPs from village collectors? Are they insiders or outsiders? Do they advance payment? Do they give loans?

*Marketing and Exchange Systems.* It is important to identify traders, where they come from, how they pay for the product and what other relationships they have with the collectors (patron-client ties, loan relationships, etc.). Understanding the processes and steps involved in marketing is crucial in order to identify future positive or negative changes to the conditions under which collectors operate. Prices are a part of this analysis, but it is the steps and conditions of exchange that are most important.

The process of marketing NTFPs may involve quite different types of exchange relationships. Sometimes the process is a relatively simple one involving cash payments from traders in exchange for products. Sometimes the traders may also provide loans to farmers and this may lead to farmers becoming trapped into the forced sale of products at poor prices. The case of the Palawan project (Box 9.2) is an excellent example of NTFP collectors falling into debt and being unable to benefit from increased collection of NTFPs.

### *Land, Tree and Forest Tenure*

What arrangements exist to regulate access to agricultural land (paddy and swidden), and various forest products?

*Tree and forest tenure* refers to the 'rights' which various people hold in relation to land and trees. Bruce (1989) defines tenure as '...the set of rights which a person or some public entity holds in land or trees. A "tenure" is a "bundle of rights". Particular combinations or "bundles of rights" in resources are recognised by law and custom in particular societies.'

Another way of thinking of tenure is as a system for regulating access to particular resources.

Tree and forest tenure are crucial from the point of view of social impact assessment, because access to trees and forests underpin the livelihoods of rural people. Changes in access to resources may result from project actions and reduced access would be an important issue of concern in assessing impacts.

It is frequently assumed that farmers, especially those involved in shifting cultivation, have no arrangements to regulate access to and/or use of trees and forests. Experience from many countries makes it clear that local (village-level) arrangements governing access to and distribution of tree and forest resources do indeed exist. It needs to be stressed that arrangements may vary greatly, even between adjacent villages. It also needs to be remembered that a single village may have quite different arrangements for different NTFPs. For example, individual bamboo clumps in 'common' forest may be the individual property of the people who planted them, while cardamom in the same forest may be common property.

### *Reasons for Selecting the Village*

An explicit statement of reasons for selecting village as pilot village.

### *Target Groups*

Specify particular target groups for people to be involved in project activities.

### *Threats to Socioeconomic Success*

Are there any potential factors identified in field visits which are likely to lead to undesirable impacts on villagers or subgroups of villagers in terms of well being, equity and exposure to risk?

Chapter Ten

# Outcome-based Policies for Sustainable Logging in Community Forests: Reducing Forest Bureaucracy

Chris Bennett

Harvesters of non-timber forest products (NTFPs) in tropical forests often also extract timber from areas perceived as part of village community lands. Timber can be extracted as an occasional or regular activity. Thus, ironwood (*ulin*) trees in Kalimantan, Indonesia, may be felled to construct settlement houses or boardwalks along river banks as well as a wide range of household and agricultural implements. In agroforests, unproductive trees are cut down and replaced, such as the damar (*Shorea javanica*) trees in Krui, Lampung, and fruit trees in the *lembo* and *tembawang* holdings of East and West Kalimantan, respectively. In restricted *ulen* lands, the Kenyah and Kayan Dayaks of East Kalimantan set aside natural forest areas for limited and non-traded timber extraction reserved solely for village-based uses, e.g., house construction. Similar arrangements for traditional forest reserve lands are found amongst the Tamambaloh and Iban Dayaks of West Kalimantan, known as the *toan palalo* and *kampung galao*, respectively (M. Ngo, personal communication, 1997).

As the forest development community makes more frequent and compelling arguments for formal recognition of extractive reserves for NTFPs, it is important not to ignore the role of timber extraction. Even if it appears to be a minor incidental activity, it may be crucial to the economic viability of some community forests. In other instances, timber may represent the major harvesting activity, while NTFPs are regarded as an additional advantage.

With government recognition of rights to extract both NTFPs and timber in state forest lands come responsibilities to the other stakeholders in such public resources. Apart from responsibilities related to the forest resource itself, there is also the obligation to conserve forest functions for the benefits they confer beyond the forest's boundaries, e.g., watershed protection. In general, the greater the amount of timber extracted, the greater the impact on post-harvest recovery of the forest ecosystem and of its external functions.

In theory, regulations governing the use of state forest lands, particularly for logging, are intended to ensure that the integrity of the forest ecosystem is maintained over the long term and that all stakeholders share in the benefits of the forest (to varying and appropriate degrees); in short, to ensure sustainability. In practice, forest management regulations have generally failed to ensure that commercial logging is sustainable. In Indonesia, the steady proliferation of regulatory prescriptions for

commercial concessions has increased the costs of compliance while reducing incentives to increase efficiency and innovation.

This chapter considers the problem of how timber extraction in community forests should be regulated in a way that allows communities to enjoy their rights of access while meeting their responsibilities to other stakeholders in the ecosystem integrity of state forests. The case of Indonesia is examined. It is argued that the nature of subsequent regulations for community forests is every bit as important as persuading governments to formally recognise such forests. If the conventional approach of establishing highly prescriptive regulations (such as those which govern logging by commercial concessions) is applied, the resulting bureaucratic burden would slow the pace of forest utilisation to the point at which efforts are made to bypass such regulations, bringing discredit to the sound concept of community forests. The solution is to frame regulations for timber extraction that are simple and outcome-based rather than complex and prescriptive. Outcome-based regulations would be assessed on the basis of readily verifiable thresholds of impacts on the forest ecosystem. The management process determining how these outcomes are achieved would be left to the discretion of the community.

Getting regulations right for both NTFP and timber harvesting is fundamental to economic and environmental viability. Getting them wrong can all too easily result in decreased interest in conserving forest functions and incentives to escape forest regulation by converting the forest land to agricultural uses.

## Regulatory Implications of Logging by Local Communities

Community forest management is slowly becoming established as a forestry development goal in Indonesia, as in many other countries. Repelita VI (Indonesia's 6th Five Year Development Plan) and the Indonesian Forestry Action Plan (MoFr 1997) make frequent reference to community involvement in forest management. Within the Ministry of Forestry (MoFr) socioeconomic and social forestry sections have been set up to support community-based forestry. Among MoFr community forestry initiatives are the People's Forest Programmes in private (*Hutan Rakyat*) and state forest (*Hutan Kemasyarakatan*) lands as well as the pilot programme for community logging with NGO support in old concessions (Table 10.1). Possibilities of limited community-based exploitation of specific zones within protected areas are also being considered. Local NGOs and development projects are promoting the recognition of long-standing and sustainable community forest systems. A case in point is the People's Forest System (*Sistem Hutan Kerakyatan, SHK*) promoted by a group of NGOs, the *Konsorsium SHK.*

As the MoFr moves cautiously towards meaningful recognition of community forest systems and the testing of initiatives to allow logging and NTFP use by local communities, the question of how to regulate such production systems becomes an increasingly important issue. Many in government, while accepting the need for local involvement in reaping the benefits of forest management, remain convinced

**Table 10.1** Potential areas for community forests in Indonesia

| Forest function | Total area 1994 (mill ha) | Area with forest cover 1994 (mill ha) | Potential candidate areas 1996 |
|---|---|---|---|
| Conservation (national parks, reserves) | 18.8 | 15.8 | Buffer/Use Zones of National Parks (NTFPs and possibly highly selective timber extraction, e.g., ironwood or *ulin*) |
| Protection (watershed protection) | 30.7 | 24.9 | *Hutan Kemasyarakatan*/Peoples' Forest (NTFP extraction only, possibly timber in future) |
| Limited production (& conservation) | 31.3 | 25.3 | NGO with community: timber extraction in ex-concession area |
| Production | 33.0 | 26.4 | NGO with community project: Timber ex-concession areas<br>Timber and NTFP extraction in donor with community projects:<br>(1) MoFr-GTZ's PFMA: TPTI or TPTI-like selective logging; or<br>(2) MoFr-BCN-Harvard Project. |
| Conversion forest (to non-forest status) | 26.6 | 20.0 | *Hutan Rakyat* / People's Forest in private forest land.<br>Other private forestry schemes. |
| Non-forest | 52.6 | 6.6 | -- |
| Totals: | 193.0 | 119.0 | -- |

Source: National Forest Inventory Project, 1994 cit. MoFr (1997).

that local communities will behave irresponsibly and abuse their rights to extract timber by exceeding harvesting regulations. This concern may lead to the use of needlessly inflexible, high-cost, top-down management or regulatory systems to guide community participation.

Applying **prescriptive** regulations would generate high-cost bureaucratic constraints (like existing forest management regulations for corporate concessions) on community forest management. A simpler **outcome-based** (end-results) set of regulations, could encourage profitable and sustainable forest management.[1] Establishing this regulatory approach would address the concerns of those who fear that local communities may indulge in excessive forest exploitation. Its greater simplicity and objectivity would encourage a transparent and practicable process readily understood by forest managers and open to scrutiny by a wide range of stakeholders, not just the existing inspection service.

[1] The term sustainable forest management used in this paper is understood to mean management of a unit of forest whereby production practices allow recovery of ecosystem integrity within the exploitation cycle (Bennett *et al.* 1997a).

Thus:
- Government acceptance of the principle of logging by local communities has proceeded slowly, in part because of legitimate concerns of harvesting excesses;
- These concerns may lead to overly prescriptive and bureaucratic regulations that are high-cost to manage and monitor effectively; and
- As a result there will be a small number of sustainable government-approved community forests.

The challenge is to develop a regulatory framework that:
- Is credible, readily understood, transparent, low-cost and goal-oriented;
- Addresses legitimate government concerns about excessive harvesting in community forests; and
- Favours widespread adoption of community forest systems with minimal outside intervention.

## Overly Prescriptive and Proxy Regulations

The current regulatory framework for Indonesia's natural production forests under corporate concession management is highly prescriptive in principle and bureaucratic in implementation. Regulation of forest practices centres around the issuing of licences, permits and approvals for prescribed requirements such as road construction, equipment types, personnel qualifications, programmes for research and development and financial reporting as well as logging itself. It focuses on inputs, primarily planning documents, placing little emphasis on actual outcomes. One of many examples of the input approach is the recent decree that mandates the preparation of 20 seedlings for each tree cut (MoFr 1996). Evidence of 20 seedlings in a nursery is a poor proxy for sufficient regeneration in the forest, where low-impact logging usually obviates the need for any enrichment planting.

Most regulations are indirect and proxy in nature, e.g., stipulations about machinery used and staffing qualifications, and therefore give little assurance that impacts on the forest ecosystem are within tolerable limits. Only a relatively small number of regulatory requirements focus on the **impact** of logging activities on the forest ecosystem, which determines the likelihood of post-harvest recovery of the forest's biophysical integrity. Most regulations prescribe forest practices rather than the sustainable **outcome** to be achieved – the 'how' rather than the 'what' of forest management goals. Much of the mandatory Indonesian Selective Logging and Planting System (*Tebang Pilih dan Tanam Indonesia*) is input-oriented with little practical emphasis on outcomes such as indications of the capacity of the forest ecosystem to regenerate, e.g., level of damage to the residual stand, site disturbance and gap size.

Thus, prescriptive regulations dictate the management process towards achievement of the development goals. The regulations encompass:
- Quantity and quality of personnel;
- Equipment used;

- Financial viability;
- Operational budget allocation;
- Research programmes; and
- Silvicultural inputs.

There is a multiplicity of possible options for the management of diverse tropical forest ecosystems. Prescriptive regulations, which by their very nature seek to lay down what management processes and practices must be followed, need to be able to accommodate this diversity. In reality, such regulations cannot be sufficiently adaptive. The TPTI is well known for its lack of site specificity. Forest managers may have to break the rules to be able to adjust their practices to site-specific conditions. This, in turn, prompts regulators to add still more rules to defend the national standards.

Not only are most current forest management regulations of indirect relevance to ensuring low-impact and sustainable harvesting, but some also encourage economically and environmentally adverse outcomes. For example, cut control mechanisms can reduce the value of the forest resource while exacerbating the problem of logging waste. The volume limit in the Annual Allowable Cut (AAC), as is typical of quota mechanisms encourages high-grading or creaming. The volume of harvestable wood according to TPTI standards is determined by a pre-logging inventory or cruising. The allowable volume is then calculated by reducing the inventory volume by two factors; a safety factor (0.8 per cent) and a performance-based exploitation factor (e.g., 0.7 per cent). In this case, for a given area, only about 56 per cent of the sustainable volume can be extracted. The resulting quota or allowable wood volume is much less than the actual volume that could be sustainably harvested. In effect, the resource is overabundant. Extraction tends to be wasteful and high-grading or creaming is encouraged. Slightly defective logs can be ignored, more trees than necessary are felled and economically useable wood is left behind in the forest (Klassen 1994).

An example of how compulsory guidelines can detract from sustainable forest management goals and even encourage harmful practices can be seen from MoFr rules for construction in concessions. To allow for sufficient drying and settling of major roads, a bare-earth strip either side of the road is required. Logs of harvestable diameter that are obtained as a result of road building can be recovered for commercial use, but are not included within the annual allowable cut quota. In the past, building the widest allowable roads has been used more as a logging than a transport strategy. A recent change to the regulations has reduced the mandated road width.

Despite the above problems, in recent years the MoFr has managed to reduce some poor forestry practices by better identification of unprofessional forest managers and by revoking or not renewing the concession licences of the worst offenders. The existing regulatory framework, however, is probably less able to distinguish between the performance of remaining concessionaires in terms of forest ecosystem impacts. It is likely to be even less informative about the impact of community management on the forest ecosystem. In addition its cost for local community managers may prove prohibitive.

## Costs of Negotiating the Forest Bureaucracy

Corporate forest concessionaires face a procedural labyrinth of over 65 distinct regulations that must be followed every year, many requiring several bureaucratic steps of indeterminate length. Corporate concessionaires engage full-time administrative and technical staff to meet the reporting and processing requirements of these regulations.[2] In 1995 (Table 10.2), one concessionaire in Kalimantan had to follow reporting, permit and licensing procedures relevant to two Presidential decrees (*Keppres*), three Government Regulations (*Peraturan Pemerintah*), 10 Minister's decrees, 37 Director General's decrees or circulars (*Surat Keputusan* or *Surat Edaran*), as well as circulars from the Agency for Forestry Research and Development (now Forestry Research and Development Agency) (*Litbang*) (1), the MoFr's office in the provincial capital (*Kanwil*) (12) and subdistrict and district of MoFr branch offices (*Dinas Kehutanan*) (3).[3] Many directives required yearly, quarterly or monthly reporting after field implementation. Fourteen reports were required each month

**Table 10.2** Regulation of a natural forest management unit in 1995

| Type[a] | Number of Decrees, Circulars, Laws Governing Management Actions[b] |
|---|---|
| Article of the Constitution (UU 1945) | 1 |
| Presidential Decree (Keppres) | 2 |
| Government Regulation (PP) | 3 |
| Minister's Decree (SK) | 10 |
| Director General's Decree (SK) or Circular (SE) | 37 |
| Litbang (SE)/Agency for Forestry Research and Development (Forestry Research and Development Agency) | 1 |
| Kanwil/Ministry of Forestry's Provincial Representative (SE) | 12 |
| Dinas Kehutanan (SE)/Provincial Forestry Inspection and Extension Service | 3 |
| Total: | 69 |

Source: Adapted from Bennett *et al*. (1997a)

Notes:

a. The various regulatory levels deal with land use mapping, planning, road, building, logging, log transport, replanting, community development.

b. 95% of the above result in yearly, quarterly or monthly reporting after field implementation. The total of 69 instructions/regulations is probably an underestimate. The compiler of the regulations noted only three of the 20 instructions dealing with the Village Development or *Bina Desa Hutan/PMDH* programme.

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[2] In 1995, the MoFr began an initiative to reduce the burden of bureaucracy on several concessions of proven performance. Under this so-called 'self-approval' system, annual cutting plans (RKT) can be approved by the concessionaire without the need to go through the many steps of MoFr approval. This initiative has yet to be fully developed because of uncertainties surrounding its implementation. Meanwhile, a decree issued at around the same time simplified the process for **all** RKT approvals (while keeping the content of the RKT unchanged), regardless of their past performance. This essentially undermined incentives to improve forest management to be eligible for RKT 'self-approval'. Furthermore, procedural simplifications alone, without refocusing on ecosystem impacts, will not necessarily ensure better forest management.

[3] The number of regulations listed is probably an underestimate. Only 3 of the 15 instructions dealing with the Village Development Programme (*Bina Desa Hutan*/PMDH) are included.

and four resports every three months. Obtaining report or proposal approval involves a few to several intermediate stages.

For community forests, meeting current regulatory requirements may prove insurmountable. It is hard to imagine how community forest managers could negotiate the present array of regulations for natural production forests. The Ministry of Forestry is now considering the possibility of recognising community forests where logging can take place, e.g., Social Forestry Development Project in Sanggau, West Kalimantan (MoFr-GTZ), and the Community-based Forest Management of Buffer Zone Forests (MoFr-Biodiversity Conservation Network-Harvard Project, Ketapang, West Kalimantan). MoFr is also considering allowing harvest of timber by local communities assisted by NGOs in ex-concession areas. Important questions surrounding the regulation of community forests remain unanswered. Under what regulatory framework will these and other community forest schemes operate during and after the lifetimes of their assistance projects? To what extent will regulation follow a similar pattern to that for concessions?

The present prescriptive approach to forestry regulation of concession management steadily increases in complexity and cost by a cumulative process designed to plug past loopholes and irregularities. It reflects legitimate concern about the future of Indonesia's natural production forests. But bureaucracy begets bureaucracy, and inspection resources remain limited. There is a tendency to focus them more on verification of reporting procedures than on visits to and evaluation of actual logging sites. Over-reliance on evaluations of 'paper' is inherently more prone to abuse.

As regulations grow in number and complexity, the MoFr at the centre has greater difficulty in conducting meaningful spot audits of both the forests and their MoFr inspectors. Other forest stakeholders have even more problem understanding the quality of forest management by reference to the present inspection process.

The professional concessionaire has little incentive to innovate and raise economic efficiency. The more heavily prescribed forest management practices are, the less opportunity there is to adapt logging to local conditions. Opportunities for maximising output or forest value and minimising impact are lost. Meanwhile, the unprofessional concessionaire can readily hide behind purchased permits.

There are high costs to the present processes for regulation.[4] Significant delays arise from the slow pace of the intricate procedure of bureaucracies which devote most energy to prescribing how each step of the production and trade process should be taken. To cite two examples for harvesting of logs by concessionaires:

> The approval process for the annual allowable cut (AAC) can take up to a year, creating uncertainty and encouraging poor planning. The process of approval for the annual cutting plan has become so problematic that the Managing Director of the parastatal concessionaire Inhutani I, has taken the

[4] This also points to a wider issue – the opportunity cost of natural forest management. Rising costs of doing forestry business make alternative non-forest uses of the land relatively more attractive to investors and to local government, adding to the pressure on MoFr to allow conversion of forest land to agriculture.

unusual step of publicly criticising its needless bureaucratic delays (Bisnis Indonesia 1997).

Government inspectors who authorise the production report (*Laporan Hasil Produksi*) must visit the concession. They are not driven by the same time imperative as the concessionaire or, for that matter, the harvester and trader of rattan or other NTFPs. A delay has no significant consequence to their welfare. A delay by just one day can hold up by a month or more the river transport of several hundred cubic metres of logs because the river level has fallen too low.

Non-timber forest products in Indonesia already face several constraints originating from the principle of prescriptive regulation with its bureaucratic consequences, notably costly delays. One of the better known cases is that of rattan production and trade which, at the local level, face a labyrinth of permits and approvals from various government offices for harvesting and transport (Bennett *et al.* 1997b). A rattan harvesting licence is required for each location where harvesters (say a group of 5-10 gatherers) wish to collect rattan from the forest. Licences are issued following a nine-step process involving the head of the subdistrict (*Camat*), subdistrict and district MoFr branch offices (*Dinas Kehutanan*), the MoFr's office in the provincial capital (*Kanwil*) and Department of Cooperatives. Photographs of the seedling nursery must be provided as an assurance of enrichment planting. Officials rarely conduct any meaningful inspection of forest conditions before issuing licences. The harvesting licence must be renewed every six months. An additional series of steps is required for the issuing of a transport licence for raw and semi-finished rattan.

The burden of the costs of negotiating the forest bureaucracy would be relatively more onerous for community forest managers than it is for concessionaires. Concessionaires have entire offices set aside to fulfill the paper requirements of the existing regulatory framework, including staff to visit government offices at various local, regional and central levels. Applying anything resembling the prescriptive regulatory system for concessionaires would, on paper and in practice, represent a bureaucratic minefield that few could negotiate. Yet past experience of concession regulation and more distrustful attitudes of MoFr to community forests indicates that government approval of tree cutting by local people will be conditional upon a typically and highly interventionist array of approvals, permits and rigid management instructions, described euphemistically as guidelines.

## Towards Objective and Transparent Forestry Regulations

Could a simpler, more objective and transparent regulatory system be developed for assuring sustainable logging under community forest management? By focussing regulation of sustainable forest management on a few key indicators of biophysical outcomes rather than on a plethora of instructions, permits, approvals and licences about how to achieve them, the system could be greatly simplified. Certainly, technical guidelines could be provided to assist rather than dictate management decisions. Sustainable forest management results could be achieved by setting simple logging impact thresholds that could be readily quantified and verified, namely, damage to

residual stand, site disturbance, canopy opening or gap size and water flow quality. These thresholds would be conservatively set to assure regeneration of the forest ecosystem following the planned cutting cycle.

An outcome-based system for community forest regulation would have a number of advantages for forest managers, other stakeholders and the primary 'stickholder', the MoFr (Bennett 1997). Replacement of conventional prescriptive approaches by outcome-based regulation of forest management would favour sustainable forest management in the following ways:

- **Simple approach for forest managers and inspectors.** Ease of understanding and implementation by community forest managers and local inspectors alike is an essential feature. It is easier and more efficient to adjust harvesting activities to tangible impacts (within the framework of a basic management plan) than to a maze of conventional planning, guideline, licensing and approval procedures.
- **Focus on the goal of sustainability.** Forest managers and regulators alike are guided by the knowledge that they will be judged more by sustainable forest management goals than by proxies such as fulfilling the gamut of permit and guideline instructions, some of which are contradictory (innumerable instructions from different branches of MoFr and other government departments result in many unintended inconsistencies), while others are inappropriate to site-specific conditions.
- **Site-specific adaptability.** Forest managers have the flexibility to adapt their logging practices to variable, site-specific conditions while keeping to overall sustainable forest management goals by remaining within acceptable impact



Innovative adaptation of skidding for logs on swampy soils (photo by John Turnbull).

parameters. These parameters must be established according to biophysical zoning of forest types (see below). Allowing forest managers, be they concessionaires or local people, the flexibility to adjust their operations to the highly variable features of timber extraction from natural or agroforest tropical forests has both spatial and temporal advantages. Apart from the obvious benefit of site-specific approaches to cutting trees, there is also the need to respond to changing market demand for the wide range of harvestable trees.

- **Innovation and efficiency.** Operational flexibility, within the limits of acceptable damage from timber extraction, favours increases in efficiency. Over the long term, perhaps of greater significance to the future economic and environmental viability of sustainable forest management is that goal-oriented flexibility of outcome-based regulation allows the opportunity for innovation.
- **Optimising economic value.** Within the acceptable impact parameters, more wood is extracted and less wastefully than under the present quota-based cut control mechanism that encourages high-grading. Currently, wood marketing regulations for concessionaires preclude many economic opportunities to sell wood that is substandard for use by the wood panel and moulding industry but useable by smaller-scale wood industries in Indonesia. Under an effective outcome-based system of regulation, there would be no trade regulation beyond the 'forest gate'.
- **Predictive value.** Outcome-based quantitative assessments of forest management units provide more objective and reliable information about the performance of a forest manager and decisions about whether to extend leases. For irresponsible forest managers, it is more difficult to hide visible evidence of damage to the forest ecosystem than paper irregularities. For the more responsible, their good performance cannot so readily be challenged by officials who might seek to find fault to impose penalties or threaten to do so unless the matter can be 'resolved'.
- **Effective tool for exposing excessive harvesting.** Having a simple, outcome-based system for regulating community forestry should help to allay the legitimate concerns of government that communities will abuse their harvesting rights, especially for logging. Excessive harvesting could be more readily exposed (by MoFr audits from the centre if not by current regional inspection services). Awareness that infringements can be relatively easily detected will make forest managers think twice about wilful evasion or even harvesting too close to threshold specifications.
- **Lower bureaucratic costs derived from the opportunity for transparency.** Given its greater simplicity, it is easier for other stakeholders (e.g., MoFr at the centre, local government, local communities and forest management observers and analysts) to evaluate the performance of the immediate 'assessors', the subdistrict and district MoFr branch offices (*Dinas Kehutanan*), and the MoFr's office in the provincial capital (*Kanwil*). This may, in turn, reduce the tendencies of forest inspectors and other officials to place unnecessarily bureaucratic and costly constraints on community forestry.
- **Integration with monitoring by remote sensing and GIS.** At least one of the core indicators that might be used in an outcome-based approach, size of canopy opening or gap (see next section), could be verified or linked to remote sensing.

This would provide a check on the system for forest managers and inspectors alike. The more quantifiable outcome-based parameters would be better suited to incorporation of GIS to monitor forest management performance.

- **Integration with spatial planning.** Finally, forest management within outcome-based parameters provides more useful information to spatial planners than existing prescriptive regulations which pay scant regard to the physical condition of the forest and the probability that forest managers will conserve it.

## Impact Thresholds for Outcome-based Regulation

Do we know enough about the impact of logging on tropical natural forest ecosystems to be able to establish impact thresholds for outcome-based regulation, let alone for the large number of NTFPs? Certainly not as much as we would like to know, but establishing forestry management guidelines and regulations, prescriptive or otherwise, has generally depended upon making assumptions from what is already known. This was how the Indonesian selective logging system known as the TPTI was developed (MoFr 1993).

Establishing impact thresholds is as much about defining objectives as it is about making use of what is known about the relationship between logging intensity and recovery of the forest ecosystem. Thus, sustainable forest management (SFM) of natural production forests managed by local communities is the objective. This objective is further qualified by an understanding that there are three principal components of SFM – production, ecological and social functions, the latter ensuring that local communities enjoy a proportionate share of the benefits of forest management.

Discussion of the following indicators of harvesting outcomes (in this case, the cutting of trees) assumes an unlogged natural dipterocarp forest. Adjustments would have to be made for different forest types. The principle of setting impact thresholds and, as far as possible, establishing more direct indications of forest health remains the same regardless of forest type.

### Impact thresholds at the logging site

From the results of past research and experience, a number of outcome-based indicators of the quality of forest regeneration after logging can be recognised, namely, damage to the residual stand, site disturbance and extent of canopy opening or forest gap and overall tree species composition. The first three indicators can be assessed in the logging year itself when access to the site is easiest. The fourth would be assessed at intervals some years after logging.

#### *Residual stand*

The incidence and severity of damage to the residual stand or *pohon inti* gives a direct indication of the quality of the second cut (35-50 years after the first cut in a lowland dipterocarp forest). According to the TPTI, no fewer than 25 trees per hectare with diameter at breast height (dbh) between 30 and 50 cm should remain after logging.

An alternative approach would be to replace the rule mandating a minimum of 25 residual trees and minimum dbh of 50 cm (60 cm in so-called limited production forests) for harvestable trees with minimum dbh thresholds for major species groups to be logged and no stipulation for residual trees (M. Leighton, personal communication, 1996; Nolan 1997), as is the case for tropical forests in some other countries. The dbh for harvestable trees would be based on assumptions of their habitat, growth and fruiting characteristics.

*Site disturbance*

Site disturbance (ranging from superficial soil disturbance to complete removal of the upper soil layers), typically along the skid-trails, is caused by the felling and extraction of trees, e.g., through the action of bulldozers particularly where skid-trails are not predesigned and constructed. This damage affects some trees of the second cut, but primarily those recruited for the third cut cycle. Based on results from the MoFr's STREK project, CIRAD suggest a conservative threshold for both parameters of around 30 per cent (Bertault and Sist 1995, 1997).

*Gap size*

The degree of canopy opening or gap size has important implications for recruitment of commercial species. Gaps that are too large will provide disproportional advantages to pioneer species and adverse microclimatic and ecological conditions for remaining trees and recruitment of desirable species. This parameter is less well understood. Suggestions for allowable gap size over say 100 ha, typically range from 10 to 30 per cent.

*Tree demography*

A fourth kind of indicator of forest regeneration could be assessed 2-4 years after logging by measuring the population of seedlings, saplings, poles and larger trees. Recovery of tree populations within acceptable limits of deviation from original species composition is arguably the most direct indicator of recovery of overall forest biodiversity. As such, this indicator is also a proxy for biodiversity and general ecological recovery within the forest, which could be replaced by more direct measures of biodiversity as they become practical tools of assessment by regulators.

Assessment of tree demography represents the most direct measure of regeneration within the exploitation cycle but also the most difficult because of the barrier to site access presented by vegetation regrowth. The first three indicators, however, can give an adequate indication of regeneration outcome shortly after logging.

It should be noted that there is a distinction between the indicators. While all are outcome-based, some more closely indicate the sustainable forest management production outcome. Thus, residual stand and tree demography indicators are actual outcomes, whereas site disturbance and gap size are strongly associated with the capacity of the forest to recover, and are a valid basis for predicting outcomes. Although in some sense they may be perceived as prescriptive, their close relationship to ecosystem recovery justifies their inclusion as outcome-based indicators (compare

with regulations that stipulate training qualifications for concession staff, equipment which should be used and reporting of company finances).

### Watershed services of the forest

Aside from immediate tree damage and site disturbance, logging activities affect watershed management within and beyond the confines of the forest management unit, e.g., when roads cross drainage and river systems. Poorly constructed roads for logging trucks built with short-term needs in mind and indiscriminate crossing of streams by bulldozers can cause serious deterioration of waterways.

Rather than stipulate in detail how skid-trails and roads should be constructed, it might be more environmentally relevant to establish baseline flow and turbidity characteristics and then decide on threshold deviation limits from the predetermined norm. Technical guidelines and related government extension activities could inform forest managers about the relationship between water system disturbance and water quality. They would then prescribe their own operational techniques to keep within impact thresholds.

### Building on the current state of knowledge

Given the complexity of the tropical rainforest ecosystem and the decades of research that are needed to fully understand its regeneration dynamics, some may argue that setting logging impact thresholds is premature. However, it is no less open to question whether the present prescriptive system of forest management controls is a valid means of ensuring sustainable forest management. And how much forest will there be left by the time knowledge about logging impact is complete?

The pragmatic solution is to rely as far as possible on the current state of sustainable forest management knowledge, integrating results from both research and practical experience, in particular the outcome of following the TPTI. Thus, logging impacts from properly implemented TPTI (a few companies have met or come close to such standards) and from reduced impact logging (RIL) techniques (e.g., those established by the Sabah Foundation; see Pinard *et al*. 1995) can be integrated with what is known from past experiments under tropical natural forest conditions (Bertault and Sist 1995).

It is likely that conservative thresholds for the above three impacts (damage to the residual stand, site disturbance and canopy opening) would range from 20-30 per cent for each parameter, under the assumption of a 35-year cycle for dipterocarp forests in western Kalimantan. If the fourth parameter, tree demographics, is to be included, there would have to be agreement about the limit of acceptable deviation from the pre-logging tree population. Establishing water quality standards to be maintained by forest managers should not present insurmountable difficulties.

To summarise, there are a number of core indicators of the forest ecosystem impacts of logging relevant to the SFM objective for the regulation of community forest management. Deciding on the appropriate thresholds for a given forest management unit should be part of a consultative process amongst stakeholders with the opportunity for periodic revision in the light of new research knowledge or practical experience.

## Implementing Outcome-based Regulations for Community Forests

Only a small part of the TPTI focuses on the fundamental determinants of regeneration, e.g., the requirement that no fewer than 25 healthy residual trees (*pohon inti*) remain after logging. An outcome-based approach for community forestry could be viewed as a fundamental reorientation of TPTI. Unlike the TPTI, it would have to allow for site-specific characteristics and the possibility of different cutting cycles. Thresholds should be set by broad-based regional committees with representatives from research institutes, MoFr and local government, as well as the community managers themselves. Impact thresholds could be reviewed, say every five years to accommodate new knowledge. If successful, the experience could also be used to argue for reform of the TPTI, recognised by the MoFr as in need of improvement (Minister of Forestry 1996 cited in *Bisnis Indonesia*) and even the wider process of concession regulation.[5]

### Introducing an alternative regulatory approach

How should the outcome-based concept for regulation of community forest management be introduced? First, development projects and other programmes for community forestry should include efforts to devise appropriate outcome-based indicators as a proposed basis for regulation beyond a project's lifetime. Such indicators could be derived from the monitoring and evaluation protocols of projects. Lessons learned from this process could form the basis of a countrywide framework for outcome-based regulations to be linked with existing community forestry programmes in state forests (e.g., People's Forests or *Hutan Kemasyarakatan)* as well as future approaches.

Secondly, policy makers in collaboration with researchers and stakeholders will have to frame a regulatory approach for community forests that displays a lighter hand of intervention, focussing on the essential outcomes being sought rather than the heavier bureaucratic involvement of prescribing how such outcomes should be sought. Supporting technical guidelines will undoubtedly help but only if they are perceived as such and not as instructions.

Finally, there is the matter of the operational side to meeting outcome-based regulations. Logging crews cannot be expected to work under no other direction than outcome-based impact thresholds. It would be at the stage of preparing harvesting plans that the forest manager, whether a local community or corporate concessionaire unit, would translate the regulatory limits on logging impacts into guidelines for the field crews. These guidelines would be prepared by integrating knowledge of site-

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[5] Reform of concession regulation need not be as radical as it might at first appear. Already there is the so-called 'self-approval system' for the Annual Cutting Plan (RKT) for well-managed concessions. The basis for judging a concession to be fit for the privilege of RKT self-approval could be modified to be more outcome-based. If a concessionaire were to abuse the greater freedom of management approval and implementation, the self-approval right could be suspended (subject to objective and transparent evaluation) and the concessionaire returned to the 'normal' management approval system.

specific biophysical characteristics with available information on the relationship between impacts and outcomes. This process should involve researchers and government agencies as well as forest managers, integrating perspectives and knowledge from the local and central levels.

Internal management of harvesting operations, however, might well be prescriptive. Field crews typically follow prescriptions, e.g., how to keep to designed skid trails, to use winches, to directionally fell and to avoid crossing streams, or how many trees of a given size and species they should fell over a given area or, in the case of corporate concessionaires, how to follow computerised tree management systems. But the important point to note here is that the practices would not be prescribed by regulations, but rather adapted to local conditions while keeping within government-set, allowable levels of impact on the forest ecosystem.

## Challenges of institutional change

Is the outcome-based approach a feasible option? Does it not depart too far from the way in which forestry institutions – and government institutions in general – operate, not only in Indonesia but in other countries where forest management is a major economic activity? One of the most intricate and exhaustive systems of prescriptive regulation is to be found in British Columbia, Canada (BC 1996). In Washington State, USA, riparian management regulations are also highly prescriptive. The outcome-based alternative being debated in British Columbia is referred to as an end-results approach.

In any setting, the challenges for introducing an outcome-based system are plentiful; some may appear insurmountable. Some may argue, pointing to existing community development projects in forestry settings, that there is no problem. These projects, e.g., the Social Forestry Development Project in Sanggau, are functioning without undue interference from the forestry bureaucracy. Yet during a project's lifetime, special agreements allow a range of activities that would otherwise not be permitted. The question here is one of replicability. What regulatory obligations will a community forest project face **after** the end of the project? Also, how favourable will the regulatory framework be for the much more numerous locations where community forestry could occur?

Perhaps most formidable of all will be the challenge of introducing such a system at the regional level where the local inspection and supervision services generally have a different set of priorities and are not noted for their willingness and ability to accept change. They will be looking for what they are adept at finding, ways around the formal system. But, given the greater clarity of goals and benefits that result from outcome-based regulations, other institutions are likely to support the approach, e.g., local government, NGOs and communities themselves. Nonetheless, training of local inspectors and other MoFr officials to refocus their attention from paper on desks to trees and NTFPs in the forest will also be necessary.

In the framing of outcome-based indicators, the 'prescriptive temptation' will be hard to avoid. Forestry specialists called upon to put together outcome-based protocols tend to operate on the assumption that they know more about the principles of

ecosystem management than concessionaires, let alone local people. As they set about establishing appropriate sustainable forest management goals, they may find it hard to resist the assumption that they know best how to achieve those goals. Forest managers are perceived as less educated, let alone local people who may be seen as a liability when, in fact, they can become sustainable forest management's greatest asset. Their detailed knowledge of the forest is likely to exceed that which can be anticipated by general and mandatory forest practices established by a centralised board of experts. Encouragingly, the MoFr's Forestry Research and Development Agency is currently working on identifying clearer post-harvest indicators of logging impacts (Mansyur and Endom 1997).

One solution to excessive bureaucratic involvement might be to release community forests from conventional inspection, by say *Dinas Kehutanan*, if the quality of forest management was to be assured by independent certification. This process should be adjusted to the particular circumstances of community forests. The Indonesian Eco-labelling Foundation and Rainforest Alliance, amongst others, are developing certification systems for community forestry. But some certification systems also run the risk of yielding to the 'prescriptive temptation' with the result that outcome-based indicators become less important.

Local people can grasp clear and simple indicators of impact thresholds and understanding about the consequences of exceeding them. Evaluating this local capacity should be tested in the field. Perhaps, only then will policy makers be persuaded that local people can be given sufficient flexibility to optimise forest resource management. There would still be a role for true technical guidelines (as opposed to guidelines which are *de facto* instructions) to help local managers understand the consequences of their logging activities on ecosystem recovery.

## Role of other Forestry Policies

Of course, overly prescriptive and bureaucratic regulations are not the only constraints to successful community forestry. Problems of industrial development policies that undervalue forest resources and uncertainty of tenure can also undermine incentives for sustainable forest management by communities and corporate concessionaires alike. Adequate rights of access are vital for local communities to invest their energy in forest management. Will the forest lease system allow long enough for harvest cycles? Agreement amongst stakeholders about the location of the outer boundaries of the forest management unit is an essential precondition. Are the boundaries consistent with the regional land use spatial plan? Do the MoFr, the Ministry of Agriculture and the Regional Planning Agency (Bappeda) concur about community-based forestry land use? In short, without tenure clarity and certainty, sustainable forest management regulations, be they outcome-based or prescriptive, are unlikely to be effective.

Another policy-related factor that plays a role in local decision making about natural resource use is relative resource value. Thus might other uses of the forest be more profitable, such as conversion to agricultural use for coffee or cassiavera in the

Barisan highlands of Sumatra, for rubber in Kalimantan, or for cocoa in Sulawesi? If the answer is yes, neither tenure nor outcome-based regulation is likely to favour long-term natural forest management. This problem is exacerbated by industry policies which undervalue Indonesia's forestry resources to favour downstream wood industries (e.g., export restrictions on logs and sawn timber that depress domestic log prices to around half the world price).

In short, outcome-based regulation could provide an answer to only one of the three fundamental questions of developing the forest resource base in Indonesia – how much is it worth, whose is it and how is it regulated (Bennett 1997)?

## Conclusions

Outcome-based regulation of community forests provides the opportunity for regulators and other stakeholders to gain a better understanding of forest quality and future value than would highly prescriptive approaches like the regulatory framework applied to natural forest concessions. Outcome-based regulations would be simpler for community forest managers to follow and inspection agencies to monitor, creating a potentially more transparent system. The system would allow for site-specific adaptations and encourage innovation.

Conventional and prescriptive approaches to community forest regulation, on the other hand, run the risk of defeating their purpose, weighing down the local managers with an array of bureaucratic rules and thereby persuading them, albeit unintentionally, that long-term forest management is a less attractive option than (a) conversion to non-forest use, or (b) simply turning their productive energy to other activities. What prospects are there, therefore, for going against the conventional wisdom of overly prescriptive regulation of forest management? Then again, what are the alternatives?

- A relatively small number of community forests, probably under government development projects and constrained by prescriptive and excessive bureaucracy; or
- A large number of sustainable schemes run largely by the communities themselves and following a practical and transparent outcome-based system of regulations.

At present, arguments for alternative approaches to forest regulation can only go so far. The principles of outcome-based regulation can be put forward. Convincing policy makers of the need for change will, in part, probably depend upon successful demonstration in the field, showing how forest managers and inspectors could learn and be willing to implement the system. The rest is politics.

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Chapter Eleven

# Conclusion

Eva Wollenberg

There is no guarantee that forest products can contribute to development or conservation. The authors of the preceding chapters show that they share this perception, and therefore share a concern for determining where and how potential gains from forest-based incomes can be achieved. They express a common need for reliable, cost-efficient methods to help guide the assessment and planning of forest product conservation and development as well as monitor and evaluate their impacts.

The chapters present and analyse methods used by researchers and practitioners for facilitating the development of forest product incomes for forest villagers in ways that are ecologically sustainable. The book focuses on methods for (1) planning and feasibility assessment and (2) monitoring and evaluation. Such methods are useful for improving information flows as forest product enterprises are often complex, highly sensitive to changing environments and lack basic management information. Iterative, timely information flows enable more adaptive management. Methods for feasibility assessment include how to assess the financial, ecological and social fit of proposed enterprises (Lecup *et al.*), how to assess opportunities for intervention in a given product market (Belcher), calculating different facets of profitability (Ames), determining the demographics of a species population and safe minimum thresholds for harvest of a product (Anderson). Techniques for monitoring and evaluation of the outcomes of forest product initiatives include estimating household incomes (Wollenberg and Nawir), identifying and evaluating social impacts (Fisher and Dechaineux) and using regulatory policies that assess outcomes (Bennett).

The methods describe tools, techniques and approaches for collecting information by (or for) forest and enterprise managers. They constitute elements of what can be called an adaptive management approach. The editors and authors have tried to purposefully intertwine methods for describing forest product systems (the conventional territory of the researcher) with approaches for enhancing the production and management of forest resources (the conventional territory of the practitioner) to break down perceptions that these are distinct spheres of methods. One of the purposes of the book has therefore been to show the benefits of drawing upon both research-oriented and practitioner-oriented methods.

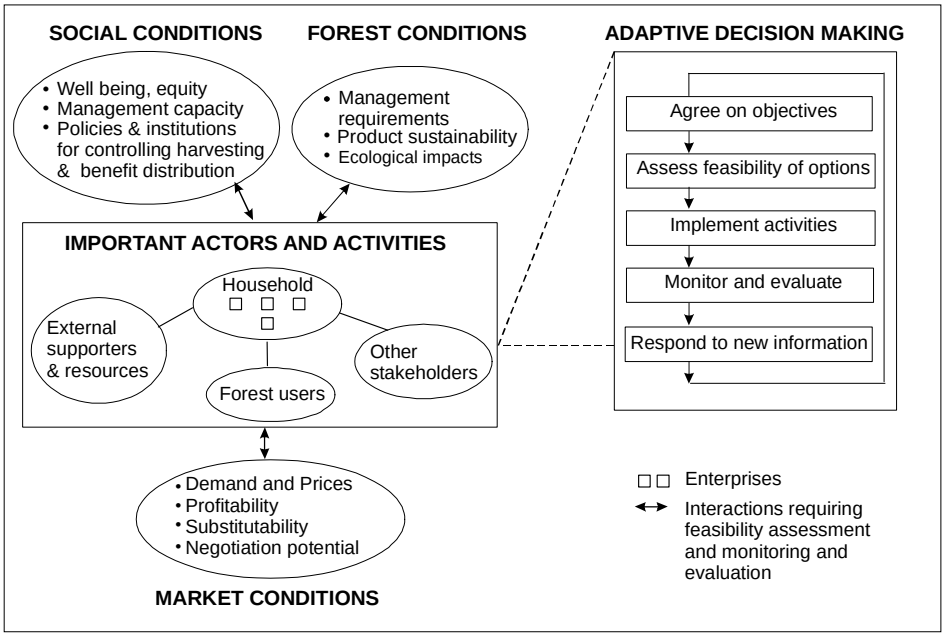
In this final chapter a conceptual framework is presented to show the conditions influencing the outcomes of forest-based enterprises and the choices that need to be made about methods to understand those conditions. The chapter also indicates conclusions about directions for further development of methods.

## A Conceptual Framework of Forest Product Conservation and Development

Forest enterprises serve as a point of intersection between the market, the villagers' economy and the condition of the forest. Enterprises are the product of what is feasible in the market, forest and household economy. They also shape the local economy and ecology. The methods described in this book can be used to assess these relationships to identify appropriate enterprises or to intervene to create a more enabling environment for the enterprise. The methods can be used also to assess the impacts of the enterprise on the people, the forest and to a lesser extent on the market.

We present a conceptual framework (Figure 11.1) to guide analysis of these interactions and the selection of methods. The framework shows the key relationships affecting an enterprise and the information flows required for adaptive decision making. The figure is based on the model of the enterprise presented in Chapter 1, but differs in several ways that reflect the lessons gained from the other chapters. First, the enterprise is situated within the household economy (or a set of household economies) where it coexists with other enterprises and economic activities that are pursued by members of the household. As Arnold and Ruiz Pérez indicated, the forest product enterprise is not an end in itself, but is intended to meet specific needs. The decision to engage in forest product development is therefore best understood by keeping the central role of diverse household needs, capacities and priorities in perspective.

**Figure 11.1** The enterprise system and information flows necessary for forest product conservation and development



A second addition to the framework is that household economy and enterprise activities rely on relationships with various groups of significant actors. Other forest users, external support agencies (e.g., development projects) and groups that have a stake in forest resources influence households' forest enterprises. Alliances with other groups are important to acquire the resources, skills, knowledge or technology to advance forest product development. Alliances contribute to meeting conservation and production aims by enabling villagers to reduce competition for forest resources and ensure management rules are collaboratively enforced. They may also be important in bringing social or political pressure to bear on other actors who constrain the development of enterprises. Methods for alliance building include identifying stakeholders, creating forums for stakeholder decision making (see chapters by Lecup *et al.*, de Jong and Utama), negotiating conflicts and collaboratively managing resources.

A third modification of the framework is the addition of flows of information that feed into a cycle of adaptive decision making. In the cycle decisions are based on objectives concerning forest product development and conservation initiatives. The cycle consists of iterative decision making based on a sequence of information flows and responses. The methods presented in this book on planning, monitoring and evaluation (see chapters by de Jong and Utama, Lecup *et al.*, Fisher and Dechaineux) help guide what kind of information goes into the decision making cycle and how it is used.

The process of adaptive decision making is based on information drawn from (a) feasibility assessment and (b) monitoring and evaluation, especially of the market, social conditions and the forest. This information is necessary to determine whether the enterprise is possible, and then to determine whether the enterprise results in desirable outcomes.

The final addition to the framework is the indication of priority areas for the collection of information. In all three components of the framework (social, forest, market), it is necessary to understand which conditions are suitable for supporting viable enterprises. In the social and forest components, it is also important to know whether the enterprise has desirable outcomes in critical areas such as well being, equity, product sustainability and ecological impact. Decisions need to be made about the trade-offs among these outcomes. The social component requires two additional types of information: local people's management capacities (e.g., technical knowledge, capacity to mobilise resources, power to enforce rules), and the scope and quality of institutions (such as tenurial rules) for controlling harvesting.

For the forest component, information is needed on the resource management requirements, sustainable harvesting levels and the environmental impacts of the activities. Each of these categories can require substantial effort to acquire the information. Anderson's analysis of *Iriartea* is a good example of the number of steps and level of expertise required to make precise estimates of sustainable harvest levels. At the market level, the demand for a product, its profitability, potential for substitution by other products, horizontal and vertical transaction links in the market

chain and cost-effectiveness of inputs are necessary. The chapter by Lecup *et al.* elaborates on the kinds of information associated with each component. Final assessment of these components and their interactions depends on the judgement of the stakeholders involved.

The framework presented in Figure 11.1 therefore reflects the authors' collective experience that successful enterprises require focussed attention to market, forest and social conditions, information channels for assessing those conditions, the identification of relevant stakeholders and iterative decision making. Successful development and conservation of forest products requires a set of 'first tier' methods for understanding the state of components in Figure 11.1, and their interactions and dynamics. These include methods such as the production-to-consumption market analysis discussed by Belcher, characterisation of profits by Ames and the village profiles described by Fisher and Dechaineux. A set of 'second tier' methods is required to act upon this information and make decisions. De Jong and Utama, for example, discuss approaches by which projects cope with poor information availability in the planning process. Lecup *et al.* outline a method for integrating information about the different components of an enterprise in a two-stage process of assessment.

The methods in this volume only scratch the surface of the many tools and approaches that can be mixed and matched from these two categories of methods. To help users select methods at the first tier level they can first review the information available for each component. Where information is not already in existence, they can identify the best source of the data for that component, their capacity to collect the information, schedule needs and costs. They can then examine those methods that are appropriate for identified needs and capacities. Most decisions will centre on whether to rely on rapid appraisal techniques or more in-depth studies. At the second tier level they can develop approaches for each information flow point in the figure, e.g., selecting objectives, making decisions and working with other stakeholders. The approach selected will depend on local circumstances. For example, if a high level of conflict threatens people's management capacities, there may be a need for more sophisticated approaches for negotiating among stakeholders. Where conflict is not high, it may be sufficient to simply keep stakeholders informed. The selection of methods needs to be coordinated across tiers in terms of actors involved, the quality and scale of information required and a schedule for sharing information.

## Areas for further methodological study/investigation

The methods for forest product development and conservation continue to expand as people adapt existing methods, refine existing methods or develop new ones. From the experiences reflected in this book, there nevertheless appears to be at least three important gaps in the types of methods available. Further work is needed on methods that are better adapted to the complexity of forest enterprise systems; methods for assessing the role of institutions in forest product conservation and development; and methods that more fully incorporate villagers' perspectives. These are discussed below.

## Dealing with complexity

The breadth and complexity of relationships among the market, social conditions and the forest lead to a fundamental tension in applying forest product-related methods. On the one hand, there is the pragmatic need for low cost, simple techniques that can be widely adapted and require few special skills. On the other hand, there is a conceptually driven need for understanding the dozens of interactions among each component of the enterprise system. The diversity of forests and local social conditions, multiplicity of forest products and subtleties of the market and village economy mitigate against any such understanding being achieved quickly or with minimal resources. The simple lack of information about these systems forms perhaps the most severe constraint to the development of forest product enterprises. This is complicated by the perception that a vast amount of information is required for conservation and development planning and monitoring, and that there is little capacity to collect the information. Diverse methods need to be coordinated to integrate information from different fields. Differences in perceptions, priorities and capacities among diverse stakeholders, including local villagers, add to complexity by requiring attention to information collection and analysis from different perspectives.

A central issue is therefore how to cope with the lack of existing information and how to make it feasible to collect the information needed. Drawing from the chapters, in practice people have dealt with the information constraint by relying on phased information collection, the prioritisation of information for each phase, and iterative decision making (see especially the chapters by Lecup *et al*., de Jong and Utama, Wollenberg and Nawir, and Fisher and Dechaineux). Multiple stakeholders are involved from the beginning to ensure that perceptions are shared and constructive alliances occur. Alliances are used to divide information gathering among organisations with appropriate capabilities and to enrich capacity to use methods from different fields. The complexity of information is simplified by relying on indicators (some very indirect) and, from the regulatory standpoint, assessing outcomes rather than inputs and prescriptions (see chapter by Bennett). The intervention points in the market can be quickly identified by considering horizontal and vertical linkages (see Belcher). The lack of capacity is addressed by selecting which tasks require specialist attention and limiting the role of experts to those tasks (see Fisher and Dechaineux), as well as training 'para-specialists' to take on tasks requiring less formal knowledge. None of these approaches provides a panacea, but together they do point to a distinctive approach for managing under conditions of poor information and high uncertainty. They reflect the fundamentals of an adaptive approach to development and conservation, where information is needed to support ongoing monitoring, evaluation and planning. It is suggested that such an approach also enables flexibility and responsiveness necessary for successful forest product initiatives. Further work is necessary to test the potential of this approach in multiple settings, especially to determine the cost-effectiveness of monitoring and involving multiple stakeholders. The high transaction costs are a major constraint to the use of adaptive methods. The validity and cost-effectiveness of these methods should be

tested against existing conventional approaches. CIFOR has initiated a programme of research on adaptive management among multiple stakeholders to further explore the utility and feasibility of such an approach.

### Institutions

Institutions are the rules for forest and enterprise management agreed upon by a social entity and are essential to any forest enterprise. They include rules about access to resources (land, forest, credit, other enterprise inputs), as well as rules about use of the forest and how benefits from the forest are allocated. Methods for assessing institutions and the strategies for establishing them are not emphasised in this book, yet constitute a major area of activity in forest product initiatives. They are often a deciding factor in whether both conservation *and* development can be achieved. Where development is successful and economic incentives for use of a forest product are high, effective rules will be necessary to prevent overharvesting and to ensure that powerful people do not capture forest benefits intended for others. A number of chapters referred to institutions, but not the methods involved in promoting them. There is a need specifically for information about approaches for building institutions related to forest and land tenure, forest protection, access to credit, and the distribution of the income or products from the forest among villagers. There is also a need for an analysis of the strengths and weaknesses of these approaches under different circumstances. The alliance building discussed by Lecup *et al.* and de Jong and Utama is a necessary, but not sufficient requirement for institution building. Institution building and enforcement are likely to require a combination of approaches built on methods for community organisation, policy advocacy and the use of sanctions or incentives to modify people's actions. Because of their political nature, these methods need to be used carefully and an analysis of their strengths and weaknesses would be of wide relevance.

### Villagers' perspectives

In addition to the need for methods to deal with the complexity of the forest enterprise and the political intricacies of institutions, methods need to acknowledge and be sensitive to the human element that lies at the core of any forest income initiative – the people intended to benefit from it. Initiatives introduce changes that can affect forest villagers' lives in profoundly positive and negative ways. Many of the chapters hinted that perspectives of forest villagers had been overlooked, and indicated that outcomes would be improved by incorporating such viewpoints into methods. For example, to the villager forest products are only one of a variety of income sources that might include agricultural-, handicraft- or wage-based sources (see de Jong and Utama, Wollenberg and Nawir). Products may be as or more important for consumption than for cash income (see Arnold and Ruiz Pérez). A product therefore can be judged not only in terms of its market exchange value, but in terms of its value *vis-à-vis* other income sources, land uses and the contribution of the income to the household economy (see Arnold and Ruiz Pérez, Wollenberg and Nawir). These

values affect whether an initiative is viewed as yielding benefits and having acceptable outcomes (see Fisher and Dechaineux) and whether it matches local people's priorities (see de Jong and Utama). They may also affect decision making about harvest levels (see Anderson). Perceptions about the security of land tenure or the effectiveness of policies regulating forest product management directly affect the expectations people have of a product and therefore how they manage it.

Although not discussed extensively in the chapters, the utility (and limits) of local people's knowledge, especially as a source of information about species where formal documented knowledge is missing, is also critical. Such knowledge can be a resource for learning and stimulating innovation in management practices (see Bennett). Knowledge can also be a source of conflict among stakeholders. There needs to be methods for testing competing paradigms, knowledge or information among different stakeholders.

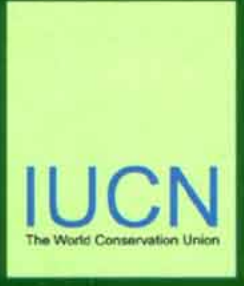
The chapters also do not give explicit attention to the role of villagers in using the methods themselves. If forest product development and conservation is ultimately about improving the well being of forest dwellers, then the associated methods must be taken up to a large extent by the forest users themselves and incorporate local people's perceptions and knowledge.

The conservation and development of forest products to benefit local people is likely to advance to the extent it is grounded in appropriate methods. This volume draws on the extensive experience of its contributors to guide the selection of methods for planning, monitoring and evaluating forest product development by villagers and other stakeholders. There nevertheless remains much to explore in the realm of methods for adaptive decision making, improved institution building and the meaningful involvement of the forest-dwelling villagers. Bringing together the perspectives of researchers and practitioners as we have done in this volume should help us to address these and other methodological frontiers with a richer stock of ideas and relevant techniques. Finding the methods is only the first step though; using them is what really counts.

In the last two decades, there has been increasing interest in the potential of small-scale non-timber forest product collection and other low-impact uses of the forest for achieving forest conservation. Experience suggests however that such uses do not guarantee conservation and economic outcomes.

This book documents and compares methods to assess options for forest-based livelihoods and their outcomes. The contributions are based on the premise that livelihood and conservation goals can be best achieved by improving information flows about changes in the environment, and the impacts of forest use. The 16 authors report on the strengths and weaknesses of methods that have been tried in the field. Their experiences and analysis should be of interest to practitioners everywhere concerned with developing livelihood options for people living in forests.




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