

## **INTRODUCTION: NTFP RESEARCH IN THE TROPENBOS PROGRAMME**

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When the term non-timber forest product (NTFP) was coined about ten years ago to replace the more disparaging appellation of ‘minor’ or ‘secondary’ forest products, there were high expectations as to what their exploitation could contribute to the sustainable management of tropical rainforests. The notorious article by Peters, Gentry and Mendelsohn (1989) in *Nature* suggested that fruits and latex in a Peruvian forest plot represented more than 90% of the forest’s total market value, leaving less than 10% for sustainably harvested timber. De Beer and McDermott (1989) pointed to the importance of non-timber forest products for the 3 million forest dwellers in Southeast Asia, quantified their contribution to the local and national economies and made a case for realising the potential benefits of NTFP development. In Brazil, the anthropologist, Mary Allegratti, and the leader of the rubber tappers’ movement, Chico Mendes, launched and made a political success of the concept of extractive reserves as a combined strategy to secure forest peoples’ rights to forest resources and promote environmental protection (Allegratti, 1990; Schwartzman, 1989). The combination of scientific interest and political struggle at grassroots level set the stage for an initially almost euphoric belief among scientists and environmentalists in the potential of NTFP exploitation to contribute to forest conservation and improved livelihoods. The implicit message to policy makers was not to kill the goose that lays the golden eggs.

The Food and Agriculture Organization of the United Nations (FAO) was the first international organisation to take up the message. It dedicated a forestry paper to the issues and potentials of NTFP development in order to encourage efforts to strengthen programmes for sustained NTFP use (FAO, 1991; see also FAO’s contribution to this volume).<sup>2</sup> Many organisations followed and Tropenbos was among them.

NTFP studies have been part of the Tropenbos programme from its very start, with attention being paid to the significance of NTFPs for the subsistence of forest-dependent people, as well as to the potential of commercial extraction to contribute to the conservation of tropical rainforests. Responding to the diverging views on the latter, Tropenbos published a strategy for NTFP research in 1995 that focused specifically on the identification of the conditions under which commercial NTFP extraction could act as a conservation strategy and socially desirable

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<sup>2</sup> The FAO prefers the term non-wood forest product (NWFP) in order to distinguish clearly between the three main outputs of forests and trees: (a) wood products, including roundwood and sawnwood, pulpwood, chips, fuel wood, small woods, etc. (b) non-wood forest products, including resins, essential oils, medicinal plants, live animals, bush meat, etc. and (c) forest services, including ecotourism, grazing, bioprospecting, etc.. De Beer and McDermott (1989) do include fuel wood in their definition of non-timber forest products. Tropenbos defines non-timber forest products as ‘all tangible animal and plant products other than industrial wood, coming from natural forests, including managed secondary forests and enriched forests’ (Ros-Tonen *et al.*, 1998). This excludes NTFPs from plantations and other human-made vegetation types. As will be seen in this volume, several authors also refer to NTFPs in the case of products of forest origin coming from plantations, home gardens and agroforestry systems (e.g. van Dijk and Wiersum, van Valkenburg, de Jong). This underlines the need for more refined concepts (see the last chapter).

form of land use in tropical rainforest areas (Ros-Tonen *et al.*, 1995). This book presents the results of almost ten years of NTFP research under the Tropenbos programme. The authors were invited to present the results of their studies against the background of the alleged potential of NTFPs to contribute to forest conservation, participatory forest management and improved livelihoods for forest-dwelling people. Thus the papers not only contribute to the evaluation of the Tropenbos research strategy, but also further the insights into the potentials of NTFP development.

In this chapter I will first present an overview of Tropenbos NTFP studies and briefly review the research strategy. I will then consider the main issues - forest conservation, participatory forest management and improved livelihoods – which form the common thread running through the papers in this volume. Finally, I will point to the main lessons that can be learnt from Tropenbos NTFP research.

## 1. NTFP RESEARCH IN THE TROPENBOS PROGRAMME

The Tropenbos programme encompasses three types of NTFP projects. The first group of projects deal with NTFPs as part of a more comprehensive project on indigenous forest use and management. The work of Clara van der Hammen (1991) (Tropenbos-Colombia), Janette Forte (Tropenbos-Guyana), Marileen Reinders (Verhey and Reinders, 1997) (Tropenbos-Guyana) and the social cluster in the Tropenbos-Cameroon programme (van den Berg, 1998; Biesbrouck 1996a-b, 1997, 1998; Nkoumbele and Seh, 1998; Tiayon, 1998) belong to this group, as well as the work previously undertaken by Wil de Jong (1993; 1995; 1998) in West-Kalimantan (Box 1).

### Box 1 NTFP studies from the perspective of indigenous forest management

#### **Tropenbos-Colombia:**

1. *Natural resource management with indigenous communities:* project aimed at drawing up regional natural resource management plans jointly with indigenous communities, through the documentation and analysis of actual forest use. Information collected includes shifting cultivation, hunting, fishing and gathering of NTFPs, and the cultural value of natural resources. The project combines indigenous and western knowledge through a participatory approach. Researcher in charge: Clara van der Hammen (Tropenbos-Colombia programme)

#### **Tropenbos-Guyana:**

2. *Amerindians as manipulators, consumers, producers and actors in their natural environment:* project aiming to increase knowledge of economic, cultural, social and ecological aspects of the management and use of the natural environment by Amerindians (the Caribs) in the NW district and Pomeroon region from a household perspective. Special attention is given to changes in management and use resulting from factors like education, contacts with other inhabitants, absorption into the cash economy and changes in government policy. Relationships with timber and gold mining companies also form part of the study. Researcher in charge: Marileen Reinders (Utrecht University).

*Kariña ( Cuyuni/ Barima areas*  
migratory way of life of scattered groups of  
gold mining and logging. Researcher in charge:

#### **Tropenbos-Cameroon:**

project describing the role of the local population in forest exploitation,  
  
sustainable forms of forest management. Researchers in charge: Karin  
Jolanda van den Berg (Wageningen University), François Tiayon and Francis Nkoumbele (University of  
Yaoundé I).

#### **Tropenbos-Indonesia:**

5. *Forest management practices of Dayaks in West Kalimantan:* project evaluating the potential of existing indigenous management practices for the development of sustainable and economically feasible smallholder forestry. Researcher in charge: Wil de Jong (New York Botanical Garden) (*completed*).

A second group of projects specifically study the forest's NTFP potential. This group comprises the non-timber forest plant resource assessment coordinated by Joost Duivenvoorden (Tropenbos-Colombia), the study of NTFPs in the NW District by Tinde van AnDEL (1998) (Tropenbos-Guyana), the study on NTFP use and potential in South Cameroon undertaken by Han van Dijk (1998) (Tropenbos-Cameroon), and the study on NTFPs in East Kalimantan (Tropenbos-Indonesia) completed in 1997 by Johan van Valkenburg (Box 2).

**Box 2 NTFP studies in the Tropenbos programme focusing on the forest's NTFP potential**

**Tropenbos-Colombia:**

1. *Non-timber forest plant resource assessment in NW Amazonia*: appraisal of resource availability of vegetable NTFPs in NW Amazonia (Colombia, Ecuador, Peru), using a land ecological approach. Includes research on markets and potential NTFP supply of vegetable origin in three pilot areas. Coordinator: Joost Duivenvoorden (University of Amsterdam).<sup>3</sup>

**Tropenbos-Guyana:**

2. *NTFPs in the NW District and Pomeroon region*: project aiming to increase knowledge of NTFPs in the region through an extensive inventory of NTFPs of vegetable origin and of economic and ecological aspects of their use, extraction and management. To assess the abundance and diversity of NTFPs, 1-hectare inventories are made of different forest types. Includes regular market surveys. A sub-project, executed by Caroline Sullivan of Keele University (UK), deals with economic aspects. Researcher in charge: Tinde van AnDEL (Utrecht University).

**Tropenbos-Cameroon:**

3. *The integration of NTFP resources in multiple-use forest management*: project aimed at assessing the economic and ecological characteristics of NTFPs and at formulating concrete recommendations for integrating NTFP resource management into sustainable forest management systems and strategies. The objective is to determine the actual and potential value of NTFPs to local people, assess the impact of exploitation on NTFP resources and identify opportunities for increasing the benefits of extraction for local people. Researcher in charge: Han van Dijk (Wageningen Agricultural University).

**Tropenbos-Indonesia:**

4. *The economic and ecological potential of NTFPs in East Kalimantan*: study of the economic and ecological potential of rattan and other NTFPs in East Kalimantan, describing the forest vegetation and the abundance and importance of various NTFPs, focusing on rattan and indigenous fruit trees. The inventory gives harvestable volumes of potentially commercial species, with projections of sustainable yield. Researcher in charge: Johan van Valkenburg (Hortus Botanicus/Rijksherbarium Leiden) (*completed*).

Finally, some recently completed studies deal with specific products and focus on aspects of their sustainable use. They were undertaken by Carlos Rodríguez (1991) on commercial fishing (Tropenbos-Colombia), by Hans-Ulrich Caspary on wildlife (Tropenbos-Côte d'Ivoire) and by Willem Assies (1997) on the social, economic and political aspects of Brazil nut exploitation in the Bolivian and Brazilian Amazon region. An ongoing study in this group is being carried out by Nicole Guedje (Guedje *et al.*, 1998) on the sustainable harvesting of *Garcinia lucida* bark (Tropenbos-Cameroon) (Box 3).

The project carried out in Côte d'Ivoire (Bonnéhin, 1992) stands somewhat apart from these, as it deals with the prospects for domestication through vegetative propagation of two forest tree species (*Coula edulis* and *Tieghemella heckelii*) in the Taï region. The idea behind this study is that the integration of these species into local farming systems would reduce the pressure on the

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<sup>3</sup> This project is part of a joint effort of Latin American and European universities to obtain an improved appraisal of the resource availability of non-timber forest plant products in Northwest Amazonia. The project includes research on NW Amazonian markets for non-timber forest plant products and potential supply of these products from mature forests in three pilot areas. The INCO-DC programme of the European Community funds the project as a whole. In Colombia it receives support from the Tropenbos-Colombia programme.

protected forest areas in Taï National Park. As such, it does not deal directly with NTFP extraction from forest ecosystems.

Box 3 Studies in the Tropenbos programme on specific non-timber forest products

**Tropenbos-Colombia:**

1. *Diagnosis of commercial fishing:* project aimed at developing a management model for commercial fisheries, based on a comprehensive diagnosis that includes social, economic, cultural and biological aspects, in order to define possible scenarios for sustainable extraction. Researcher in charge: Carlos Rodríguez (Tropenbos-Colombia programme) (completed).

**Tropenbos-Cameroon:**

2. *The sustainability of NTFP harvesting: the case of *Garcinia lucida*.* The aim of this study is to determine the effects of the harvesting of bark and seeds on *Garcinia lucida* populations and to define a sustainable harvest system for *G. lucida* bark, based on participatory monitoring and evaluation techniques. Researcher in charge: Nicole Guedje (University of Yaoundé I).

**Tropenbos-Côte d'Ivoire:**

3. *Domestication of two fruit tree species from the Taï forest:* project investigating the prospects for domestication and integration through vegetative propagation of two forest fruit trees (*Coula edulis* and *Tieghemella heckelii*) into local farming systems in the Taï region. The ultimate objective of the project is to reduce the pressure on the protected forest areas in the Taï National Park. Researcher in charge: Léonie Bonnéhin (Wageningen Agricultural University).
4. *Hunting wildlife in the region of Taï National Park:* a study focusing on the importance and volume of village hunting and poaching, covering the different stages of game exploitation from hunting and consumption to trade. The study addresses the question of whether the actual exploitation and marketing of game can be transformed into a more sustainable utilisation system. Researcher in charge: Hans-Ulrich Caspary (Humboldt University, Berlin).

**Bolivia/Brazil:**

5. *The social, economic and political aspects of Brazil nut exploitation in the Amazon region:* project aimed at establishing the socio-economic and cultural parameters of sustainable extraction of Brazil nuts. Researcher in charge: Willem Assies<sup>4</sup> (completed).

## 2. THE EVOLUTION OF A RESEARCH STRATEGY

As stated in the opening address by Erik Lammerts van Bueren, Tropenbos felt the need to come forward with a systematic approach when optimistic views were expressed about the potentials of NTFP development. There were reasons enough to doubt the prospects for a successful NTFP-based conservation strategy. Over-exploitation, substitution by synthetics and exploitative commercialisation systems discourage extractors from managing forest resources sustainably (Richards, 1993). We also stressed the fact that extraction is seldom an exclusive livelihood, but is usually combined with other, less sustainable forms of land use, such as farming, gold mining or logging. We also questioned the contribution of commercial extraction to improved livelihoods, as many extractors live in poor and isolated conditions, with little access to such basic amenities as education and health care. Finally, we pointed to other pitfalls and potential dead ends, such as the tendency towards substitution with cultivated or synthetic alternatives, conflicting land and product uses and the loss of indigenous knowledge and skills necessary for the extraction of non-timber forest products. In sum, we did not want to accept commercial NTFP extraction as a simple panacea for deforestation (Ros-Tonen *et al.*, 1995).

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<sup>4</sup> Project jointly financed by WOTRO and Tropenbos and carried out in association with the Programa Manejo de Bosques de la Amazonía Boliviana (PROMAB) based in Riberalta, Bolivia. The latter project is a joint effort of the Instituto para el Hombre, Agricultura y Ecología, the Universidad Técnica del Beni and the Prince Bernhard Centre for International Nature Conservation of Utrecht University.

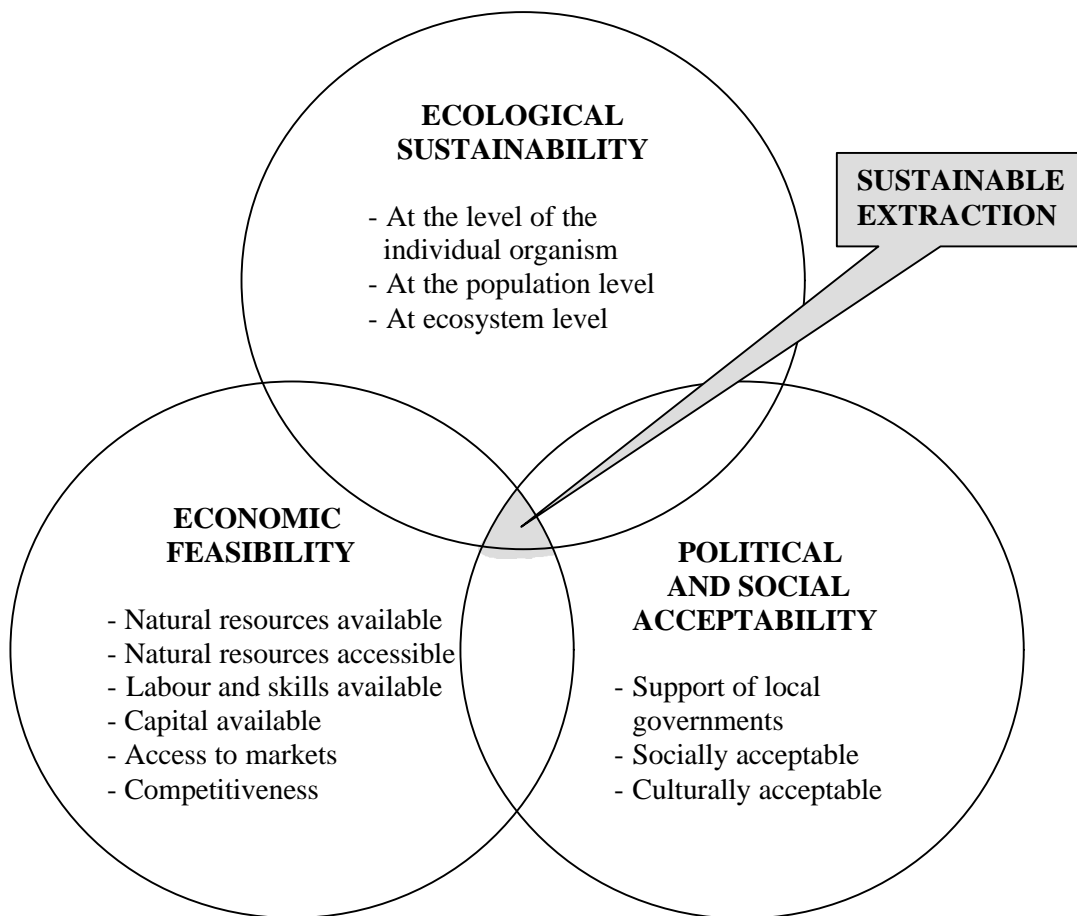


Figure 1 The main attributes of sustainable NTFP extraction (based on Ros-Tonen *et al.*, 1995)

The main objective of the Tropenbos research strategy for NTFPs was to provide a scientific basis for the commercialisation-conservation link and to make it operational for policy makers and land-use planners by providing an insight into the conditions for sustainable commercial extraction. Following the definition of sustainable development by Barbier (1987), we provided an overview of attributes of sustainable extraction, distinguishing between ecological sustainability, economic feasibility and socio-political acceptability (Figure 1). The idea was to develop, on the basis of this overview, a checklist of attributes and requirements for the sustainable commercial extraction of NTFPs. In addition, it was intended to develop a methodology for the application of this checklist in land-use planning. With at least two programmes - Tropenbos-Colombia and Tropenbos-Cameroon - aimed at developing land-use plans, we wanted land-use planners to consider commercial NTFP exploitation as a potential land use just like logging and farming. The identification of conditions for sustainable and successful NTFP exploitation was viewed as an essential step towards the integration of NTFP use in land evaluation. The individual case studies were monitored and evaluated for their contribution to the identification of factors determining (or obstructing) successful and sustainable NTFP exploitation.

Several points should be taken into account in relation to a checklist for NTFP use. In the first place, the NTFP concept comprises a wide diversity of products with varying characteristics and prospects for sustainable harvesting. The ecological conditions for the sustainable harvest of Brazil nuts, for example, are quite different from those for the sustainable harvesting of wildlife

or entire plants. A general checklist for NTFP-based forest use should therefore be refined for each of the specific products involved. Secondly, a checklist cannot cover the dynamics of market-oriented NTFP use. Products with no market today, can be exploited tomorrow if a trader shows up in a village who wants to buy them. By the same token, the production of what looks like a promising product today may collapse next year if it can be obtained more cheaply elsewhere. Finally, when defining NTFP extraction as a land utilisation type, additional options for subsistence and income-generating economic activities should be available and included. Commercial NTFP use cannot be defined as an exclusive land use, as in practice it is a seasonal and part-time activity combined with subsistence activities and other forest uses.

Although the checklist has not yet been published, two efforts have been undertaken in the Tropenbos programme to develop a methodology for including NTFP use as an option in land-use planning. The first is the land evaluation undertaken in the Tropenbos-Cameroon area by Barend van Gernerden and Gerard Hazeu (1999). In this evaluation, the collection of NTFPs was explicitly defined as a land-use type, along with nature conservation, timber production, shifting cultivation and plantation agriculture (Hommel and van Kekem, 1998). Combining data on the occurrence of NTFP plant species in various forest types and distance between forest and habitation, a suitability assessment was made at reconnaissance level (1:100,000) of NTFP use. The focus here was on subsistence use, however, and not on commercial use as we proposed in our strategy document.

In the Tropenbos-Colombia study area, a suitability assessment is being carried out as part of an EC-financed project on vegetable NTFPs in NW Amazonia. In this project, which also covers parts of the Peruvian and Ecuadorian Amazon, ecological surveys are combined with market surveys to produce maps that provide realistic estimates of NTFP usefulness per forest type (see the contribution of Duivenvoorden *et al.* to this volume). The outcome of this project will help to design location-specific strategies for NTFP development, but in the Colombian case subsistence forest and NTFP uses also prevail, implying that it is not realistic to propose commercial NTFP extraction as a land utilisation type that is isolated from other forest uses. In their contribution, Carlos Rodríguez and Clara van der Hammen make it sufficiently clear that 'indigenous management implies the use of the biodiversity as a whole, (and) not just the exploitation of a few products with commercial value' (this volume).

These lessons indicate that there is a need to place the research strategy as proposed in 1995 in a broader perspective. As a first step, the three expectations of what NTFP development could bring about will be re-examined. These comprise its contribution to forest conservation, improved livelihoods and participatory forest management.

### **3. THE POTENTIAL CONTRIBUTION OF NTFP EXTRACTION TO FOREST CONSERVATION**

A central hypothesis underlying much NTFP research is that commercial extraction, through adding value to the forest, may provide an incentive to conservation and sustainable forest management. The underlying reasoning is that local authorities and forest resource managers will have an interest in preventing indiscriminate forest use or conversion of forest to other land uses when NTFP extraction contributes to the Gross National Product and export earnings. For local communities, increased income from the trade in NTFPs is thought to provide a stimulus to protect their forests and manage them sustainably. Many NTFPs can be harvested without significantly altering the forest structure, thus maintaining the forests' environmental value and biological diversity. All these factors have led to the notion that the commercial extraction of

NTFPs is a potentially sound conservation strategy (e.g. Fearnside, 1989; Nepstad and Schwartzman, 1992).

This commercialisation-conservation link is now being strongly disputed. Any harvesting of NTFPs does have a number of ecological impacts, including a gradual reduction in the vigour of harvested plants, decreasing rates of seedling establishment of harvested species, potential disruption of local animal populations and nutrient loss from harvested material (Peters, 1996). Compared with logging or conversion of forest to other land uses, however, these impacts are viewed as minimal, especially in the case of NTFP use for subsistence. However, it is the low extraction levels rather than the ecological ability to maintain yields that makes the extraction of NTFPs sustainable. It is incorrect to suggest that NTFPs can be harvested indefinitely without proper management practices to sustain their yield.

There was ample evidence of over-harvesting even at the time that NTFP exploitation was promoted as a nature conservation strategy. The very same Brazil, where extractive reserves raised great expectations for the participatory management of forest resources, had in the past witnessed the depletion of its Brazilwood (*Caesalpinia echinata*) and rosewood (*Aniba rosaedora*) resources (Ros-Tonen *et al.*, 1995), which were exploited to obtain natural dye and essential oil, respectively. De Beer and McDermott (1989) reported the overharvesting of rattan, edible bird's nests and other NTFP resources in Southeast Asia. Various other examples of overexploited NTFPs can now be added, such as wildlife in Guyana and Côte d'Ivoire (see van AnDEL and Reinders, this volume and Caspary, this volume), palm heart (*Euterpe precatoria*) in Bolivia (Peña and Zuidema, 1998) and the bark of *Garcinia lucida* in Cameroon (van Dijk and Wiersum, this volume). In general, it may be said that, the larger the market for an NTFP, the higher becomes its value and the greater the danger of overexploitation (Sepp, Walter and Werner, 1996).

Taking plant parts such as bark, roots or palm heart (in the case of single-stemmed species) in fact kills the individual tree and can only be done if special measures are taken to guarantee the plant's recovery or regeneration. Only products which can be harvested without killing the individual plants or animals, which are abundant or which regenerate easily offer good prospects for sustainable management (Peters, 1994). Examples are Brazil or Amazon nut (*Bertholletia excelsa*) exploited in Bolivia and Brazil (Assies, 1997), palm heart from multi-stemmed species<sup>5</sup> such as *Euterpe oleracea* and the aerial roots of 'nibi' (*Heteropsis flexuosa* (Araceae)) and 'kufa' (*Clusia grandiflora* and *C. palmicida* (Guttiferae)), which are used as plaiting material for basketry and furniture in Guyana (van AnDEL and Reinders, this volume).

Even if products are identified which offer good prospects for sustainable management, they can only be sustainably harvested on a commercial scale if a procedure is followed which comprises careful species selection, yield studies, monitoring of regeneration and harvesting adjustments. Such a procedure is described in Peters (1994) for vegetable NTFPs, while van Wieren (this volume) presents a model for the sustainable management of wildlife. Although sustainable exploitation of selected species is thus feasible from an ecological point of view, various social factors impede this happening. Why should people who live in poor conditions and have few

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<sup>5</sup> In contrast to single-stemmed species, such as *Euterpe precatoria*, multi-stemmed species such as *Euterpe oleracea* regenerate more rapidly. Their high abundance and rapid growth seem to offer good prospects for sustainable extraction. Maintaining a minimum diameter for palm heart and applying a rotation system that allowed vulnerable areas to regenerate proved to be effective in preventing over-harvesting (van AnDEL *et al.*, 1998). In the long term, however, it could prove to be necessary to extend the rotation period in order to maintain the rootstock (Dijkman, personal communication).

alternative income opportunities, spend money on expensive yield studies or refrain from getting an income because harvest levels ought to be adjusted to ecologically sustainable levels? Maybe this will happen in some isolated, externally sponsored projects, but expecting this from communities that are involved in a daily struggle for subsistence can hardly be seen as realistic.

Another reason to doubt the conservation value of extractive economies to which we already pointed in 1995 is that extractors combine NTFP harvesting with other, ecologically often less sustainable, economic activities to make a living. It was Assies (1997 and this volume), who launched the concept of the *agro-extractive cycle*, on the basis of his socio-economic study of the Brazil nut economy in Bolivia and Brazil, to clarify this. In this cycle, the Brazil nut gatherers combine their activities with rubber tapping and agricultural activities, to make a living in the forest throughout the year. If one of the extractive activities declines in importance, which actually happened as a result of collapsing rubber prices, they compensate the loss by expanding their agricultural activities. The sustainability of the 'cycle' is thereby threatened because of increasing conversion of forest to farming land.

Moreover, Assies made it clear that, like any other sector in economic life, the organisation and dynamics of the extractive economy is profit-driven rather than based on the aim of satisfying social needs or promoting ecological sustainability. In order to keep production profitable, the costs per unit of the product need to be minimised, resulting in either a tendency towards production in plantations (Homma, 1992) or in a reorganisation of the production cycle. The latter occurred in the Bolivian Brazil nut economy where, in a process of vertical integration of extraction and processing, urban-based labour gangs, who have no affinity with forest conservation at all, replaced the forest-dwelling extractors, who are becoming increasingly marginalised (Assies, 1997, and this volume).

This and other examples show that it is not easy to realise in practice the conservation potential of commercial NTFP exploitation. Much work is still needed to identify promising products and to improve harvesting methods and management systems.

#### **4. NTFPs AS A MEANS OF IMPROVING PEOPLE'S LIVELIHOODS**

One of the attractive promises of NTFP development is its potential for improving the livelihoods of people who depend on the forest for their basic needs and cash income. An important motive for promoting the commercial extraction of NTFPs has therefore been the expectation that increased marketing of NTFPs may lead to higher incomes.

Such expectations have been packaged in commercial messages for such products as Ben & Jerry's Rainforest Crunch ice cream made with Brazil nuts<sup>6</sup>, which are marketed through Cultural Survival Enterprises (USA). CSE was founded in 1989 to expand and develop markets for NTFPs from organisations of forest residents and to pay fair prices, thus ensuring a far larger return than, for instance, the regular 3% which extractors of Brazil nuts receive of the New York wholesale price (Clay, 1992).

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<sup>6</sup> The slogan 'You're not eating ice cream because you like it, it's for charity!' provides a nice example of such a message (<http://www.hoovers.com>).



Although it has been suggested that ‘the sale of Rainforest Crunch helps support native residents of the world’s rainforests’, the Brazil nuts are in fact being gathered by the very same non-indigenous Brazilian rubber tappers described in Assies’ study. The major provider of Brazil nuts for the Rainforest Crunch had to be the Xapuri cooperative in the Brazilian state of Acre. The nut-processing plant of this cooperative was established with funding from the Ford Foundation, Cultural Survival and some other international donors after Chico Mendes’ death, and was closely linked to the rubber tappers’ movement and the proposal for extractive reserves. The cooperative, although often presented as a success, soon ran into problems through competition from Bolivian producers, who had the comparative advantage of substantially lower labour costs. Faced with such competition, the Xapuri plant finally had to dismiss its personnel in 1993. It subsequently adopted a piecework-based put-out system to reduce its labour costs and social security bill. Thus the claims that the Xapuri plant would be able to substantially increase the gatherers’ income and provide improved labour opportunities thus finally had to be tuned down (Assies, 1997).

The foregoing is not to deny that NTFPs contribute substantially to forest people’s incomes. Various studies reported on in this book are sufficiently clear about this. The potential for improving people’s livelihoods through an extractive economy should not be exaggerated, however. In the first place, NTFP use is basically associated with poverty. It is the socially most marginalised people who are the main actors in NTFP extraction. This holds true for the Bagyeli (‘pygmy’) people in Cameroon, the Amerindians in Guyana’s North West District, as well as for the Dayaks in Indonesia. For these peoples, NTFP extraction is generally a subsistence-oriented, part-time and seasonal activity (van Dijk and Wiersum, this volume) complementary to other economic activities such as farming, mining or timber logging. Only in a few situations is extraction capable of providing a livelihood. In general, however, people prefer other jobs, once alternative employment opportunities become available.<sup>7</sup> Many non-timber forest products are still ‘minor’ in this respect. Except for bush meat and some NTFPs traded on national and international markets, society’s appreciation of NTFPs is generally low, while extraction is looked upon as an inferior economic activity (*cf.* Dove, 1993).

Moreover, the extraction of NTFPs is often based on exploitative labour and trading relations (*cf.* Browder, 1992). In all the Tropenbos studies carried out in South America, a similar picture emerges of debt-peonage, in which the extractor is seldom or never paid in cash for his work. Instead, the buyer of his product advances him merchandise, which can be paid off with the harvested products. Because the buyers demand higher prices for the merchandise advanced as compared with what they pay for the NTFPs, they place the extractors in a situation of permanent indebtedness, from which it is hardly possible for them to escape. This system is called *endeude* in Colombia (Rodríguez and van der Hammen, this volume), ‘bonded labour’ in Guyana (Forte, this volume), *aviamento* in Brazil and *habilito* in Bolivia (Assies, 1997). It will be clear that these in-debt relationships hold little promise for improved livelihoods, where these are based on the extraction of forest products. Promoting commercial NTFP extraction without tackling such unequal production and marketing relationships will not result in a socially desirable land use (Ros-Tonen *et al.*, 1995).

Other factors which limit the potential of NTFPs to contribute to forest dwellers’ incomes are the poor infrastructure and high transport costs in tropical rainforest areas, which hinder

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<sup>7</sup> Van Anel and Reinders (this volume) make clear that there are exceptions to this ‘rule’. Although they note that ‘indigenous harvesters seem to perform a job that most other Guyanese are not willing to do’, the Amerindians themselves ‘prefer independent NTFP harvesting to the monotony of wage labour.’

successful marketing of NTFPs. Also the lack of organisation among harvesters and lack of access to credit and storage facilities limit the opportunities for commercial extraction (Verhey and Reinders, 1998; van Dijk, 1998). Moreover, forest-dwelling people generally live in poor conditions, where even the most basic health care and educational services are lacking. Forte's conclusion (1997) that the Amerindians in Guyana's North West District are unable 'to make more than marginal use of the endowment apparent in their geographical environment' because of 'such poor conditions of basic existence', therefore probably extends to many other forest-dwelling people all over the world.

The problem with non-timber forest products from natural forests, - with the exception of mono-specific stands or oligarchic forests where one or two species dominate - is that they often occur at low densities and are irregularly distributed (van Dijk, 1998; van Valkenburg, 1997). This leads van Dijk and Wiersum (this volume) to the conclusion that focusing on human-modified vegetation types might offer better prospects if the primary aim is to generate incomes. Such habitats have a higher species density and are generally located closer to the villages and cultivated lands. Similar conclusions are put forward in the contributions of van Valkenburg and de Jong, based on their studies in Indonesia.

In sum, the marketing of NTFPs extracted from natural forests cannot simply be expected to function as a vehicle for improving the livelihoods of forest-dwelling people. It is inherent in NTFP-based livelihoods that they tend to disappear. Once people are offered other opportunities, they often invest in other economic activities, such as cash crops<sup>8</sup> or trade (e.g. Dijkman *et al.*, and de Jong, this volume). Thus, if the aim is to raise forest peoples' incomes, opportunities to do so will probably best be found outside the forest. Support for NTFP development can be recommended only in situations where such alternative options are absent or difficult to integrate into people's way of life. In such cases, it must be realised that support should also be given to the satisfaction of basic human needs and the improvement of the social conditions under which extractors live and work (*cf.* Forte, 1995; Browder, 1992; Ros-Tonen *et al.*, 1995).

## 5. THE ROLE OF NTFPs IN PARTICIPATORY FOREST MANAGEMENT

A third important reason why NTFPs have become a major issue on the international agenda is the political struggle of rubber tappers in Brazil. In this context, the concept of extractive reserves was put forward as a combined strategy to get the rubber tappers' property rights legally recognised and to promote forest conservation and sustainable use at the same time (Allegretti, 1990; Schwartzman, 1989). In fact, extractive reserves were seen as a model for participatory forest management.

From the very beginning, several authors questioned the effectiveness of extractive reserves as a conservation strategy (e.g. Anderson, 1990; Browder, 1992; Fearnside, 1989). In general, however, the concept was regarded as a useful way of organising collectors of forest products and mobilising them in order to secure and defend their rights to natural resources, to escape exploitation by landowners and merchants, to build their marketing capacity and improve their living conditions.

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<sup>8</sup> The resulting cash crop production system may, of course, involve the cultivation of financially lucrative NTFPs in either enriched forests or mixed plantations (*cf.* Wiersum, this volume).

Central to the concept of extractive reserves is the issue of recognised and legally protected rights to land and resources. Although secure tenure is not a guarantee for successful extraction, as Assies' study (1997) has made clear, several studies in the Tropenbos programme have confirmed that the potential of NTFPs to contribute to sound forest management very much depends on who owns the land. The prospects are better in cases where extraction areas have a legal status, as the development of participatory local resource management models requires confidence and long-term collaboration among the parties involved.

A good example is the experience of Clara van der Hammen and Carlos Rodríguez, who are conducting participatory research with indigenous communities in the Caquetá region of Colombia on the cultural aspects of natural resource use and management. As their contribution indicates, indigenous households are actively participating in the research and conducting their own studies in order to recover traditional knowledge of indigenous management systems. In a slow process, by which more and more households gradually became part of the project and several community workshops were organised, a situation was reached in which an entire community became involved in a dynamic discussion on the state of resource use. These discussions and the results of research now form the basis for a participatory natural resource management plan for the legally recognised territory of these indigenous people.

How decisive secure land tenure is in this context, is also illustrated by an experience in the Tropenbos-Cameroon Programme, where efforts are being undertaken to develop participatory methods for the sustainable harvesting of *Garcinia lucida* (Guedje *et al.*, 1998). This small understorey tree is found on steep slopes at elevations exceeding 500 m above sea level and its bark is used as an additive in palm wine production. Experiments were set up to determine the effect of various harvesting techniques and there are plans to develop a simple sustainable exploitation and management strategy for the *G. lucida* resource, based on local knowledge and practices and participatory monitoring of the harvest. In this case, however, the resource grows in restricted areas at some distance from the villages (van Dijk, 1998). Because it is an open-access resource, no specific group feels responsible for the management of the resource and it is proving difficult in practice to protect the experimental stands from unplanned and unexpected stripping (van Dijk, personal communication).

Various experiences in the Tropenbos programme have also shown that the intervention of outsiders may help in the development of participatory forest management systems. The Colombian case, for example, is helping to revitalise indigenous knowledge of traditional management techniques and to apply this knowledge in natural resource management plans. An interesting result of these efforts is the publication of a book by two Indians (Matapí and Matapí, 1997) in which they document the indigenous world view, the use of natural resources and the social organisation of the Upichía tribe (now known as Matapí). Another example can be found in the study among Dayaks in West Kalimantan by de Jong, which was carried out as part of an NTFP enterprise development project. This project - a common effort of the governments of Germany and Indonesia and the Pontianak-based NGO Yayasan Dian Tama - is part of a Social Forestry Development project in the district of Sanggau and is being implemented in what is known as a 'Participatory Forest Management Area'. Analogous to the extractive reserve concept in Brazil, this is a model concession for communal forest management on some 102,250 ha of state forest land (de Jong and Utama, 1998). NTFP development is receiving particular attention in this project with a view to meeting the twin goals of increased incomes and forest conservation, based on the participation of the local stakeholders.

Although such externally sponsored and supported initiatives may encourage local people to engage in participatory management, in general, the expectations about the sustainable management of NTFP resources should not run too high. For forest people, NTFP extraction is just one way, beside others, of making a living. In general, it is the need to survive and the wish to earn money for desired 'luxury' items that primarily motivate their participation.

## 6. THE TROPENBOS NTFP RESEARCH STRATEGY IN RETROSPECT

In the Tropenbos NTFP research strategy, a strong case was made for the integration of NTFP use in land-use planning. For various reasons explained in Section 2, we focused on commercial extraction as a potential strategy for the conservation of tropical rainforests.

It has become clear in the past few years that the conservation potential of *commercial* NTFP extraction is limited. Although sustainable extraction of selected NTFPs is possible from an ecological standpoint, poverty and a lack of alternative income-generating options are unlikely to encourage extractors to reduce unsustainable harvesting levels. Moreover, it seems fairly impossible in practice to define commercial NTFP extraction as a separate land-use type, as it is combined with subsistence uses of NTFPs, farming and other economic activities.

At the same time, research has confirmed that NTFPs - albeit often for lack of other employment opportunities - play an important role in the livelihoods of forest-dwelling people and may contribute substantially to their incomes, both directly and indirectly. From this perspective, it is justified and commendable that attention should continue to be paid to NTFP use in forest land-use planning. The effort in the Tropenbos-Cameroon Programme to identify areas that are particularly suitable for NTFP-based livelihoods, may serve as an example. NTFP assessments such as those developed by Duivenvoorden *et al.* in the Tropenbos-Colombia area and other locations in Northwest Amazonia may be of help in identifying the most promising vegetation types and market conditions. In any event, it should be taken into account that assigning land to NTFP extraction implies that the forest will also be used for farming, while commercial NTFP use forms only a fraction of subsistence uses.

While subsistence use of NTFPs hardly affects the structure and composition of the forest, commercial NTFP exploitation often exceeds sustainable levels. The challenge is to develop sustainable harvesting methods for products extracted from natural forests. Such methods will be adopted only if they have been developed in joint efforts with the extractors, make use of traditional knowledge and are easy to apply. The best chance of achieving this is through a participatory and interdisciplinary approach (*cf.* de Jong and Utama, 1998 and Rodríguez and van der Hammen, this volume) in situations where commercial extraction forms a substantial part of people's livelihoods.

If the aim is to improve people's livelihoods, the prospects of doing so on the basis of 'wild' products are restricted to a few products which occur in high densities. Where such species are absent, opportunities for raising incomes through the trading of products of forest origin are better sought in human-modified vegetation types which have higher densities and are more accessible (*cf.* van Dijk and Wiersum, this volume). Research can help in providing insight into marketing opportunities, the possibilities for the domestication of commercially attractive forest products and their integration into farming or agroforestry systems, and in the development of yield-raising methods and techniques.

The importance of wildlife in NTFP-based livelihoods, as documented by Rodríguez (1991), van der Hammen (1991), van Dijk (1998), Caspary (this volume) and van Anandel and Reinders (this volume) demands more scientific attention to the development of sustainable models for wildlife exploitation and management. Hunting may seriously affect the structure and composition of the forest, as animals play a key role in seed dispersal and pollination (Redford, 1992) and are easily over-exploited. In van Wieren's contribution to this volume, a model is proposed for determining optimal harvesting rates from data on growth and densities that are easy to estimate in the field.

Research cannot solve all problems related to the sustainable management of tropical rainforests and the poor living conditions of forest-dwelling people. Critical to indigenous and other forest-dependent people is the question of land tenure and secure access to forest resources. This can be solved only at policy level. What research can contribute is an insight into the - often complex - tenure rights of NTFPs, the characteristics of the forest, and the way people make a living from it, so that forest-based livelihoods are recognised and included in land-use planning and forest management plans. Land-use planning is essential to ensure that all aims of forest management can be fulfilled (e.g. protection of natural biodiversity, indigenous land and resource rights, timber exploitation and non-timber forest use). As far as forest management plans are concerned, it is important to design multipurpose and participatory management systems containing a place for timber and non-timber use by local populations. In developing such management systems, it is important to bear in mind that NTFP use forms part of a total livelihood strategy of which other forms of forest land use also form a part. The role of enriched forests and other human-modified vegetation types as a source of NTFPs deserves more attention, as a way of reducing the pressure on natural forests. Moreover, research can contribute to forest management planning through the development of decision-support models that simulate various possible scenarios.

## **7. OUTLINE OF THIS BOOK**

This volume is structured in three parts. The first part places the location-specific studies described in Part 2 in a more global context. In this chapter, I have presented the main issues linking the various NTFP studies carried out under the Tropenbos programme. In the next chapter, Janette Forte places the NTFP-related projects in Guyana in a context of global discourses, such as those on intellectual property rights and the protection of indigenous knowledge and rights. She argues that, rather than focusing on Intellectual Property Rights legislation or the marketing of NTFPs, it would be more helpful to indigenous communities to draw up partnership arrangements and contracts for sharing profits generated as a result of their knowledge. Her contribution is a warm plea for recognising the link between cultural and natural biodiversity as a guide for research and a strategy for biodiversity conservation.

Part 2 contains the descriptions and results of case studies carried out in the framework of the Tropenbos programme. The authors dwell upon the question that runs as a common thread through this volume: that of the role that NTFP exploitation can play in tropical rainforest conservation, improved livelihoods of forest-dwelling people and participatory forest management. The first contributions refer to case-studies carried out in Middle and South America. Tinde van Anandel and Marileen Reinders argue that NTFP use in Guyana should be included in land-use planning and forest laws, in order to prevent conflicting claims to forest land and to create better conditions for Amerindians to organise themselves for the sustainable management of forest resources. If such conditions are realised, they see various opportunities

for realising the ecological potential of NTFP extraction and to develop it further as a culturally appropriate forest use.

Carlos Rodríguez and Clara van der Hammen (Tropenbos-Colombia) believe that NTFP use can only serve as an alternative for regional development if all aspects - including those related to indigenous culture and knowledge - are taken into account and the plans are developed in a participatory manner. They emphasise that although the trade in a few non-timber forest products may offer interesting income-generating opportunities, it may also cause imbalances in the indigenous management models, which are based on the use of biodiversity as a whole.

Joost Duivenvoorden *et al.* proposes a combined forest ecological and socio-economic approach to gain insight into interregional variations in, and interactions between, NTFP trade patterns and NTFP supply. They expect that the application of this approach in three study sites in NW Amazonia will result in more refined location-specific recommendations on NTFP development, providing an alternative to prevailing generalist approaches.

On the basis of his study of the Brazil nut economy in Northern Bolivia and the Brazilian state of Acre, Willem Assies puts forward various arguments against the viability of commercial extraction as a strategy for conservation and sustainable rainforest management. He makes it clear that the dynamics of the NTFP trade lead to the marginalisation of forest-dwelling extractors, resulting in an expansion of agriculture and migration to the cities. He argues that such a context does not provide many incentives for the sustainable and participatory management of forest resources, nor does it contribute to improved livelihoods.

Han Overman and Josefien Demmer<sup>9</sup> address an interesting question that is relevant to the conservation potential of NTFP use, namely the effect of income on forest use. Their data on forest use by the Tawahka Indians in Honduras suggest that NTFPs that are successful in terms of income generation outcompete themselves as a source of livelihood, as richer households decreasingly rely on the forest as a source of food or income. They hypothesise that increasing exposure to the market will initially increase the pressure on forest resources, but that this pressure will decrease once people become more wealthy.

The next two contributions refer to studies carried out in Africa. Han van Dijk and Freerk Wiersum use their research results from Cameroon to underpin their suggestion for a dual approach to NTFP management. One aspect of this approach is the multiple-use management of natural forest for the sustainable production of both timber and non-timber forest products, while opportunities for commercial NTFP production can better be sought through optimised and intensified management of human-altered vegetation types.

Whereas van Dijk and Wiersum focus mainly on vegetable NTFPs, Hans-Ulrich Caspary (Tropenbos-Côte d'Ivoire) specifically deals with the use of wildlife, the management of which has so far received too little attention. Although he is not optimistic about such options for wildlife management as trophy hunting or wildlife tourism, he argues that the cultural and economic importance of wildlife use demands the integration of game resource management in land-use planning and forest management plans. The experience with wildlife management in East and Southern Africa could possibly serve as an example. He further recommends the study

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<sup>9</sup> Their study is not directly part of the Tropenbos programme, but is being supported through supervision and the publication of its results.

of the employment of traditional, cheap and selective hunting techniques, the possibilities for captive breeding and the density of game populations; the latter being a parameter that needs to be known to enable the establishment of sustainable harvesting rates.

The last two chapters in Part 2 deal with NTFP use and potentials in Indonesia. Comparing the costs and benefits of various tree-based land-use systems with low external input, Johan van Valkenburg evaluates various management options for NTFPs in East Kalimantan. He concludes that NTFP extraction from natural forests is a competitive land use only if the environmental costs of watershed protection, erosion control, etc. are taken into account. Even then, it is an economically viable option only from a national and regional perspective, but not for individual landowners. Like van Dijk and Wiersum, he recommends that further research be geared towards integrated forest management, including both timber and non-timber resources, and the opportunities to further develop traditional agroforestry systems in, for instance, depleted permanent production forest.

Wil de Jong puts forward a reformulated exploitation-conservation proposition. He argues that commercial exploitation will lead to alternative procurement, e.g. through species management or the planting of NTFPs in plantations or home gardens. Such alternative procurement may follow different pathways with varying conservation effects. In his view, the challenge of NTFP development lies in altering a less favourable pathway that a forest landscape will undergo towards a situation with substantially more complex and diverse forests. Using the results of his study on Dayak forest management in West Kalimantan, he demonstrates that *tembawang*<sup>10</sup> deserves special attention in this respect, as this can be a viable alternative to oil palm estate development, while being more benign to the conservation of biodiversity. The challenge for research therefore, lies in the identification of those features of NTFPs that make them the most suitable for smallholder management or production.

That brings us to the last part of these proceedings, in which various NTFP experts share their opinions on the future perspectives for NTFP research. They elaborate the statements which were put forward during a forum discussion at the Tropenbos NTFP seminar in January 1999. Freerk Wiersum advocates an approach that focuses on the management characteristics of NTFPs instead of the characteristics of their collection and use. Arguing that local people manage NTFP resources under diversified management systems, he strongly favours a research line which focuses on the identification of different types of indigenously developed forests and the factors that determine their dynamics and sustainability. He further emphasises the importance of studying the role of NTFP production in integrated land-use systems. Jenne de Beer proposes a research agenda that is primarily guided by the priorities of forest-dwelling people and which is supportive of forest resource management. Wim Dijkman *et al.* propose employing sensitivity and elasticity analysis to determine whether NTFP extraction is ecologically sustainable, and aggregating species diversity and interactions into functional groups in order to study its effects on the structure and functioning of the forest. As far as the social aspects of NTFP exploitation are concerned, they recommend that more attention be paid to the social dynamics and the transitional nature of NTFP extraction. Sip van Wieren proposes the development of user-friendly harvest models to determine sustainable harvesting levels for the exploitation of wildlife. Finally, Mirjam Ros-Tonen aims to synthesise all recommendations, thereby making a plea for more refined concepts and research questions.

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<sup>10</sup> *Tembawang* is a tree-planted swidden that eventually turns into a full-grown forest garden of a natural forest-like structure and diversity.

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