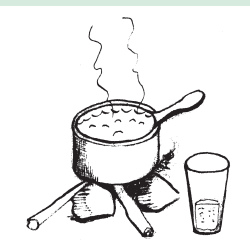
Agrodok-series No. 39

Non-timber forest products

the value of wild plants



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Tinde van Andel

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Foreword

Non-timber forest products (NTFPs) are wild plant and animal products harvested from forests, such as wild fruits, vegetables, nuts, edible roots, honey, palm leaves, medicinal plants, poisons and bush meat. Millions of people – especially those living in rural areas in developing countries – collect these products daily, and many regard selling them as a means of earning a living.
This Agrodok presents an overview of the major commercial wild plant products from Africa, the Caribbean and the Pacific. It explains their significance in traditional health care, social and ritual values, and forest conservation. It is designed to serve as a useful source of basic information for local forest dependent communities, especially those who harvest, process and market these products. We also hope that this Agrodok will help arouse the awareness of the potential of NTFPs among development organisations, local NGOs, government officials at local and regional level, and extension workers assisting local communities.
Case studies from Cameroon, Ethiopia, Central and South Africa, the Pacific, Colombia and Suriname have been used to help illustrate the various important aspects of commercial NTFP harvesting. Several examples are given of how NGOs can help local communities to improve the sustainable harvesting and marketing of wild plant products.

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I am grateful to Lieselot de Witte and Roy Keijzer (Agromisa) for offering me the opportunity to write this booklet. I wish to thank the contributors Norbert Sonné, Maria Paula Balcázar, Hanny van de Lande and Mulugeta Lemenih for their case studies and hope their experiences will serve as an example for other parts of the world. Eva Kok, Ernst van Heurn and Martinus de Kam are thanked for their critical review of the text and Bertha Valois for her beautiful drawings.

Tinde van Andel

Contents

1 Introduction

Non-timber forest products (NTFPs) are wild plant and animal products harvested from forests, savannahs and other natural vegetation types. This definition includes the use of wood for canoes, woodcarvings, local house construction, fencing materials and firewood, but excludes industrial timber. We have decided not to use the term non-wood forest products (NWFPs), often employed by the FAO, because this would exclude the use of wood for dye, poison, craft making and medicine. We also felt the reference to 'minor forest products' to be less appropriate as the local people regard many NTFPs as being more important than industrial wood.

Although NTFPs are harvested from the wild, people often gather the seeds of useful plants from the forest and plant them near their homes. These plants are then in the process of domestication. Plants and trees exclusively cultivated in plantations or gardens and no longer collected in the wild (e.g. neem tree and potato) are considered to be agricultural products and are not included in this Agrodok. Some important subjects covered by the definition of NTFPs mentioned above but not dealt with here, such as firewood and bush meat, merit separate publications.

In this Agrodok we use the term *sustainable use* to mean a condition in which people take advantage of the NTFPs in their region, while making sure that care is taken of the plant species that deliver these products and of the environment in which they grow. This helps maintain the important functions that these plants play in the daily social and economic lives of the local people.

We explore and explain the main issues associated with NTFPs, such as subsistence use, commercial use, sustainable and destructive harvest, transport, marketing, their potential for forest conservation, indigenous land rights and the loss of traditional knowledge. More specifically, we provide information surrounding the following questions:

- What is the importance of non-timber forest products to rural and forest-dwelling communities?
- How can these products increase the income of local people?
- Does harvesting them help to protect the forest?
- What are the major commercially harvested NTFPs in Africa, the Caribbean and the Pacific?
- How can NGOs and government officials support local initiatives related to NTFPs?
- Can wild plant products be harvested sustainably?
- What are the effects of overharvesting?
- Can certification contribute to sustainable NTFP harvesting and increased local income?

Case studies from various parts of the world illustrate these issues and provide possible solutions to the main problems associated with NTFP extraction. Particular attention is paid to the potential role of NGOs in the successful commercialisation of products and the development of sustainable management plans.

Our objective is to provide civil administrators at local and intermediate level, NGOs working at local and/or regional level and extension supervisors with basic information on the subject.

Our focus is on the so-called ACP countries (Africa, Caribbean, Pacific). These include all African states, the Caribbean islands including Guyana and Suriname, and the Pacific islands excluding Indonesia and Australia. Within the ACP region, we predominantly focus on Africa, since most available information is from that continent.

2 Importance of NTFPs of plant origin

2.1 Livelihood of local people

Estimates done by the World Health Organisation reveal that 80% of the people living in developing countries use wild plants to meet some of their health and nutritional needs. Thus, billions of people, especially those living in rural areas in developing countries, make use of NTFPs on a daily basis. This involves thousands of plant and tree species, most of which are consumed within the household of the gatherers and are not traded in markets. This home-consumption is also called 'subsistence use'. Life would be virtually impossible for most people living in rural areas in developing countries without the availability of palm leaves for roof thatch, medicinal plants and natural fibres to construct baskets and fish traps. Many people in these regions have no money to buy zinc sheets for roofing, prescription medicine, construction material or domestic utensils. Moreover, the further away from cities and towns, the higher the transport costs are. Commodity items inevitably become too costly or even unavailable in remote rural areas, so that people are heavily dependent on the forest and savannah products around their homes.

Although the majority of the products never reach a marketplace, a small percentage is sold in local and regional markets offering an important source of cash income, as their commercial value is high. The extraction, processing, and trading of NTFPs is often the only employment available for the population in remote rural areas.

> The Baobab, Adansonia digitata, is found as isolated trees, usually in or near settlements in Africa south of the Sahara. It has over thirty uses. The fruit, leaves, and flowers have a high nutritional value. Various parts are used to treat a large number of ailments. Nearly every part of the tree has some medicinal value. Bark fibres are used for making ropes, baskets, cloth, strings for musical instruments, etc. *(Source: www.fao.org/documents)*

Figure 1: The Baobab is recognized as one of the most useful trees in East Africa.

Use categories

To get an overview of useful plants and animals, it is helpful to divide them up into categories related to their use. These categories assist researchers and NGOs in making inventories of useful plants in a certain region. The following list, based on the recently developed International Economic Botany Data Collection Standard, is an example of the several lists of use categories of NTFPs.

- Food: wild fruits, vegetables, nuts, edible roots, bush meat, edible insects, honey.
- Food additives: spices, flavourings, food colorants, fermentation agents.

- Animal food: fodder for livestock, straw, bait to catch animals, bee plants.
- Animal products: skins (leather and fur), living animals as pets, feathers, bones.
- Construction: palm leaves or grass for roof thatch, bamboo, wood (sticks and poles).
- Materials: fibres, baskets, furniture, bow and arrow, dye, paint, varnish, glue.
- Fuel: firewood, charcoal, petroleum substitutes, lighting resins.
- Medicine: medicinal plants, bark, resin, seeds.
- Poisons: for fishing, to control insects, etc.
- Social uses: religious and magic plants, drugs, narcotics, intoxicants.
- Environmental uses: ornamental plants, shelter trees, plants for soil improvement

2.2 International market

Wild plants are sold in nearly every marketplace in Africa, the Caribbean and the Pacific, but little is known about their contribution to the national economy of the countries. Few countries register the species that are sold, and where, in what quantities and at what prices. Even less is known about who harvests and sells them, and who buys them. Unlike timber and agricultural products, no regular monitoring or evaluation of the resources, market chains and socio-economic contribution of NTFPs at national level is done anywhere. Only exported non-timber forest products sometimes appear in national statistics. Still, the annual world market of wild plant products is estimated at US$ 60 billion, and this market continues to grow by nearly 20% each year. In 1996, the trade monitoring network TRAFFIC estimated the global market for medicinal plants at US$ 1.3 billion. These statistics do not show the percentage of the cultivated plants or the percentage of true NTFPs involved. Since reliable data are absent, it is difficult to give an overview of the major commercial NTFPs in Africa, the Caribbean and the Pacific. Various references often show different production data for the same product contrary to national statistical in-

formation. We have used data from the Food and Agriculture Organisation of the United Nations (FAO) to create the lists of the major commercial NTFPs (Tables 1, 2 and 3).

In a few countries, like Cameroon, Guyana and South Africa, more research groups and NGOs have been active in NTFP research than elsewhere. These countries are often cited here simply because their statistics are available. This does not mean that these products are less important in other ACP countries; we just do not know which forest products are marketed in those countries. Values and volumes presented should thus be seen as estimates, which may differ from actual numbers but will make certain trends visible. We hope that this Agrodok inspires NGOs to gather more information on the harvesting and trade in wild plants so that more reliable data will become available.

2.3 Traditional health care

According to the World Health Organisation, more than 4 billion people rely on traditional plant-based systems of medicine for their primary health care. Egypt is the most important medicinal plant exporting country in Africa, and the fifth biggest exporter of medicinal plants in the world. In the early 1990s, Egypt exported 11,250 tons of medicinal plants per year worth over US$ 12 million.

The national trade in medicinal plants in South Africa has been estimated to be worth between US$ 6 and 9 million per year. Some 7.5 million plant units (of over 600 species) are sold annually in Natal. A total of 39 medicinal species have been exploited to the extent that they are now endangered; one species is already extinct. South African medicinal herbs are now for sale on the internet. The national market in medicinal plants is believed to be more important than the export market since the vast majority of Africans consult traditional healers.

Malawi serves to illustrate the importance of medicinal plants in traditional health care. A mere 35 medical doctors were working here in 1987 against an estimated 17,000 traditional healers. Similar trends

are seen in Tanzania, Nigeria, Ghana and Southern Africa. Economic and demographic projections for most African countries offer little ground for change. A shift from using traditional medicines to consulting medical doctors will only occur with socio-economic and cultural change, access to formal education and economic growth. Unfortunately, in the light of the declining economy in most African countries, the need will remain to involve medicinal plants and traditional healers in national health care systems through training and evaluation of effective remedies. The sustainable use of medicinal plants, therefore, is essential.

In the past, the gathering of medicinal plants was restricted to traditional healers and their apprentices. Rapid urbanisation, however, has resulted in big cities becoming centres of demand for traditional medicines from outlying rural areas and across national boundaries. Nowadays, large quantities of plant material are collected by commercial harvesters and sold through increasing numbers of informal sellers (mainly women) to urban traders or herbalists. This shift from subsistence use to commercial trade has led to increased pressure on wild medicinal plant populations. Local herbalists are worried that their source material might become so scarce that they would have to buy the bark, roots and leaves they need from merchants in the city.

An overview of Africa’s most important medicinal plants and aspects of their international trade is given by Cunningham, Mander and Walter (see Further Reading). Two of the African medicinal plants threatened with extinction due to commercial extraction are described below.

Native to Southern Africa, devil's claw (*Harpagophytum procumbens* and *H. zeyheri*) is named after the miniature hooks that cover its fruit. For thousands of years, the peoples of the Kalahari Desert have used the devil's claw root in remedies to treat pain, skin problems and pregnancy complications. Since its introduction to Europe in the early 1900s, wild-harvested roots have been provided on the world market for anti-rheumatic treatments. Commercial harvesting of the roots has

resulted in the removal of about 66% of the plant population, thus far. In 2000, there was a proposal to list devil's claw on Appendix II of CITES, meaning that trade of the species is only allowed if long-term damage to the population can be prevented. This was successfully rejected by the countries involved and local NGOs, as they were worried that the CITES listing would negatively affect the lives of devil's claw traders. Initiatives have recently been taken to harvest devil's claw on a more sustainable basis (see www.resourceafrica.org/ programmes).

Figure 2: Illustration of how to use locust bark (Hymenaea courbaril) to treat coughs in a Brazilian booklet for rural people. Source: Recipes without words: medicinal plants of Amazonia.

The African cherry (*Prunus africana*) is a fast-growing mountain forest tree, highly valued for its medicinal bark, which is locally used for chest pain, heartburn, fever and madness. After its discovery as an effective remedy against prostate cancer in 1966, the active ingredients were patented and commercial extraction started on a large scale. Cameroon and Madagascar are main exporters of the bark, which is

collected from wild populations in African mountain forests. In both countries, the tree is severely over exploited, as it is either felled to harvest the entire bark, or ring-barked, also causing the tree to die. Although the species has been put on the Cites Appendix II, this has not led to sustainable harvesting of the bark throughout its range of distribution. Cameroon can sustainably supply approximately 200 tons of bark, but over 3,500 tons were harvested and exported in 1999. Several initiatives for sustainable extraction have been undertaken in Cameroon. The tree has a good potential for sustainable harvesting, since it grows relatively fast and can withstand bark harvesting rather well. Most trees will survive if the bark is removed only on two opposing sides of the trunk. The interval between successive partial debarking should be at least 4 to 5 years. Plantation grown trees might take 15 to 20 years to grow to bark harvesting size. The value of the bark has encouraged small farmers to cultivate the African cherry tree from seeds in agroforestry systems. Seedlings are also propagated by a local botanic garden (see Section 5.5).

2.4 Social and ritual values

In traditional communities, many forest products play an important role in social and ritual activities. Frankincense resin, for example, is widely used in religious ceremonies in Ethiopia and Eritrea (see case study in Section 4.2).

Kava, a medicinal herb with mild narcotic properties, is used in the Pacific Islands as a ceremonial drink. It causes a short euphoric state of tranquillity and friendliness. To the indigenous people of the South Pacific, drinking kava is a major part of their life. It is almost impossible to imagine that kava might be removed from the marketplace. Yet its consumption has come under fire on different fronts. Some people in the Pacific Islands say the drink has a negative impact on marriages, work performance and family income. But today Kava faces a greater challenge: the product has been banned in numerous Western countries for fear that the drink might cause liver diseases and

other ailments. Kava export sales have plummeted, devastating local economies.

In Southern Cameroon, a wide range of forest products is commonly used in traditional ceremonies like marriages, funerals, inauguration ceremonies of chiefs, initiations, birth celebrations and conflict resolution. Fruits from the oil palm (*Elaeis guineensis*) and cola nuts (*Cola* spp.) are handed out to welcome visitors and symbolise peace, hospitality and friendship. NTFPs are also the basic materials for musical instruments (e.g. guitar-type instruments, drums and rattles) used in traditional ceremonies. The socio-cultural function of NTFPs is illustrated by the case study in Section 4.1.

Figure 3: Kava leaf and preparing the Kava roots to make a beverage from it, South Pacific.

2.5 Ecological value and forest conservation

The exploitation of NTFPs is often proposed as a potential means of ensuring sustainable management of forests and conservation of biodiversity. However, this depends very much on the species and the extent to which they are harvested. When standing forest is needed to supply particular plant products such as aerial roots or rattan, commercial extraction can contribute to forest conservation, as harvesters often deliberately protect useful trees from logging. Moreover, if people make money by selling wild plant products, they will not need to cut down trees to make a living. But, when prices for NTFPs drop and harvesting is no longer economically viable, or if extractors are expelled from customary collection sites, people may shift to more destructive activities such as logging, cash-crop agriculture or cattle ranching.

The various case studies presented here reveal that wild plant extraction does not always contribute to biodiversity conservation. Harvesting vulnerable species or using destructive harvesting techniques has a negative impact on the populations of NTFP-producing species. This could lead to local species extinction, eventually affecting the entire ecosystem.

3 Land ownership and user rights

Land rights can take various forms, from individual or collective ownership to extractive reserves exclusively set aside for NTFP harvesting. Obtaining formalised land tenure by communities, or the formal or informal rights to have access and gather wild plant resources, e.g. in timber concessions, are important steps towards sustainable management of forests and non-timber forest products. Communities will treat their forests more responsibly if they have an undisputed claim to them. Good care for the surrounding forest only comes with clear land rights.

Especially important in this respect is the governments' willingness to grant land tenure and stable land use rights to local communities, because in many countries forests are owned and administered by the government. If land ownership and land use rights are not unambiguously regulated, commercial extraction runs the risk of being prohibited and extractors could be expelled from the forest. If extractors harvest wild plants from forests where they have no formal ownership or user rights, they will take little responsibility for the management of the resource to ensure a sustainable harvest.

NGOs must be aware of and familiar with local land right issues before they start promoting commercial extraction of NTFPs. This may prevent conflicts between neighbouring communities, timber concessions and local administrations.

The overharvesting of commercial rattan species in West and Central Africa has led to scarcity of rattan and consequently to high prices for both furniture and the raw material. This is partly due to the absence of well-regulated land tenure and user rights of local communities and commercial extractors. In Equatorial Guinea, for example, rattan extractors need to pay the equivalent of US$ 4 to the local village chief for each visit to the forest. Few management plans have been set up so far to assure sustained production of the rattan, because long-term user

rights are not guaranteed. If legislation were in place allowing ownership of rattan along the same lines as for timber trees, encouraging *in situ* management might be more successful.

Management agreements between forest users and forest owners should be developed and implemented for potentially high-value plant products, addressing intellectual property rights, land tenure and resource access. Communities should possess the legal authority to regulate access for commercial extractors of NTFPs, while ensuring that people within the community retain access rights to collect these products for their own use.

Although land tenure and well-regulated user rights are very important, they are not universal remedies that guarantee a sustainable harvest. This is illustrated by the case of commercial palm heart harvesting in Guyana. Some groups of indigenous extractors abandoned subsistence farming and took up legalised full-time palm heart extraction. After depleting the palm resources within their indigenous reserves, they needed to migrate into state-owned forests in order to find sufficient palm trees for exploitation. With no food reserves grown at home, extractors had to cut palms full-time in order to make a living. As a result, the rate of overharvesting was similar to that in areas where communities had no land rights at all.

Those extractors who had kept their agricultural fields to maintain their food security, practised palm heart harvesting only part-time to be able to buy luxury goods. After several years of harvesting, they had still not depleted the resources within their reserve boundaries. This example demonstrates that combining commercial NTFP extraction with subsistence activities is a better way of ensuring a sustainable harvest than solely through obtaining land tenure or user rights.

4 Practical aspects of NTFPs

4.1 Factors related to gathering

Many cultures have a fairly strict gender-related division of labour. Men collect other forest products than women, and both have different roles in processing and marketing. Different tribes in a certain region often have their own special tradition of forest use. Elders collect other products than young people. The following case study from Cameroon illustrates this.

Differences in NTFP use between Bulu and Bagyeli people in Cameroon

CASE STUDY by Norbert Sonné, Leiden University, The Netherlands

Many wild plant and animal products are collected in and around the Campo-Ma'an National Park in Southern Cameroon. Two major ethnic groups populate the study area: Bagyeli Pygmies and Bulu immigrants. A total of 148 plant species are commonly collected in the area, of which 15 are considered highly important in the daily life of both ethnic groups. The species of plants harvested, the collection methods and marketing, however, depend on the ethnicity, age, socio-economic conditions and gender of the extractors.

On their daily trips to the fields, or during opportunistic trips in secondary forests women collect NTFPs, mainly food products. Men collect forest products during hunting-stays in the primary forest and on their way back to the village, whereas children collect fruits and nuts around the village. For products of economic importance, special collection trips are organised by groups of three or four persons.

Almost everyone in the region has knowledge about plants that can be used to cure common diseases such as malaria, fever, headaches, diarrhoea, dysentery and colds. A total of 56 medicinal species were recorded in the region.

Older women have specialised knowledge of herbs used to ease difficulties during childbirth and to avoid undesired pregnancies, while younger women have know-ledge about different species to add to their husband's food as aphrodisiacs. Pregnant women often wear a liana string around their bellies to protect themselves or the foetus. Men are familiar with species used as energising tonics, while young people know of different plants to treat headaches, diarrhoea or dysentery. People of both sexes often carry a piece of bark in their pocket or attach it to their doorways to protect themselves against evil spirits.

Although knowledge about disease treatment using plants is widespread in both ethnic groups, the Bagyeli are more involved in traditional medicine than the Bulu. In case of health problems Bulu often consult the Bagyeli. Even people from outside the region consult the Bagyeli pygmies, as they are renowned for their knowledge about herbal treatments and mystic practices.

Both ethnic groups in the Campo-Ma'an area earn money through the collection, processing and sale of wild plant products. Men, women, and to some extent children are involved in the commercialisation activities. However, the Bulu people are more interested in commercialisation than the Bagyeli, the latter using most products for home consumption. There is one exception: the Bagyeli are specialised bush meat hunters and earn most of their cash income by selling wild meat.

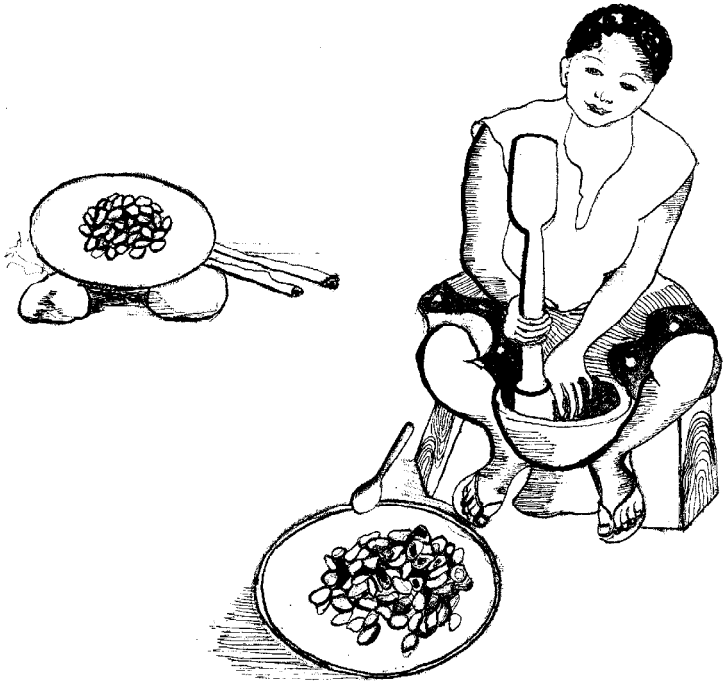

Figure 4: Bulu woman toasting and pounding bush mango kernels, Southern Cameroon.

The products are sold directly to consumers, processors or manufacturers in the villages or to middlemen. These middlemen are mainly women from neighbouring villages, who transport the products to urban markets and sell them to wholesalers and retailers. In Bagyeli communities, middlemen often exchange NTFPs for commodities like soap and salt. For some products, the processing and commercialisation is strictly gender-structured. Men cut down oil palms (*Elaeis guineensis*) and raffia palms (*Raphia* spp.), tap the trunks and ferment the juice into palm wine. This is then distilled to obtain a strong alcoholic drink called 'odontol'. The processing of oil palm and raffia wine is common practice with the Bulu. The odontol is sold to Bulu women, who sell the product. The Bagyeli have less experience in the distillation of palm wine.

Both Bulu and Bagyeli are involved in the harvesting of bush mango (*Irvingia gabonensis*), the seeds of which are used to thicken soups and sauces (see figure 4). The Bagyeli mainly collect the raw material, while the Bulu grind the seeds into a paste, which is sold on local and regional markets.

4.2 Environmental impact of NTFP gathering

It is often said that NTFPs can be harvested without destroying the natural ecosystem. Indeed, collecting fruits, eggs, honey, mushrooms, bark or leaves is less damaging than cutting down entire trees for timber or converting entire forest areas to agricultural land. Although many wild products are extracted without damaging the forest, techniques of collection have different impacts on the regeneration of the species and, therefore, on their future availability. The collection of fruits, nuts, leaves and bark is less harmful, as only specific parts are removed and the tree or shrub easily regenerates. The collection of wood or resin, on the other hand, can be fairly destructive because in certain cases the entire tree is cut down.

Uncontrolled harvesting, as well as very low, or exceptionally high prices may all cause overharvesting, lead to forest degradation, and even result in local extinction of species. The following case study illustrates how uncontrolled harvesting of a valuable tree resin in the Horn of Africa has resulted in serious environmental and economic problems.

Ecological effects of frankincense harvesting
CASE STUDY by Mulugeta Lemenih, Wondo Genet College of Forestry, Shashamane, Ethiopia

Frankincense is a resin harvested from the tree *Boswellia papyrifera* (and some other *Boswellia* species), growing in the dry woodlands of Eritrea, Ethiopia, Somalia, Kenya and Sudan. Frankincense is used locally as incense and medicine. Large quantities are also exported for the pharmaceutical, cosmetic and perfume industry. To harvest the resin, trees are tapped by shaving off the bark of the trees with a sharp axe or knife (see figure 5). The tree reacts by secreting the frankincense resin to heal its wound. Tappers collect the dry 'tears' of incense. The first incisions are shallow, but subsequent tappings are wider and deeper. An average *Boswellia* tree is tapped up to 13 times a year, within the 6 to 10 months of the dry season, depending on the area where it grows. (Every 15 to 25 days until the onset of the rainy season).

Large productive trees may bear about a hundred wounds at a time, while small trees that are being tapped for the first time may have no more than four incisions. In some places, trees are allowed to recover for a period of 3 to 5 years after one year of harvest. The average annual cash income generated per household by resin tapping in Ethiopia was estimated at US$ 80, almost one-third of the annual household income in rural communities in Ethiopia.

Despite the great economic benefits, the stock of *Boswellia* species and the woodlands themselves are deteriorating. Several factors are responsible for the decline of this resource:

1 *Improper tapping and the consequent damage to the trees: i*ntense tapping and improper wounding are harmful, in particular, the repeated stabbing to harvest more incense. Deep incisions affect the sapwood, causing trees to dry out. Trees that survive the deep incisions often produce non-viable seeds. Perhaps over 50% of the tapped trees are damaged.
2 *Overgrazing*: cattle often destroy seedlings and young trees.
3 *Clearance of woodlands*: trees are cut down to clear land for the cultivation of crops.
4 *Bush fire*: the bark of the trees is often damaged.
5 *Insect and termite attacks*: incisions facilitate the invasion by insects, fungi and termites.

The export of frankincense from the Horn of Africa is declining, not only because of severe droughts in the region, but also as a result of dwindling resources caused by unsustainable harvesting.

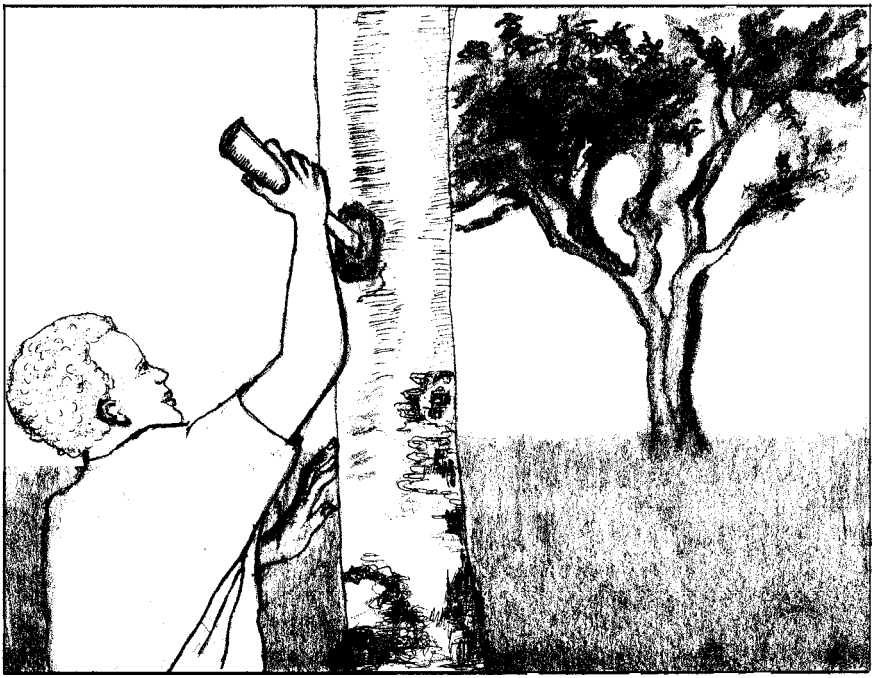

Figure 5: Cutting the bark of a frankincense tree to obtain its resin

4.3 Processing and preserving

The fact that many wild plant products are harvested far away from markets and processing facilities is a major problem for the commercialisation of NTFPs. Getting products to city markets implies high transport costs, and wild fruits and vegetables are often spoiled by the time they arrive. To solve this problem, small 'cottage industries' need to be established near productive forests, where local residents are responsible for the processing of fruits and other plant products. Drying, grinding, freezing, canning, candying and oil extraction also increase the product's price and the villager's share of its value.

Some of these techniques seem out of reach of forest-dwelling communities, as they require a reliable supply of cheap energy. Nevertheless, in many rural areas, this kind of processing is already taking place in a sophisticated way. The following case study illustrates the economic importance of processing perishable NTFPs into products that can be stored for a long time and have an increased market value.

Processing forest products in Southern Cameroon

CASE STUDY by Norbert Sonné, Leiden University, the Netherlands

In the Campo-Ma'an region in Southern Cameroon, 67 wild food species have been recorded. Most fruits and nuts are directly eaten, whereas starchy tubers have to be cooked and are accompanied by a sauce made of leaves and spices. Other NTFPs require more complex processing methods and local people have a long history of preparing the products derived. Oil palms (*Elaeis guineensis*) and raffia palms (*Raphia* spp.) are cut down, the trunk is tapped for a few days and the sap is then fermented with sugar in 2-4 days into palm wine, often flavoured with the bitter bark of *Garcinia lucida*, another forest tree. This liquid is then distilled into a strong alcoholic drink called 'odontol'. For 10 litres of odontol, 20 to 25 litres of palm wine are required. Palm wine spoils quickly, but the distilled drink, if kept in a hermetically sealed can or bottle, can last for over a year. The demand for palm wine and odontol is so high that its production has a negative effect on palm regeneration. Indigenous management practices include the tapping of standing trees (instead of felling the palm), and the planting of palm seedlings in home gardens and village yards. Since only male raffia palms are tapped, the species is less vulnerable than the oil palm. Oil palms are also planted for the production of nuts, the raw material for palm oil.

Fruits of the bush mango (*Irvingia gabonensis*) are greenish-yellow with fleshy fibrous pulp surrounding a large, hard stone containing the kernel. The fruits are eaten directly, because they cannot be stored for a long time. The kernels are a key ingredient in sauces that accompany the local staple food of **starchy tubers.** To store bush mango kernels, they are separated from the fruit pulp, dried for 1-2 weeks in the sun, toasted for about 30 minutes above a fire and pounded in a wooden mortar for approximately 10 minutes (see figure 4). The paste obtained is put into a mould for one night to harden. The final product, a solid paste, locally known as 'etymbado'oh', can be stored for a year or even longer.

4.4 Transportation and marketing

Transport costs are a major bottleneck for the commercialisation of NTFPs. Bringing products to the market can be so expensive that people cannot compete with extractors closer to the towns This is unless their products are not found (anymore) in more populated areas and their unit prices are high enough to cover transport costs. Consequently, in remote rural communities, commercial harvesting of the products is rarely worth the effort. This often means that living animals and bush meat are the only products worth transporting from remote areas to city markets. Most forest fruits, nuts, craft materials and medicinal plants can be harvested closer to market towns. Unless subsidies from governments or NGOs are introduced for NTFPs from remote forests, or raw materials could be locally processed into valuable products, the marketing of the products from remote forests would generally not be worth the effort. The following example illustrates this.

In the remote forests of Guyana, Carib Indians use over 120 different species of wild plants for medicine. Many medicinal herbs and barks are sold in the capital Georgetown. None of these products, however, comes from the Carib region, because if they have to be transported by river for three days, they become too expensive. Most medicinal plants are harvested close to the capital, with the exception of one product: the oil from seeds of the crabwood tree (*Carapa guianensis*). The complicated processing method (the seeds are left in water for a month to decay, then they are ground, kneaded and sun-dried to let the oil drip out of the paste) makes the oil rather expensive. Crabwood oil, used as insect repellent and skin disinfectant, can be stored for years. Bottles can thus be stored until people get an opportunity to travel to a market and sell the product. Several NGOs now support remote indigenous communities in Guyana to market this oil. The product has already found a steady market in the cosmetic industry in Brazil.

5 Supporting local communities to exploit NTFPs

To realise community-based NTFP production, the first emphasis should be on the improvement of the expertise of local people. NGOs can certainly play a role in supporting rural communities to set up forest-based enterprises, but should only actually assist them when local skills fall short. A useful manual for NGOs planning to set up participatory research into NTFP use has been published by the Dutch development cooperation Novib (1997). We will not duplicate Novib's work here, but will highlight certain aspects of it to complement our efforts or go into them in greater detail.

5.1 Inventory of local NTFPs

In most places the local flora has already been studied to some extent, but information about the use of plants in a particular area might be harder to find. Before starting their own research, NGOs should try to locate available information in local government offices, libraries, universities, herbaria and on the internet. If no useful information is available, NGOs should encourage local communities to carry out an inventory in the area.

The best way to make an inventory is to go for a walk in the forest with some local people and ask them which plants are used, for what purposes, and whether they sell them or not. Make detailed field notes, including the local names, uses and processing methods. If the explanation is not totally clear (e.g. is a plant processed by squeezing, pressing or beating?), ask them to demonstrate it to you. Make sure to find out whether the plants grow in the wild or are cultivated, or both.

Do not limit the survey of NTFPs to interviews. People might not feel at ease when being questioned and will generally point out more products when you walk with them in the forest than when they are

interviewed face to face. Moreover, if you are planning to work with wild plants, you must know what they look like and where they grow.

Local names for plants vary considerably from country to country. In areas where many traditional languages are spoken, local names may vary among villages and even among families. However, each plant has only one scientific name. To be sure about which species you are dealing with, the appropriate scientific (Latin) name for the plant must be known. The Latin name will enable you to find the literature pertaining to the management systems, processing methods and marketing issues of that particular species. To be certain of a plant's scientific name, a botanical sample of the plant, called a 'botanical voucher' has to be made, which can later be identified by an expert in the field (see figure 6).

Instructions on how to make a botanical voucher:

1 Make field notes of the area before collecting the plant, indicating where it grows, whether it is a shrub, herb or a tree, and its name in the local language.
2 Collect a good branch with leaves, and preferably flowers, fruits and seeds. These are needed for proper identification. For small herbs, collect the entire plant, with the roots attached. Make a photograph. Label the plants as you collect them to avoid confusion during identification. Give consecutive numbers to each collected plant and use the same numbers in your field notebook and on your label.
3 Press the plants between newspaper while they are fresh. Dry them either in the sun or above a stove until they are crisp dry.
4 Keep the plants in plastic to protect them from moisture and ask an expert in a herbarium or local university for the correct scientific names.

More instructions on how to collect plants and to interpret indigenous knowledge can be found in Martin (1995) and on the website: http://herbarium.usu.edu/K-12/Collecting/specimens.htm#ethics.

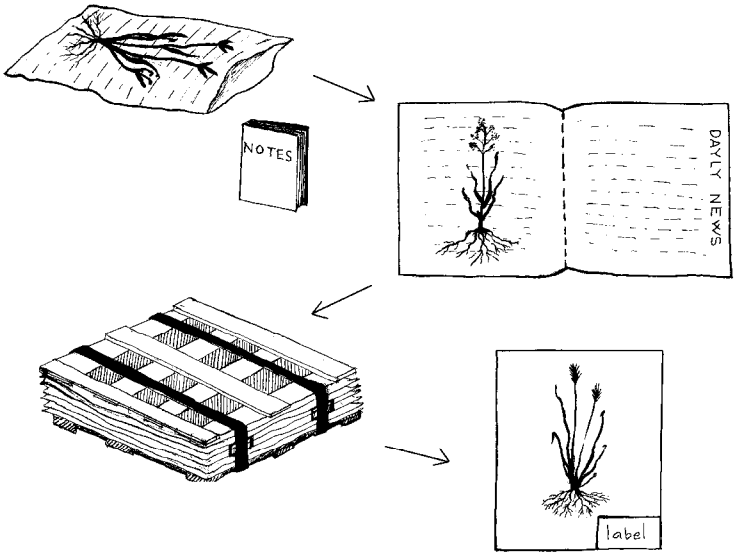

Figure 6: Making a botanical sample of a useful plant for identification (voucher).

When making a list of useful plants from a certain region, it is advisable to describe the uses of plant species according to international standards and categories (see Section 2.1). This will enable the results to be compared with other studies. Especially when recording medicinal plants, it is important to ensure that they are placed in the correct category, such as inflammation, pain, mental disorders or pregnancy related problems.

However, many diseases are culture-bound (such as ‘evil eye’ or possession by evil spirits) and do not fit into the categories set up by Western-trained doctors. It is important, therefore, that the local disease concept is documented along with the particular plant species.

If designing management plans is the objective, an inventory should be made of the current forestry management systems used by local communities. Baseline ecological data (rainfall, temperature, soil type, forest cover, vegetation type, etc.) must be collected for the habitats of NTFPs. Different harvesting regimes should be tested to verify their sustainability.

Management plans considering ecological, social and economic concerns need to be established for forests that yield important NTFPs. It is also important to check whether certain plant species are protected under national or international law, before stimulating their extraction.

5.2 Revival of local knowledge

Much of the traditional knowledge about wild plants and their use is disappearing. This is due to the continuing destruction of tropical forests and the 'modernisation' of indigenous cultures. Modern times have introduced new food habits and new crops. Traditional food plants suffer from a double tragedy: genetic erosion (loss of cultivars) and the loss of traditional knowledge about how to grow and prepare them.

Still, NTFPs are an essential dietary and economic safety net for poor families and especially for refugees suffering from warfare, famine or drought they are often of life-saving significance. Better nutrition and health can be achieved among rural populations by promoting traditional food plants, whose use might have been largely forgotten. An effort to help was made by Maundu et al. (1999) who provided an illustrated guide to traditional food plants of Kenya, along with recipes.

An example of the successful revival of local knowledge in Suriname, initiated by a government agency is given in the case study below.

Gathering wild plants for food: an awareness project for elementary school children in Suriname

CASE STUDY by Hanny L. van de Lande, Anton de Kom University, Paramaribo, Suriname

In urban areas of Suriname, children and elderly people of families living in low-income neighbourhoods do not have a sufficient intake of fresh and nutritious food. Many school children have the daily task of cooking the evening meal for the entire family when they get home. The cost of vegetables often results in inadequate daily portions. This has serious consequences for the children's growth and development. A poverty alleviation pilot project was set up to raise awareness about the use of edible plants that can be gathered from nature. Project members included lecturers and students form the University and Teachers College, and an extension officer from the Ministry of Agriculture, Animal Husbandry and Fisheries.

As part of the biology classes, 205 children, aged 8 to 12 years, were taught about edible wild and escaped cultivated plants, which grow close to their homes or in vacant lots along the road to school. The children came from different schools in Paramaribo and surrounding communities, situated in low-income neighbourhoods with relatively large families. Training material was developed that was adapted to the children's everyday life. For three months, five one-hour classroom and one outdoor (school yard, home garden) sessions were organised, during which children, their parents and their teachers were taught where to look for edible plants growing in the wild, and how to identify them. They also learned how to grow vegetables on a small scale, even if space for gardening at home was limited. Many wild vegetables, often considered as weeds, can be gathered and grown in buckets or in a little corner of the yard. Examples are 'bitawiri' (*Cestrum latifolium*), 'agumawiwiri' (*Solanum americanum*), 'watra dagublat' (*Ipomoea aquatica*) and 'klarun' (*Amaranthus* spp.).

Many well-known cultivated vegetables have additional uses few people know about. The young shoots and leaves of ''dyari pesi' (*Vigna sinensis*), 'switi patata' (*Ipomoea batatas*) and 'pampun' (*Cucurbita pepo*) also provide nutritious side dishes. The training sessions continued with a cooking class, organised in the classroom with the help of teachers and parents. Children brought leaf and fruit vegetables that they had gathered in yards or from the wild, and a number of dishes were prepared and consumed. A drawing and writing competition completed the training. The drawings, poems and short stories, together with over 500 colour photographs illustrating the children's activities during training sessions, were exhibited in a theatre in Paramaribo. Wild plants grown in buckets were put on display to show visitors living examples of growing wild vegetables for home use.

There was a lively exchange of information amongst children, teachers and project team members. Occasionally, children provided new information on plant use, such as the use of young leaves of 'olive' trees (*Zizyphus jujuba*) as a vegetable and the use of certain plant parts for medicinal purposes. The results of this project were well received at national level, as shown by the coverage by local newspapers, radio and television programmes. Project team members were interviewed and children were visited at home for a cooking demonstration using lesser-known edible parts from wild and escaped cultivated plants. An illustrated book describing 30 edible plant species was published (van de Lande, 2004). One of the most remarkable results was that a local market vendor started selling wild vegetables directly after the televised report on the project. The project will be developed further to serve future national, regional and international activities to promote the local use of these lesser-known food sources that can be gathered from urban, rural and forest areas of nature.

Figure 7: Schoolchildren drawing wild edible vegetables, Suriname.

5.3 Processing and preserving plant products to enhance their value

To enhance the value of products it is advisable to process them rather than sell the raw material. This can be achieved by small, community-based NTFP-processing industries near the extraction sites. NGOs should assist local communities with setting up such small-scale industries. In Gabon, for example, the EU-funded research programme ECOFAC has established an artisan workshop at Mont Alén, which produces high quality furniture from crude rattan cane and bamboo stems. The furniture is mainly sold to expatriate customers in Bata. This workshop has been extremely successful and the material produced certainly has export potential. Unfortunately, ECOFAC did not undertake a study in the surrounding forest to find out whether the rattan was harvested sustainably.

To prevent overexploitation of resources, organisations that stimulate commercial NTFP extraction *must* combine their work with sustainability studies. The following case study of an international research programme that focuses on rattan harvesting in Central and West Africa sets an example.

The African Rattan Research Programme

CASE STUDY taken from Sunderland, T.C.H. 1998. The rattans of Rio Muni, Equatorial Guinea; utilisation, biology and distribution

Rattans are climbing palms with very prickly stems that grow in tropical forests and quickly colonise forest gaps. Their long flexible stem ('cane') is ideal for weaving and binding. The raw cane is taken out of the forest and either used at the nearby village or transported to urban centres, where they are used for larger-scale basketry and furniture production. There are over 600 species of rattan in South East Asia, many of which are harvested for commercial furniture production. Rattan is the main NTFP of South East Asia; its industry is valued at US$ 6.5 billion per year. Only 17 rattan species occur in Africa, but some of them are widely used for basketry and furniture. African rattans have long been recognised by donor agencies and national governments as playing an important role in regional markets and a potential role on the world market. However, the development of the rattan industry is hindered by a lack of basic information about the exact rattan species and their ecological requirements.

The African Rattan Research Programme, based in the Limbe Botanic Garden in Cameroon, is involved in botanical and ecological research on African rattans. It monitors its commercial use and investigates methods for rattan cultivation in Nigeria, Cameroon, Equatorial Guinea and the Central African Republic. Research in Cameroon is focused on its chain of production, transformation to value-adding products such as furniture, and marketing. Other studies are being carried out on rattan growth in natural forests and on regeneration under different harvesting regimes. This is to identify the most appropriate harvesting regime for each species, based on a detailed understanding of its ecology.

Much more cane is being processed in Africa now than five or ten years ago. This has led to a significant decline in wild stocks, particularly around urban centres. Large quantities of raw cane are brought every day into the towns of West and Central Africa. The development of a wide network of logging roads through the African forests has enabled greater access to remote areas and has resulted in increased rattan exploitation.

Instead of selling raw cane to urban merchants, local artisans would make better profits if they could make high-quality furniture themselves. Improved methods of processing and production, resulting in less waste, would make it possible to harvest less cane from the wild and enhance conservation. The African Rattan Research Programme has introduced appropriate processing and transformation technologies from Asia, suitable for the African environment. A model processing unit has recently been constructed in Limbe (Cameroon) to serve as training and demonstration unit. Training courses are organised for local farmers who have expressed an interest in planting rattan. Several trials have been set up to study the domestication of commercial rattan species. Planting material has been made available to communities to cultivate rattan in agroforestry systems, on abandoned farmland, in secondary forest and in abandoned rubber plantations.

Case study: Shea butter tree products: the saving account of Sahelian women

Based on an article of J-M. Tendon, M.M. Diarra, F. Picard, C.D. Sow, F. Kouduahou and A. Ouatarra, 2005. in: Intercooperation, Working Group 'Trees and forests in development cooperation'. 'Le Karité, l'or vert des femmes du Burkina'. (A common saying in Burkina Faso).

The shea butter tree, Karité (Vitellaria paradoxa), occurs solitary in the savannah of the sahelo-sudanese zone of Africa. It produces green edible fruits, the kernels of which have a fat content of 40 – 55 %. From these kernels shea butter is extracted, the raw material for a number of important products. Shea butter is used for cooking by 80% of the sahelian population and is also used to produce candles and soap, whereas residues are used for animal food. Shea butter is a raw material for the industrial manufacture of chocolate and of many cosmetics. It is, among other countries, exported to the European Union, the USA and to several Asian countries, where it is used in pharmaceutical and cosmetic industries as well as in the food industry. Shea butter is an important NTFP in the Sahel.
Traditionally, shea butter has been a saving commodity for women, as they harvest and store the fruits, process the kernels to produce shea butter and sell the butter or the kernels. Due to the limited purchasing capacity of the local population, the development of a shea butter industry mainly relies on export. However, the quality of locally produced shea butter varies considerably. Moreover, the extraction rate could be twice as high if modern technology would be used. Hence, multinational companies prefer to import the raw Karité kernels and carry out the butter extraction and purification themselves, leaving the local market to the rural population.

The Centre Ecologique Albert Schweizer (CEAS) and Intercooperation (CI) have jointly established a project in Burkina Faso and Mali with the objective to strengthen the competitiveness of the local actors by realizing independent shea butter product chains. In this project local organisations are strengthened and their financial capacity is increased. The trees are protected from fire and divagating animals; regeneration techniques are improved. Quality control is carried out during collection and storage of the kernels. The traditional laborious processing technique is optimised, so that the women have more time left to carry out their other tasks.
The aim is also, to obtain a product quality label for the locally processed shea butter, that guarantees quality, good labour conditions and respect for the environment.

This way, the product has added value. It can obtain a better concurrence position for export and the trade can contribute in mitigating poverty.

Figure 8: Shea butter tree

5.4 Monitoring the market chains

Because the market chains of many NTFPs are seldom monitored, the social and economic importance of these products is often underestimated.

In order to identify sustainable harvest levels, it is essential that basic information is available about those doing the actual harvesting, what quantities are taken out from the forest, how the product is processed, how it is marketed and who profits from the trade. Can local harvesters negotiate a better price for their product and can the product be transported or processed more efficiently? As most of the information on many wild plant products is lacking, the trade in plants from the extractor in the forest up to the consumer in the urban market needs to be monitored. An analysis of the trade of a commercial forest product

by Mander and co-workers (2002), who monitored the commercial marula industry in South Africa, serves as a good example.

The production chain of marula fruits, South Africa

CASE STUDY taken from Mander, M. 1998. Marketing of Indigenous Medicinal Plants in South Africa - A Case Study in Kwazulu-Natal, FAO, Rome.

The marula fruit (*Sclerocarya birrea*) is harvested in the wild in Southern Africa. It is eaten raw, but also made into jam, juice and beer. The kernels, which are small tasty nuts rich in protein, are industrially processed into cooking oil and cosmetic skin cream. Marula cream, juice and oil are produced by companies that purchase the fruit from local extractors. The marula beer is brewed, marketed and consumed entirely by traditional communities, with all returns accruing directly to the households. The marula jam is not a major commercial item, as it is solely consumed within households. The major constraints of the marula industry are:

1 The supply of marula fruit exceeds the demand for industrially processed marula products. As a consequence, the extractors get low prices from the buying companies.
2 Although traders are able to coordinate their harvesting of fruit and reduce spoilage, the poor coordination of transport results in great losses.
3 Most consumers know the marula fruit, but there is no significant current demand for traded products. Marula products should be marketed more widely to increase their popularity.

Households' earnings from the trade in marula products are only 10% of their total annual income, which limits the potential for investment by individual households. The total value of the marula trade by rural communities is estimated to be worth US$ 110,000 per year in South Africa, a relatively small amount compared to other plant products traded in the region, such as medicinal plants (valued at over US$ 6 million per year). It is recommended that harvesters (mainly women with limited schooling) be empowered to establish enterprises that generate additional income through financial management training, for example. This capacity building would enable local people to benefit more from this free natural resource.

Many other recommendations about how research institutes and NGOs could assist communities in the marula industry are given in this extensive survey, which may serve as a good example of how to monitor the trade in commercially interesting NTFPs in developing countries.

Figure 9: Women processing marula fruits, South Africa

5.5 Domestication of rare and valuable NTFPs

All agricultural crops in the world were once wild plants. Their popularity and high market value eventually led to their cultivation and this domestication process still continues.

Today, many NTFPs are not only collected from the wild, but also cultivated by subsistence farmers. Examples are oil palms, shea butter trees, and many medicinal and ornamental plants mentioned in Tables 1, 2 and 3 (see Chapter 6). Producing valuable NTFPs on farms or people's yards or gardens could generate extra income and improve rural livelihoods.

Most wild forest plants, however, do not grow easily outside their natural environment. Some plants might take several years to produce the desired product, which makes it hardly worthwhile for farmers to plant them. Other plants lack the right pollinators when transported from the forest to the village and will not produce flowers or fruits. Moreover, the favourable growing conditions of many species are not known.

To relieve the pressure on threatened wild populations it is worthwhile trying to cultivate rare and valuable NTFPs. This so-called *ex situ* conservation and domestication could contribute to the *in situ* conservation of the species (i.e. conservation in their natural environment), making extracting the product from wild populations no longer necessary. NTFPs harvested from cultivated sources then become farm crops and not 'forest products'. Although valuable for their genetic traits, wild populations in their original environment might loose their importance to local people and run the risk of being felled for timber or got rid of to make space for agriculture.

An example of a wild forest tree that is increasingly being planted around villages is *Dacryodes edulis*, locally known as 'safou', 'African plum' or 'prunier'. In West and Central Africa, the purple fruits are widely sold in local and regional markets. The roasted or boiled fruit pulp is eaten with salt as a vegetable, and is thought to have the potential for commercial success on the international market as well. Apart from its commercial value, its richness in carbohydrates, essential amino acids, oils and minerals makes it an attractive species for domestication. The seeds can be fed to farm animals. The end users of fruits from agroforestry trees are the urban consumers. They fancy large fruits with a high flesh mass, small seeds, recognisable skin colours, long shelf life and a good taste. Together with longer and more predictable fruiting periods, these traits will influence the selection of *Dacryodes edulis* trees for domestication. Future research should also focus on better storage and processing techniques.

The increasing scarcity of commercial rattan species in South East Asia has stimulated people to grow valuable rattan palms in forest gardens. Rattan seems to be an ideal crop for agroforestry systems: it needs trees for support, grows relatively fast and it has a high market value. We know little of the domestication potential of African rattan species, such as what the best conditions are for their seeds to germinate; how rattan changes in appearance from seedling to adult; and how rattans can best be cultivated. To find an answer to these questions, the African Rattan Research Programme has recently established a 'rattan garden' in the Limbe Botanic Garden in Cameroon, where 12 of the 17 African rattan species are being studied.

The Limbe Botanic Garden also produces seedlings of *Prunus africana* (African cherry), highly valued for its medicinal bark. An eight-hectare plantation of this tree has been established using seedlings to ascertain if it can be grown as a plantation crop. Other valuable NTFPs that have been planted in Limbe include the leaf vegetable 'eru' (*Gnetum africanum*) and the medicinal plant yohimbe (*Pausinstalya yohimbe)*. Overexploitation of *Gnetum* has driven wild populations of this vine to local extinction in Nigeria and large parts of south-western Cameroon. Worse still is the current practice of partial bark stripping harvesting of yohimbe. Although called 'sustainable', it exposes the trees to stem-boring insects. The result is that 50 to 90% of the trees die after harvesting. The Limbe Botanic Garden hands out seedlings to local farmers to prevent overharvesting of the wild populations of these vulnerable species.

These examples illustrate that botanic gardens could play an important role in supporting communities with the domestication of wild plants and trees, thus contributing to forest conservation work. More strategies and techniques to domesticate NTFPs can be found in the guidelines described by Leakey and Newton (1994).

5.6 Transport and marketing

To improve the marketing of NTFPs and to enhance the benefits to local communities, the following actions are suggested:

1 Market research to understand trade channels and to encourage alternative channels if needed.
2 Dissemination of market information to local communities to ensure that fair prices are paid to the collectors. Making the role and the profits of middlemen transparent.
3 Encourage the formation of cooperatives of collectors/processors of NTFPs. Cooperatives are far likely to better counterbalance the power of buyers than individuals and negotiate realistic prices for their products.

As mentioned before, traditional communities in remote areas have limited access to markets. Consequently, they have little chance of earning a living by harvesting NTFPs because of the high transport costs to the market. With proper marketing arrangements, however, even very high transport costs can be overcome. An example is given below of a Colombian NGO that is successfully marketing basketry from a remote area in the country's vast rainforests.

Case study: Use and marketing of hemi-epiphytes for craft production by Piaroa and Piapoco Indians, Colombia

By María Paula Balcázar Vargas, Utrecht University, the Netherlands

Aerial roots of hemi-epiphytes have been used for centuries by Amazonian Indians to weave baskets, animal traps and for housing construction. Some hemi-epiphytes germinate on a host tree and send roots to the soil where they take up nutrients. Other species germinate on the forest floor and climb up a host tree, and then produce long roots that eventually make contact with the soil to take up nutrients. These aerial roots are strong and flexible. They are peeled and slit with a knife into long strips that are woven into baskets or used as tying material.

Aerial roots are promising non-timber forest products, because they are relatively abundant and easy to harvest. Roots are simply pulled from the tree branches without killing the plant, which will remain in the treetop and produce new roots. Hemi-epiphytes need a living tree as a host and are only found in mature (primary) forests. To be able to harvest aerial roots for several years, people often protect trees that are heavily colonised by hemi-epiphytes from timber harvesting. The roots have a well-established market for the manufacturing of rattan-like furniture and handicrafts. Hemi-epiphytes promote employment because they require much manual labour during each stage of their conversion into the final product. At the same time, international demand for products made of natural fibres is increasing.

Piaroa and Piapoco Indians live in Vichada, the forested headwaters of the Orinoco River in Eastern Colombia. For their artefacts, they carefully choose the roots that fit the required quality, pliability, thickness and length. They use one species of Cyclanthaceae and five species of Araceae, mostly from the genus *Heteropsis*, which has four suitable species.

A number of factors have had a great impact on the traditional lifestyle of the Piaroa and Piapoco Indians. Landless farmers from other regions in Colombia colonised their traditional lands. Evangelisation by Protestant groups, forced sedentary lifestyles, the rise and fall of the rubber industry and the integration into the market economy all have greatly affected their culture. Recently, guerrilla groups and commercial coca growers have offered employment to young indigenous men. Wooden buildings with zinc roofs are replacing traditional dwellings made with palm leaves and tied together with hemi-epiphytes. Nylon fishing nets are used instead of fish traps made from aerial roots and guns replace the traditional animal traps. Only elderly people now make elaborate pieces of basketry.

Since 1995, the Colombian NGO Fundación Etnollano has been carrying out surveys on community well-being, infant nutrition and health. They discovered that children suffered more from malnutrition and diseases in households where the fathers had temporarily moved away from the community to work as wage labourers in a coca plantation, than those whose fathers stayed within the community and spent their time hunting, fishing and helping the mother to cultivate the family farm plot. It appeared that the money earned by the wage labourers was often spent away from the community, leaving the children with a protein-poor diet and the mother with the heavy workload of tending her garden all by herself.

By means of several handicraft projects, Etnollano tries to combine the recovery of indigenous knowledge with generating alternative income for men involved in commercial coca growing. With the help of village elders and a craft designer, a number of elaborate craft designs were reintroduced in several communities. Both the extraction of the roots and the manufacture of handicrafts are predominantly carried out by men. Field guides with drawings of craft designs and hemi-epiphytic source plants were published and distributed among the participating communities.

Unfortunately, transport to the nearest market of Puerto Iñirida is expensive and infrequent, and there is no tourism in the region because of its remoteness and the heavy guerrilla presence. With such high transport costs and the absence of a craft market, stimulating commercial basketry weaving would seem to be a foolish idea. However, Etnollano found a sophisticated way of marketing. The NGO buys the crafts from the communities and transports them to the closest airstrip, where they are flown to the Colombian capital Bogotá and sold in high quality shops and special craft fairs like Expoartesanias (see www.etnollano.org).

Colombia is famous for its crafts, and the country's indigenous artefacts are renowned for their unique designs and high quality. There is a great demand for indigenous crafts in Bogotá, and products are even sold online. Since Etnollano is a non-profit organisation, much of the revenues return to the Piaroa and Piapoco communities. Since baskets are sold for US$ 25 or more, the craft projects offer an attractive alternative to coca growing. Moreover, collecting aerial roots and craft making takes place in and around the villages. Indigenous men spend considerably more time with their families and combine NTFP harvesting with hunting, fishing and subsistence agriculture. This lifestyle was reflected in the better health and nutritional status of their children.

This project shows that commercial NTFP extraction can improve the livelihood of the local people and at the same time contribute to the conservation of traditional culture. It is, however, of great importance that these roots are harvested in a way that does not harm the natural population. If no sustainable management system is developed and roots become scarce, harvesting will eventually become so time-consuming that extractors might shift again to more profitable jobs, such as working on coca fields.

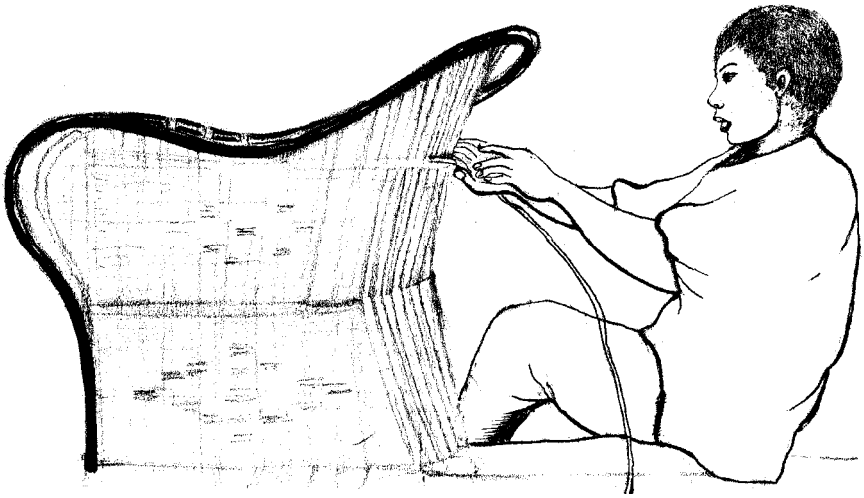

Figure 10: Indigenous craft worker weaving a chair from the aerial roots of hemi-epiphytes, Guyana

5.7 Organising NTFP harvesters and other relevant stakeholders

Sustainable management of community forests starts with the design of simple management plans, the basis of which is the delimitation of the relevant area and a survey of the NTFPs present. Making a management plan will only be possible if the whole community and all harvesters within the region are involved in carrying out the survey and making agreements, and feel responsible for respecting them. If there is competition between extractors for the same resource, NTFPs tend to be rapidly overexploited. In many cases, traditional (indigenous) management systems can hold the key to sustainable management.

NGOs could play a key role in informing the communities about the importance of a management plan, and assist them by realising such a plan, which often involves extensive paper work. They can help with the delimitation and the survey of the area that needs to be managed. NGOs can organise discussions between harvesters, helping them to form cooperatives, and setting fixed prices to prevent middlemen from profiting from the rivalry between harvesters. NGOs should provide producers with information on market prices of forest products, to allow them to negotiate more effectively with buyers. They should also make available information about transformation, packaging and marketing options, access to micro-loans, grants and cooperation possibilities. If extractors form some kind of cooperation, they can better withstand attacks and encroachments on their territory and be stronger when negotiating with middlemen and processing plants. Empowerment of local communities and ensuring their subsistence is crucial to sound forest management.

International NGOs should strengthen local NGOs and transfer knowledge to government departments, national forestry institutions, community institutions in charge of NTFP activities and international donors. They should make them aware of the potential of NTFPs for family subsistence and rural development.

5.8 Ecologically sustainable management

Conservation and long-term utilisation of NTFPs can only be realised if they are harvested on an ecologically sustainable basis. The extraction of wild plant products is considered sustainable if it has no long-term harmful effect on their regeneration and when the yield remains more or less constant throughout the years. Sustained harvest depends much on the part of the plant harvested. Collecting leaves, aerial roots, flowers, fruits, resin or a piece of bark might slow down its growth, but does not kill the plant. Harvesting the entire plant, digging out the roots, cutting the trunk or removing the whole bark is much more destructive.

In a species-rich forest, only a few individuals of a useful plant species are present per hectare, so that people may have to travel long distances to find sufficient quantities of the desired product. Depletion of the resource is a major risk. Sustainable harvesting is more likely to be successful in forests where a few marketable species dominate. Examples of such low-diversity forests are the Brazil nut groves in Bolivia, Peru and Brazil, and the extensive swamps along the Amazon and Orinoco Rivers dominated by fibre and/or fruit producing palms like *Euterpe oleracea*, *Mauritia flexuosa* or *Leopoldinia piassaba*. In these forest types, commercially important species have such a high density and yield, that they look like natural fruit orchards. These forests are often swamps and not suitable for agriculture, cattle ranching or logging. The products from these 'natural monocultures' such as fruits, fibres and palm heart, have the best potential for sustainable harvesting. Similar vegetation types in Africa and the Pacific should be inventoried for their potential as a commercial NTFP resource.

Sustainable harvesting methods could include systems in which part of the bark is removed on only one side of the tree, a limited number of fruits or seeds are collected and the rest left to ensure regeneration. People should climb the trees instead of cutting them down to harvest fruits or leaves. Sufficient adult individuals of a plant should be left in the forest to ensure regeneration and care should be taken not to destroy seedlings. Harvesting should be concentrated in certain months, leaving the plants to recover during the remainder of the year.

NTFP producers should also consider certification to distinguish their products from others and improve marketing possibilities. Certain consumers are willing to pay a higher price for products from well-managed forests, where negative environmental and social impacts are limited, laws are respected, and employment conditions are fair. There is a need to design 'green' criteria and certification processes for the trade in NTFPs, as well as transparent and useful methods for monitoring effectiveness of management activities.

For instance, some of the finished rattan and bamboo furniture produced in Equatorial Guinea is of export quality. This trade would be especially lucrative if it could be combined with a 'fair trade' or certification policy, ensuring that harvesters and artisans are paid a reasonable sum for their work, as well as an ecological policy ensuring there is an on-going planting programme to replace the material removed through exploitation.

A well-known certification programme is the one developed by the Forest Stewardship Council (FSC), which concentrates on sustainable forest management and biodiversity conservation. Until recently, the FSC mainly focused on sustainable timber harvesting, but the first NTFPs with a FSC certification are now appearing on the market. Several other NTFP-producing companies are in the process of obtaining a certificate. Most of these projects are situated in the USA, South America and Europe. More emphasis should be put on the incorporation of wild plant products from ACP countries into certification programmes.

Certification, however, requires a high level of organisation and technical know-how from producers, especially with regard to management, monitoring, product tracing and marketing. This, together with the costs involved, will prevent most NTFP harvesters in developing countries from participating in such initiatives, unless they have access to technical and financial assistance. NGOs and government agencies can assist small forest-based industries to implement sustainable management plans and obtain certification. An example of an NGO helping local NTFP harvesters to design a management plan is given below.

In South Africa, certain wild-harvested medicinal barks have become rare because of over-exploitation (e.g. *Siphonochilus aethiopicus*, *Warburgia salutaris*). Women living in the uMzimkulu District, however, depend almost entirely on the bark trade for their livelihood and continue harvesting these barks, which is now illegal. Recently, a local NGO launched the 'Commercial Products from the Wild' project. The

NGO has set the basis for a participatory forest management system in the uMzimkulu District by organising local bark traders willing to solve the problem of uncontrolled bark harvesting. The members drafted a management plan together with local government officials, which included guidelines for harvesting, recovery and conservation of the forests, the planting of alternative species, and monitoring the impact of the use of the resource. Registered bark harvesters are now allowed to continue harvesting. The efforts and the costs of harvesting have been reduced, damage to the trees has been minimised and now there are better opportunities for the development of viable, productive small businesses.

5.9 Pitfalls and how to avoid them

Let us assume that a natural forest is adequate for providing a regular harvest of forest products. To be economically successful, these NTFPs must have a lasting market appeal and harvesters should get a good price for the product. If the price is low, the harvesters might shift to destructive extraction techniques to get higher quantities of the product, or abandon the extraction of the product completely.

If on the other hand the price of a product is too high, it may lead to over-exploitation as people go for a short-term profit, which may even lead to extinction of the species. This high demand-high value scenario is difficult to manage. It often leads to increased collection, since collectors accept more risks and invest more effort in finding the species. Consequently, species with a high economic value (such as wildlife or rare but powerful medicinal plants) are often decimated by uncontrolled harvesting.

Irregular availability of the product is another pitfall. The flow of a consistent supply of the products to the buyers must be guaranteed. This implies that the harvest must be ecologically sustainable. Middlemen involved in the product chain should be kept to the minimum to ensure that the harvesters themselves earn more of the revenue.

If an NTFP is very successful, other communities might also start harvesting, flooding the market and causing prices to drop. This could be avoided by creating harvesters' associations and setting fixed prices. Other useful suggestions for the starting NTFP entrepreneur are found in Clay (1992), Shanley et al. (2002) and FAO (1995), see References.

6 Conclusions

From the case studies presented here and from the literature review, we conclude that NTFPs play an important role in the livelihood of rural and forest-dwelling communities. Throughout Africa, the Caribbean and the Pacific, millions of people depend on those products for their nutrition and medical care, and to feed their domestic animals. NTFPs are used for household equipment and construction, and they are traded to generate cash income.

Data for many products on harvested quantities, provenance, trade and export volumes are unreliable or nonexistent. This is because most people do not keep a record of what they use, buy or sell. Monitoring the market chains of forest products is essential to obtain insight into their role in the national and regional economy. If this were done we would undoubtedly see that the trade in NTFPs is much more important than most people realise.

Many of these products can be harvested in a sustainable way, but unfortunately this does not always happen. Products from which much money can be made, in particular, are often overharvested or harvested in a way that is destructive to the plants. As a result, after a certain period the product is no longer available, sometimes with devastating consequences for the harvesters and their families. Abundantly present and fast growing species withstand a certain degree of exploitation far better. There are sustainable management systems for only a limited number of species. For the greater majority of the species, however, the lack of information on growth rates and regeneration hampers the design of adequate harvesting models.

Commercial NTFP extraction may contribute to forest conservation because harvesters often protect useful trees from being logged. Moreover, if people can earn a living by selling these products, they will not need to engage in other, often environmentally more destructive activities. But if the harvesting of wild plants is no longer economi-

cally viable, or when extractors are expelled from their collection sites, they may shift to less sustainable land use practices. NTFP extraction does not, however, always contribute to biodiversity conservation. Harvesting vulnerable species or using destructive harvesting techniques has a negative impact on the populations of useful species and may lead to the extinction of local species, eventually even affecting the entire ecosystem.

Transport costs are a major bottleneck for the marketing of NTFPs from remote areas. To solve this problem the raw materials can be processed locally before bringing them to a market. This will normally raise their value and may prolong their preservation period. Subsidies for NTFPs and improved marketing techniques may also solve the transport problems.

NGOs can play a key role in organising NTFP harvesters and assisting them to obtain a higher share of marketed products. They could assist in designing sustainable management plans, setting up small forest-based industries and obtaining ecological certification.

Appendix 1: Major NTFPs in ACP countries

Table 1: Major commercial NTFPs of Africa

NTFP	Scientific name	Main uses	Countries
African cherry	*Prunus africana*	Medicine for prostate cancer (bark)	Cameroon, Madagascar, Equatorial Guinea, Burundi, Kenya
Aleppo pine	*Pinus halepensis*	Food (seeds)	Tunisia
Argan oil	*Argania spinosa*	Cooking oil, cosmetics, soap, medicine (seed)	Morocco
Baobab	*Adansonia digitata*	Food, medicines, basketry, fibre	Sahelian countries
Bush mango	*Irvingia gabonensis*	Food (fruit), condiment (seed)	Cameroon, Equatorial Guinea, Gabon, Nigeria
Carob	*Ceratonia siliqua*	Food (fruits), fodder (fruit, leaves)	Egypt, Morocco, Tunisia
Chewsticks	*Lophira lanceolata*	Toothbrush (wood)	Guinea, Mali
Cola	*Cola nitida, Cola* spp.	Stimulant (seeds)	Ghana, Guinea, Guinea-Bissau, Nigeria, Cameroon, Gabon, Democratic Republic of Congo, Ivory Coast, Burkina Faso
Cork	*Quercus suber*	Corks, walls, floors (bark)	Morocco, Algeria, Tunisia
Devil's claw	*Harpagophytum zeyheri, H. procumbens*	Medicine for rheumatism (root)	Namibia, South Africa, Botswana
Doum palm	*Hyphaene thebaica*	Crafts (leaves)	Sudan, Eritrea
Eru	*Gnetum africanum Gnetum buchholzianum*	Vegetable (leaves)	Cameroon, Central African Republic, Gabon, Congo-Brazaville, Democratic Republic of Congo, Equatorial Guinea, Nigeria
Fodder	*Acacia* spp. *Prosopis* spp. various other species	Animal food (leaves, whole plants, fruits)	All countries of the African continent where cattle ranging is practised
Frankincense, olibanum	*Boswellia papyrifera Boswellia* spp.	Incense, cosmetics, perfume, chewing gum, medicine, pharmaceutics industry (resin)	Eritrea, Ethiopia, Somalia, Kenya, Sudan, Nigeria, Egypt
Gum arabic	*Acacia senegal Acacia seyal, A. laeta, A. nilotica*	Medicinal, Preservative in soft drinks (resin)	Sudan, Nigeria, Niger, Mauritania, Mali, Cameroon, Senegal, Eritrea, Etiopia

NTFP	Scientific name	Main uses	Countries
Marula	*Sclerocarya birrea*	Jelly, liquor, beer (fruits). Oil, starch (seeds)	Senegal, Namibia, Mali, S. Africa, Cameroon, Niger, Burkina Faso, Kenya, Mauritania, Madagascar, Mozambique, Zambia
Medicinal plants	Various species	Leaves, roots, seeds, bark, resin, etc.	Whole African continent
Mushrooms	*Cantharellus* spp. *Boletus* spp. various other species	Food (mushroom)	Morocco, Zambia, Burundi, Tunisia, Cameroon, Zimbabwe
Muthaiga	*Warburgia* spp.	Medicine (bark)	Kenya, South Africa
Myrrha	*Commiphora myrrha* *C. truncata* *C. borensis*	Incense, perfume, chewing gum, flavouring (resin)	Eritrea, Ethiopia, Somalia, Kenya, Sudan, Egypt
Néré	*Parkia biglobosa*	Food (fruit pulp and seeds)	Burkina Faso, Ghana, Ivory Coast, Chad, Mali, Togo, Senegal, Guinea
Njansang	*Ricinodendron heudelotii*	Condiment (seeds)	Cameroon, Gabon
Oil palm	*Elaeis guineensis*	Wine (stem), oil (fruits)	West and Central Africa, from Liberia to Angola
Ornamental plants	Various species of orchids, tree ferns	Whole plants (living)	Madagascar, South Africa
Prunier, safou, African plum	*Dacryodes edulis*	Food (boiled fruit pulp), oil (fruit and seed)	Cameroon, Central African Republic, Democratic Republic of Congo, Equatorial Guinea, Congo, Gabon, Nigeria, Sierra Leone, Uganda, Angola
Raffia	*Raphia* spp.	Mats, hats (fibre), wine (starch in trunk), food (fruits)	Madagascar, Gabon, Uganda, Congo, Cameroon, Democratic Republic of Congo
Rattan	*Laccosperma spp.* *Eremospatha spp.* *Oncocalamus spp.*	Furniture, basketry (stem)	Cameroon, Gabon, Central African Republic, Nigeria, Equatorial Guinea, Congo Democratic Republic of Congo
Shea butter Karité	*Vitellaria paradoxa (=Butyrospermum parkii)*	Cooking oil, candy, cosmetics, chocolate, margarine (seed)	Senegal, Chad, Nigeria, Cameroon, Mali, Burkina Faso, Ghana, Ivory Coast, Togo, Guinea, Benin, Central African Republic
Wattle	*Acacia mearnsii* *A. mollissima*	Tannins (bark)	Kenya, Tanzania
Yohimbe	*Pausinystalia yohimbe*	Aphrodisiac, stimulant (bark)	Cameroon, Gabon, Democratic Republic of Congo
Firewood Charcoal	Various species	Fuel (wood)	Entire African continent

Source: Non-wood news (FAO, 1995-2003; Walter, 2001; various other sources).
Spp.: more than one species of this genus are used.

Table 2: Major commercial NTFPs of the Caribbean

NTFP	Scientific name	Main uses	Countries
Allspice, pimento	*Pimenta dioica*	Essential oils (leaves)	Jamaica
Amyris, sandalwood west	*Amyris balsamifera*	Essential and medicinal oil (wood)	Haiti, Jamaica
Bay leaf, bay rum	*Pimenta racemosa*	Medicinal and essential oil (leaves)	Dominica
Crabwood oil, krappa, grappo	*Carapa guianensis*	Medicine, cosmetics (oil from seeds)	Suriname, Guyana, Trinidad
Hog plum, plum, mopé	*Spondias radlkoferi* *S. mombin*	Fruits	Trinidad, Suriname, Guyana
Hoop vine, guaniquique	*Trichostigma octandrum*	Fibre for basketry (bark)	Cuba, Virgin Islands
Kokerite, maripa, cocorite	*Maximiliana maripa*	Fruits	Trinidad, Suriname, Guyana
Lokus, locust	*Hymenaea courbaril*	Food (fruit pulp), medicine (bark)	Suriname, Guyana
Mangrove	*Rhizophora mangle*	Tannin (bark)	Guyana, Cuba, St. Lucia, Trinidad
Cuban royal palm, yaguas Cubana, bottle palm	*Roystonea regia*	Food (palm heart), thatch (leaves), crafts (fibres), oil (fruits)	Cuba
Medicinal plants	various species	Whole plant, root, leaves, bark, resin	Guyana, Suriname, Dominican Republic, Jamaica, Cuba
Mokru, tirite, larouma reed	*Ischnosiphon arouma*	Basketry (stem)	Guyana, Suriname, Dominica, Trinidad
Nibi and kufa	*Heteropsis flexuosa* and *Clusia* spp.	Furniture, basketry (aerial roots)	Guyana
Ornamental plants	Heliconiaceae, Bromeliads, Orchids	Living plants	Suriname, Guyana, Jamaica, Cuba
Palm heart	*Euterpe oleracea*	Palm heart (leaves)	Guyana
Pine resin	*P. caribaea, P. tropicalis and P. cubensis*	Pharmaceutical and cosmetic industry (resin from wood)	Cuba
Lignum Vitae, pock wood, gum guajacum, guaiac	*Guaiacum officinale* *G. sanctum*	Medicinal (resin), furniture (wood)	Nearly all Caribbean Islands
Sarsaparilla	*Smilax aristolochiaefolia*	Medicinal (oil)	Jamaica
Sweet wood bark, quinquina	*Croton eleuteria*	Medicinal, aromatic tonic (bark, leaves)	Bahamas
Tibisiri	*Mauritia flexuosa*	Basketry (leaves)	Guyana, Suriname
Wood carvings	*Aspidosperma* spp. *Carapa guianensis* various other species	Crafts (wood)	Suriname, Guyana, Jamaica
Adapted from various sources, in particular van Andel (2000), Non-wood news (FAO, 1995-2003).			

Table 3: Major commercial NTFPs of the Pacific Islands

NTFP	Scientific name	Main uses	Countries
Agarwood, eaglewood	*Gyrinops ledermannii*, *Aquilaria* spp.	Medicine, perfume industry (oil from fungus infection in wood)	Papua New Guinea
Barkcloth	*Broussonetia papyfera*	Crafts, textile (bark)	Fiji, South Pacific Islands
Beach hibiscus	*Hibiscus tiliaceus*	Cordage, mats, grass skirts (fibre from bark)	Pacific Islands
Candlenut, lama	*Aleurites triloba* *A. moluccana*	Dyes for crafts (bark), torches, tattoo ink (seeds)	Fiji, South Pacific Islands
Galip nuts, ngali nuts, nangai	*Canarium indicum*	Food (seeds), cosmetics (oil from seeds)	Papua New Guinea, Solomon Island, Vanuatu
Kawa, Kava, 'awa, yaqona	*Piper methysticum*	Medicine, stress-reducing beverage (root)	Fiji, Vanuatu, Hawaii, Tonga, Samoa, Micronesia, French Polynesia, Wallis, Futuna
Mangrove	*Eleaocarpus pyriformis*	Dyes (bark)	Fiji, South Pacific Islands
Medicinal plants	Various species		Fiji, Papua New Guinea, Samoa
Ninuvusa	*Carpoxylon macrospermum*	Weaving (leaves), food (fruits, palm heart, seedlings), medicine (bark)	Vanuatu
Noni	*Morinda citrifolia*	Food, medicine (fruit)	Cook Islands, Tonga, Fiji, Solomon Islands, Hawaii, Tahiti Papua New Guinea
Nypa palm	*Nypa fructicans*	Alcoholic drinks (sap from trunk), thatch, construction, tying, sails (leaves). food (fruits)	Papua New Guinea, Pacific Islands
Okari	*Terminalia kaernbacchii*	Food (seeds)	Papua New Guinea
Ornamental plants	Orchids, mainly Dendrobium spp. and *Bulbophyllum* spp.	Gardens (living plants)	Papua New Guinea
Rattan, kanda	*Calamus hollrungii* *C. warburgii* *C. schlechterianus* *Korthalsia brasii*	Utensils, crafts, furniture, construction (stem)	Papua New Guinea, Solomon Islands
Sandalwood	*Santalum* spp.	Perfume industry (wood oil)	New Caledonia, Fiji, Papua New Guinea, Vanuatu, Tonga, Erromango, French Polynesia
Screw palm, karuka	*Pandanus* spp.	Mats (leaves), food (seeds)	South Pacific, Fiji, Samoa, Papua New Guinea

Wood crafts	*Intsia bijuga, Cordia subcordata, Antho-cephalus chinensis Diospyros* spp.	Wood carvings, crafts, ships, music instruments (wood)	Fiji, Vanuatu, Samoa, Papua New Guinea
Source: Non-wood news (FAO, 1995-2003). Spp.: more than one species of this genus are used.			

Appendix 2: List of abbreviations

ACP	Africa, Caribbean and Pacific countries
CAR	Central African Republic
DFID	United Kingdom Department for International Development
FAO	Food and Agricultural Organisation of the United Nations
FSC	Forest Stewardship Council
NGO	Non-Governmental Organisation
NTFP	Non-Timber Forest Product
NWFP	Non-Wood Forest Product
Spp.	Several species in one genus are included
WHO	World Health Organisation

Appendix 3: Contributors

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Appendix 4: Tropenbos International

TBI - a partnership for people and forests

Forests remain important yet undervalued and threatened resources on which millions of people in the tropics depend for their livelihoods. They utilise a wide range of products for subsistence or trade, such as timber, edible fruits, nuts, medicines, latexes and resins. If managed carefully, forests can play a key role in sustainable development, while their services are not undermined.

Tropenbos International (TBI) has established itself for many years as an important platform to support the forest and development agenda in developing countries - improving knowledge, personal capacity and institutional capacity for better governance, conservation and management of tropical forest resources, with a strong emphasis on the human dimension of forest management and the role of forests for people's livelihoods. TBI's goal is to achieve that tropical forest lands are managed in a sustainable way for the benefit of people, conservation and sustainable development. TBI's objective is to achieve that forest actors in the partner countries are using sound and adequate information for formulating appropriate policies and managing tropical forest lands for conservation and sustainable development.

In TBI's vision, five critical results will help to achieve these objectives:

1 adequate and relevant knowledge and information needed for better decisions on forests are available (which we achieve by means of research);
2 national human capacity is available to generate knowledge and to use it (by means of training and education);
3 national forest sector organisations are able to identify, manage and apply relevant information (by means of institutional development);
4 national mechanisms are operational for the exchange of information (by means of fostering multi- stakeholder knowledge networks and dialogue);

5 national and international forest agendas are linked in support of forest-based sustainable development and poverty alleviation (by means of promoting knowledge-based international dialogue). Tropenbos International (TBI) addresses these aspects in an integrated way in 5 programme countries. These are: Colombia, Ghana, Indonesia, Suriname and Vietnam.

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Useful addresses

Central African Regional Programme for the Environment
CARPE engages African NGOs, research and educational organisations, private sector consultants, and government agencies in evaluating threats to forest integrity in the Congo Basin and in identifying opportunities to sustainably manage the region's vast forests for the benefit of Africans and the world. Participating countries include Burundi, Cameroon, Central African Republic, Democratic Republic of Congo, Equatorial Guinea, Gabon, Republic of Congo, Rwanda and São Tomé e Principe.
W: http://carpe.umd.edu

Centre for International Forest Research (CIFOR)
An international research and global knowledge institution committed to conserving forests and improving the livelihoods of people in the tropics. Headquartered in Bogor, Indonesia, with regional offices in Brazil, Cameroon and Zimbabwe. CIFOR's research helps local communities and small farmers gain their rightful share of forest resources, while increasing the production and value of forest products.
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Food and Agriculture Organisation of the United Nations (FAO)
The FAO's Non-Wood Forest Products programme's activities include gathering, analysis and dissemination of information on the world's NWFPs. The FAO publishes the free magazine "Non-Wood News", a very informative annual newsletter that provides information on the potential of NTFPs and their contribution to the sustainable development of the world's forest resources. Examples of publications 1997; State of the World's Forests 1997. Rome and FAO Technical Papers: Non-Wood Forest Products Series. An excellent 12-volume series on non-wood forest products (NWFPs) and their role in integrated for-

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International Centre for Underutilized Crops (ICUC)
As a good source of information on various plants and their uses (e.g. safou)
PO Box 2075, Colombo, Sri Lanka
T: +94 (0) 11 2787404, F: +94 (0)11 2786854
W: www.icuc-iwmi.org

Medicinal Plants Network
As a better, global address, which includes Tramil and others and proposes many links.
W: www.medplant.net
South Asia Regional Office, (SARO)
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Plant Resources of Tropical Africa (PROTA)
PROTA is an international, not-for-profit foundation. It intends to synthesise the dispersed information on the approximately 7,000 useful plants of Tropical Africa and to provide wide access to the information through Webdatabases, Books, CD-Rom's and Special Products. PROTA is hosted at WUR (Wageningen University, the Netherlands), and co-funded by DGIS, EDF and others (including CTA). The information is also made available through books and CD-ROMs (which can be obtained free – for PDS subscribers – from CTA, or purchased from Backhuys publishers). W: www.prota.org
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Oxfam- Novib
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A Dutch NGO that facilitates the formulation and organisation of participatory, objective-oriented and multidisciplinary research and development programmes in tropical rain forest countries (Colombia, Ghana, Suriname, Guyana, Cameroon, Indonesia, Vietnam and the Ivory Coast).
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World Agroforestry Centre (ICRAF).
The World Agroforestry Centre is part of a global network of 15 Future Harvest centres, funded by the Consultative Group on International Agricultural Research (CGIAR). It is an “autonomous, not-for-profit research and development institution” that promotes the exchange of information about agroforestry research in the tropics.
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Glossary

Aerial roots	Type of roots growing from epiphytes from the tree branches to the soil to take up water and nutrients..
Agro-forestry	The use of woody perennials (trees, shrubs, etc.) on the same land as arable crops, pasture and/or animals, either mixed in the same place at the same time, or in a sequence over time.
Bark	Natural covering layer on tree trunks. Bark consists of two parts, the inner bark and the outer bark. The inner bark is a spongy layer of live tissue with sieve tubes (phloem), conducting sugars and other substances from the leaves to the tree stem, roots, etc. The outer bark is the most external layer and is formed by dead tissue of former inner bark.
Capacity building	Enhancing the capacity of an individual or community to perform tasks which require a substantial level of skills and professional training
Commodity item	Basic product or raw produce (particularly from agriculture and mining)
Empowerment	Capacitating people to take their fate in their own hands
Epiphyte	Type of plant that grows on host plants (mostly trees) for mere support purposes, i.e. without displaying any parasitic behaviour.
Ex-situ conservation	Conservation of plant species outside of their original growing place
Fallow	Abandoned forest garden or formerly cultivated field, with the purpose of restoring soil fertility
Forest-based	Displaying activities and/or having residence within a forest area

Frankincense	Resin harvested from the Boswellia papyrifera and some other Boswellia species, growing in the dry woodlands of Eritrea, Ethiopia, Somalia, Kenya and Sudan. Frankincense produces a sweet fragrance if burned and is used locally as incense and medicine. It is obtained by making incisions in the tree bark, which induces the tree to produce the frankincense resin as a response to the inflicted wounds.
Heartwood	The central woody tissue in trees which serves only for mechanical support. It actually consists of dead tissue (of former sapwood), and often contains natural preserving substances which are accountable for its dark colour.
Hemi-epiphyte	Plant which starts growing as an epiphyte, but whose aerial roots reach the forest ground at a later stage.
Host tree	Tree acting as a recipient for other organisms such as parasites, epiphytes, hemi-epiphytes, lichens, animals, etc.
Indigenous	Native or traditionally resident in a certain area. Indigenous medical traditions make extensive use of non timber forest products and other indigenous plants.
In-situ conservation	Conservation of plant species in their original growing place
Logging roads	Roads which serve as infrastructure for transportation of felled trees
Monoculture	Cultivation of a single crop on a farm, in a region or a country.
NTFP	Non Timber Forest Products: wild plant and animal pro-ducts harvested from forests, such as wild fruits, vegetables, nuts, edible roots, honey, palm leaves, medicinal plants, poisons and bush meat.

NWFP	Non Wood Forest Products: basically the same as NTFP but by definition excluding the use of wood for dye, poison, craft making or medicine. We prefer NTFP, being a more encompassing term.
Rain forest	Dense evergreen forest, mainly in tropical areas but also existing in temperate regions, with an average annual rainfall of more than 2.5 metres (100 inches).
Resin	Sticky substance produced by certain tree species, particularly pines, firs and some tropical species, such as Boswellia papyrifera.
Sapwood	Sapwood is the woody, vessel-containing tissue (xylem) beneath the bark, which conducts water and mineral nutrients from the roots to the leaves of a tree. Sapwood tends to be lighter in colour than heartwood.
Seedling	Young plant, just germinated from a seed
Sustainable	Way of using natural resources without causing damage to the environment, and without depleting natural reserves
Wildlife	Animals and plants that grow in natural conditions