

# Commercialisation of Non-Timber Forest Products: A Reality Check

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*This article challenges the pervasive view that commercialisation of non-timber forest products can (easily) achieve ecosystem and species conservation as well as improving livelihoods. Following a brief review of who and what is involved, it focuses on the main ecological and livelihood risks of unconsidered promotion of NTFP commercialisation, drawing on a wide range of case studies from around the world, and concludes with some recommendations for useful interventions.*

## 1 Introduction

In the environmental and development dialogue of the late 1980s, and especially in the post-Rio 1990s, non-timber forest products (NTFPs) – first brought to public attention in the form of ‘rainforest crunch’ – became quite literally the flavour of the day. Conservation and development organisations alike, particularly those working in the tropical rain forest, promoted the idea that NTFP production and trade had the potential to supply local people with sufficient incomes to provide them with incentives to maintain the forests (Nepstad and Schwartzman, 1992; Ruiz Pérez and Arnold, 1996; Wollenberg and Ingles, 1998). By the end of the century, the number of NTFP initiatives had grown rapidly, leading also to questions about their real impact (Sheil and Wunder, 2002). This article reviews and challenges the still dominant view that NTFP commercialisation provides an easy answer to the problem of achieving species and ecosystem conservation at the same time as improving local livelihoods.

The very fact that NTFPs are defined by what they are ‘not’ (Belcher, 2003) is indicative of the wide range of potential products they encompass, and helps to explain the lack of consistent results in the literature. In this article, we focus on plant-based materials harvested from more or less intensively managed ‘wild’ sources (ranging from forests to grasslands). We include discussion of the way in which commercialisation may shift production from the wild to a domesticated (actively cultivated) source on farm, but do not attempt a detailed examination of the process of domestication (for a recent review see Leakey et al., 2005). While we acknowledge the important

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subsistence-level uses of NTFPs, we deal first and foremost with trade beyond the local level, drawing predominantly on developing-country experience.

Broadly speaking, there are two principal objectives for promoting NTFP commercialisation. From the livelihoods perspective, NTFP commercialisation, defined as increasing the value of an NTFP in trade, is expected to increase income and employment opportunities, especially for poor and otherwise disadvantaged people. This expectation is based on the well-documented importance of many NTFPs in rural livelihoods (de Beer and McDermott, 1989; Falconer, 1990; Scoones et al., 1992; FAO, 1995), the emergence of new markets for natural products, the development of new marketing mechanisms (green marketing, fair trade), and some successful examples. Building on their local importance, there is increasing interest in the possibility of NTFP commercialisation acting as an engine for rural growth, as in the case of woodcarving in Bali (Rohadi et al., 2004), and contributing to improved national incomes. In Burkina Faso, for example, shea (kernels and butter) is the third most important national export (Schreckenber, 2004). In Mexico, the potential importance of 'non-traditional products' has been highlighted by the establishment of a national logo 'From Mexico to the World' (Ramírez Farías, 2001). In a similar vein, the establishment of a national indigenous fruits task-team in Namibia signals high-level support for a co-ordinated approach to the development of new natural product-based enterprises (Schreckenber, 2003). Even in a country with a timber resource as valuable as that of Indonesia, the Forestry Department has recently declared that this value may be surpassed by that of NTFPs. And in India there is a great deal of optimism among NGOs and government that NTFPs can offer a means to alleviate rural poverty (interviews by authors, November 2002).

From the conservation side, there has been much speculation that NTFP commercialisation can provide opportunities for (relatively) benign forest utilisation (Myers, 1988) and even create incentives for the conservation of individually valuable species and the environment in which they grow. The idea is that demand for products from a forest environment will translate effectively into demand for forest. This was fuelled by research such as that by Peters et al. (1989), which suggested that the value of NTFPs that could be sustainably extracted from a hectare of Peruvian Amazon forest far outweighed the value of the timber or alternative land uses. Conservation organisations have therefore been prominent among the advocates of NTFP commercialisation, seeing it as a way to encourage conservation-compatible income sources and to displace more destructive land- and resource-use options. Early examples were the support to rubber tappers and Brazil nut collectors, which aimed to increase the sustainability of Brazil's 'extractive reserves' (Schwartzman, 1992).

But was the optimism of the late twentieth century justified? To answer this question, we draw on the experience of two multi-case-study research projects, which sought to learn lessons about the impact of NTFP commercialisation on conservation and livelihoods. The first of these was implemented by the Center for International Forestry Research (CIFOR) and compared 61 case studies from Asia, Africa and Latin America (Ruiz-Pérez et al., 2004a). A second project, known as 'CEPFOR', was undertaken by the UNEP World Conservation Monitoring Centre (UNEP-WCMC), with case studies in 18 communities in Bolivia and Mexico (Marshall et al., 2006). We begin in Section 2 with an overview of NTFP value chains, highlighting factors that

differentiate them from other product value chains. In Section 3 we discuss the key challenges associated with NTFP commercialisation, with an emphasis on export trade. In Section 4 we present some of the risks, from both livelihood and conservation perspectives, of unconsidered promotion of NTFP commercialisation. Possible steps that can be taken to support NTFP commercialisation for new and existing products, while reducing the risks, are outlined in Section 5, followed by a brief conclusion in Section 6.

## **2 What is involved in NTFP commercialisation?**

To understand the implications of promoting NTFP commercialisation, we first need to understand what and who is involved in the 'production-to-consumption system' (Belcher, 1998) or 'value chain'. Defined as a complex web of companies and other actors that affect the production-to-consumption process (Blowfield, 2001), the term 'value chain' highlights the value that is realised in the process and how it is communicated (Schreckenberget al., 2006). It is synonymous with terms such as 'supply chain', or 'market chain' used by Neumann and Hirsch (2000) in their review of NTFP commercialisation. In this section, we present some of the key functions being carried out in NTFP-based value chains, the different actors involved, and the relationships between them.

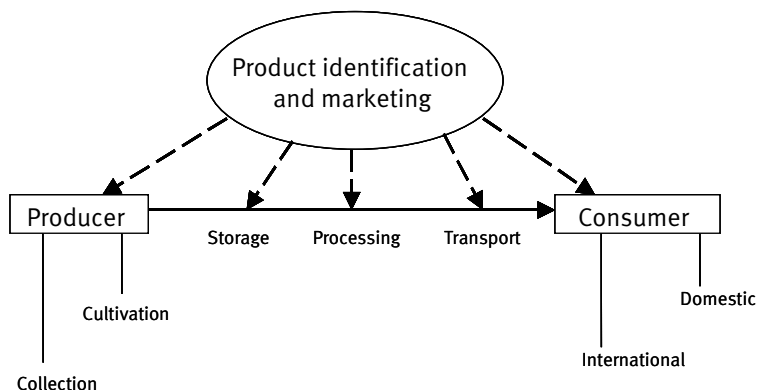
### ***2.1 What are the functions within the NTFP value chain?***

An NTFP value chain can be broken down into several sub-sets of activities: production, collection, processing, storage, transport, marketing and sale (Figure 1). The relative importance of each of these differs from product to product, they may not occur sequentially and some may even be repeated or omitted for particular products (Marshall et al., 2003). Some chains, particularly for locally traded products, are very short and simple, with harvesters selling their products direct to consumers. Value chains that extend beyond the local level tend to be more complex. Although some NTFPs (such as shea butter from the Sahel, gum Arabic from Sudan, natural rubber and vegetable ivory from the Amazon) have been exported for centuries, the recent trend towards increased globalisation has transformed the way business works, making value chains more complex and difficult to manage.

A key difference between most NTFPs and agricultural products is the importance of wild harvesting in the production process, often from locations that are distant from the home and over which the collector has no secure tenure. Storage, processing and transport, in no precise order, may be more or less complex, depending on where the product is produced, the nature of the product, the degree of processing, and the requirements of the consumer. NTFPs include many fresh fruit for which perishability is a serious concern. These require careful storage and handling and rapid transport to market or some level of primary processing close to the point of origin. The predominantly wild, and therefore low-density, production of NTFPs means that 'bulking-up' – the collection of sufficient volumes of the raw or partially processed

material to make any subsequent processing step economical – is a key function of the value chain.

**Figure 1: The production-to-consumption system**



If the product is traded internationally, export and import requirements (with respect to quality standards, phytosanitary regulations, permits and taxes) must be fulfilled. Once in the importing country, another round of storage, processing and transport may be required, often involving an array of agents and distributors, before a more highly processed (sometimes completely transformed) product is sold by retailers to the final consumer. In some cases, products may also be re-exported to other destinations. At each stage of the trade normal commercial considerations – a guaranteed supply of quality-assured material delivered according to a predictable schedule at reasonable cost – are critically important for developing a sustainable long-term relationship between sellers and buyers.

## ***2.2 Who are the actors in the NTFP value chain?***

Unlike at the local level, where a family may gather fruit and sell it direct to local consumers, for nationally or internationally traded products the whole production-to-consumption system is rarely encompassed within a single enterprise. Often there is a chain or network of different types of organisations, from individuals to loose associations to shareholder companies, involved in getting the product from the forest or field to the retail shelf.

Some types of organisation may be more appropriate for performing different functions along the value chain. Where the NTFP is collected from communal land, community organisations may be best placed to ensure that over-exploitation does not occur, while collection from individual plots is more likely to lead to the development of co-operatives with individual members (Marshall et al., 2006). Both types of organisation allow for pooling of produce to meet the minimum order requirements, sharing the costs and benefits of collective investments in storage, processing or transportation, and improved bargaining power through collective negotiation. A pita

producers' co-operative in Oaxaca, Mexico, for example, was able to negotiate guaranteed producer prices in spite of falling demand (Edouard and Marshall, 2006).

The importance of individual entrepreneurs in helping to establish international NTFP value chains is highlighted by te Velde et al. (2006). Often maligned in the literature as exploitative middlemen, intermediaries can play a critical role in communicating information from consumers to producers, providing market acumen, organising transport and quality control, advancing credit, consolidating volumes for export or national processing and shouldering risk – all contributions that are often intangible and hard to value.

As trade develops beyond local and regional markets it becomes ever more sophisticated and relationships between actors are likely to shift from informal agreements to formalised arrangements circumscribed by contracts and memoranda of understanding. Access to such markets can be intimidating or impossible for poor rural people. However, there is increasing global interest in ensuring that trade is 'fair' to all concerned. This usually means introducing conditions or practices to safeguard the interests of the less powerful partners in any relationship, typically the producers, or increasing their ability to exert their power by promoting producer associations and networks.

### **3 The challenges of commercialising NTFPs beyond the local level**

In this section, we present some of the challenging characteristics of NTFP markets that must be understood if promotion of national-level or export-oriented NTFP enterprises is to succeed. Recognising that some aspects of NTFP commercialisation are similar to those for specialist agricultural products (Vosti et al., 1997), fair-trade items (Maynard et al., 2001) or organic products, we summarise those that are specific to NTFPs in Table 1.

#### ***3.1 Production is often dispersed and markets poorly developed***

There are important market inefficiencies for products that are traded in relatively small volumes. Markets for major agricultural commodities function smoothly because producers can be reasonably confident that they will be able to purchase needed inputs and sell their produce, often with many options for sales outlets. Likewise, traders and processors can be confident that there will be an annual (or more frequent) supply and a demand for the commodity, so they can invest in storage and processing equipment and establish long-term market relationships. In contrast, many NTFPs are produced in small volumes, dispersed over wide areas. Wild harvested products in particular can be very unreliable in the quantities, qualities and even locations of production, due to the biology of the organism and the vagaries of the weather. In southern Mexico, for example, the yields of shitake mushrooms (harvested for sale to Japan) correlate with levels of rainfall (Edouard et al., 2006). Quantities may also be affected by the existence of competing opportunities for producers, for whom NTFP production typically contributes just a small part of their income. Moreover, products that come from forests

almost by definition come from remote areas, with poorly developed communications and transportation infrastructure, making it difficult and costly to move products to market. Incense collection in Bolivia illustrates how such transport constraints can be overcome if products have a high value per unit weight (Enriquez et al., 2006).

### ***3.2 Markets are diverse and faddish, but product development is long***

NTFPs are widely used in sectors as diverse as pharmaceuticals, botanical medicines, cosmetics, abrasives, and food and beverage industries. Industry is interested in these products for their new properties, as cheaper or more effective substitutes for existing products, and because they can be marketed as 'exotic' products (C. Lombard, pers. comm.). The latter reason is particularly important in the botanical medicine and cosmetics industries, both of which are extremely fickle and trend-driven (Laird and Guillén, 2002). Many of these products are considered 'luxury' items, meaning that change in demand is particularly difficult to predict. Rai (2004) provides a good example with the boom of the 'uppage' (*Garcinia gummi-gatta*) market when it was promoted as a weight-loss supplement and the bust of that market when scientific tests showed it to be ineffective. Demand for many NTFPs may vary greatly from year to year because of the availability/price of other products, as in the case of brazil nuts (competing with a basket of other mostly European nuts for the Christmas nut market) and shea butter (competing with a number of other so-called 'cocoa butter equivalents' in the chocolate industry).

In direct conflict with the often faddish nature of NTFP markets is the fact that the development of a new product requires at least 5-10 years and a significant investment of resources (Clay, 1992). In addition, such efforts are often small-scale and experimental, with many mistakes made along the way. Once the product is developed, larger operations can easily duplicate the process for less cost, in less time and with more efficiency of scale (Ervin and Mallet, 2002). This may result in control shifting to other players. Furthermore, keeping new products in the market is also problematic. NTFP markets are notoriously vulnerable to substitution, as in the 'boom and bust' experience of natural chicle, which fuelled the modern chewing gum industry. Chicle extraction was the main industry in the Yucatan Peninsula of Mexico in the mid-twentieth century but, by 1960, the development of much cheaper petroleum-based gum had almost eradicated demand (Laird and Guillén, 2002). In addition to substitution by synthetic products, NTFP producers may have to compete with large-scale cultivation in other countries, as in the case of the Brazilian natural rubber harvesters, whose livelihoods were turned upside down by the massive production of plantation rubber from South-East Asia.

### ***3.3 Volumes are typically small***

Many NTFP markets are small in scope and value, and therefore attract limited attention or investment (Shanley et al., 2002). When they do become successful, sustaining supply may be a serious problem. Clay (1996) emphasises the importance of volume to NTFP marketing, stating that it is unlikely that any single producer could provide enough product to meet the needs of even a small company in North America. This

seems to be a common problem among NTFP start-up enterprises in developing countries, many of which are supply-led and have relatively poor understanding of market issues. Product development must include detailed planning of how to meet possible future demand, including looking into how different producers can collaborate through market co-operatives to provide adequate supplies of NTFPs to major markets (Ervin and Mallet, 2002). Where products derive from threatened plant species, supply issues are complicated by conservation considerations, as is the case for pygeum and devil's claw in Africa (Sunderland et al., 2004). On the other hand, niche and fair trade-type markets may be small relative to potential production, as in the case of marula oil, the supply of which is far greater than can be absorbed by its current main international market, the Body Shop (Schreckenber, 2003).

### ***3.4 What technology is appropriate?***

There is frequent misunderstanding about the level of technology required to get NTFPs to market. This is in part due to the predominance in the literature of work on products that are exported with only minor processing (for example, brazil nuts, vanilla, wild harvested rubber, baskets). However, many NTFPs are today being used as ingredients in very sophisticated industries. A high degree of technological innovation may be necessary to achieve value-added in the country of origin, at the same time as meeting the quality standards of demanding international clients. Examples include the need to develop new extraction and refining technology to produce international-standard oil from the hard seeds of the Kalahari melon in Namibia, where the available technology was not adequate to achieve a profitable rate of extraction (Schreckenber, 2003). Similarly, the isolation of active ingredients for new drugs can only be carried out in fairly sophisticated laboratories.

### ***3.5 Barriers to entry may be high***

A major stumbling block for new traders is that each destination industry has its own research, manufacturing and marketing requirements that must be taken into account during product development (Laird and Guillén, 2002). Even in the case of a single product, such as shea butter, the cosmetics industry prefers a high content of unsaponifiables (requiring early harvest of the kernels and traditional forms of extraction), whereas the food industry prefers the more stable product obtained by solvent extraction (Boffa, 1999). Barriers are particularly stringent for food and herbal or medicinal products. Notwithstanding the centuries-old experience of trade in some NTFPs, such as spices from India and gum Arabic from Sudan, very few low-income countries have the high degree of infrastructural and institutional development, strict quality control and sophisticated supply-chain management practices necessary to enter the international market with a new product. Because of these concerns, Laird and Guillén (2002) argue that selling products to mainstream markets is probably beyond most NTFP producers and that therefore a variety of 'green' and 'fair-trade' niche markets will be the most useful starting point. However, consideration needs to be given to how to move beyond the protected arena of fair-trade markets, particularly for those products with a high volume-production potential.

### *3.6 Certification is a mixed blessing*

A marketing approach that opens up opportunities to niche markets, certification of natural products is a rapidly evolving field with four main areas of focus (Ervin and Mallet, 2002; Laird and Guillén, 2002):

- environmental – for example, Forest Stewardship Council (FSC) which promotes ecologically sustainable as well as socially responsible forestry;
- health – for example, International Federation of Organic Agriculture (IFOA) which focuses on the avoidance of exposure to, and contamination by, chemical pesticides and fertilisers;
- social – for example, Fairtrade Labelling Organisations International (FLO), which aims to ensure fair and equitable distribution of benefits to producers;
- quality – for example, International Organisation for Standardisation (ISO) and Good Manufacturing Practices (GMP).

However, certification requires a high level of organisation and technical sophistication from producers, especially with regard to management planning, monitoring, and product tracing and marketing. In addition to the costs involved in obtaining certification, possibly from several different bodies, this will prevent most NTFP harvesters around the world from participating in such initiatives unless they have access to sustained technical and financial assistance (Shanley et al., 2002). Once these obstacles have been overcome, experience in the timber sector (Varangis et al., 1995) suggests that certification does not necessarily guarantee a better market price.

### *3.7 Intellectual property rights issues*

The commercial development of many NTFPs builds on indigenous knowledge of natural products and their use. There is growing concern about how to compensate the holders of that indigenous knowledge. Furthermore, given that product development often occurs far from where the plant originates, there is equal concern about how to avoid so-called ‘biopiracy’ and ensure proper compensation for the nation where the plant has been collected. The 1992 Convention on Biological Diversity provides a broad legal framework to structure access and benefit-sharing (ABS) agreements resulting from the use of biological and genetic resources (Alexiades, 2002). The implementation of clear national biodiversity legislation may be critical in establishing favourable conditions to attract companies looking for countries in which to buy natural products. Costa Rica’s early start in dealing with these issues, for example, has led to a steady growth in bioprospecting agreements (Eberlee, 2000). In contrast, delays in the finalisation of relevant legislation in Ecuador meant that imports of the medicinal resin, *Sangre de drago*, by the US-based company, Shaman, were put on hold in 1994 (Borges et al., 2000, cited in Alexiades, 2002).

At the same time as recognising indigenous rights, it is important to acknowledge the intellectual property rights of the researchers or companies that take a product forward to market (for example, isolating its active ingredient). A good example of how this has been achieved is the development of a new appetite-suppressing drug based on



the *Hoodia* plant in southern Africa. Although the active ingredient was isolated and patented by the South African Council for Scientific and Industrial Research, this was possible only because of the traditional knowledge of the San Bushmen, who had long used the plant to stave off hunger. After intense debate, agreement has now been reached so that both parties will share in the benefits of the drug being developed (Wynberg, 2004).

**Table 1: Key differences in the value chains of NTFPs and smallholder agricultural products**

Factor	NTFPs	Smallholder agricultural products
Resource biology	Collection areas for wild harvested NTFPs often distant from the home	Fields usually close to or in walking distance of home
Resource biology	Low-density production means bulking-up becomes very important	Cultivation leads to higher density; usually many producers in one area
Resource biology	Usually 'wild' or relatively unimproved leading to problems of inconsistent quality, sometimes highly dependent on vagaries of weather	Known varieties and availability of inputs allow for more uniform production
Resource tenure	Insecure tenure over collection areas leads to risk of over-exploitation; inability to manage the resource (to improve quality and/or quantity)	Individual tenure, therefore ability to exclude others, provides incentive to invest in the resource
Resource – knowledge base	Traditional knowledge only, little formal research	Many staple and minor agricultural products subject of agricultural research and extension programmes
Policy issues	Little relevant policy in support of commercialisation; usually restricts harvest and/or transport and sale of NTFPs	Supportive policies in place, including credit provision, extension, research
Market structure	'Thin markets' – often few buyers for the total product from a production area	Many buyers at different scales; producers have more options for trading
Market information	Very little available; channelled through intermediaries	Often widely available via radio, parastatals
Production volumes	Often a supplementary activity, therefore production varies as producers choose between different livelihood opportunities	Usually a more consistent part of livelihoods, leading to more predictable production volumes
Destination markets	Very diverse, faddish, frequently 'luxury' goods and niche markets	Better known markets and more predictable
Intellectual Property Rights issues	May be critical for medicinal products and, if active ingredients are synthesised away from original source, requiring negotiation of benefit-sharing agreements	Can be an issue with respect to propagation of improved varieties

Note: For the purpose of the discussion, the table polarises the two extremes, although some NTFPs are now cultivated as smallholder crops, and some smallholder crops are produced for niche markets, giving them similar characteristics to NTFP value chains.

## 4 The risks associated with NTFP commercialisation

We have considered the structure of natural products markets and recognised the increasing complexity of those markets in a global economy. We have also looked at some of the constraints that limit the opportunities, especially of NTFP producers and poor people generally, to participate profitably in these markets. But what happens when commercial markets for NTFPs develop and demand increases? There are some clear lessons from theory and from experience regarding the risks that are associated with NTFP commercialisation from both the conservation and livelihoods perspectives.

### 4.1 *Ecological implications*

One objective of many NTFP projects is to encourage biodiversity conservation. This is because low-intensity extraction of NTFPs from a natural forest can have a low impact on the local ecology and on biodiversity at the landscape scale, and even at the species scale unless these are particularly rare and slow-growing. However, successful NTFP development in the form of better markets, improved infrastructure and higher product demand and/or prices provides a strong incentive for increased production. This can be achieved through more intensive harvesting (harvesting more per unit area), more extensive harvesting (harvesting from a larger area) or from intensified management (either in the forest or through cultivation). Depending on the production system employed, the result can be more or less compatible with biodiversity conservation.

#### **More intensive harvesting**

In most of the CEPFOR project cases, the initial response to increased demand was more intensive harvesting leading to over-exploitation of the species (Marshall et al., 2006). Almost all non-cultivated products in the CIFOR comparison were reported to show declining resource bases (Belcher et al., 2005). What follows next depends very much on the resource-tenure situation and the biology and spread (occurrence) of the species. In open access conditions, increased value leads to uncontrolled competition for resources and inefficient and damaging harvesting. In many of the CIFOR cases, harvesters lamented the fact that they felt pressure to harvest immature specimens, or harvest beyond sustainable levels. Their explanation is simple and rational – ‘if I don’t take it, someone else will’. So profits for harvesters are pushed to the minimum. There is always someone willing to undercut the selling price, especially if the product is perishable and the market is thin, and when access to markets is limited by poor infrastructure or various ‘social barriers’. In some situations, as more people get involved and/or as prices drop, harvesters are compelled to increase their harvesting, just to break even.

#### **Extensive harvesting**

Where the land/resource base is not limiting, opportunities may exist for extensive management. For example, in conservation areas or in buffer zones around protected areas, some NTFPs can be managed to provide income for local people, with relatively

low impact. The harvest of cardamom fruits from the Ba Be National Park in Vietnam (Dinh Van Tu, 2004) provides a good example of this potential. Harvesting is illegal, and there is active enforcement, mainly affecting the traders. This increases their risk and costs and has the effect of pushing down prices paid to harvesters. However, harvesting seems to have a relatively small impact on the cardamom plants and on the surrounding biodiversity. It is possible that a solution could be found to allow some harvesting, with appropriate rules to maintain the resource and limit inadvertent damage by harvesters to other resources.

### **More intensive management**

In situations where the land/resource base is limiting and the competition among harvesters is too high, intensification (management, cultivation) is the only option for increasing the quantity of production. Intensified management can also give better quality products and more control over the timing of production. So, as demand/prices increase, so do the rewards for intensified management. If the NTFP is collected from land under communal tenure, there is potential for more intensive production in the forest, while cultivation is more likely where producers have access to individually held land and the species concerned is cultivatable.

Intensively managed NTFP production systems may completely displace the natural vegetation within the management unit, as is frequently the case with bamboo, for example (Fu and Yang, 2004). However, the impacts at the landscape or plot level are less clear for some of the less intensively managed cases. In most cases ecological and biodiversity impacts have not been measured or even estimated. Moreover, assessing impacts of this kind needs a clear understanding of the baseline situation. Should the current management system be compared with a natural undisturbed forest? Or should it be compared with a degraded forest or even an agricultural field? In the case of the West African parklands, for example, diversity is certainly lower than in the original savanna vegetation. Nevertheless, the range of useful trees retained by farmers clearing their fields represents a much higher level of structural and biological diversity than the monocultures (for example, of cotton) which typically replace them when markets for the tree products decline (Boffa, 1999). The main constraints on successfully intensifying management of the wild resource are a good understanding of the biology and ecology of the NTFP species combined with secure tenure and good organisation. Mushroom collectors in Oaxaca, Mexico, for example, have zoned their communally owned land to prevent timber extraction or other land uses from damaging mushroom collecting areas. They have also started training harvesters to avoid litter removal, which has a negative impact on production, and to recognise different quality grades (Edouard et al., 2006).

As intensified production increases, Homma (1992) has argued that wild resources will be harvested to economic extinction, while the market is increasingly supplied with cultivated material. This is illustrated by several cases in the CIFOR study, including woodcarving in Bali (Rohadi et al., 2004), rattans in Kalimantan (Pambudhi et al., 2004) and Vietnam (Quang, 2004), paper mulberry in Lao PDR (Aubertin, 2004) and mushrooms in Korea (Youn, 2004). Although industrial-scale NTFP cultivation may displace natural vegetation (as in the case of oil palm or rubber plantations – both

originally collected only from the forest), NTFP production can also be incorporated with other agricultural-horticultural production. There are many good examples of indigenous mixed systems (forest gardens or complex agroforests) in tropical Asia. More recently, developed multi-strata systems incorporating NTFPs are found in the humid lowlands of West and Central Africa. In Cameroon, high densities of safou (*Dacryodes edulis*) and other fruit trees are planted in the cocoa and coffee plantations to provide shade for the commodity crop, as well as food for the family and an income at a time when no other income sources are available (Schreckenber et al., 2002). Through selection of preferred traits, farmers in the region have improved the fruit and kernel size of *Dacryodes edulis* and *Irvingia gabonensis* trees respectively, apparently without jeopardising intra-specific diversity (Leakey et al., 2004). In Oaxaca, Mexico, farmers say that enrichment planting of pita gives them a reason to retain the forest rather than convert it to other land uses (Edouard and Marshall, 2006).

Ecological concerns aside, domestication of NTFPs is constrained by the need for secure tenure (usually at the individual level) and, depending on the requirements of the plant, some technical skills and investment capital. These conditions can prevent landless and other poor people from participating. Furthermore, those people who continue to harvest from the wild may be disadvantaged by the often better and more consistent quality of the cultivated product. This is important as NTFP supply is usually ensured by a combination of production strategies, as illustrated by the case of agarwood in South-East Asia. Until recently this highly valued aromatic resin produced by infected trees of *Aquilaria* spp. has been produced only in wild trees. High prices have led to intense harvesting efforts (including using helicopters to access very remote resources). But there have also been research efforts to develop a means to induce infection and resin production, with some success (Jensen, 2004). As with many other NTFPs (for example, ginseng, birds' nests, various medicinal plants, bushmeat), the wild resin is likely to fetch a premium price in some markets. Nevertheless, domesticated production can be expected to supply some of the demand for this product. This shift has social implications because the current producers, such as the Punan of East Kalimantan or other indigenous forest people, are unlikely to be able to compete in the production of domesticated agarwood. Similarly, cardamom is produced in the Western Ghats of India under a range of production systems (Nair and Kutty, 2004). Small quantities are still harvested from wild sources. Many small producers integrate cardamom production in secondary forests, retaining some of the original forest biodiversity. However, some of the larger producers use artificial shade and irrigation to maintain an appropriate micro-climate for intensive cardamom production, with very little biodiversity at the plot level.

#### **4.2 Livelihood implications**

The rationale for supporting NTFP commercialisation is often to improve the livelihoods of poor people, especially NTFP producers. By creating and capturing more value, it is hoped that poor people will gain from improved income and employment opportunities. NTFPs are often the only source of cash income for people in remote areas, as is the case for incense harvesters in Bolivia (Enriquez et al., 2006), and can be particularly important for women, for whom few alternative income-generating options

may exist (Marshall et al., 2006; Shackleton, 2006). Even where the absolute value of NTFP-derived income is not high, its timing may complement that of other activities, providing an income at critical times of the year and/or in years when other activities fail (Schreckenberg et al., 2002; Shackleton, 2006). These benefits notwithstanding, there is a real risk that the gains of increased commercialisation will not be captured by the intended beneficiaries.

Successful trade requires a minimum set of skills and assets, including business contacts and knowledge of the ways of doing business. Poor people typically do not have those skills and assets and so, when new commercial opportunities arise, they may be out-competed by local 'elites' with more capital to invest, better connections and better skills, or by competitors from other areas. For example, research in China showed that, as opportunities in the bamboo sector increased and farmers intensified their management, better-off households gained the largest share of the increased earnings, and poorer households gained the least (Ruiz-Perez et al., 2004b). Risks exist in terms of resource access and control and of commercial competitiveness. When a wild resource gains value, the most powerful actors are likely to capture control (Dove, 1994). And, as discussed above, intensified management, whether in a plantation or a managed forest system, requires security of tenure over the land/resource, some confidence that there will be a market for the product when it is harvested, and enough economic security for the grower to be able to afford to wait for slow-maturing products. The poor, by definition, do not have these assets.

Potentially more serious, many NTFPs represent important sources of 'safety-net' (a resource that households can turn to in times of need), subsistence (for households' own consumption) or cash. Increased commercial trade can quickly lead to reduced access through over-exploitation and/or changing property rights, such that poor local people are left worse-off and more vulnerable. In the case of marula in north-central Namibia, for example, although the tree is widespread, one quarter of households do not have direct access to marula fruits and related products and rely on the goodwill of their friends and neighbours to share the resource. There is a risk, therefore, that commercialisation will lead to the increased 'privatisation' of the resource and the exclusion of certain groups from the benefits (Wynberg et al., 2003). This situation was well described by May (1986) with reference to the babassu palm kernel trade in Brazil. And where commercialised products have important local ritual or medicinal uses, increased exploitation to supply the market may lead to an erosion of cultural values and health. This may be particularly problematic for women, who frequently bear the brunt of the greater labour investments required by increased commercialisation.

Increased harvesting may also lead to reduced prices, once again with negative impacts on small-scale producers. In rare cases, NTFP activities may even be classified as 'poverty traps', where decreasing prices nevertheless result in the need to increase harvesting to maintain a minimum income level. Others, under the prevailing institutional conditions, do not offer sufficient economic advantage. The most cited example of this is the case of rubber tappers in the Amazon, whose reliance on traders to bring them commodity goods bartered for rubber amounts to a form of debt peonage (Schwartzman, 1992). It is necessary, therefore, to examine each case carefully to see where the real constraints operate and to identify solutions.

## 5 Improving the odds of achieving successful (and low-risk) NTFP commercialisation

Despite the risks and constraints associated with NTFP commercialisation, the successes at different levels indicate that there is potential to be explored. And there are encouraging new opportunities, with increasing demand for more variety and for more natural products on the demand side and a worldwide trend towards increasing recognition and devolution of rights and responsibilities of local people to manage and profit from their natural resources (Scherr et al., 2003). To take advantage of new opportunities, interventions designed to encourage or support NTFP commercialisation should consider the following.

### 5.1 *There are no 'magic-bullet' products*

It is tempting to look for an ideal type of NTFP for commercialisation, with key characteristics that will lead to successful outcomes. In practice there are many variables that determine success,<sup>1</sup> and very different sets of objectives against which to judge that success. Identifying the varying objectives of the range of stakeholders in an NTFP value chain is a necessary first step, including support to negotiate possible trade-offs between them (Marshall et al., 2006). Other considerations include the biology of the organism that produces the NTFP. Fast-growing, high-yielding species are less likely to be over-exploited than slower-growing, low-yielding species. Harvesting of fruits, seeds or leaves is likely to be more easily managed in a sustainable way than destructive harvesting, especially of long-lived species. Plants and fungi that remain in place are easier to manage than 'fugitive resources' – and, in particular, migratory animals. From an economic perspective, organisms with shorter periods of productive and reproductive maturity are more interesting than longer maturing species because the returns to investment are quicker. Resource tenure and community organisation are important factors in determining the best production options to meet increased market demand, which may range from intensified management of the 'wild' resource to cultivation, or even negotiation of benefit-sharing agreements in cases where valuable chemical compounds are synthesised.

### 5.2 *Do not ignore national policy*

Interventions to promote NTFP commercialisation have often focused solely on the local project level. This reflects the fact that NTFPs have been largely overlooked in many national policy environments. At the production level, they have been considered 'minor forest products' and regulations and management plans have ignored them or treated them under the same umbrella as timber products. This has resulted in regulations that (usually inadvertently) discriminate against NTFP producers. For example, the same kinds of transit permits that apply to timber are often applied to much less valuable NTFPs. Traders transporting NTFPs must therefore pay relatively

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1. A decision support system created by Newton et al. (2006) identifies 66 factors that may affect the success of different NTFP commercialisation initiatives.

high official fees and/or unofficial fees collected at every checkpoint. These costs effectively push down the price paid to producers. In another example, cultivated rattan in East Kalimantan, Indonesia, was subject to a fee intended to capture rents on wild forest products simply because it was not possible to distinguish the cultivated from wild material.

Whether the market is newly established, like that for Namibian exports of marula oil to the Body Shop (Schreckenber, 2003), or hundreds of years old, as with the bird's nest trade or gaharu trade from Indonesia, efforts to support the trade need to understand the structure and function of the entire production-to-consumption system (Belcher, 1998). The most effective interventions are those that have a simultaneous impact on many similar firms, what Haggblade and Gamser (1991) term 'leverage'. Thus, policy-level interventions that encourage investment in processing and trade may be the most effective way to support raw material producers, as seen very clearly in the case of the China bamboo sector (Ruiz-Pérez et al., 2004b). In other cases, the most helpful intervention may be improvements to transport infrastructure.

There is good scope for positive impacts from improved policies affecting small-enterprise development. For example, efforts to encourage provision of business development services focused on the specialist needs of the NTFP sector, and recognition of the investment potential of this sector by credit providers (for example, banks, microfinance schemes), could release important constraints. As more interest and effort are concentrated on developing natural products, there is a need to work within (or promote) a legal environment that recognises local rights to control the use of, and benefit from, traditional knowledge, as well as rewarding the innovation necessary to develop a product for the market.

### ***5.3 Consider the implications of different production options***

If support for small-scale producers is a main objective, then a careful calculation of the returns of different production systems is needed to ensure that the costs of small-scale producers, whether individually or communally, are sufficiently lower than could currently be achieved by potential competitors. If not, efforts to encourage commercialisation may have a strong negative impact on the intended beneficiaries. It is also important to understand whether the type of NTFP activity is a more 'specialised' strategy (with high-value products managed intensively by specialised producers) or simply a 'coping' strategy (with less managed and low-value products produced by large numbers of less specialised producers) (Ruiz-Pérez et al., 2004a).

Any biological resource can benefit from improved management, be it as basic as better (for example, less destructive or more efficient) harvesting techniques for wild harvested species, through to the development of improved varieties for higher yields and/or improved qualities. But scientific knowledge about many NTFPs is extremely poor. These species have not benefited from targeted research efforts and basic information about ecology, growth rates, silviculture, or responses to harvesting, for example, may be lacking. Particular management systems might benefit from the development and/or implementation of inventory and monitoring techniques for sustainable management plans, improved harvesting techniques, or the selection and breeding of improved varieties. There appears to be good potential for the development

and expansion of management systems that produce a range of goods and services. In other words, whereas it may not be economical to manage a given unit of land/forest to produce a single NTFP, the combination of several products and services (as markets develop for carbon sequestration or watershed management) may be attractive from both economic and biodiversity-conservation perspectives.

Efforts to manage a resource can only be effective with secure property rights that ensure that the benefits are captured by the managers and that protect the resource from over-exploitation. In open access situations a necessary first step will be the creation of institutions governing resource access and use. Where domestication is technically possible and economically attractive, it can be promoted in a participatory manner (for example, Leakey et al., 2003) to ensure that control over the process is retained by small producers and that levels of intra-specific on-farm diversity remain high.

#### ***5.4 NTFPs should be considered in the context of livelihood strategies***

It is critical to appreciate that NTFP commercialisation is not necessarily a pro-poor activity. NTFPs are used as components in people's livelihood strategies according to their economic conditions. Development interventions need to consider this fact and not focus on any one product, but instead consider an NTFP in the context of the overall household economy (Ruiz-Pérez et al., 2004a; Ros-Tonen and Wiersum, 2005; Marshall et al., 2006). On the one hand, this kind of approach may help recognise production limitations. On the other hand, it is important to avoid encouraging producers to put 'all their eggs in one basket'. It is also important to consider the impact of commercial use on other users. In the case of marula oil, for example, only the nuts or kernels (from which the oil is extracted) are purchased, leaving the fruit flesh on the farm where it forms the basis of a culturally important traditional beer (Wynberg et al., 2003).

#### ***5.5 Take an integrated view of the value chain***

For a successful business, all elements of the value chain must work well together. It is important not to support one actor at the expense of others. While the literature often recommends 'eliminating the middleman' or 'shortening the trade chain', such action needs to be based on a comprehensive analysis of the costs borne by the trader (including the costs of advancing credit, collecting and transporting the product, paying bribes to corrupt officials, and accepting the risk of produce spoiling or being damaged en route) and to consider whether or not those costs and services can be borne more efficiently by another provider (if they could, it is quite likely that other competitors would enter naturally). It may be more effective to focus on how to improve the bargaining power of producers without necessarily replacing the trader. This can be done through collective action in post-harvest storage and processing, and collective bargaining. It can also be helpful to organise improved market information and to help develop and disseminate information about quality (grading) standards. In many cases NTFP producers have little knowledge of where their produce goes and what it is used for, or what qualities are demanded or what prices paid downstream. The advent of cell-phones and the internet is quickly improving access to information, even at the village level, but it is still an area where outside support can be very influential.



### ***5.6 Markets are important***

The size and nature of the market are crucial factors to consider. Goods and services that are primarily exported outside the producing region tend to have significantly larger markets and can act as a powerful engine for economic growth (Haggblade et al., 2002), as in the case of bamboo production and processing in Anji County, China (Fu and Yang, 2004). The main constraints to entering export markets, from a local or regional perspective, are on the supply side. As long as producers can access the markets for the product, their most important challenge is to increase the quality and quantity of production at competitive prices.

But for many NTFPs the markets may be restricted to the local area or within the producing region. Fruits and nuts and other foods, many medicinal plants, and products used in local crafts often fall into this category. In these cases where the main market is local/domestic, efforts to expand require attention to the demand side. This is also true for NTFPs such as baskets, roof thatch, mats and hand-made rope, which face a declining market as they are displaced by cheaper and more effective commercial products (Haggblade et al., 2002). Increased production in a stagnant market is likely to lead to depressed prices and reduced incomes. But product development for a new market requires a very good understanding of the many potential markets for natural products and their trends (for example, in terms of pricing structures, availability of substitutes, quality requirements, preferences for certain types of certification) in order to stay ahead of the game.

### ***5.7 Improve both quality and quantity***

Small-scale NTFP producers are often at a disadvantage in marketing their produce because they produce small volumes of inconsistent quality in relatively remote areas. If their product is perishable, they face the additional pressure of having to sell the product before it spoils. Investment in post-harvest storage and processing can extend the economic life of the harvest, reduce some of the urgency for selling, and allow for the collection of larger volumes at one time and in one place by a single producer or by a group of producers. In this way producers can gain considerable bargaining power, and create efficiencies in the overall market.

Likewise, investment in value-added processing in the producing area can pay off. Concentrating the valuable component of the product can greatly reduce transport costs and lead to greater profits for producers. In many cases, the first step is to communicate consumer requirements to producers. Mushroom collectors in Oaxaca, Mexico, for example, have been able to improve their incomes by grading their mushrooms into different qualities (Edouard et al., 2006). In contrast, incense collectors in Bolivia sell their ungraded product to traders who reap the benefits of selling the product on in three different quality categories (Enriquez et al., 2006). Product quality is a key factor in accessing and maintaining position in high-value markets (Alexiades and Shanley, 2004). Achieving the necessary quality may not be possible with low-level 'appropriate technology'. Cost-benefit calculations are needed to determine the relative benefits to different stakeholders of different levels of processing. In the case of melon seed oil from Namibia, for example, relatively low production volumes mean that it is better for

producers to sell unprocessed seeds (for processing in the UK) than to invest in the sophisticated processing technology necessary to produce the desired quality oil (Schreckenber, 2003).

## 6 Conclusion

Our intention in this article has not been to condemn all attempts at promoting NTFP commercialisation, but rather to caution against the optimism still prevailing in some quarters that it can be an easy answer to achieving simultaneous conservation and development. Intervening in NTFP commercialisation is perhaps more challenging than many other activities, requiring a long-term and multidisciplinary approach that ranges from providing support to both the technical and social aspects of natural resource management to understanding how markets function from local to international level. It must deal with complex resource tenure and intricate value chains that may be difficult to penetrate. As NTFPs are often the product of a range of production strategies carried out by different people, interventions must be as much about promoting commercialisation as ensuring that it does not disadvantage those people who depend on the products for their subsistence or as safety-nets. In general, NTFP commercialisation is less likely to be successful primarily as a means of achieving conservation. However, it remains a useful means of contributing to improved livelihoods, particularly of the marginalised forest-dependent poor.

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## References

- Alexiades, M. N. (2002) 'Sangre de drago (*Croton lechleri*)', in P. Shanley; A. Pierce; S. A. Laird and A. Guillén (eds), *Tapping the Green Market: Certification and Management of Non-timber Forest Products*. London: Earthscan.
- Alexiades, M. N. and Shanley, P. (eds) (2004) *Productos Forestales, medios de subsistencia y conservación: Estudios de caso sobre sistemas de manejo de productos forestales no maderables. Vol. 3: América Latina*. Bogor: CIFOR.
- Aubertin, C. (2004) 'Paper Mulberry (*Broussonetia papyrifera*) in Lao PDR: A Successful Example of Forest Product Domestication', in K. Kusters and B. Belcher (eds), *Forest Products, Livelihoods and Conservation: Case-studies of Non-timber Forest Product Systems. Vol. 1: Asia*. Bogor: CIFOR.
- Belcher, B. (2003) 'What Isn't an NTFP?', *International Forestry Review* 5 (2): 161-8.
- Belcher, B. (1998) 'A Production-to-consumption Systems Approach: Lessons from the Bamboo and Rattan Sectors in Asia', in Wollenberg and Ingles.
- Belcher, B. M., Ruiz-Pérez, M. and Achdiawan, R. (2005) 'Global Patterns and Trends in the Use and Management of Commercial NTFPs: Implications for Livelihoods and Conservation', *World Development* 33 (9): 1435-52.
- Blowfield, M. (2001) *Value Chains*. Issue Paper 2. London: Resource Centre for the Social Dimensions of Business Practice. Available at [www.resource-centre.org](http://www.resource-centre.org) (accessed 28 December 2005).

- Boffa, J.-M. (1999) *Agroforestry Parklands in Sub-Saharan Africa*. Conservation Guide 34. Rome: FAO.
- Clay, J. (1996) *Generating Income and Conserving Resources: Twenty Lessons from the Field*. Washington, DC: WWF.
- Clay, J. (1992) 'Some General Principles and Strategies for Developing Markets in North America and Europe for Non-timber Forest Products', in M. Plotkin and L. Famolare (eds), *Sustainable Harvest and Marketing of Rain Forest Products*. Washington, DC: Island Press.
- De Beer, J. H. and McDermott, M. (1989) *The Economic Value of Non-timber Forest Products in South-East Asia*. Amsterdam: The Netherlands Committee for IUCN.
- Dinh Van Tu (2004) 'Extraction and Trade of Cardamom (*Amomum villosum*) from Ba Be National Park, Vietnam', in K. Kusters and B. Belcher (eds), *Forest Products, Livelihoods and Conservation: Case-studies of Non-timber Forest Product Systems. Vol. 1: Asia*. Bogor: CIFOR.
- Dove, M. R. (1994) 'Marketing the Rainforest: "Green" Panacea or Red Herring?', *Analysis from the East-West Center* 13: 1-7.
- Eberlee, J. (2000) *Assessing the Benefits of Bioprospecting in Latin America*. IDRC Reports. Available at: [http://www.idrc.ca/en/ev-5571-201-1-DO\\_TOPIC.html](http://www.idrc.ca/en/ev-5571-201-1-DO_TOPIC.html) (accessed 8th January 2006).
- Edouard, F. and Marshall, E. (2006) 'Pita: *Aechmea magdalenae* (Bromeliaceae): Traditional Use, Organization and Domestication Contribute to a Successful Niche Marketing Strategy', in Marshall et al. (2006).
- Edouard, F., Quero, R. and Marshall, E. (2006) 'Wild Mushrooms: *Boletus edulis*, *Cantharellus cibarius*, *Amanita caesarea*, *Tricholoma magnivelare* (Basidiomycetes): Fresh, Dried and Exported Mushrooms: Community Business and Entrepreneurs', in Marshall et al. (2006).
- Enriquez, C., Arancibia, E. and Marshall, E. (2006) 'Incense and Copal: *Clusia cf. ramosa* (Guttiferae) and *Protium sp.* (Burseraceae): Two Resins: Different Values, Different Uses, One Value Chain', in Marshall et al. (2006).
- Ervin, J. B. and Mallet, P. (2002) 'The Rise of Certification, the Current State of the Playing Field for NTFP Certification Programmes and Future Prospects', in P. Shanley; A. Pierce; S. A. Laird and A. Guillén (eds), *Tapping the Green Market: Certification and Management of Non-timber Forest Products*. London: Earthscan.
- Falconer, J. (1990) *The Major Significance of 'Minor' Forest Products: The Local Use and Value of Forests in the West African Humid Forest Zone*. Community Forestry Note No. 6. Rome: FAO.
- FAO (1995) *Non-Wood Forest Products for Rural Income and Sustainable Forestry*. NWFPs 7. Rome: FAO.
- Fu, M. and Yang, X. (2004) 'Moso Bamboo (*Phyllostachys heterocycla var. pubescens*) Production and Marketing in Anji County, China', in K. Kusters and B. Belcher (eds), *Forest Products, Livelihoods and Conservation: Case-studies of Non-timber Forest Product Systems. Vol. 1: Asia*. Bogor: CIFOR.
- Hagglade, S., Hazell, P. and Reardon, T. (2002) *Strategies for Stimulating Poverty-Alleviating Growth in the Rural Non-Farm Economy in Developing Countries*. EPTD Discussion Paper No. 92. Washington, DC: Environment and Production Technology Division, IFPRI, and Rural Development Department, World Bank.

- Haggblade, S. and Gamser, M. S. (1991) *A Field Manual for Subsector Practitioners*. GEMINI Tools for Microenterprise Programs: Nonfinancial Assistance Section. Washington, DC: Development Alternatives Inc.
- Homma, A. K. O. (1992) 'The Dynamics of Extraction in Amazonia: A Historical Perspective', in Nepstad and Schwartzman.
- Jensen, A. (2004) 'Domestication of *Aquilaria* spp. and Rural Poverty: Socio-economic and Genetic Aspects of the Planting Boom in the "Wood of the Gods"', in Summary report of Conference on 'Poverty Reduction and Shifting Cultivation Stabilization in the Uplands of Lao PDR: Technologies, Approaches and Methods for Improving Upland Livelihoods', held in Luangprabang, 27-30 January, [http://www.nafri.org.la/document/uplandproceedings/Summaryreport\\_eng.pdf](http://www.nafri.org.la/document/uplandproceedings/Summaryreport_eng.pdf)
- Laird, S. A. and Guillén, A. (2002) 'Marketing Issues', in P. Shanley; A. Pierce; S. A. Laird and A. Guillén (eds), *Tapping the Green Market: Certification and Management of Non-timber Forest Products*. London: Earthscan.
- Leakey, R. R. B., Schreckenber, K. and Tchoundjeu, Z. (2003) 'Contributing to Poverty Alleviation: The Participatory Domestication of West African Indigenous Fruits', *International Forestry Review* 5 (4): 338-47.
- Leakey, R. R. B.; Tchoundjeu, Z.; Schreckenber, K.; Shackleton, S. E. and Shackleton, C. M. (2005) 'Agroforestry Tree Products (AFTPs): Targeting Poverty Reduction and Enhanced Livelihoods', *International Journal of Agricultural Sustainability* 3 (1): 1-23.
- Leakey, R. R. B.; Tchoundjeu, Z.; Smith, R. I.; Munro, R. C.; Fondoun, J.-M.; Kengue, J.; Anegebeh, P. O.; Atangana, A. R.; Waruhiu, A. N.; Asaah, E.; Usoro, C. and Ukafor, V. (2004) 'Evidence that Subsistence Farmers have Domesticated Indigenous Fruits (*Dacryodes edulis* and *Irvingia gabonensis*) in Cameroon and Nigeria', *Agroforestry Systems* 60 (2): 101-11.
- Marshall, E., Schreckenber, K. and Newton, A. C. (eds) (2006) *Commercialization of Non-timber Forest Products: Factors Influencing Success: Lessons Learned from Mexico and Bolivia and Policy Implications for Decision-makers*. Cambridge: UNEP World Conservation Monitoring Centre.
- Marshall, E., Newton, A. and Schreckenber, K. (2003) 'Commercialisation of Non-timber Forest Products: First Steps in Analysing the Factors Influencing Success', *International Forestry Review* 5 (2): 128-37.
- May, P. H. (1986) 'A Modern Tragedy of the Non-commons: Agro-industrial Change and Equity in Brazil's Babassu Palm Zone', Ph.D thesis, Cornell University.
- Maynard, B.; Blowfield, M.; Burchell, R.; Collinson, C.; Nelson, V.; Tallontire, A. and Thornback, J. (2001) *Ethical Trade, People and Forests: A Manual*. London: University of Greenwich, Natural Resources Institute.
- Myers, N. (1988) 'Tropical Forests: Much More Than Stocks of Wood', *Journal of Tropical Ecology* 4: 209-21.
- Nair, T. K. R. and Kutty, M. G. (2004) 'Cardamom (*Elettaria cardamomum*) in Kerala, India', in K. Kusters and B. Belcher (eds), *Forest Products, Livelihoods and Conservation: Case-studies of Non-timber Forest Product Systems. Vol. 1: Asia*. Bogor: CIFOR.

- Nepstad, D. and Schwartzman, S. (eds) (1992) *Non-Timber Forest Products from Tropical Forests: Evaluation of a Conservation and Development Strategy*. New York: The New York Botanical Garden.
- Neumann, R. P. and Hirsch, E. (2000) *Commercialisation of Non-timber Forest Products: Review and Analysis of Research*. Bogor: CIFOR.
- Newton, A. C.; Marshall, E.; Schreckenberg, K.; Golicher, D.; Te Velde, D. W.; Edouard, F. and Arancibia, E. (2006) 'Use of a Bayesian Belief Network to Predict the Impacts of Commercializing Non-timber Forest Products on Livelihoods', *Ecology and Society* 11 (2): Art. 24, [www.ecologyandsociety.org/vol11/iss2/art24/](http://www.ecologyandsociety.org/vol11/iss2/art24/)
- Pambudhi, F.; Belcher, B.; Levang, P. and Dewi, S. (2004) 'Rattan (*Calamus* spp.) Gardens of Kalimantan: Resilience and Evolution in a Managed Non-timber Forest Product System', in K. Kusters and B. Belcher (eds), *Forest Products, Livelihoods and Conservation: Case-studies of Non-timber Forest Product Systems. Vol. 1: Asia*. Bogor: CIFOR.
- Peters, C. M., Gentry, A. H. and Mendelsohn, R. O. (1989) 'Valuation of an Amazonian Rainforest', *Nature* 339 (29): 655-7.
- Quang, V. D. (2004) 'Domestication of Rattan (*Calamus tetradactylus*) in the Buffer Zone of Ke Go Natural Reserve Area, Cam Xuyen District, Vietnam', in K. Kusters and B. Belcher (eds), *Forest Products, Livelihoods and Conservation: Case-studies of Non-timber Forest Product Systems. Vol. 1: Asia*. Bogor: CIFOR.
- Rai, N. D. (2004) 'The Socio-economic and Ecological Impact of *Garcinia gummi-gatta* Fruit Harvest in the Western Ghats, India', in K. Kusters and B. Belcher (eds), *Forest Products, Livelihoods and Conservation: Case-studies of Non-timber Forest Product Systems. Vol. 1: Asia*. Bogor: CIFOR.
- Ramírez Farías, L. (2001) *Globalisation and Livelihood Diversification Through Non-traditional Agricultural Products: The Mexico Case*. Natural Resource Perspectives No. 67. London: Overseas Development Institute.
- Rohadi, D., Permadi, P. and Hidayat, S. (2004) 'The Development of the Woodcarving Industry and the Cultivation of *Paraserianthes falcataria* in Bali, Indonesia', in K. Kusters and B. Belcher (eds), *Forest Products, Livelihoods and Conservation: Case-studies of Non-timber Forest Product Systems. Vol. 1: Asia*. Bogor: CIFOR.
- Ros-Tonen, M. A. F. and Wiersum, K. F. (2005) 'The Scope for Improving Rural Livelihoods Through Non-timber Forest Products: An Evolving Research Agenda', *Forests, Trees and Livelihoods* 15: 129-48.
- Ruiz Pérez, M. and Arnold, J. E. M. (eds) (1996) *Current Issues in Non-timber Forest Products Research*. Bogor: CIFOR.
- Ruiz-Pérez, M.; Belcher, B.; Achdiawan, R.; Alexiades, M.; Aubertin, C.; Caballero, J.; Campbell, B.; Clement, C.; Cunningham, T.; Fantini, A.; de Foresta, H.; García Fernández, C.; Gautam, K. H.; Hersch Martínez, P.; de Jong, W.; Kusters, K.; Kutty, M. G.; López, C.; Fu, M.; Martínez Alfaro, M. A.; Nair, T. R.; Ndoye, O.; Ocampo, R.; Rai, N.; Ricker, M.; Schreckenberg, K.; Shackleton, S.; Shanley, P.; Sunderland, T. and Youn, Y. (2004a) 'Markets Drive the Specialization Strategies of Forest Peoples', *Ecology and Society* 9 (2): <http://www.ecologyandsociety.org/vol9/iss2/art4>
- Ruiz-Pérez, M.; Belcher, B.; Maoyi, F. and Xiaosheng, Y. (2004b) 'Looking Through the Bamboo Curtain: An Analysis of the Changing Role of Forest and Farm

- Income in Rural Livelihoods in China', *International Forestry Review* 61 (3-4): 306-16.
- Scherr, S. J., White, T. A. and Kaimowitz, D. (2003) 'A New Agenda for Forest Conservation and Poverty Reduction: Making Markets Work for Low-income Producers'. Washington, DC: Forest Trends and Bogor: CIFOR. Available at [www.forest-trends.org](http://www.forest-trends.org)
- Schreckenber, K. (2004) 'The Contribution of Shea Butter (*Vitellaria paradoxa* C. F. Gaertner) to Local Livelihoods in Benin', in T. C. H. Sunderland and O. Ndoye (eds), *Forest Products, Livelihoods and Conservation: Case-studies of Non-Timber Forest Product Systems. Vol. 2: Africa*. Bogor: CIFOR.
- Schreckenber, K. (2003) 'Appropriate Ownership Models for Natural Product-based Small and Medium Enterprises in Namibia'. Consultancy Report for the Ministry of Trade and Industry, Windhoek, Namibia.
- Schreckenber, K.; Degrande, A.; Mboosso, C.; Boli Baboulé, Z.; Boyd, C.; Enyong, L.; Kanmegne, J. and Ngong, C. (2002) 'The Social and Economic Importance of *Dacryodes edulis* (G. Don) H. J. Lam in Southern Cameroon', *Forests, Trees and Livelihoods* 12 (1): 15-40.
- Schreckenber, K., Rushton, J. and te Velde D. W. (2006) 'NTFP Value Chains: What Happens Between Production and Consumption?', in Marshall et al. (2006).
- Schwartzman, S. (1992) 'Social Movements and Natural Resource Conservation in the Brazilian Amazon', in S. Counsell and T. Rice (eds), *The Rainforest Harvest: Sustainable Strategies for Saving the Tropical Forests?* London: Friends of the Earth.
- Scoones, I., Melnyk, M. and Pretty, J. (1992) *The Hidden Harvest: Wild Foods and Agricultural Systems. A Literature Review and Annotated Bibliography*. London: International Institute for Environment and Development.
- Shackleton, S. E. (2006) 'The Significance of the Local Trade in Natural Resource Products for Livelihoods and Poverty Alleviation in South Africa'. PhD Thesis, Rhodes University.
- Shanley, P.; Laird, S. A.; Pierce, A. R. and Guillén, A. (2002) 'Introduction', in P. Shanley, A. Pierce, S. A. Laird and A. Guillén (eds), *Tapping the Green Market: Certification and Management of Non-timber Forest Products*. London: Earthscan.
- Sheil, D. and Wunder, S. (2002) 'The Value of Tropical Forests to Local Communities: Complications, Caveats and Cautions', *Conservation Ecology* 6 (2): Art. 9.
- Sunderland, T. C. H., Harrison, S. T. and Ndoye, O. (2004) 'Commercialisation of Non-timber Forest Products in Africa: History, Context and Prospects', in T. C. H. Sunderland and O. Ndoye (eds), *Forest Products, Livelihoods and Conservation: Case-studies of Non-Timber Forest Product Systems. Vol. 2: Africa*. Bogor: CIFOR.
- te Velde, D. W.; Rushton, J.; Schreckenber, K.; Marshall, E.; Edouard, F.; Newton, A. and Arancibia, E. (2006) 'Entrepreneurship in Value Chains of Non-timber Forest Products', *Forest Policy and Economics* 8 (7): 725-41.
- Varangis, P. N., Braga, C. A. P. and Crossley, R. (1995) *Is there a Commercial Case for Tropical Timber Certification? Vol. 1*. Policy Research Working Paper No. WPS 1479. Washington, DC: World Bank.

- Vosti, S. A. and Witcover, J., in collaboration with Gordon, A. and Fereday, N. (1997) *Domestic Market Potential for Tree Products from Farm and Rural Communities*. Final report for the Department for International Development, project R5871. Washington, DC: International Food Policy Research Institute.
- Wollenberg, E. and Ingles, A. (eds) (1998) *Incomes from the Forest: Methods for the Development and Conservation of Forest Products for Local Communities*. Bogor: CIFOR and IUCN.
- Wynberg, R. (2004) 'Rhetoric, Realism and Benefit-sharing: Use of Traditional Knowledge of *Hoodia* Species in the Development of an Appetite Suppressant', *Journal of World Intellectual Property* 7 (6): 851-76.
- Wynberg, R.; Laird, S.; Botha, J.; den Adel, S. and McHardy, T. (2003) *The Management, Use and Commercialisation of Marula: Policy Issues*. Project report, DFID/FRP Winners and Losers project. Cape Town: Science and Technology Policy Research Centre, University of Cape Town.
- Youn, Y. C. (2004) 'The Production of Oak Mushrooms (*Lentinula edodes*) as a Source of Farmers' Income in the Republic of Korea: The Case of Cheongyang-Gun', in K. Kusters and B. Belcher (eds), *Forest Products, Livelihoods and Conservation: Case-studies of Non-timber Forest Product Systems. Vol. 1: Asia*. Bogor: CIFOR.