

Non-farm income from non-wood forest products

FAO Diversification booklet 12



Diversification booklet number 12

Non-farm income from non-wood forest products

Elaine Marshall and Cherukat Chandrasekharan

Rural Infrastructure and Agro-Industries Division
Food and Agriculture Organization of the United Nations
Rome 2009

*The views expressed in this publication are those of the author(s)
and do not necessarily reflect the views of the
Food and Agriculture Organization of the United Nations.*

The designations employed and the presentation of material in this information product do not imply the expression of any opinion whatsoever on the part of the Food and Agriculture Organization of the United Nations (FAO) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The mention of specific companies or products of manufacturers, whether or not these have been patented, does not imply that these have been endorsed or recommended by FAO in preference to others of a similar nature that are not mentioned.

All rights reserved. Reproduction and dissemination of material in this information product for educational or other non-commercial purposes are authorized without any prior written permission from the copyright holders provided the source is fully acknowledged. Reproduction of material in this information product for resale or other commercial purposes is prohibited without written permission of the copyright holders. Applications for such permission should be addressed to: Chief Electronic Publishing Policy and Support Branch Communication Division FAO Viale delle Terme di Caracalla, 00153 Rome, Italy or by e-mail to: copyright@fao.org

© FAO 2009

■ Preface	v
■ Acknowledgements	ix
■ Introduction	1
■ Scope of non-wood forest products	1
■ A brief history of non-wood forest products	3
■ Non-wood forest products in the twenty-first century	4
■ The role of non-wood forest products in improving rural livelihoods	5
■ Purpose of the booklet	7
■ Overview of the principal uses of non-wood forest products	9
■ Foodstuffs	10
■ Medicines	11
■ Fibres	12
■ Fatty oils	14
■ Essential oils	14
■ Resins	17
■ Waxes	19
■ Gums	20
■ Latexes	20
■ Natural dyes and colours	22
■ Food colours	23
■ Tannins	23
■ Sweetening agents	25
■ Other non-wood forest products	25
■ Non-wood forest products assets for sustainable livelihoods	27
■ Natural assets	27
■ Social assets	29
■ Human assets	31
■ Physical assets	32
■ Financial assets	33
■ Summary	34

■ Non-wood forest products value chains	37
■ Production to consumption system	37
■ Production and harvesting system	39
■ Post-harvest	43
■ Transport	43
■ Processing	44
■ Marketing and selling	46
■ Strategies for successful non-wood forest products trade	49
■ Managing natural assets for a sustainable supply of non-wood forest products	49
■ Social assets and personal skills for successful non-wood forest products trade	51
■ Value chain analysis of the non-wood forest products trade	53
■ Supply or demand driven non-wood forest products value chains	56
■ Addressing poor physical access, transport and communication	57
■ Sustainable non-wood forest products value chains	58
■ Support and services to help promote non-wood forest products	61
■ Public policy	61
■ Direct assistance	62
■ Extension support	64
■ Opportunities and challenges	69
■ Opportunities for improved livelihoods	69
■ Challenges	70
■ Selected further reading	73
■ Sources of further information and support	79

Table of contents

Preface

The purpose of the FAO Diversification booklets is to raise awareness and provide decision support information about opportunities at farm and local community level to increase the incomes of small-scale farmers.

Each booklet focuses on a farm or non-farm enterprise that can be integrated into small farms to increase incomes and enhance livelihoods. The enterprises profiled in the FAO Diversification booklets selected are suitable for smallholder farmers in terms of resource requirements, additional costs, exposure to risk and complexity. The products or services generated by the enterprises are suitable for meeting demand on a growing, or already strong, local market and are not dependent on an export market. However, in this particular booklet, export markets will be considered. This is because small enterprise development and local markets are influenced by international market demand for non-wood forest products.

The main target audience for these booklets are people and organizations that provide advisory, business and technical support services to resource-poor small-scale farmers and local communities in low- and middle-income countries. It is hoped that enough information is given to help these support service providers to consider new income-generating opportunities and how these might enable small-scale farmers to take action. What are the potential benefits? What are farmer requirements and constraints? What are critical ‘success factors’?

The FAO Diversification booklets are also targeted to policy-makers and programme managers in government and non-governmental organizations. What actions might policy-makers take to create enabling environments for small-scale farmers to diversify into new income-generating activities?

The FAO Diversification booklets are not intended to be technical ‘how to do it’ guidelines. Readers will need to seek more information or technical support, so as to provide farmer advisory and support activities relating to the introduction of new income-generating activities. To assist in this respect, each booklet identifies additional sources of information, technical support and website addresses.

A CD has been prepared with a full series of FAO Diversification booklets and relevant FAO technical guides, together with complementary guides on market research, financing, business planning, etc. Copies of the CD are available on request from FAO. FAO Diversification booklets can also be downloaded from the FAO Internet site.

If you find this booklet of value, we would like to hear from you. Tell your colleagues and friends about it. FAO would welcome suggestions about possible changes for enhancing our next edition or regarding relevant topics for other booklets. By sharing your views and ideas with us we can provide better services to you.

Cherukat Chandrasekharan

(1933–2007)

Dr C. Chandrasekharan, co-author of this booklet, passed away on 11 September 2007, leaving an imprint on professional forestry spanning more than 50 years.

Chandra's career is a remarkable example of hard work and commitment as he moved up the professional ladder in India (his home country), occupying various positions and dealing with a wide array of issues, before joining FAO in 1975. He worked as the Regional Forestry Economist in Bangkok and subsequent assignments with FAO included: Senior Forestry Planning Officer at FAO headquarters; Team Leader of the FAO/World Bank Project in Indonesia; Forestry Institution Specialist in Bangladesh; and, eventually, Chief of the Non-Wood Forest Products and Energy Branch in the Forestry Department at FAO headquarters in Rome, a post he held until his retirement in 1995.

After he retired from FAO, Chandra's professional involvement in forestry continued and his advice and expertise were much sought after. He welcomed the opportunity to contribute to the FAO Diversification booklet series by addressing a topic that was very close to his heart. Bringing NWFPs to the forefront of the forestry agenda was one of his most significant achievements. In co-authoring this booklet, he drew on his rich depth of experience about NWFPs and was able to convey his enthusiasm and knowledge for the subject.

When a roll call of outstanding foresters in the world is taken, Chandra will be at the forefront.

Acknowledgements

Gratitude is owed to P. Vantomme, Forestry Officer, Forestry Division, FAO, for his detailed review and revisions to the booklet. Thanks also go to H. A. Hilmi, former Senior Forestry Officer, Forestry Division, FAO, for his review and comments on the booklet.

Acknowledgements for the series

Gratitude is owed to Doyle Baker, Chief, Rural Infrastructure and Agro-Industries Division (AGS), FAO, for his vision, encouragement and constant support in the development of the FAO Diversification booklet series. Thanks are also due to Josef Kienzle, Agro-Industries Officer, AGS, FAO, for his patience, commitment, and contributions to the production and post-production of the series. Clare Bishop-Sambrook, principal editor of the series, provided technical support and guidance, both during the development and finalization of the booklets. Martin Hilmi provided both technical and editorial inputs and managed the post-production phase of the series. Fabio Ricci undertook the design and layout of the booklets and desktop publishing.

Introduction

■ *Scope of non-wood forest products*

Non-Wood Forest Products (NWFPs) comprise a wide range of forest goods (and services), which have different sources, characteristics and uses. Since time immemorial NWFPs have made a significant contribution to human welfare and progress, in particular providing sources of food, fodder, fertilizer, fibre, medicine, organic construction materials and cultural products in rural areas (see Case Study 1). They also provide industrial raw materials to support processing enterprises. NWFPs make valuable socio-economic, cultural and ecological contributions and this booklet describes how they are used to meet basic subsistence needs and the role they can play in income generation through local, regional and international trade.

There are several definitions of NWFPs, indicating their scope and coverage. Some restrict the product boundary to extractive products that are collected from the wild, while others include managed or cultivated products. Some restrict their discussion to plants, whereas others

include animals, fungi, and fish. Planted forests, grasslands and other environments, and environmental services, may or may not be included. All these factors cause the definition of NWFPs to be ambiguous, inconsistent, and still evolving; it is often necessary to provide situation-specific definitions.

Non-Timber Forest Products (NTFPs) is another term used which encompasses all biological materials other than timber, which are extracted from forests for human use. This includes small wood and fuelwood, including wood for handicrafts, agricultural implements, etc., and excludes wood of a specified quality or dimension in a form suitable for heavy construction such as houses, ships and bridges.

A simple definition, agreed at the International Expert Consultation on NWFPs held in Indonesia in 1995, defined NWFPs as: ‘goods of biological origin, other than wood, as well as services, derived from forests and allied land uses’. Allied land uses refer to farm forests, agroforestry plots and home gardens with low levels of tilling, hence

CASE STUDY 1 Wild plants in daily use: the case of Nigeria

In Nigeria, wild plants are used on a daily basis for food, medicine, farm implements, household tools, canoes, furniture, dyes, construction, etc. The plant species in use vary from one ecological zone to another, and between different communities.

A recent study of daily used wild plants known to rural communities showed that:

- number of wild plants varied from 27 for food, through 20 for commercial fuelwood; 16 for wood work (carvings and construction), 8 for dyes, 6 for roofing materials, and 6 for other uses such as rituals, festivals and design of masquerades,
- the majority of these plants were harvested from natural forests,
- a small portion of the wild plants were domesticated, particularly for traditional medicine (24 percent), rituals, festivals and masquerades (15 percent) and dyes (13 percent),
- rural people had some traditional knowledge about tree plants used as dyes (31 percent), traditional medicine (25 percent) and food (17 percent),
- rural communities were aware of some of the wild plants in daily use that are endangered among the different categories.

The use of wild plants was influenced by traditional land tenure systems which controlled access to wild bio-resources and determined the level of conservation attainable for plants and their habitats. Land tenure was communal and rural communities enjoyed clearly defined spatial user rights over different parcels of land common to them.

Traditional beliefs influenced the use of resources and helped to create awareness of plant biology and ecology and provided a mechanism on which to pass on traditional knowledge to younger generations.

The end use differs across plant species, with *Elaeis guineensis* the most diversified plant in daily use in Nigeria. It is used for food, wine, oil pomade, candles, traditional medicine, ropes, baskets, soap making, construction of culverts, brooms, fencing, roofing, energy, masquerades, rituals and worshipping of deities.

Some plants harvested for food are processed and stored, salad including (*Gnetum Africana*) leaves which are dried for storage and kuka (*Adansonia digitata*) leaves are further processed into powder for ease of storage. The fruits of *Irvingia grandifolia* and *Irvingia gabonensis* are processed and dried for continuous utilization throughout the year.

Domestication of wild plants has been a slow process, involving the collection of seeds with desirable characteristics, to grow closer to home. Some of the plants which have been selected for domestication by rural communities include: *Irvingia gabonensis*, *Irvingia grandifolia*, *Gnetum africana*, *Garcinia manni*, *Elaeis guineensis*, *Fromomum melaguata*, *Piper guineensis*, *Ocimum gratissimum*, *Pterocarpus osum*, *Alstonia boonei*, *Costus cafar*, *Acacia nilotica*, *Leucaena leucocephala*.

Source: Osemeobo, G.J. 2001. Wild plants in everyday use: Conservation towards sustainable livelihoods in Nigeria, *Int. Journal of Sustainable Development and World Ecology* 8. 369-379.

distinguishing them from agricultural and horticultural uses. This booklet focuses only on plant based products which are derived from forests and allied land.

■ *A brief history of non-wood forest products*

For millennia, people have thrived on products harvested from forests. NWFPs have played a more important role than wood in the early development of human history. Ancient communities discovered multiple uses for, and accumulated considerable knowledge about, non-wood products, ranging from food, spices and condiments to medicine, oils, and fragrances, to enhance the quality of their lives. Several uses have cultural roots, and the early social and cultural formations in different parts of the world were linked to the forest. NWFPs were among the earliest commodities to be domesticated, leading to the agricultural revolution. They have been traded over long distances for many centuries, while wood products have only become major international commodities comparatively recently. The influence of trade in NWFPs continued up to the industrial revolution in the West, when economies of scale slowly eased out small-scale production of NWFPs.

The dominance of wood started in the seventeenth century, with the opening of colonies, and was later promoted by the industrial revolution for various purposes such as ship building, packaging commercial products (tea chests), mining, infrastructure development, establishment of wood-based industries and urbanization. The production of NWFPs was considered incidental or subsidiary to wood production, and in several cases it led to the development of a dual economy in the forestry sector: extensive extractivism on the part of poor people living in and around forest areas on the one hand, and the timber-based forest economy dominated by large and rich entrepreneurs on the other. Extractivism, signifying traditional low-technology harvesting of naturally occurring products (mostly NWFPs) from forests can be seen around the world, supporting the subsistence of poor forest dwellers and indigenous communities. Caused by the association with subsistence livelihoods, the potential of NWFPs for value-adding tended to be neglected. Eclipsed by timber and neglected by public institutions for a long time, NWFPs remained largely of local importance, with few exceptions.

■ *Non-wood forest products in the twenty-first century*

In recent years NWFPs have attracted considerable global interest because of the increasing recognition that not only can they support improved rural livelihoods, household food security and nutrition, but their harvest may be more ecologically benign than that of timber, and they can make an important contribution to national economic development and international trade. This renewed interest in NWFPs began in earnest in the early 1970s. It has more recently been prompted and facilitated by international commitments to provide incentives for biodiversity conservation (such as the 2010 targets adopted by the Convention on Biological Diversity in 2002), and address global poverty (in particular, the United Nations Millennium Development Goals).

In many developing or transition countries in particular, significant proportions of the population depend on traditional medicines derived from both tropical and temperate plants, insects and animal products; forest food sourced from wild leaves, roots, fruits, seeds, nuts, tubers, fungi, gums, saps, palm heart and bush meat; and valuable construction materials such as thatch grass and bamboo. A variety of NWFPs are also of importance to populations living

in industrial countries. Of notable interest are maple syrup (*Acer* spp.) from North America; wild edible fungi (including *Boletus edulis*, *Tricholma magnivelare*, *Lentinula edodes* etc.), and various forest nuts and berries (*Rubus* sp.). (The FAO publication 'NWFPs from Temperate Broad-Leaved Trees' is a source of extensive information; see sources of further information and support at the end of this booklet.)

There have been many attempts to estimate the subsistence value of NWFPs. For detailed information about validated data on the value and volumes of production and trade in major groups and/or products can be found in the specialized publication series both in hard copies and on-line: the FAO Non-Wood Forest Products Series (see sources of further information and support at the end of this booklet).

While there remains a growing interest in NWFP trade as an engine for rural growth through contribution to national incomes, coupled with much speculation that trade can provide opportunities for (relatively) benign forest utilization and even create incentives for conservation, some are beginning to question how realistic expectations like these are (Belcher & Schreckenberg 2007). Indeed, reviews of the experience and impact that NWFP projects have had

both on rural livelihoods and natural resources during the past 15 years, indicate that approaches have not been universally successful. Expectations of local income generation potential have frequently been unrealistic and not achieved in practice, and many NWFP resources have been harvested in an unsustainable manner, resulting in the degradation of forest resources. Paradoxically, it has been suggested that the same characteristics that make NWFP activities attractive to poor people also make them economically inferior activities, offering little prospect for accumulating sufficient capital assets to escape poverty.

This has led to NWFP activities being labelled a potential poverty trap that keeps people in chronic poverty and, in spite of the abundant evidence that NWFP activities can help people to survive poverty, the debate continues as to whether NWFPs can make a significant contribution to poverty reduction by providing people with pathways out of poverty.

However, it is important to recognise and understand that some NWFP activities meet the objectives of contributing to and improving the livelihoods of the rural poor and at the same time, ensuring the sustainable management of forest resources to keep the delicate environmental factors in balance.

■ *The role of non-wood forest products in improving rural livelihoods*

NWFPs play many different roles in supporting the rural economy by contributing to:

- subsistence food security,
- nutrition,
- medicine,
- generating additional employment and income,
- providing raw materials,
- offering opportunities for processing enterprises,
- contributes to foreign exchange earnings,
- supports biodiversity conservation and other environmental objectives.

In addition, the activities related to the collection and primary processing of NWFPs represent opportunities for rural women to engage in income generating activities. The degree of processing and value addition varies greatly between NWFPs, and while the trade in some products is largely confined to regional markets, others are successfully traded internationally.

Over the past twenty years, there has been a rapid growth of interest in NWFPs among both conservation and development organizations. This because of the increasing recognition

of the contribution that these goods can make to the livelihoods of large numbers of people in developing countries, however this potential contribution is not always realized.

When thinking about the contribution of NWFP activities to reduce poverty, vulnerability, and stimulate rural development, three different NWFP-use strategies have been identified. They highlight the fact that people may use NWFPs in different ways at different times, or that the same NWFP may provide a safety net to some and a stepping stone to others. The three categories of NWFP activity with regards to poverty reduction are:

- 1 Safety nets** to prevent people from falling into greater poverty by reducing their vulnerability to risk. They are particularly important in times of crisis and unusual need (e.g. during natural disasters such as drought or family illness).
- 2 Gap-filling activities**, carried out regularly often during the non-agricultural season, allow for income spread and generally make poverty more bearable through improved nutrition or higher income. There is a large body of evidence suggesting that although many NWFP-based activities generate only small

amounts of income, the timing of this income during the non-agricultural season may increase its relative importance. Such seasonal income can play a key part in reducing vulnerability of the poor through a decrease in the variance of their annual revenue.

- 3 Stepping stone activities** to reduce poverty. Where they can permanently lift people out of poverty, this is termed poverty removal or elimination. It is only in areas that are well integrated into the cash economy that some NWFP producers are able to pursue a specialized strategy in which the NWFP contributes more than 50 percent of total household income and collectors and producers tend to be better off than their peers.

Likewise, three household economic strategies have been identified with regard to NWFP activities, based roughly on the level of integration into the cash economy and the proportion of household income contributed by the NWFP. They are:

- 1 Coping strategies**
Households will harvest a large number of NWFPs from unmanaged or lightly managed forests, and in most cases resources are in decline;

2 Diversified strategies

Households use NWFP generated income as additional income, earning the bulk of their income from agriculture or non-farm sources;

3 Specialized strategies

Households following these strategies tend to get better production per hectare of NWFPs, command higher prices for their products, have higher household incomes, and are the most integrated into the cash economy.

Thus, there is a need for those involved in and supporting NWFP activities to be both realistic about objectives and outcomes, and clear and methodical about how the social and ecological impacts will be monitored and managed.

■ *Purpose of the booklet*

The purpose of the diversification booklets is to raise awareness about livelihood diversification opportunities among people and organizations that provide advisory, business and technical support services to resource poor small-scale farmers and local communities in low and middle income countries.

This booklet provides an overview of the uses of NWFPs (section 2); insight into the complementary contribution that they can make to sustainable livelihoods (section 3); an overview of the NWFPs trade (section 4); strategies for successful NWFPs trade and livelihoods (section 5); and support and services which can help promote NWFPs as a livelihood source (section 6). Sources of additional information and technical support for any follow-up are identified at the end of the booklet.

Overview of the principal uses of non-wood forest products

The major geographical regions of the world, and the agro-ecological zones within them, have tens of thousands of species of flora and fauna capable of meeting material and non-material human needs. All the broad categories of NWFPs mentioned below can be found in all regions, with differing levels of availability, quality and cost of production, such that they generate comparative advantages and considerable scope for trade.

Universally recognized species include the domesticated and/or introduced species such as cashew (*Anacardium occidentale*), rubber (*Hevea brasiliensis*), eucalyptus (*Eucalyptus* spp.), oil palm (*Elaeis guineensis* and *Elaeis oleifera*), wattle (*Acacia* spp. including *mearnsii*), quinine (*Cinchona* spp.), annato (*Bixa orellana*), pepper (*Piper* spp.), cardamom (*Amomum* spp.) nutmeg (*Myristica* spp.), sapota (*Manilkara zapota*) and ginseng (*Panax* spp.) among others.

Some regions dominate production: the Asia-Pacific region accounts for almost the entire production of rattan and for about 80 percent of the world production

of bamboo. There are other plants which, to some extent, serve the purpose for which rattan and bamboo are used – including *Salix viminalis* in subtropical and temperate regions and *Clusia grandiflora* in Guyana, particularly for production of wicker furniture and handicrafts.

In different regions and sub-regions, specific source species of different categories of NWFPs may vary. Indeed, across regions, even where the same species are in existence, caused by the influence of cultural, technological and/or economic factors, variations can be seen in their uses (and consequently in their management and harvesting practices). For example, in Central America, sapodilla (*Manilkara zapota*) is tapped in the wild for its latex, whereas in Asia it is cultivated mainly for edible fruits. The bark of paper mulberry (*Broussonetia papyrifera*) is used for handmade paper in some countries like the Lao People's Democratic Republic, whereas it is used for bark cloth in the South Pacific. Many NWFPs traded commercially are now domesticated, but wild harvest is still viable in some

areas. Natural production systems can attract a niche market and a price premium, as seen in the cases of wild aromatic plants, orchids, mushrooms and ginseng.

At a general level, NWFPs can be categorized as food, medicinals/ phyto-pharmaceuticals, fibre, oils, gums, resins, latex, dyes, tannins, and sweeteners. Some activities and products, often loosely considered under the banner of NWFPs, such as beekeeping and honey, and cultivated mushrooms, are addressed in more detail in other FAO Diversification booklets (see FAO Diversification booklet No.1 ‘Beekeeping and

sustainable livelihoods’ and FAO Diversification booklet No.7 ‘Make money by growing mushrooms’).

■ **Foodstuffs**

Edible NWFPs used as food staples, supplements and additives include bush meat, honey, edible fruits and nuts, leaves, shoots, tubers, whole plants and fungi. They are important food sources for forest-dependent communities (see Box 1).

In several African countries, wild fruits play an important role in people’s diet and contribute to the economy of the rural community (see Box 2).

BOX 1 Examples of the global distribution of different species which yield edible NWFPs

Africa

Desert date (*Balanites aegyptica*), twisted cluster or stink bean (*Parkia speciosa*), Chinese date (*Zizyphus Zizyphus*), Mango (*Mangifera spp.*), neem tree (*Melia azadirachta*).

Asia

Cashew (*Anacardium occidentale*), mangostein (*Garcinia mangostana*), tengkawang (*Shorea stenoptera*), milk fruit (*Chrysophyllum spp.*), gooseberry (*Ribes uva-crispa*), sea buckthorn (*Hippophae spp.*) cardamom, (*Elettaria and Amomum spp.*).

Latin America

Brazil nut (*Bertholletia excelsa*), bacuri (*Platonia insignis*), camu-camu (*Myrciaria dubia*), cupuassu (*Theobroma grandiflorum*), jatoba (*Hymenaea courbaril*).

BOX 2 Wild fruit and local diets

A study of indigenous edible fruits conducted by the University of Malawi has shown that:

Fruits of the monkey bread tree (*Adansonia digitata*), Kharub (*Bauhinia thonningii*) and chocolate berry (*Vitex sp.*) are excellent sources of vitamin C.

Wild custard apple (*Anona senegalensis*) and natal mahogany (*Trichilia emetica*) are rich in protein.

Governor's plum (*Flacourtia indica*) and snake bean tree (*Syzygium guineense*) are rich sources of iron.

Baobab (*Adansonia digitata*), camel-foot (*Bauhinia thonningii*) and black plum (*Vitex doniana*) are excellent sources of calcium. The baobab seed kernel is also rich in protein (28.7 percent dry weight) and fat (29.5 percent), and as such is an important source of vegetable oil used in household cooking.

■ Medicines

An estimated 80 percent of the world's population depends largely on traditional natural medicines, mostly derived from plants, and an estimated 35 000 plant species have at one time or another been used for medicinal purposes. Over 25 percent of the drugs in modern pharmacopoeias are originally plant derived, either as pure phyto-pharmaceuticals extracted from plants, or as synthetic derivatives of them. Forest flora and fauna are a hidden chest of organic chemicals, including phyto-chemicals, aroma-chemicals, and agro-chemicals. The anti-cancer compound taxol is extracted from the Pacific Yew Tree (*Taxus brevifolia*), and phytochemicals from

Pterocarpus osum are used in the treatment of sickle cell disease. The origins of traditional herbal medicine predate all existing records, and the knowledge accumulated over thousands of years in different parts of the world is enormous (see Box 3).

All the agro-ecological regions and sub-regions have a large number of medicinal plants which are used locally – for example: *Alstonia scholaris*, *Aconitum heterophyllum*, *Aegle marmelos*, *Cinnamomum camphora*, *Aquilaria sp.*, *Emblica officinalis*, *Panax sp.* and *Tinospora crispa* in parts of Asia; *Tagetes glandulifera*, *Mauritia flexuosa*, *Pithecellobium avaremotemo*, *Chinchona sp.*, and *Hyptis pectinata*

BOX 3 New uses for *Ginkgo biloba*

The ginkgo tree (*Ginkgo biloba*) is native to the People's Republic of China and is the sole survivor of the ancient family Ginkgoaceae. In the People's Republic of China, it is traditionally cultivated for both its timber and seeds, while outside the People's Republic of China it is valued chiefly as an ornamental and shade tree.

Recently, however, it has been extensively planted for its fern like leaves which have valuable medicinal properties. The leaves and seeds contain biologically active substances used for improving cerebral and peripheral blood circulation.

As the developed world has started to appreciate the medicinal properties of this natural product, so the demand for dried ginkgo leaves and seeds has increased. The ginkgo leaf-processing industry is booming and nearly 200 processing enterprises have been set up in the People's Republic of China with an annual production valued upwards of US\$ 25 million. In some rural areas, ginkgo cultivation is becoming one of the most vigorous industries.

Source: FAO. 1999. *Non-Wood News*, No.6, Rome.

in parts of central and South America; and *Prunus africana*, *Curtisia pentata*, *Cryptocarya myrtifolia*, *Gnetum africanum* and *Catharanthus roseus* in parts of Africa.

Traditional medicines for local use involve simple preparation methods such as hot and cold water extraction, expression of juice after crushing, powdering of dried material, formulation of powder into pastes via such vehicles as water, oil or honey and even fermentation after adding a sugar source. Preparation of standard extracts and their conversion into dosage forms are activities that can be done as a rural-based small industry to meet the demands of the local population. This is essential in areas where traditional medicines are the main form of treatment for

illness. Additional processing with sophisticated machinery, and also with health and safety considerations, are required to produce pure phyto-pharmaceuticals used in modern medicine. Moreover, as these compounds naturally occur in small quantities in a plant, large volumes of raw material have to be processed to enable economies of scale.

■ *Fibres*

Apart from the non-wood sources of raw materials for pulp making, a number of plants provide fibrous substances suitable for making cloth, ropes and woven materials, including several species of grasses (*Sterculia villosa*, *Broussonetia paryrifera*, *Agave sissalana*, *Ceiba pendandra*, etc.) and palms (*Carludovica palmatae*

BOX 4 Global examples of different Palm species

Africa

Raphia venifera, Elaeis guineensis, Borassus aethiopicum, Phoenix reclinata, Livistona carinensis, Selerosperma mannii, Hyphaene reptans.

Asia

Arenga wightii, Corypha umbraculifera, Borassus flabellifer, Caryota urens, Nypa fruticans, Phoenix acaulis, Metoxylon sagu.

Latin America

Brahea aculeata, Euterpe edulis, Jubaea chilensis, Jessenia bataua, Mauritia flexuosa, Bactris guineensis, Orbignya phalerata.

and *Brahea dulcis*). Palms and grasses are used for weaving baskets, hats,

mats and other items in Latin America, Africa and Asia (see Box 4).



FIGURE 1 Bamboo baskets, mats and plaited products are sold in local markets
(Photo: © FAO/FO CFU000720/R. Faidutti)

BOX 5 The revival of the most resistant natural fibre in the world

Pita (*Aechmea magdalenae*), a thorny leaved terrestrial bromeliad, grows naturally in the tropical forests of the Southeastern Mexico. It is not that easy to harvest, or carry, and to gather 1 kg of pita fibre: about 300 leaves need to be collected and the longer the leaf the better, because it means a longer fibre and a better market price.

Processing begins with scraping away the leaf pulp, pulling out the fibre, bleaching it in lemon juice and washing powder, combing it and finally rolling it into thread. The fibre is then used to embroider leather articles e.g. belts, boots and saddles, by skilled craftsmen, and is sold principally in Mexico, the United States and Spain.

One hectare of forest can provide about 20 kg of fibre each year and an average cash income can amount to US\$930 per hectare, far superior to what coffee or cattle producers might obtain. Pita is the most valued and demanded natural fibre in the Mexican market, and surpasses the price of linen and silk, with a price as high as US\$100 per kg.

Source: Marshall, E., Schreckenberg, K., & Newton, A. 2006. Commercialization of non-timber forest products in Mexico and Bolivia: factors influencing success. Research conclusions and policy recommendations for decision-makers, UNEP-WCMC, Cambridge.

Bromeliad species also provide an important natural source of fibre (see Box 5).

■ **Fatty oils**

Many forest plants possess fatty oil. Seeds are processed to give vegetable fats, for example, African oil palm (*Elaeis guineensis*), Kusum (*Schleichera trijuga*), Babassu (*Orbignya phalerata*), Andiroba, or Crabwood (*Carapa guianensis*), Neem (*Azadirachta indica*), Ucooba (*Virolasurinamensis*), Tung (*Vernicia fordii*), and Shea nut (*Vitellaria paradoxa*) (see Case Study 2).

Edible oils are used for cooking, in the food industry, and also in soap making on both a small and large

scale. Some are used as components of other industrial products after secondary processing, and several oils have medicinal properties. The process of producing fixed oils is simple and when carried out at the rural level often involves softening the kernel (sometimes through boiling) and pressing it out. The equipment required is often simple and can be manufactured locally.

■ **Essential oils**

There are a large number of wild and cultivated aromatic plants around the world, used for essential oils. The aroma compounds are located in diverse parts of the plant material such as flowers, fruits, leaves, berries,

CASE STUDY 2 Shea nuts and butter

Shea nuts, locally known as *Karite*, are primarily grown in West and Central Africa in the semi-arid Sahel, referred to by traders as the 'Shea Belt'. The two main varieties are *Vitellaria paradoxa subsp. paradoxa* and *Vitellaria paradoxa subsp. nilotica*.

Shea nut products, the solid fat (butter or stearin) and the liquid oil (*olein*) are ideal for use as raw materials in cooking oil, margarine, cosmetics, soap, detergents and candles, and they are commonly used as a substitute for cocoa butter in the chocolate and confectionery industry.

The trees only begin to bear fruit after about 20 years and do not reach maturity for 45 years. They may continue to produce nuts for up to 200 years after reaching maturity. The nuts, which are embedded in a soft fruit, fall to the ground during the harvesting period (typically June to August). They are then buried in pits, which causes the pulp to ferment and disintegrate and produces enough heat to prevent germination. The nuts are dried for a few days and are later shelled and winnowed, usually by hand. The kernels are dried further to reduce moisture content from about 40 percent to about 7 percent.

A process called fractionation separates the oil (*olein*) and butter (*stearin*). This can be done locally and allows for extraction of the liquid oil by a process involving heating and kneading of crushed kernels and straining the resultant oily mass.

Manufacturers in the chocolate and other food industries prefer to buy the nuts as opposed to the butter so that they can have as much control as possible over the processing and, hence, the quality of the final product. Nuts are also preferred because they can be stored for up to five years in the right conditions, while butter is more expensive to store and deteriorates more rapidly.

Shea butter is produced on a commercial scale in Europe using hydraulic presses on the nuts and then placing them in hot air ovens. The product is then bleached with a hexane solvent. The butter must be stored and transported in cool conditions and in airtight containers to avoid becoming rancid.

Shea nut supply far outstrips demand. More than 600 000 tonnes of the dominant variety, *Vitellaria p.paradoxa*, are produced in West Africa (Benin, Burkina Faso, Cote d'Ivoire, Ghana, Nigeria, Mali and Togo). Most is used as cooking oil or as butter for the skin and hair.

The other variety, *Vitellaria p.nilotica*, has a superior quality and is preferred by cosmetics firms. This variety is primarily grown and processed in Northern Uganda and Southern Sudan.

The Shea project for Local Conservation and Development in Uganda began in 1995 with pilot funding from the United States Agency for International Development (USAID). Under the project, more than 2 000 members of community-based rural women's group have formed the North Uganda Shea Processors Association, which currently sells several tonnes of pharmaceutical grade shea butter to cosmetic formulators and private companies in the United States, Europe and Japan.

Source: FAO, 2001. *Non-Wood News*, No.8, Masters, E.T., Yidana J.A. & Lovett P.N. 2004. Reinforcing sound management through trade: Shea tree products in Africa, In *Unasylva* 219, Vol.55, Rome.

stems, barks, heartwood, roots, rhizomes, exudates and even in whole plants. Extraction methods depend on the essential oil, but include steam (as with *Dalbergia spp.* - rosewood), cold

expression (as with oil from *citrus spp.*), and solvent distillation, which is more costly, but necessary for more delicate oils (*jasmine spp.*). The cost of production varies according

to the raw materials, facilities for processing, and labour and energy costs. Their production on a large industrial scale requires significant variations in the technologies used.

As flavours and fragrances, essential oils find various uses in: food, beverages and confectionary; personal care products as perfumes,

shampoos, bath lotions, toilet soaps, tooth pastes; pharmaceutical preparations; detergents, cleaning products and air fresheners, etc. Essential oils also have several industrial uses including medicinal and veterinary preparations; paints; adhesives; insecticides; textiles; dental preparations; cosmetics and

CASE STUDY 3 Damar gardens of Krui in Indonesia

Damar is a generic Indonesian term for resin produced by around 115 different types of forest trees. These resins vary in quality with the clear yellowish 'damar mata kucing' (meaning 'cats eyes') produced by *Shorea javanica* considered to be the best. Damar was initially used for lighting torches, making batik dyes and incense, and sealing seams in boats to render them watertight. Since the mid-eighteenth century, it has also been used in the paint, ink and varnish industries and more recently, as an additive in sodas.

Damar resins have been traded between Southeast Asian islands as far back as 3 000 BC and they were probably included in the first long distance exchanges with the People's Republic of China in the third to fifth centuries. On the west coast of South Sumatra, in the foothills of the Bukit Barisan mountain range, lie the damar gardens of Krui. To casual observers these gardens look like natural forests: uneven aged, with a large variety of tree species and lianas growing up to 45 m high. But many of the trees have been planted by local farmers. Initially they probably tapped naturally-occurring trees in the forest, but as early as 1782, British explorers had remarked on the large extent of planted damar forests.

Innovative farmers planted damar tree seedlings (wildlings collected from natural forests) into their mixed coffee and pepper plantations, along with fruit trees. Until the damar trees reach the age at which they can be tapped (15 to 20 years), the other products are harvested to provide farmers with cash income. Their early success led to a long lasting wave of damar planting amongst local farmers, which has continued until the present day. In 1998, damar agroforests covered more than 50 000 ha. For nearly three quarters of the area's 70 villages, damar agroforestry represents the main land use, providing 60 to 80 percent of household income.

Currently, Indonesia is the only country in the world producing damar from planted trees. Krui is the centre of production, producing about 10 000 tonnes of damar mata kucing each year and accounting for more than 80 percent of national damar production. The best grades are exported (about one third of production) and the remainder is used within Indonesia, mainly in the handmade batik industry and in incense production, where damar is mixed with benzoin resin.

Source: Lopez, C. & Shanley, P.2004. Riches of the forest: food, spices, crafts and resins of Asia. CIFOR. Bogor.

FAO.1995. Gums, resins and latexes of plant origin, by J.J.W. Coppen, Non-Wood Forest Products No.6., Rome.

toiletries; paper and printing industry; rubber and plastics and petroleum industry.

■ **Resins**

Resins are a complex mixture of organic compounds called terpenes and terpenoids, which are insoluble in water and categorized as hard or soft. The term ‘damar’ is used as a collective term for a great variety of hard resins, and damars

of international commerce come principally from the Dipterocarp forests of Southeast Asia, and sources include *Shorea* spp., *Hopea* spp., *Vatica* spp., *Vateria* spp., *Balanocarpus* spp. (all belonging to Dipterocarpaceae) and Burseraceae (*Canarium* spp.). ‘Cat’s eyes’ (*Mata kuching*) is a term applied to the crystalline damar resin obtained from certain Dipterocarp species (see Case Study 3).

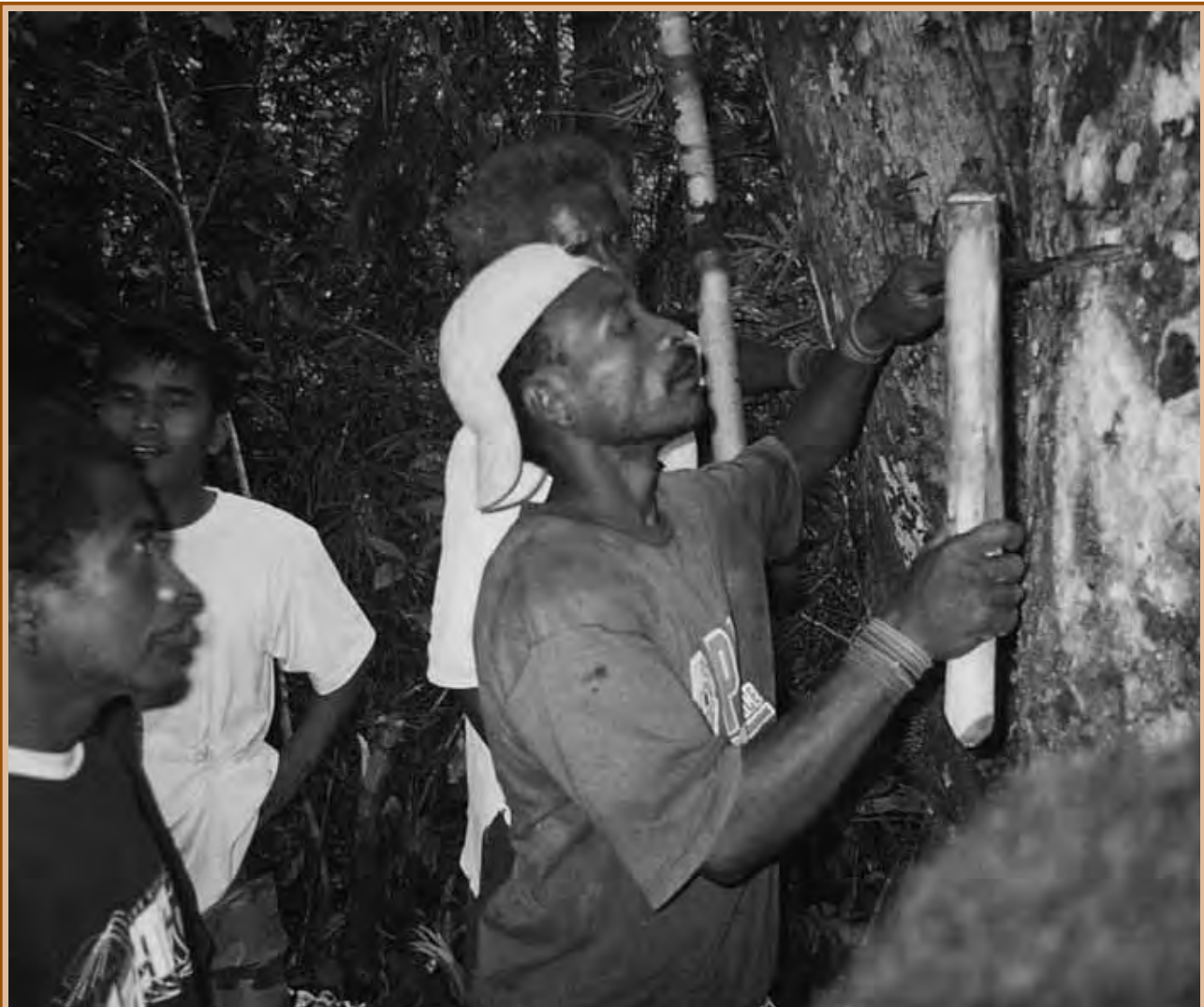


FIGURE 2 A Dumagat tribesman tapping almaciga resin, better known in international trade as Manila copal

(Photo: © FAO/FO-6091/A. Ella)

BOX 6 Cultural importance of copal resin in Latin America

Incense and copal resins Guttiferae (*Clusia cf. ramosa*), and Burseraceae (*Protium* spp.) are harvested from, among other places, the remote foothills of the Eastern Andes. There is a stable market for incense and copal which are used extensively in the Republic of Bolivia and throughout Latin America for ritual burning in Catholic and traditional ceremonies, at parties, on saints' days and for blessings. The Quechua people also use these aromatic resins as a medicine for various ailments. Resin is graded in qualities according to the size of the drops harvested, but the species are not naturally abundant and collection is very time intensive because of the remoteness of the harvesting sites. In addition, the lack of management capacity and unsuccessful attempts to domesticate the species has had a negative impact on the natural resource, with observed reductions in the productivity of remaining trees, and even death from over cutting that results in terminal disease.

Source: Marshall, E., Schreckenberg, K., & Newton, A. 2006. *Commercialization of non-timber forest products in Mexico and Bolivia: factors influencing success. Research conclusions and policy recommendations for decision-makers*, UNEP-WCMC, Cambridge.

The hard resin of *Agathis* spp. is commercially known as copal (see Box 6). The main use of hard resins is in the manufacture of paper, wood varnishes, lacquers and paints, although consumption has declined over the years with the widespread use of synthetic materials. In India, *sal damar* is widely used as incense and in indigenous medicine.

For resin tapping, the bark is chipped to expose the ducts from which the resin exudes; pine oleo-resin (*Pinus* spp.) is produced on the largest scale. In the Amazonian countries, oleo-resins are obtained from species such as Copaiba (*Copaifera multijuga* and other *Copaifera* spp.) and Jatoba (*Hymenaea courbaril*) and have multiple uses in the region including treatment of throat infections,

bronchitis and other respiratory problems; as an antiseptic for wounds and scratches; and as a cure for diarrhoea and urinary tract problems. There is great demand for Copaiba oleo-resin in international markets, as a component of high temperature resistant varnishes, for cosmetics (as a perfume fixative), and in various sectors of the pharmaceutical industry.

Others include several species of *Boswellia* and *Commiphora* (traded as Frankincense), sourced from many countries within the African continent as well as the Middle East and South Asia. Balsams are also resinous mixtures and are used in medicine and other consumer industries and have extensive fragrance applications. Important balsams and plants from which

they are obtained, among others, include: Benzoin (obtained from *Styrax tonkinensis* and *S.benzoin* in Southeast Asia); Styrax or Liquidamber balsam (obtained from *Liquidamber formosana* in East and Southeast Asia); Tolu balsam (obtained from *Myroxylon balsamum* in the Bolivarian Republic of Venezuela); Elemii (obtained from *Canarium* spp. in the Philippines) and Asafoetida (obtained from *Ferula asafoetida* in Middle Eastern countries).

■ Waxes

Natural waxes have commercial value when used as components of industrial products like candles, varnishes, cosmetics and pharmaceuticals. Despite severe competition from synthetic waxes, some specific properties of natural waxes have kept them in demand. The processing and refining of the wax oils are simple but important in order to produce good quality grades.

Carnauba wax is an important vegetable wax which is secreted from the leaves of the wax palm (*Copernicia cerifera*), a native of Brazil and other parts of tropical South America. Young leaves are carefully selected and gathered before they are fully open, dried in the sun for several days until the

wax is a flourlike dust, and then removed by threshing and melted down in clay vessels. After straining and cooling, it is often broken into small pieces for transport. Similar to carnauba, cauassu wax, is obtained from *Calathra lutea*, a tall herb of the lower Amazon region.

The wax is produced on the underside of the large leaves, and drying in the sun for only two to three hours is sufficient for the tissue-paper-thin scales to form, which can then be scraped off. Candellila wax is obtained from *Euphorbia antisyphilitica*, a desert shrub of North and Central America, particularly Texas in the United States and Mexico. The wax exudes from pores and forms a thin film on the stems, and is extracted by solvents or by boiling.

It is a soft wax containing more resin and has a lower melting point than carnauba, consequently it is in lower demand. Jojoba wax, provided by the seed of *Simmondsia chinensis*, is used in cosmetics, shampoos, and medicinal preparations, as well as for covering fresh fruit to prevent dehydration. Myrtle wax obtained from the berries of bayberry (*Myrica pensylvanica*) and wax myrtle (*M.cerifera*), both native to the Eastern United States, is similar to jojoba wax in their properties and uses.

■ Gums

Important gum-producing species include *Acacia senegal*, *Sterculia urens*, *Astragalus* spp., and *Strychnos potatorum*, *Caesalpinia spinosa*, *Prosopis juliflora*, and *Ceratonia siliqua*. Gums have diverse applications in the pharmaceutical, cosmetic, food additive, printing and textile industries. Although many synthetic products have replaced the uses of natural gums, their use continues for specific purposes. Gums permitted for use in foodstuffs command high prices, but are subject



FIGURE 3 A worker tapping latex from an old rubber tree in Viet Nam
(Photo: © FAO/FO-6780/M. Kashio)

to strict international regulations concerning food safety and purity.

The most widely used and traded gum is gum arabic (*Acacia senegal*). Gum Karaya, also known as Indian Tragacanth, is obtained mainly from the Indian tree species *Sterculia urens*. Some ten percent of all the gum produced is used as a food additive and the remainder goes into pharmaceutical products. Seed Gum (*Strychnos potatorum*) grown in the forests of the Indian sub-continent may play an important role in managing pollution as it binds with several toxic heavy metals including uranium, mercury and cadmium, and has been used for centuries in purifying drinking water.

■ Latexes

Latex, a milky white fluid, is obtained by injuring the plant to make it bleed. Latex tapped from *Hevea brasiliensis*, is now produced on a large scale in several Asian countries. Rubber is still produced in the extractive economy in Brazil (see Case Study 4), and the local use of natural rubber stands is important to livelihoods throughout the Amazon basin (see Box 7). However, commercial plantations of rubber have also been established in this region to compete both with rubber from plantations in Asia, as well as the increased supply of synthetics.

CASE STUDY 4 Extractive reserves in the Brazilian Amazon

In the second half of the 1980s, the Brazilian Government decreed the formation of several extractive reserves in response to requests from the National Council of Rubber Tappers. Extractive reserves are areas owned by the State, which give a concession to the association of inhabitants of the reserve, which in turn give use rights to the various families. The use rights are exclusive, are subject to the sustainable use of the resource, and they cannot be transferred inter vivos. The exploitation of the rubber stands, undertaken by families, is subject to the rules of the extractive reserve which are established by the forest dwellers themselves, the associations representing them, and the state agency responsible for the reserves. The administration of common areas, such as forest paths, lakes, and common facilities, is carried out by the community.

The creation of extractive reserves involved several institutional changes in the context of Brazilian legislation: recognition of community rights to land; inclusion of environmental concerns as a motive for disappropriation; acknowledgement of extractivism as a (potentially) viable economic activity; and creation of areas where conservation and sustainable livelihoods are coexisting objectives. In the extractive reserves in Brazil, there has been a shift from 'aviamento' (debt-based peonage of NWFP collectors with traders) to an autonomous system of management, particularly in the more accessible areas. Some 1.5 million people in the Brazilian Amazon derive a significant portion of their income from extractive forests.

While most extractive reserves in Brazil depend largely on two species – i.e. Brazil nut (*Bertholletia excelsior*) and rubber (*Hevea brasiliensis*), the total number of NWFPs extracted runs to over 100, providing sustainable economic benefits.

The extractive reserves, which are administered by the Brazilian Institute of Environment and Renewable Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – IBAMA), now cover about 4 million ha (0.8 percent) of the Brazilian Amazon. The National Council of Rubber Tappers of Brazil has set 10 percent of the Amazon as its target for extractive reserve.

Several other governments in Latin America have followed the example of Brazil and have passed laws establishing extractive reserves.

Source: IBAMA. 2007.

Other latex-yielding plant species of commercial importance include *Manilkara zapota* (chicle), Coquirana (*Ecclinsa balata*), Jelutong (*Dyera*, *Sorva* and *Couma* spp.). Chicle is used mainly for chewing gum and is produced on a commercial scale in Mexico and certain parts of Central America. It is also widely cultivated

for its fruit, both in tropical America and in India, Sri Lanka, Malaysia, Thailand, Philippines and other Asian countries. Balata latex is tapped from the native wild *Manilkara bidentata* of tropical America, and is valued for its special non-elastic and hard-setting properties and is used, among other purposes, for coating golf balls.

BOX 7 Rubber, the local economy really is bouncing back

Deep in the Bolivian Amazon basin, community tapping of natural rubber stands (*Hevea brasiliensis*) is still in demand, despite the boom and bust of the gold mining industry, which left many locals without work. Initially, these remote communities relied on rubber to waterproof themselves to work in mines. Now, despite the demise of the original rubber markets, and the challenge of imported substitutes, they creatively use their abundant natural resource to provide for the production of a variety of goods from rubber gloves and football bladders, to bike pedals and rubber flooring. Rubber is also used in transport: rubber sacks are sent miles downstream to the nearest town with goods for sale kept safely dry inside; filled with air, they can be used as floats to provide safe passage across rivers for adults. However, very marginalized communities do not always benefit from adding value locally and processing the goods themselves: the more successful community sells simple rubber latex and leaves small industries in La Paz to do the more complex part of the job.

Source: Marshall, E., Schreckenberg, K., & Newton, A. 2006. *Commercialization of non-timber forest products in Mexico and Bolivia: factors influencing success. Research conclusions and policy recommendations for decision-makers*, UNEP-WCMC, Cambridge.

■ *Natural dyes and colours*

Many forests are rich repositories of plants producing dyes and pigments which can be sustainably harvested for commercial use and processed locally, thereby supporting rural employment and development. Ornamentation of cloth with natural dyes dates back about 3 000 years, and because of the toxic nature of some synthetic pigments, there has been a resurgence of interest for natural dyes. An advantage of natural dyes lies in the potential for designers to control variations of shade and tones, which is not possible with synthetic dyes. Dye pigments are derived from tree bark, leaves and wood, including the bark of Akan-asante or Yaruba (*Anonidium mannii*) and the leaves of Magnolia (*Rothmannia whitefieldii*).

Examples of natural dyes include henna, which is extracted from the dried leaf of *Lawsonia inermis* and provides a dye ranging in colour from black to red; kamala, an orange yellow dye used for textiles is obtained from the fruit of Kamala trees (*Mallotus philippinensis*); and the widely used blue coloured indigo dye (*Indigofera tinctoria*), traditionally used for dyeing a variety of textiles, including silk and wool garments.

Research from the forests of the Peru has identified 56 dye-yielding plants, and the Vegetable Dye Society in Bangladesh has identified about 30 dye-yielding plants for textiles. Examples of natural dyes used in the Lao People's Democratic Republic are presented in Box 8.

BOX 8 Some of the common natural dyes used for silk in the Lao People's Democratic Republic

Pink	rind of mangostein fruit (<i>Garcenia mangostina</i>)
Red/purple	stick lac, wood of <i>Caesalpinia sappan</i>
Yellow	root of berberin (<i>Coscinium finestratum</i>)
Orange	seed of annato (<i>Bixa orellana</i>)
Greyish black	fruit of ebony (<i>Diospyros mollis</i>)
Pinkish grey	leaf of teak (<i>Tectona grandis</i>)
Grey	tuber of <i>Dioscorea bulbifera</i>

■ **Food colours**

The most well-known food colourant is Bixin derived from the seeds of Annatto tree (*Bixa orellana*), which is native to the tropical forests of South America and has been introduced in India, Sri Lanka and Kenya. Peru is the leading producer and exporter of Annatto, and Bolivia, Brazil and Mexico also produce it. Another widely known food colourant, Cochineal, is obtained from the dried body of the pregnant female scale insect *Dactilopius coccus*, indigenous to Central and South America. The main host plant for this insect is the 'prickly pear' and 'torch thistle' cacti and Peru is the principle producer of this colourant.

Lac is another edible dye, which is used in colouring soft drinks and food and also has various industrial uses. This resinous secretion from the body of a *Hemipterous* insect (*Laccifer lacca*), is collected from branches of host trees, and it is common practice to inoculate various species of trees, including Acacia and *Ficus spp.*, with wild or cultivated insects. Lac is produced in India, Thailand, Myanmar, the People's Republic of China, Indonesia, Viet Nam and the Lao People's Democratic Republic.

■ **Tannins**

Tannins are a widely distributed group of compounds localized in specific plant parts such as beans,

nuts, fruits, barks and stems. They are very important both because they combine with animal skins to form strong and flexible leather, and also react with salts of iron to form dark-blue or greenish-black compounds, the basis of common inks. Processing to obtain tannin extracts and tannin powder, though simple, needs carefully controlled conditions.

Tannin extraction from Myrobolans (e.g. fruits of *Terminalia chebula*), involves soaking the mashed fruit in hot water, then evaporating the tan-liquor under vacuum, and drying where solid

tannin is required. Australian wattle (*Acacia mearnsii* and *A. decurrens*) is cultivated in some tropical countries (e.g. India, Kenya) for its tan bark; the heartwood of *Acacia catechu* and the nuts of Areca palm (*Areca catechu*) are important sources of tannin in some Asian countries; and Gambir, or white cutch, is a resinous substance extracted from the leaves and young branches of *Uncaria gambier*, a climbing shrub of the Malayan peninsula and Indonesia. In addition, several mangrove species (*Rhizophora spp.*) are also rich in tannin.



FIGURE 4 Bamboo (*Bambusa guadua*) is used to build houses, Ecuador.
(Photo: © FAO/CFU000897/R. Faidutti)

■ *Sweetening agents*

Many countries have plant-based sources of sweeteners other than industrially produced sugar, and these can be good substitutes in rural areas where access to refined sugar is poor. Raw material processing is simple and can be carried out at a rural level with minimal training and locally assembled equipment. In many instances, fermentation has to be prevented and any toxic substances removed (i.e. with *Stevia spp.*). Processing as a small-scale industry is cost effective for placing the product in a local market, and the remaining liquor (molasses) can be fermented to yield alcoholic beverages and vinegar.

Sweeteners can also be extracted from the sap of palm flowers, the leaves of *Stevia rebaudiana*, arils of *Thaumatococcus daniellii* and bark sap of the maple tree. The final products are syrups, powders and solids. Bees' honey is also a valuable sweetening agent and this is discussed fully in another FAO Diversification booklet (see FAO Diversification booklet N.1 'Beekeeping and sustainable livelihoods').

There are palms throughout the tropics which are sources of sweetening agents; for example, *Nipa fruticans*, *Caryota urens*, and *Phoenix sylvestris*. The young flower (inflorescence) buds of palms such as palmyrah (*Borassus spp.*) and coconut are cut at the top,

the process being called 'tapping', to yield a sap. Sap fermentation can be prevented by adding agents such as bark from *Shorea spp.* or adding lime (calcium hydroxide). The sap is collected once or twice a day, and the sap is boiled to obtain sufficiently thick syrup which, on cooling, gives solid palm sugar.

Low-calorie sweeteners of high value include Thaumatin, a protein sourced from the arils of the seeds of *Thaumatococcus daniellii* and found in Ghana and other parts of Western Africa. It is approximately 3 000 times sweeter than sucrose, used also as a flavour-enhancer, and is an internationally authorized food additive of high value and demand.

■ *Other non-wood forest products*

Other NWFPs which need to be recognized for their importance and value as traded products include cork and cork products (*Quercus suber*); bamboo (*Arundinaria*, *Bambusa*, *Cephalostachyum*, *Chimonobambusa*, *Dendrocalamus*, *Dinochloa*, *Fargesia*, *Gigantochloa*, *Guadua*, *Melocanna*, *Ochlandra*, *Oxytenanthera*, *Phyllostachys*, *Schizostachyum*, *Thyrsostachys* etc); and rattan (*Calamus*, *Daemonorops and Korthalsia*). Products from these NWFPs include furniture, mats, flooring and roofing, reinforcing materials and decorative items.

Non-wood forest products assets for sustainable livelihoods

NWFPs help rural people to strengthen their livelihoods and, in doing so, become less vulnerable to poverty by enabling them to gain greater access to a range of assets, and supporting their capacity to build these assets into successful and sustainable livelihood activities. This section reviews the five main livelihood assets in the context of NWFP activities.

■ *Natural assets*

NWFP livelihoods are built upon, or powered by, the natural resource base from which products are harvested. This range of plant and animal biodiversity is often freely available and accessible to those living in even the most marginal of conditions. These natural assets are therefore important for people who need to restore their livelihoods or create



*FIGURE 5 Vietnamese women collecting litter (dried leaves, branches and twigs) of *Acacia auriculiformis* from a forest plantation for domestic use as fuel*

(Photo: © FAO/FO-6090/A. Ella)



FIGURE 6 Breadfruit (Artocarpus altilis) leaves and fruit
(Photo: © FAO/FO-6556/S. Braatz)

new ones. NWFP activities are often wholly combinable and compatible with other natural resource uses, including forestry, agriculture, and conservation.

As NWFPs are a large and diverse group of products they vary in their nature, source, production system and use. Some NWFP species are found only in intact primary forests and do not lend themselves to domestication of any sort. The

availability of NWFPs is in part determined by species, land tenure and secure access rights for local users, but most of all by the health of the ecosystem. Habitat destruction or degradation and land use change reduces the quality, diversity and availability of natural assets for livelihood security. It is therefore important that a natural resource base which supports livelihoods is well managed. To ensure this,

NWFP projects should incorporate a resource inventory (to assess the quantity, quality and productivity of the available resource), harvest monitoring (to assess how much is extracted and also left behind), and various resource management practices which are species specific, but may include manual cross pollination of trees, zoning of areas to spread out harvesting pressure or prevent harvesting at certain times, and establishment of a plant nursery through locally collected and germinated seeds.

The sustainability of NWFP activities based on wild harvest is linked to the ability of the natural resource base's ability to recover after harvesting, and product substitution through a combination of cultivation, domestication and/or enrichment planting. Resource use and management factors that can influence whether or not NWFP activities are successful are many and some of the principal factors include:

- rights or access to the resource, including subsidies for competing land uses,
- resource availability,
- variation of NWFP yield,
- species domestication,
- seasonal availability of the NWFP.

■ *Social assets*

These can be formal, informal and varied, but generally include help and support from families, friends, organizations and networks, and membership of groups, which collectively strengthen the individual. In addition, these contacts can help individuals, households, and communities to access wider societies, valuable information, and other resources. For many people living in and around forests, the critical deficit related to social capital is the uncertainty surrounding resource rights.

Social assets, such as networks and producer and marketing associations, can play an important role in the success of NWFP trade and in establishing enterprises. Local associations can provide marketing support, legal and policy advice, and credit; disseminate information; and organize collectors and traders to increase their market power. Access to networks through government, non-governmental organizations (NGOs) and private sector contacts, can help take advantage of regional, national and international contacts, find sources of training, identify new markets, and improve understanding of the industry.

Cultural, social and organizational issues are important in determining the direct and indirect benefits of

NWFP trade for different social groups and between men and women. This includes distribution within individual households or across the community, through income generation, employment generation, and preservation of traditional resource use. Ideally potential trade should have a positive or, at worst, a neutral impact, on the most vulnerable members of the community.

Social and organizational factors that can influence whether or not

trade is successful and provides for growth include:

- women's involvement in NWFP trade and their control over NWFP generated income,
- availability of NWFPs relative to labour availability,
- community or cultural norms that facilitate NWFP trade,
- organization of access to the NWFP resources,
- organization of the NWFP trade.



FIGURE 7 Artisan making flutes from bamboo (Bambusa guadua)

(Photo: © FAO/CFU000893/R. Faidutti)

■ *Human assets*

Many societies have considerable traditional knowledge and skills pertaining to the management, harvest, processing and use of NWFPs, and the location and identity of local or regional markets and traders. The best NWFP projects recognize these existing skills and build on them for greater income generation and to ensure enterprise sustainability. NWFP trade typically involves small-scale activities that require few skills and low capital investment, and as they combine well with traditional domestic roles, it makes them an accessible livelihood option for people with limited resources, particularly women.

The set of skills required however, depend very much on what scale, and at what level, activities are undertaken. As activities require more sophisticated processing and packaging, and trade moves from local to regional or national, so the skills, resources and entrepreneurial expertise needed, will increase.

It is therefore essential for NWFP projects to assess the capacity available for resource management, harvesting, processing, and product promotion and marketing, and facilitate the development of these where necessary, to ease the transition from subsistence into trade, or to expand existing trade.

The sustainability of an enterprise will increase by, among other things, reducing waste, maximizing returns and adding value. Information on human capacity can be used to evaluate existing levels of technical skills and experience in production, processing and marketing NWFPs, and can help identify potential interventions to support NWFP trade. Other skills include the ability to interpret market information and relate to the education levels of the people involved in trade.

Areas of expertise that may influence whether or not NWFP activities are successful include:

- knowledge of the impact of pests and diseases on the natural resource,
- impact of harvesting techniques on product quality,
- impact of processing methods on product quality,
- experience of different marketing strategies,
- understanding the links between variation in quality of the product or the raw material and its impact on price.

Finally, good health and strength are also important as NWFPs can be labour intensive. However the many different roles involved between

harvesting and selling a product are often distributed amongst household members, with men often engaged in harvesting and selling, and women, with the help of children, undertaking the processing.

■ *Physical assets*

Depending on the NWFP, successful enterprises require different amounts of production equipment and infrastructure. Buildings, roads and tools provide the security, mobility and capability that allow people to produce, transform, exchange and consume goods. Although people living in remote forested areas have easy access to forest resources, they often do not have access to markets because roads and transport facilities are lacking.

Many of the physical assets needed to undertake NWFP activities are not exclusive items, but rather assets which help to meet general livelihood needs. These include a transport and communication infrastructure, clean water, a source of energy, and buildings for shelter and storage. The more developed the infrastructure provisions are, the easier establishing and undertaking NWFP activities will be.

Information on the physical infrastructure including transport network of roads, rivers, railways, airports and their related costs, and

the availability of energy, as water, electricity, fuelwood, etc., are all needed to evaluate the potential to physically move a product down the marketing chain. In addition, physical communication networks are important in transmitting messages along the market chain, either in the form of prices for quality and quantity or descriptions of how a product should be presented or processed. It is important to consider a variety of factors at collection sites and the first points of trade within and outside the community, as these may be the key determinants of a successful marketing strategy.

Factors relating to infrastructure which can influence whether or not trade is successful include:

- access from the harvesting to the collection or production site, and market,
- the extent and reliability of a communications network,
- the perishability and storage requirements of a product,
- value per unit weight of the traded product – the bulkier and cheaper the product, the better the infrastructure needs to be in order to keep transport costs down.

In addition, to promote sustainability and reduce some of the risks facing NWFP projects, physical resources

such as equipment and tools should be sourced, maintained and repaired locally. This contributes to the livelihoods of others in the locality: harvesters, processors, local and regional traders, transporters, people with storage facilities, etc. The more sustainable NWFP projects will strive to utilize available assets and not depend on imported resources or equipment.

■ *Financial assets*

Financial assets such as cash, savings and access to credit or grants, are seldom essential to initiate NWFP activities, particularly at a subsistence or local level of trade. Indeed, NWFP activities generate often one of the only sources of instant cash in times of need. However, financial resources become more important as NWFP production systems move from wild harvest to cultivated in order to meet increasing market demand, as enterprises become more complex involving specialist processing or packaging to access more demanding markets, and as trade moves from local to regional or export. Different NWFPs also have different needs: more perishable products or higher value goods require more financial investment to secure specialist containers or packaging to facilitate their transport and marketing, and as such, are higher risk.

Credit may be necessary for NWFP associations to run collection centres, undertaking quality control and product grading, and to bulk up supply to a level where traders will purchase it. Access to credit can enable poor people to improve their NWFP-based income generation through increased volume of trading. Money may be needed to make long-term investments in forests, tree crops and equipment, but access to financing is often problematic for those who live in rural and remote areas. Where there are clear rights over forests and trees, these resources can serve as collateral for enterprise development.

Information on financial capacity can be used to determine the extent to which communities are integrated into the cash economy, have access to different forms of credit, receive land use subsidies, and have a need for investment capital. On a family or individual basis there are likely to be differences in access to credit and credit facilities, which need to be examined in terms of socio-economic and gender status.

Financial factors which may influence whether or not NWFP activities are successful include:

- Speed with which money and time invested in NWFP activities are returned.

- Compatibility between income generating activities with subsistence activities.
- Where necessary, the availability of investment capital and external financial support such as:
 - access to different forms of credit at reasonable interest rates,
 - willingness of entrepreneurs to invest in key components of the NWFP marketing chain.

■ *Summary*

There are many situations where NWFP activities can be especially valuable for livelihoods precisely because they are always accessible at some level: harvest for subsistence or trade requires access to natural assets, basic species knowledge, and some willing labour. NWFP trade can essentially be considered as a process of converting natural capital to financial capital, drawing on social, physical and human capital to do so.

Where is a good starting point for NWFP livelihoods?

It is helpful during both the planning and monitoring stages of any initiative or project to take stock of where you are, to identify what opportunities and challenges are present, and to decide where you want to get to. This process allows

you to think realistically about what strengths, skills and resources you have available to draw on, either as a household, community, or small enterprise.

It might be helpful to think of how ‘successful NWFP activities’ are defined. Success cannot be summarized by a single variable and perceptions will differ between people. It could be that transparency, equitability and social, economic, and ecological sustainability are attributes which are of fundamental importance. It may be that the most important outcome is a positive impact on poverty reduction and gender equality, or resource access, tenure and management. Success should not simply be considered at the product level, but in relation to the needs of people, and definitions of success may be dynamic and change in response to variations in socio-economic circumstances, market behaviour, etc.

Setting goals and objectives for NWFP activities

It is advisable to discuss these perceptions of success directly with communities and other stakeholders in NWFP activities, jointly identify objectives to work towards, and discuss the trade-offs that might be needed between them. A useful starting point is to identify the

livelihood aspects which are directly affected by NWFP involvement, and establish if the households, community, group, etc., wants to:

- improve trade of an existing NWFP or start on a new one;
- improve the lot of a few producers or wants everyone to benefit;
- achieve its objectives through community organization or on an individual basis.

From these a series of culturally appropriate indicators, based on community perceptions of success, can form the basis for a monitoring system that enables to ascertain the impact of NWFP activities. Examples of criteria used for defining success and the perception of stakeholders' view on success could be used to set the goals or objectives of an activity or project. These are schematically presented in Box 9.

BOX 9 Stakeholder definitions of successful outcomes resulting from NWFP activities

Household level

Economic

- The product generates income and can be sold quickly.
- Provides employment and generates enough money to create opportunities for the next generation.
- The activity helps meet the basic needs of the family.
- Labour (particularly of women) is rewarded.
- Provides cash-generating opportunities for women in marginalized rural communities.

Social

- The income generated makes an important contribution to food, education and health.
- The work involved is agreeable.
- Provides opportunities to build capacity (through new skills and networking).
- Provides recognition and improves self-esteem, by producing something that is valued.
- It is compatible with other livelihood activities.
- Empowers women and provides them with greater self-confidence and improved household status.



BOX 9 Stakeholder definitions of successful outcomes resulting from NWFP activities *(continued)*

Community level

Economic

- A high proportion of people within the community is involved and benefit directly.
- A large percentage of the final product price stays in the community.
- The activity provides employment and the community can add value to the product.
- The producer community controls the supply (and can negotiate the price).
- The product may have more than one buyer.
- There are price differentials for different qualities.
- The market chain is not vulnerable to risk.

Social

- There is equal access to opportunities for local producers, processors and traders.
- There is a fair distribution of profit margins along the market chain, in relation to the investment made.
- The activity does not cause internal conflict within the producer/processor community.
- It permits people to continue to stay in the community, rather than having to migrate.
- It strengthens local culture, preserves spiritual values, and improves community organization.
- The activity increases community prestige.

Environmental

- The resource base is productive and in good health.
- Trade rate is consistent with biological sustainability and helps conserve the forest resource.
- NWFP species lends itself to being domesticated.

Beyond community level, including national

Economic

- A market chain exists that connects producers to consumers.
- The market works well (i.e. prices at producer level reflect those at consumer level).
- There are price differentials for different product qualities.
- The market chain is not vulnerable to risk.
- Increases employment and supports economic growth in other sectors (harvesting, processing, marketing).
- It increases tax revenues to national governments and export earnings.
- It generates national prestige.

Social

- It improves the welfare of consumers.

Environmental

- It strengthens the conservation and sustainable development of natural resources.

Source: Marshall, E., Schreckenberg, K., & Newton, A. 2006. Commercialization of non-timber forest products in Mexico and Bolivia: factors influencing success. Research conclusions and policy recommendations for decision-makers, UNEP-WCMC, Cambridge.

Non-wood forest products value chains

As NWFPs are sourced, derived and extracted from different parts and types of plants and animals, they have varying and complex requirements for their resource management, harvesting, post-harvest treatments, processing and marketing. This section presents the generic stages which are common to most NWFPs activities which involve harvesting, production and trade. In other words, this illustrates the complete value chain of NWFPs.

■ *Production to consumption system*

All NWFP activities take place within a production-to-consumption system, which is sometimes referred to as a market, supply, or value chain. This booklet uses the terminology value chain, but in fact the chain most closely resembles a network in which many of the activities, such as storage and transport, are repeated several times by different people and at different locations before

BOX 10 Activities carried out along NWFP value chains

NWFP value chains comprise a number of different activities, and these may include:

- collection of the wild resource,
- management of the wild resource,
- cultivation or domestication of the resource,
- processing, ranging from cleaning or air-drying to more complex processing requiring specialist skills (e.g. drying, weaving, distilling), purchased inputs (e.g. ammonia to make rubber goods) or technologies (e.g. fermentation, solvent extraction),
- storage, including accumulating the raw product and/or the processed product at different points in the chain,
- transport, from the harvesting site to the home and along the value chain,
- marketing – identifying and developing good market niches,
- sale – often between several sets of people, or actors, working in the value chain.

There are also less obvious but nevertheless important activities, such as information gathering and capacity building.

Source: Marshall, E., Schreckenberg, K., & Newton, A. 2006. Commercialization of non-timber forest products in Mexico and Bolivia: factors influencing success. Research conclusions and policy recommendations for decision-makers, UNEP-WCMC, Cambridge.

the final product reaches the end-consumer. The value chain refers to the network of people and processes that take place to move a product from production to consumption (see Box 10).

NWFP value chains can involve large numbers of people and, only in the shortest chains, will the same

people harvest, process, and sell the product to the final consumer. It is common for different activities to be carried out by different individuals, groups or organizations, but the same people may be engaged in more than one activity (see Box 11). Understanding the specific role of each actor is important and, in an equitable

BOX 11 People involved in NWFP value chains

Private or community owners of the resource.

Individual collectors of the product.

Individual cultivators of the plant from which the product is derived.

Individual processors.

Informal groups of producers.

Community-based traders, who transport NWFPs from source to market, often accompanied by accumulation of the product and a degree of quality control.

Traders and companies situated outside the community, who may be responsible for starting up new value chains.

Community-owned enterprises.

Cooperatives, which may act to negotiate quantities, qualities and prices of product sold onto end consumers, or wholesalers, or more specialist processors, etc.

Associations, which may have many of the benefits of a cooperative, but possibly without any decision-making capacity.

Government departments, which may have a regulatory role in issuing and monitoring permits, providing grants, and promoting NWFPs.

NGOs, which may play a role in information provision and technical and business support.

Source: Marshall, E., Schreckenberg, K., & Newton, A. 2006. Commercialization of non-timber forest products in Mexico and Bolivia: factors influencing success. Research conclusions and policy recommendations for decision-makers, UNEP-WCMC, Cambridge.



FIGURE 8 Many species of epiphytic bromeliads and orchids are still harvested from the wild across Latin America, and are sold either to plant nurseries or in local markets for household plants

((Photo by E. Marshall))

chain, all actors should be reasonably compensated for their contribution, including labour, technical expertise, marketing skills, etc.

■ ***Production and harvesting system***

The production system loosely falls into wild harvest or production.

Wild harvest

The majority of NWFPs are wild harvested from unmanaged or managed forests, but a significant quantity is also sourced from either domesticated, cultivated or enriched sources. This production may be in response to various factors, including reduced natural stocks and concerns

over resource conservation, the need to boost supply to meet demand, improvements in quality and yields, and the wish to bring the resource closer to the harvesters.

Many NWFPs can be harvested without harming or killing individual trees or plants, but as baseline ecological data on many species is limited, and other components of sustainable management (such as harvesting techniques, sustainable yields and monitoring) remain poorly understood, it remains a challenge to assess whether the harvesting impact on the resource is sustainable.

Sustainable yields vary considerably between different species and are influenced by which parts of the organism are harvested, as well as the ecological and demographic characteristics of the species. In addition, security of tenure may influence harvesting intensity, with open access production systems resulting in no specific group assuming management responsibility for the resource. Many believe that increasing trade, at least initially, results in overexploitation of wild populations, leading to domestication or substitution of the product.



*FIGURE 9 Cardamom (Elettaria cardamomum) plant with fruits
(Photo by C. Chandrasekharan)*

Domestication

Cultivation is typically associated with private tenure, a higher value of NWFP trade, and higher household incomes. In its extensive stage, it often involves planting using seedlings collected from the forest. Intensive cultivation, which may or may not involve some genetic improvement, is often considered as a means of ensuring controlled production and economic success and can take place as monoculture, mixed cropping or an agroforestry system.

Oil palm, rubber, cashew, coffee, cocoa, cardamom, pepper, and mango are but a few of the many wild forest plants that have been largely replaced by production from cultivated sources, both under monoculture plantations and under agroforestry systems. It has been the experience that once a product achieves commercial importance, its supply from wild sources tends to be replaced by cultivated sources. Since tree domestication by breeding is a long and slow process, vegetative propagation and clonal selection that have been developed for tropical trees are particularly promising techniques. In several instances these techniques are already in practice.

Improved resource management

In addition to domestication and product substitution, a third possible

scenario resulting from resource depletion is improved and more sustainable resource management or landscape domestication. This is achieved by managing the natural resource and utilizing agroforestry systems, which occupy an intermediate position between natural forests and plantations and may reduce harvesting impacts on wild populations. Some NWFP species have long been domesticated and grown as pure agricultural crops or as mixed crops under agroforestry systems. It is important that species and their management and use are compatible with the farming system in biophysical, economic and social terms; however, there is extensive scope for crop combinations.

The range of agroforestry combinations are highly varied and interesting:

- rubber and rattan;
- timber trees, bamboo with tropical fruits and spices;
- popular with medicinal plants; mulberry along farm bunds;
- *Eucalyptus* spp.;
- cardamom:
 - *Ceiba pentandra*,
 - *Spondias dulcis*,
 - *Anona* spp.,
 - *Jatropha curcas*
 - *Erythrina* spp., as live hedges, etc.

Some NWFPs can be managed along with timber in an integrated silvicultural system, increasing overall productivity and environmental stability of forests. Examples include wild fruits, edible nuts, mushrooms, gums and latex, in combination with wood. These systems have received much less attention than they deserve.

Harvesting techniques

The quality of NWFPs often depends on how they are harvested, and techniques vary considerably between NWFPs:

- Edible nuts: collecting raw nuts, cleaning, drying and grading.
- Fibres: cutting relevant parts of the plant (leaves, branches), removing thorns and hard coating, boiling, beating and separating fibres, dressing or treating with chemicals, drying and bundling.
- Some latexes: making incision on the tree trunk, treating as necessary with acid for enhancing exudation, collecting of crude exudates, boiling it to a pasty consistency, cooling it into balls or blocks for packing and transport.
- Annatto seeds: collecting pods, drying, threshing, winnowing, screening and fumigation.

The stage and time of harvesting, the rate and temperature of drying, storage conditions and duration differ for different products, and influence the quantity and quality of yield. Likewise, harvesting regimes vary from a few weeks for tender shoots to longer periods for mature fruits or rhizomes.

The timing (season, time of the day) and technique of harvesting also vary for mature and tender (immature) parts. Some medicinal herbs are collected only at night. Roots are harvested by digging 15 to 20 cm away from the plant and by levering the root. Exudates are tapped into small containers and transferred to field containers. In many cases, the harvested products need to be field-dried for short periods in order to remove excess moisture, whereas others, such as flowers or fungi, are more perishable and need to be processed or transported without delay.

Harvesting of most NWFPs has to be linked to the processing schedule and optimum conditions have to be determined for each plant material. Efficient harvesting reduces waste and produces quality products, and can be achieved through good planning, implementation of effective systems, and provision of proper training.

■ *Post-harvest*

Apart from improving the harvesting methods and technology, it is necessary to ensure adequate post-harvest care, particularly when producing for distant markets. Post-harvest action before supplying the produce to the intermediate or final markets, can be broadly categorized into: treatment to avoid deterioration or contamination, storage, packaging and transport.

Losses

Reduced quantity and quality of product can happen during harvest, processing, transport and storage. Physical infrastructure becomes more important when harvested products are delicate or perishable compared to those that can withstand rough handling and long storage. Perishability of harvested produce is product specific and some amount of degradation is inevitable for most products. Different management regimes are required for different products.

Storage

The shelf-life and recommended storage conditions vary for different NWFPs, but dry, ventilated areas are important for most. Humid shady conditions are required for roots and tubers for evaporative cooling; sawdust and straw is used for some

fruits to avoid skin damage; some spices are spread over ventilated trays. Mixing different types of produce in the same storage room should be avoided as odours and gases given off can cause degradation. Storage often reduces quality; therefore the storage period should be reduced to the minimum.

Packaging

Packaging to avoid damage during transport is different from packaging used to grade products, improve presentation and shelf-appearance. Some NWFPs are sensitive to compression or impact damage and bruising, and require individual wrapping with appropriate mediums, such as bubble paper, straw, wooden or plastic trays.

■ *Transport*

Transport by open or containerized trucks, trains, boats and even planes can be expensive, and will vary according to whether the product is traded locally, nationally or internationally. Perishable goods require refrigerated (or temperature controlled) vessels. As many NWFP collectors are unable to afford specialist transport, this is where a mixture of processing to increase value per unit weight of product, and the role of market intermediaries can play a key role (as discussed in

the following section). Commercial enterprises have access to financial and specialist physical assets, and they are also in a better position to bulk up the required volumes (and grades) of product required for these high-risk systems.

■ *Processing*

Processing NWFPs to add value occurs at different scales, using a range of technology and equipment, from basic to very specialist. Likewise, production facilities range from units producing ornamental baskets and hats, oil presses, incense factories, and simple distilleries of essential oils, to highly sophisticated factories producing perfumes and medicinal preparations.

Most processing of NWFPs for local use are low economic return activities, undertaken in small family units, employing people with basic training who work on a part-time basis. Local processing can also play an important role in providing economic opportunities for women. However, their survivability can also be low, tending to be abandoned as wages rise and alternative opportunities grow.

While some products like fruits, fodder, thatch and edible nuts are ready for use in their raw form immediately after harvest, others go through local cottage level

processing, small or large scale industrial processing and a series of multi-stage downstream processing or refinements to meet the market needs (and specifications), thereby adding value to the product at each stage in the process (see Case Study 5).

At the subsistence level, most NWFPs are consumed immediately after harvest or with minimal processing. When trade begins,



*FIGURE 10 Detail of Parkia Biglobosa bean fibre, used in repairing a vessel made from calabash gourd (Lagenaria siceraria)
(Photo: © FAO/CFU000369/R. Faidutti)*

processing is often very basic or non-existent. Improved processing becomes important when the market expands and producers find themselves in competition with other producers or substitute products. Adding value locally by processing is often considered an important aim for NWFPP projects. Local bottling and labelling of the drink *mezcal* in Guerrero, in Mexico for example, increases its value from

US\$6 to US\$18/litre, yet most of this additional income is lost through taxes and other legal costs. For some products, processing is essential to increase the value per unit weight or volume of the products to overcome supply and transport constraints sufficiently. Processing can also be used to upgrade or improve products, which may enable access to new value chains.

CASE STUDY 5 Processing of medicinal plants in Nepal

In Nepal, the primary production (of essential oils and medicinal extracts) is estimated to use about ten plant species that are almost exclusively cultivated by farmers, with small quantities collected from the wild.

The Herb Production and Processing Company in Nepal originated from an activity of the Department of Medicinal Plants. In 1981, the company was created as an autonomous entity to take over the commercial activities related to the manufacturing of medicines, including cultivation, training, extension and development. The majority of production is used within the country by local pharmaceutical factories, the soap industry and manufacturing units of toothpaste and aftershave lotions, etc. However, some products are exported, such as lichen resinoid (from the tree moss *Parmelia tinctorum*), sugandha kokila oil (from the berries of *Cinnamomum cecidodaphne*), tagetes oil (from the overground flowering parts of *Tagetes glandulifera*), jatamansi oil (from the rhizomes of *Nardostachys jatamansi*) and palmarosa oil (from the whole plant of *Cymbopogon martinii*).

The company has a factory in the Kathmandu valley for the processing of medicinal extracts and high value essential oils. It also has processing and production units operating at the farm level, including four central processing units utilizing resources from surrounding areas and 21 subsidiary collection and processing units. Of these 21 units, 19 are owned by the company but are managed by farmers on contract, while two are entirely owned by farmers. Some 600 families are involved in the cultivation and processing business as satellite units of the company. In addition, there are also a few independent farmers' cooperatives engaged in growing and processing medicinal plants.

During the initial stages, the company received FAO's assistance for the cultivation of medicinal and aromatic plants and the United Nations Industrial Development Organization's (UNIDO) assistance for establishing a laboratory and quality control system.

Source: FAO.2007. Non-wood News No.3, Rome.

■ *Marketing and selling*

The variation in NWFPs, from raw fruits to aroma chemicals and phyto-pharmaceuticals, is reflected in a wide range of market types, from bulk to niche, informal and seasonal, to formal and regulated.

In any one locality, management unit, or even country, there may be only a limited number of NWFPs that have commercial or economic value, because of geographic, climatic, cultural, social and other factors. Market development has helped transform a number of subsistence products into traded goods.

Most NWFPs are traded regionally and in small quantities. However, certain NWFPs may be associated with national trade: gum arabic (*Acacia senegal*) is a strong revenue earner in Sudan, chicle gum (*Manilkara zapota*) in Mexico, annatto (*Bixa orellana*) in Peru, Brazil nut (*Bertholletia excelsa*) in Brazil, rattan and spices in Indonesia, Chestnut (*Castanea* spp.) in Mediterranean countries and ginseng (*Panax* sp.) in the Republic of Korea. While the estimated export market of primary NWFPs globally is about US\$50-60 billion, the NWFPs

support a downstream processed consumer trade worth over US\$600 billion.

With the move from subsistence to trade, many small-scale businesses and community-based producers and processors often encounter barriers to entry into trade along the value chain. At the producer level these may relate to obtaining access to the resource and the necessary skills for harvesting and processing the product for sale. Activities become more specialized further along the market chain, there are greater opportunities for single traders or small groups of traders to exert their market power and establish mechanisms to prevent others entering the business. These are often related to market power in the form of relative access to financial assets, strategic information, particular buyer arrangements, and market contacts. In addition, export-oriented marketing is particularly demanding, requiring detailed information about specific markets, product specifications and standards. A key challenge for people involved in NWFP activities is to identify these barriers and, where possible, identify ways to remove them.



FIGURE 11 Selling of all kinds of traditional oils, creams, ointments and medicines in a market in Brazil

(Photo: © FAO/ CFU000634/R. Faidutti)

In recent years an upsurge of green consumerism, coupled with a concern for environmental conservation and a preference for organic products, has provided a new impetus for NWFPs. This trend is evident in a variety of NWFP-based products. The food products produced using organic manures and bio-pesticides are also obtaining premium prices in world markets. Green marketing

is however both a competitive and heavily regulated industry, and requires both specialist knowledge and considerable financial investment to become certified with an organic label.

The following section details some strategies for analysing market needs and utilizing resources for successful trade and livelihoods.

Strategies for successful non-wood forest products trade

Various strategies and approaches to managing and trading NWFPs can help increase the level of success and degree of sustainability of the value chain, in turn making for a more secure livelihood option for poor producers, processors and traders.

■ *Managing natural assets for a sustainable supply of non-wood forest products*

Both natural abundance and reproductive rates are species dependent, and vary enormously across different NWFPs. The first



FIGURE 12 Women members of a Jipi Japa Weavers' Association in Bolivia benefit from the guaranteed purchase of their products, and also have access to additional social benefits (Photo by E. Marshall)

BOX 12 Can all species be domesticated?

The ability to domesticate a species and whether it is likely to succeed depends on a combination of the following factors:

Biological characteristics. Some species (*mycorrhizal fungi*) are not readily domesticated as they are difficult to propagate and establish. Other species, particularly trees, take a long time to become productive; for example incense and rubber do not produce until 15 years of age.

Tenure characteristics. Tenure can determine whether **1** a community improves its management of the wild resource, possibly supplementing it through enrichment planting or regulating practices that lead to overexploitation, or **2** a process of individual domestication on private plots takes place.

Opportunity cost of collection versus production. Domestication is generally more costly – in terms of land and capital resources – than collection. It is usually only worthwhile if the resource has become relatively difficult to collect or demand is sufficiently high. Where substitutes exist, domestication may not be worthwhile unless start-up costs are very low.

Traditional knowledge and management capacity. Traditional use can be advantageous both for natural resource management and domestication, and processing. Indigenous knowledge can provide essential information on various issues, including pest or disease management, harvesting techniques, propagation, etc. It is uncommon for people to begin to domesticate a species unless they have previously collected it in the wild.

Technical and organizational capacity. Technical know-how can be a constraint to domestication and this is an area in which external intervention and support can be particularly helpful. Where domestication takes place on communal land, the ability of the community to organize itself to manage the resource is also a critical area frequently requiring external support.

Source: Marshall, E., Schreckenberg, K., & Newton, A. 2006. Commercialization of non-timber forest products in Mexico and Bolivia: factors influencing success. Research conclusions and policy recommendations for decision-makers, UNEP-WCMC, Cambridge.

challenge facing many small-scale producers and processors is securing a consistent supply of a product that meets market demand in terms of both quantity and quality.

Resource management, through enrichment planting and cultivation, and domestication can help overcome some challenges relating to supply, and results in the accumulation of

larger quantities of a product (see Box 12). Further, improved organization of producers, processors and traders can result in the bulking up of sufficient volume of a product to meet market demand, as can new technologies for production and processing. As the efficiency of production improves along the value chain, it may facilitate access to new markets.

■ *Social assets and personal skills for successful non-wood forest products trade*

Organization

Good organization plays an important role in determining successful NWFP trade, for producers, processors and traders. Producer and processor organizations may exist within a community, or include several communities. Their activities may have a positive impact on:

- improving product quality (including grading), quantity (including consistent quantities), and diversification;
- more cost-effective transportation and overcoming large distances to the point of sale;
- accessing, and acting upon, market intelligence thereby increasing the ability to negotiate with other actors in the market chain;
- promoting the product, e.g. attendance at fairs.

A useful starting point for community-based organizations is to ensure a supply of adequate quantity and quality NWFPs to meet market requirements. This is particularly important where transport links are inadequate. Then, depending on the other challenges facing producer communities, organizations may

choose to engage in resource management and/or processing, improving relationships with traders, and even establishing a trading organization for NWFPs and other products.

The ability of a community to organize itself to take action in favour of NWFP trade is influenced by a number of factors including social cohesion (affected by the ethnic and religious composition of the community), the existence of community organizations dealing with non-NWFP issues, and the presence of charismatic individuals able to motivate people to action. Where the resource is predominantly harvested from private land, the organization is more likely to take the form of a cooperative, whereas collectively-owned resources lead to the development of communal organizations. Initial sources of external support can help establish or strengthen organization within communities.

Accessing market information

Good organization can help local producers, processors and traders access market information and develop social assets, including contacts with particular traders, knowledge of alternative sales points and information about market trends. Market information can be varied,

often relating to the quantity, quality and price characteristics of particular products in different markets, and is essential for entering new markets and maintaining market share.

However, information alone is not sufficient and producers also need to have the capacity to act upon it. Lack of information and contacts generally present less of a problem when product demand is high. Market information is often less of a barrier for short market chains, where largely ungraded and unprocessed produce are sold at a local or regional level, but often becomes more important for trade in processed or graded products selling at different prices. Where a lack of market knowledge and contacts are considered to be a significant barrier for small-scale producers to enter the market, it may mean there is insufficient demand to sell products easily or there is poor coordination between supply and demand.

NWFP value chains are very vulnerable to market concentration in the hands of one person or organization because of the distance to information sources and the generally low education levels of the collectors. Producers are located in remote areas and intermediaries are often the only source of information between producers and markets. Community organizations can enable

producers to offer sufficient produce to interest new traders or to negotiate an improved relationship with existing traders.

Culture and tradition

A community's indigenous knowledge can be very important in determining its interest in a product and its ability to manage natural problems, such as minimizing pest and disease damage to plants. Many NWFPs are considered particularly useful by poor people because they combine well with their traditional livelihood strategies, and a traditional link between producers and consumers can be an important factor in maintaining the value chain.

Relationships between harvesters and other value chain actors

There are variations on institutional organizations of NWFP harvesters, and these may not always have a positive impact on producer livelihoods. One common system is NWFP collection by local people under extractive rights, often with some form of patronage and financial help from the purchasing agent. Another is by the employment of casual or contract labour by those who have obtained collection rights on lease. Such NWFP collectors may be exploited by middlemen when they control resource or market access.

There may be a debt-linked relationship between the collectors and the middlemen: debt peonage or ‘aviamento’ exists in the Brazilian Amazon, where the middlemen or purchasing agents supply the market goods needed by the extractors of rubber and Brazil nuts at inflated prices on credit, to be repaid in-kind in extracted products. Under such conditions, the vast majority of collectors are poorly compensated for their inputs and have an extremely limited capacity to negotiate any aspects of trade.

Education, business skills and a willingness to take risks

Education is an important factor in determining people’s capacity to engage in income-generating activities, but its impact on successful NWFP trade is mixed, and at producer level it appears that informal education and learning on the job may be more important in ensuring a household’s success. Basic bookkeeping and numeracy skills are often required to trade successfully in NWFPs and, when lacking, may be addressed through the provision of training. Moreover, links between producers and enterprises further along the market chain can help counteract the generally low education levels amongst producers, and bring the necessary business

skills and entrepreneurship into the market chain.

Characteristics, such as self-confidence and audacity, together with a willingness and an ability to take risk appear to be useful qualities among producers and traders. Social networks can help manage risks. Activities ranging from being a good citizen and fulfilling social responsibilities in the community, to attending rituals and ceremonies, can all help establish reliable working relationships. An individual’s success may be influenced by the community in which they live, particularly when trade is organized as a community activity.

■ *Value chain analysis of the non-wood forest products trade*

As noted in the preceding section, various people and processes are involved in moving the NWFP along the value chain, from collection to the final use or consumption. These actors fulfil the different functions of processing, storage, packaging, marketing and selling of the product, and at each stage they add value to the product. Each actor plays a role in successful trade, and has different incentives and abilities to influence the value chain.

Value chain analysis is important in identifying these main actors or organizations and their specific

activities, the different routes for trading the NWFP (which currently exists and what potentially is available or could be developed), the skills, capacity and experience available for successfully engaging in trade, and in general, to assess how well the value chain is working (see Box 13).

Value chain analysis enables the constraints and opportunities for successful NWFP trade to be assessed and helps in making decisions about:

- the advantages and disadvantages of local value addition through processing;
- how organizing into community, producer or processor groups can help market access, improve the quality and quantity of supply and strengthen negotiating power with traders;
- opportunities for product innovation – at production, processing or trading level – to meet changing consumer demand;
- options for closer relationships with key traders to reduce vulnerability to sudden changes in the market;
- how to obtain more detailed information on the price, quality and quantity requirements of different markets.

Basic research and dialogue with communities provides information on resource use and management, NWFP products currently used or traded, actors involved in trade and their skills and capacity. It also assesses community contact with traders, their awareness of trade routes, the number of markets for existing products, and the potential for new ones.

An important part of value chain analysis is to understand the costs and benefits of trading, and this involves preparing an enterprise budget. An enterprise budget is an economic representation of an activity - be it the collection, processing or marketing of a NWFP - and while a relatively simple tool, if well used, it can be very powerful in identifying opportunities and constraints of NWFP activities. The information in an enterprise budget helps estimate profitability, assesses efficiency and productivity, equitability of the distribution of benefits along the chain, and identifies how well producers and processors meet current demand and respond to growing demand. Information generated from such analysis is useful in helping communities and projects plan activities to support NWFP trade and thereby support its success.

BOX 13 Information needed to undertake a NWFP value chain analysis

Identify the main actors or organizations at each stage in the value chain and their activities; for example, producers, processors and traders, entrepreneurs, small business, industry.

Assess who is doing what: i.e. whether NWFP producers just harvest and sell, or whether they are also able to add value through processing, or whether traders external to where the NWFP is produced assume all control over buying and selling, etc.

Evaluate the skills and experience of these actors (in trading other goods), whether there is a tradition of using the NWFP, and whether any traditional links exist between producers and consumers (directly, or through an organization).

Consider the dependence of the NWFP value chain on the trade of other products.

Calculate the proportion of the NWFP harvested from cultivated and non-cultivated sources.

Consider product related issues, including perishability, storage requirements, processing requirements, presence of substitutes, the need for brand identity, etc.

Evaluate the institutional context, perceived constraints and the cost of trading (transaction costs):

- Regulations governing collection, processing, marketing and sale.
- Trader characteristics (age, experience, education, skills, social networks).
- Community level transport infrastructure and communication networks.
- Access to market information and technical support (how to best harvest and process the NWFP with regards to environmental sustainability and market demand).

Assess the economic context of the NWFP value chain in terms of:

- Existing options for trade, trends in quality and quantity of goods traded, and equitable distribution of benefits along the value chain (i.e. reasonable compensation for contributions made, including labour, technical expertise, marketing skills, etc.).
- Market trends (local, national, international) including fluctuations in volume and value of product traded.

Investigate value chain governance, including analysing the role of entrepreneurs or organizations in:

- Providing financial capital (loans and credit) for collection, processing and trade.
- Facilitating NWFP trade through the provision of market information and contacts.

Identify the different routes to commercialize the NWFP, which could be what currently exists and what potentially is available or could be developed.

- Assess how well the value chain is working, and where there are any weak or vulnerable points, such as supply bottlenecks, poor quality processing, or monopolization by one trader or company.

Source: Marshall, E., Schreckenberg, K., & Newton, A. 2006. Commercialization of non-timber forest products in Mexico and Bolivia: factors influencing success. Research conclusions and policy recommendations for decision-makers, UNEP-WCMC, Cambridge.

This booklet does not cover the development of an enterprise budget, but the authors recommend that further information be sought from Marshall, Rushton & Schreckenberg (2006), Galpin *et al* (2000), and the complementary guidelines produced by FAO in conjunction with this booklet, these can be found on the FAO Diversification CD.

■ ***Supply or demand driven
NWFP value chains***

NWFP market chains can be supply driven - especially when the chain is short as in local or regional trade – with collectors and producers making the key decisions (see Box

14). Longer chains, particularly those trading products beyond national boundaries, are almost always demand driven, with actors closer to the consumer determining what is produced, where, when and how.

Many projects concerning conservation and development work with communities begin by taking a supply-driven approach, focusing on those NWFPs that can be produced in quantity in an environmentally sustainable manner. However, because they assume an unlimited market demand, these projects often overestimate the potential value of the NWFP. Subsequent attempts to

BOX 14 Important conditions for market chains to work

Supply driven

- Recognition of an incipient market, possibly located away from the community, for a product available in the community.
- Existence of an effective intermediary to establish links between the community and the market, particularly with respect to communicating consumer quality and quantity requirements to producers.
- Community organization enabling it to adapt production and/or processing to meet the demands of the new market while maintaining the resource.

Demand driven

- Good flow of information from the consumer back to the producer, often moderated by an intermediary and/or community organization.
- An understanding demand trends to enable producers to determine the appropriate levels of investment in production and processing.
- Effective communication ensures that producers are able to respond quickly to changes in demand, whether for a greater quantity or a different quality of product.

Source: Marshall, E., Schreckenberg, K., & Newton, A. 2006. Commercialization of non-timber forest products in Mexico and Bolivia: factors influencing success. Research conclusions and policy recommendations for decision-makers, UNEP-WCMC, Cambridge.

identify or create demand can end in failure because of the lack of understanding of market networks, contacts, sustained demand, etc. It is worth noting that, in many cases, rural NWFP trade chains are partly dependent on demand and trade in other products; for example, seasonal cocoa beans may be traded on the back of a consistent year-round trade in dried fish.

■ *Addressing poor physical access, transport and communication*

Often production areas are remote and poorly connected by low quality or seasonal roads, or river access. A lack of physical infrastructure can be problematic for small-scale producers to expand trade, because inefficient distribution systems result in high handling losses and transport expenses. Where transport infrastructure is poor, communication infrastructure becomes very important to enable producers to assess the range of prices available, and the quality and quantity demanded by consumers. Producers may need to rely on visiting or returning community traders for information on product prices, quality and quantity, and intermediaries who can withstand the relatively high transport costs.

Strategies which may be used to

overcome lack of access to a physical market include:

- processing and adding value locally, which can decrease the unit weight and make the product easier to transport. Additionally, it can make it more attractive to traders, who may only be interested in buying processed and less bulky goods;
- building effective working relationships and trust with intermediaries who may be able to provide a reliable transport network;
- being organized by working collectively and bulking up sufficient volumes of a product within the community to attract traders or make it worthwhile to select a trustworthy individual to transport and sell the product, and share the costs. This is easier if the product is not highly perishable. The principle is to work towards gaining economies of scale by increasing the output and sharing the costs;
- collectively acquiring a means of communication such as a telephone or arranging for someone to collect market information on a regular basis, to aid communication between producers, processors, and consumers.

■ *Sustainable non-wood forest products value chains*

The following list summarizes the main factors contributing to the sustainability of NWFP value chains and strengthening their contribution to livelihood security:

- **A good understanding of the NWFP and its management**, whether based on indigenous knowledge or acquired through external support, NWFP management enables a community to manage disease, plant reproduction, etc. In addition, improved resource management provides more consistent quantities and qualities of the products, enabling producers to attract traders more easily.
- **Effective communication and good relationships** between producers, consumers and intermediaries are important to ensure effective information flows to combat the danger of competition and substitution.
- **Identification of a reliable level of market demand.** Most NWFP market chains are demand

driven. Establishing a new NWFP market chain solely on the basis of existing supply is unlikely to succeed. The general level of market development in areas where NWFPs are promoted is the most important factor determining NWFP market potential.

- **Ability to innovate**, by introducing new products or processes as well as variations on existing products, is very important to the sustainability of market chains by enabling them to adapt to external change and maintain market share. Innovation may be a response to resource scarcity, leading to improved resource management or domestication; or a response to the threat of substitution, leading to improved processing, improved marketing and branding, or the development of new products. A specialized market niche and product quality helps to protect against substitution. Product innovation requires the ability to define a niche market and the organization and flexibility to act upon the new information. External actors, whether NGOs or entrepreneurs,

are particularly important in supporting innovation which is vital to maintain the viability and resilience of market chains in the face of competition.

- **Length of chain.** Resilience may be greatest for shorter chains, which are characteristically less demanding in terms of meeting the demands of sophisticated consumers than longer chains.
- **Low concentration of market power.** The ability to exert market power and the length of chain are correlated. Control of profits is exercised mainly by those who control market information and capital. Entrepreneurs play an important role in finding markets and supplying information, but however effective and socially minded they may be, the concentration of market power in a single individual is a risk for producers. Resilience of the market chain is greater where market power is less concentrated or relationships between dominant entrepreneurs and other actors in the chain are strong enough to avoid abuse

of market power. Concentration of power is most likely in market chains producing highly processed or perishable products for a sophisticated international market.

- **High levels of transparency,** both in setting prices and in defining the rules of trade, is often linked to the concentration of market power and good producer/processor organization may help overcome this. The price received by producers should reflect production costs, but these are often difficult to define because local wage rates can vary by season, and women often do not have a labour rate. It can be helpful to determine whether or not all producers are treated according to the same rules.
- **Organization** can help producers and processors to be more resilient to external shocks. Markets may also be made accessible by community organization. Organization is less important if demand is buoyant and suppliers can easily get the product to the sales point.

Support and services to help promote non-wood forest products

There are various types of support and services which are recognized as having the potential to improve conditions for small-scale producers, processors and traders, and make NWFP activities more secure and viable. Some of these interventions are low level and practical and could easily be delivered by extension organizations, undertaking project-based work with communities and small enterprises. Others are more overarching, including policy recommendations, and therefore rely on continued advocacy work by local, regional and national organizations. The two approaches are not mutually exclusive but will likely involve working with different people and over different time scales.

■ *Public policy*

Many of the basic prerequisites for supporting growth in the NWFP sector are public goods, such as roads, electricity, telecommunications, rural markets and other infrastructure. Public investments have an impact on people's capabilities to carry out an activity or business, whatever the sector. Investment in rural education,

health, transport and communication infrastructure, and skills development will have an important impact on individual capabilities. Such investment could support the entry of remote, marginalized producers into market chains, and, as people's capabilities increase, so does efficiency, while costs, risks and vulnerability are reduced.

The policy environment relating to NWFP activities is generally not overly enabling. There are few policies, laws or institutions designed specifically to promote the NWFP trade, nor incentives to support the sustainable management of natural forests, or the integration of small-scale producers and businesses into the national economy.

Possible public interventions to support successful NWFP activities at a policy level include:

- rural livelihood support policies which go beyond a narrow focus on one product or sector (e.g. agriculture, livestock or forestry) and support NWFP activities as part of a diversified livelihood strategy;

- stimulation of demand for some products through trade policies affecting competitive imports and protecting national and traditional production from imported substitutes;
- develop NWFP subsector-specific policies (special trade promotion, branding, food standards);
- incentives for lending institutions to invest in NWFP enterprises and make credit provision accessible to the rural poor and small-scale entrepreneurs;
- natural resource use and conservation policies.

■ *Direct assistance*

Support for NWFP activities at the community level can come from the state or municipal government, the private sector and, most likely, NGOs. Again, interventions that support NWFP activities will likely have much relevance and positive knock-on effects for other sectors. Often small changes can result in large outcomes, and direct assistance does not need to be about increasing financial assets, but rather encouraging the sustainable development of NWFP activities through capacity building, increasing technical skills, encouraging innovation and resourcefulness, and in doing so, guiding small-scale producers into the business world.

Successful interventions come about after considered discussion with NWFP stakeholders of their expectations, the realistic strengths and weaknesses of producer and processor groups, and value chain analysis. Any interventions to make NWFP trade more sustainable and equitable should consider the whole value chain. It is useful to remember that the importance of NWFPs may vary considerably between households, and it may be that interventions are best targeted at those functions carried out by the poor or those that constitute the key bottlenecks to the functioning of the whole value chain.

It is also important to recognise that NWFPs are associated activities and people will rarely want to invest all their efforts in one livelihood activity. Projects should be encouraged to go beyond a narrow focus on one product or product area, and look at strategies to trade different products: agricultural, forest, textile, etc. This is particularly important for many NWFPs which are often only available seasonally, and through encouraging diversification, it helps communities and households manage risk.

Examples of direct assistance to communities by governments, NGOs or the private sector include:

Encouraging community organization to reduce the vulnerability of individuals

- Promote organization at producer and processor levels to increase market power and reduce vulnerability to shocks. This also helps achieve a more consistent, better quality and larger volume of supply.
- Build on existing community organizations where present, e.g. a women's sewing group; church or other spiritual group, agricultural workers' group, etc.
- Facilitate links between actors in

the market chain, e.g. establish buyer/seller agreements or product demonstration days.

Community collaboration and working partnerships

- Company-community partnership can take various forms, such as collaboration between a company or organization which provides credit and technology, and farmers who have an agreement to grow and supply a product. Examples also include partnership arrangements between large

CASE STUDY 6 Innovative organizations

Minor Forest Produce Cooperative Federation, the Republic of India

Madhya Pradesh State Minor Forest Produce Cooperative Federation Limited is a state sponsored cooperative institution in India, solely dedicated to NWFPs. It was established as an autonomous body in 1984. It is the responsible and regulatory authority for resource management, harvesting, trading and development of NWFPs in Madhya Pradesh State. The prime product falling under the purview of the cooperative is *beedi* leaves (from the tree, *Diospyros melanoxylon*), used as a wrapper for making Indian cigarettes known as *beedis*.

The prime purpose of the cooperative is to: improve market power for collectors and ensure fair wages and benefits; assist in product marketing; empower and provide capacity for communities to manage their own affairs through appropriate institutional arrangements; and to ensure that the resources are sustainably managed and protected.

The cooperative comprises almost 60 district unions and has a total membership of 5 million gatherers. The extent of forests accessed by the cooperative collectors is over 8 million ha, and the Federation, at various levels in its structure, employs about 50 000 people. The Memorandum of Association specifies the rights and privileges of the members of the primary societies, their responsibilities in terms of managing the resource and delivering the produce at the collection centres, payment of wages and sharing of benefits equitably, and the functions and roles of the higher level bodies in the hierarchy.



(export-oriented) companies and a number of smaller/satellite units whereby the production of the smaller units is sold to the larger company, which in turn provides technical and financial assistance to the smaller units. These innovative initiatives bode well for NWFP development (see Case Study 6).

Support to women

- Focus activities close to home and help to overcome constraints imposed by women's traditional domestic roles.

Support to small businesses and entrepreneurs

- Develop basic business skills: administration; access to credit; cash flow analysis; negotiation with creditors, clients and suppliers; development of strategies to maintain quality and quantity, and expand markets.
- Encourage lending institutions to recognize the commercial potential of NWFP enterprises and to make credit provision accessible to the rural poor and small-scale entrepreneurs.

Market information

- Provide information on trends in product price, quantity and quality, understanding how market chains work and how to identify key actors, and training/support to enable a community to use this information to its advantage.

Resource management

- Technical and organizational know-how for sustainable resource management, harvesting, and processing. Where small-scale domestication takes place, focus on products with qualities that make them difficult to grow in large-scale plantations.
- Support to fulfil regulatory requirements, develop management plans and establish monitoring systems.

■ ***Extension support***

Extension organizations, especially NGOs, can play a very important role in supporting individual communities and NWFP value chains. Examples of activities that external organizations might undertake include:

CASE STUDY 6 Innovative organizations (continued)

Kalahan Foundation, Philippines

The Kalahan Education Foundation of northern Luzon in the Philippines, founded in 1973, was motivated by the legal rights given to them over their ancestral forest lands to protect their watersheds and to support a good livelihood. The community decided to generate the cash they required from forest produce, rather than converting the land to agriculture.

Accordingly, the Foundation selected two wild forest fruits to develop into three products: jelly, jam and butter. From that start, they have developed 15 recipes of preserves of wild and cultivated fruits. With the help of the Asian Institute of Management, the Foundation identified markets in Manila and ascertained preferences for packaging, container size and volume. Their product line now includes jellies made from *Saurauia subglabra* (Dagwey), *Embelia philippinensis* (Dikay), *Zingiber officinale* (Ginger), *Passiflora edulis* (Passion fruit), *Hibiscus sabdariffa* (Roselle), *Tamarindus spp.* (Tamarind) and *Sandoricum koetjape* (Santol). Today their products are sold in major shopping centres in Manila and are exported to the United States, Japan and Australia.

The Lao People's Democratic Republic Farmers' Products

The Lao People's Democratic Republic Farmers' Products is a fair trade enterprise which cooperates with the European Fair Trade Network, involving fair trade organizations of the France, Belgium, Germany and the Switzerland. The company collects a large number of farm products for processing and sale as quality produce in Europe. The company is owned by some 50 shareholders, some of whom are farmers. Some 15 000 farmers from several provinces are involved in supplying agricultural produce, through eight credit cooperatives. The raw products are collected from farmers on the basis of contracts, for which prices are fixed periodically. The company provides quality control and technology. The company has three factories producing jams, juices, slices, fruit pastes, fruit drinks etc.; and another producing wines.

Rural Art Enterprise, Bolivia

Rural Art is a private enterprise, established by a social entrepreneur with the aim of helping indigenous people by selling a range of handicrafts made by different underprivileged groups in the company's shops. It is affiliated to a NGO which provides technical support to a range of indigenous crafts people in Bolivia. Producers who sell to Rural Art, and work with the NGO, are afforded membership of an Association of Producers.

Although Rural Art dictates the range of artefacts that can be produced, it undertakes market assessment and consequently is in a good position to know what products can be easily sold in its shops. The Association of Producers offers its members training in product design, higher prices paid for goods, a social fund that pays health bills, and a rotating fund that occasionally provides financial capital for investments. In addition, affiliation with Rural Art helps weavers overcome market barriers. Through the organization, their products are able to reach otherwise inaccessible tourist markets that are demanding in terms of quality but pay higher prices.

Trade is direct and in the form of cash for all the communities, although Rural Art defers some of the payment for merchandise, placing it into a compulsory savings account. A proportion of each seller's profit is held back for health services and year-end gifts for the members. The association is particularly interested in supporting income generating activities for women.

Source: Marshall, E., Schreckenberg, K., & Newton, A. 2006. Commercialization of non-timber forest products in Mexico and Bolivia: factors influencing success. Research conclusions and policy recommendations for decision-makers, UNEP-WCMC, Cambridge.

Technical support to production and processing

- Technical and organizational support to improve harvesting techniques and establish more sustainable management of the natural resource, including development of management plans.
- Technical support for the domestication of the natural resource including collection of seed, establishment of nurseries and agroforestry plantations.
- Technical and marketing support to improve post-harvest processing techniques to respond to market demand for better quality products.

Business and marketing support

- Technical and business support for the establishment of a social enterprise and an alliance of processors.
- Marketing support to develop recognized product brands.
- Acting as a trade intermediary between community and buyers.

Funding support

- Support in obtaining funds from domestic and international sources for technical projects such as nurseries, storage facilities, etc., and to meet regulatory requirements.
- Direct provision of funds

or subsidies for processing equipment, exchange visits, and training.

- Provision of credit.

Information provision

- Participatory research on resource management, alternative technologies and marketing through which producers and community leaders could take control of the development of their activities.
- Provision of contacts with management experts, designers, national and international clients, and funders, both public and private.
- Accessing information from

private enterprises operating in the same sector, including useful information from failed businesses.

- Attending national and international trade fairs to obtain price and quality information.
- Accessing national and international literature.

Information dissemination and advocacy

- Broad dissemination of issues related to NWFP commercialization through workshops with other organizations and to the general public, e.g. by initiating a NWFP promotional fair.

Opportunities and challenges

■ *Opportunities for improved livelihoods*

Livelihoods activities based upon NWFP trade should be carefully planned, and preferably have an initial focus on products which producers, processors and traders are familiar with. Activities should start with: **1** agreeing the goals and objectives of NWFP trade; **2** analysing what skills and assets are available for NWFP trade activities; **3** identifying market opportunities for different products (and assessing experience in trading other products); and **4** undertaking a value chain analysis.

When this information is taken into account, the development of NWFP activities will have more potential to improve smallholder livelihoods. Various assets, including resource management skills, labour, and experience trading other products, will help equip rural families to succeed in NWFP activities. Given the combinability of such activities with other income earning and domestic opportunities, women in particular should be encouraged to participate. Through the acquisition of additional

skills, women can become involved in economic activities which can result in strengthening their position within the family and the local community. NWFP can provide a readily available and important source of income, which can supplement cash flow, and provide a safety net during critical times. In addition, involvement in NWFP activities can strengthen livelihood assets. This not only reduces vulnerability to such things like ill health, etc., but enhances an individual's or a community's capacity to act upon other economic opportunities.

Development of effective and successful NWFP trade activities require a high level of sound organization, either on an individual or collective basis. Through involvement in organized NWFP production, processing and trading, rural poor can empower themselves in other spheres, including in relation to authorities, service providers and other traders. Therefore improved levels of organization not only benefit those rural poor involved directly in NWFP activities, but also the whole community.

Diversification of activities in order to create rural non-farm employment opportunities based on NWFPs presents an opportunity for even the most marginalized members of the rural population. It can also contribute to slowing down the rural exodus to urban centres, or even emigration. Trade which contributes to the construction of improved infrastructure and the creation of links to urban centres, together with the establishment of a service and supply industry, lifts the standard of living for the rural populations as a whole.

■ *Challenges*

However, as noted in the early sections of this booklet, there are many examples of NWFP activities being unsuccessful both in terms of delivering development and conservation objectives. Success is underpinned by a complex set of

macro and micro level factors and processes, including technological, social, economic and political issues.

Some of the key constraints facing small-scale producers in the development of NWFP activities, include the following:

- Seasonal fluctuations in resource availability and quality.
- Low technical knowledge of resource management and processing and, particularly, a limited understanding of market requirements.
- Uncertain land and/or species tenure systems and weak local governance.
- Weak producer organizations with poor management and lack of political influence.
- Poor infrastructure which acts as a general constraint for economic

growth in rural areas, often resulting in seasonal failures.

- Unreliable and costly access to profitable urban markets which may increase reliance on market intermediaries who, if not socially minded, may result in a market monopoly scenario.
- Lack of reliable farm input supply and services, including financial services and credit.
- Lack of research and business development opportunities directed towards the NWFP sector.
- Lack of enabling policies to facilitate access into or encourage responsible small-scale or community based trade (including social and financial incentives, such as tax breaks or ecologically oriented subsidies).
- Lack of government supported advisory services which are often

poorly equipped and unreliable in providing simple but effective business development advice, and rarely exist for smallholders.

In conclusion, NWFP activities bring cash to rural areas, have the potential to boost rural economic growth in general and improve local purchasing power. This can result in increased demand for inputs and services and attracting additional business opportunities. Indeed, when opportunities are favourable, there are few alternative interventions that have the same impact on rural employment for men and women, providing a regular cash income for even the landless rural poor and, at the same time, an invaluable source of quality food, medicine, and other materials.

Selected further reading

Alexiades, M., & Shanley, P. (eds). 2004. *Productos Forestales, Medios de Subsistencia y Conservación: Estudios de Caso Sobre Sistemas de Manejo de Productos Forestales no Maderables Vol.3*, America Latina, CIFOR, Bogor.

Angelsen, A. & Wunder, S. 2003. *Exploring the forest poverty link: Key concepts, issues and research implications*, CIFOR Occasional Paper No. 40. CIFOR. Bogor .

Arnold, J.E.M. 2004. Foreword. In K. Kusters, & B. Belcher, (eds). *Forest Products, Livelihoods and Conservation: Case studies of non-timber forest product systems*. Volume 1 – Asia. CIFOR, Bogor.

Arnold J.E.M. 2002. Clarifying the links between forests and poverty reduction. *International Forestry Review* 4(3): 231-234.

Ashley, C., Start, D., & Slater, R. 2003. *Livelihood diversity and diversification. Understanding livelihoods in rural India: Diversity, change and exclusion*, Livelihood Guidance Policy Sheet 2.3. Overseas Development Institute, London.

Belcher, B. 2003. What isn't an NWFP? *International Forestry Review* 5 (2).

Belcher, B., Pérez.,R. & M Achdiawan, R. 2005. Global patterns and trends in the use and management of commercial NWFPs: Implications for livelihood and conservation, *World Development* Vol.33 (9). Pp 1435-1452.

Belcher, B., & Schreckenberg, K. 2007. Commercialisation of Non-timber Forest Products: A reality check. *Development Policy Review*, 25 (3): 355-377.

Chandrasekhan, C. 1996. *Cost, incentives and impediments for implementing sustainable forest management*, Paper presented at the UNDP/Denmark/South Africa Workshop on Financial Mechanisms and Sources of Finance for Sustainable Forestry. 4-7 June 1996. Pretoria, South Africa.

FAO. 2007. *Better Forestry, Less Poverty. A practitioner's guide*, Forestry paper 149. Rome

FAO. 2003. Forests and poverty alleviation, by W.D. Sunderlin, A. Angelsen & S. Wunder, *State of the World's Forests 2003*, Rome.

FAO. 2002. Non-wood forest products from temperate broad-leaved trees, by W. M. Ciesla, *Non-Wood Forest Products* No. 15, Rome.

FAO. 2000. *Community-based tree and forest product enterprises: Market Analysis and Development Manual*, Rome.

FAO. 1998. Linkages between domestication and commercialisation of Non-Timber Forest Products: implications for agroforestry. Domestication and commercialisation of non-timber forest products, by R.R.B. Leakey, & A.M.N. Izac, *Non-Wood Forest Products* No. 9, Rome.

FAO. 1997. Non-Wood Forest Products Outlook for Asia and the Pacific Towards 2010. *In, Asia-Pacific Forestry Sector Outlook Study*, by A.J. Mittelman, C.K. Lai, N. G. Michon E. Katz, Working Paper Series, No. 28, Rome.

FAO. 1995a. Report of the International Expert Consultation on Non-Wood Forest Products, Yogyakarta, Indonesia, 17-27 January 1995.

Non-Wood Forest Products, No.3, Rome.

FAO.1995b. Gums, Resins and Latexes of Plant Origin, by J.J.W. Coppen,

Non-Wood Forest Products No.6, Rome.

FAO. 1993a. More than wood – special options on multiple use of forests,

Forestry Topics Report No.4, Rome.

FAO. 1993b. *International Trade in Non-Wood Forest Products:*

An Overview, by M. Iqbal, FAO Working Paper, FO MISC/93/01, Rome.

FAO. 1990. The major significance of “Minor” forest products.

The local use and value of forests in West African humid forest zone,

Community Forestry Notes 6, Rome.

Galpin, M., Dorward, P. & Shepard, D. 2000. *Participatory Farm*

Management methods for agricultural research and extension:

a training manual, University of Reading, Reading.

Homma, A. K. O. 1992. The dynamics of extraction in Amazonia: a

historical perspective. In D.C. Nepstad, & S. Schwartzman, (eds), *Non-*

Timber Forest Products from Tropical Forests: Evaluation of a conservation

and development strategy. New York Botanical Garden, New York. Pp. 23-

32.

Kusters, K., & Belcher, B. 2004. *Forest products, livelihoods and*

conservation: case studies on NWFP systems, Vol.1, Asia. CIFOR, Bogor.

Lewington, A. 1990. *Plants for People*, Natural History Museum Publications. Royal Botanic Gardens, Kew.

Lopez, C. & Shanley, P. (eds).2004. *Riches of the Forest: food, spices, crafts and resins of Asia*, CIFOR. Bogor .

Marshall, E., Schreckenberg, K., & Newton, A. 2006. *Commercialization of non-timber forest products in Mexico and Bolivia: factors influencing success. Research conclusions and policy recommendations for decision-makers*, UNEP-WCMC, Cambridge.

Marshall, E., Rushton, J. & Schreckenberg, K., 2006. *Practical tools for researching successful NTFP commercialization: a methods manual*, UNEP-WCMC, Cambridge.

Marshall, E., Newton, A.C., & Schreckenberg, K.2003. Commercialising non-timber forest products: first steps in analysing the factors influencing success. *International Forestry Review* 5 (2): 128-137.

Masters, E.T., Yidana J.A. & Lovett P.N. 2004. Reinforcing sound management through trade: Shea tree products in Africa, *Unasylva* 219, Vol.55. 2004.

Neumann, R.P. & Hirsch, E. 2000. *Commercialisation of non-timber forest products: Review and analysis of research*. Centre for International Forestry Research, Bogor.

Newton, A. C., Marshall, E., Schreckenberg, K., Golicer, D., Te Velde, D. W., Edouard, F. & Arancibia, E. 2006. Use of a Bayesian Belief Network to Predict the Impacts of Commercializing Non-timber Forest Products on Livelihoods. *Ecology and Society* 11 (2): Article. 24.

Osemeobo, G. J. 2001. Wild Plants in everyday use: Conservation towards sustainable livelihoods in Nigeria. *Int. Journal of Sustainable Development and World Ecology* 8. 369-379.

Peters C.M. 1994. *Sustainable harvest of non-timber plant resources in Tropical moist forest: an ecological primer*, BSP, Washington DC.

Ruiz Pérez, M., Belcher, B., Achdiawan, R., Alexiades, M., Aubertin, C., Caballero, J., Campbell, B., Clement, C., Cunningham, T., Fantini, A., de Foresta, H., García Fernández, C., Gautam, K.H., Hersch Martínez, P., de Jong, W., Kusters, K., Kutty, M.G., López, C., Fu, M., Martínez Alfaro, M.A., Nair, T.R., Ndoye, O., Ocampo, R., Rai, N., Ricker, M., Schreckenber, K., Shackleton, S., Shanley, P., Sunderland, T. & Youn, Y. 2004. Markets drive the specialization strategies of forest peoples, *Ecology and Society* 9(2):4.

Scherr, S. J., White, T. A. & Kaimowitz, D. 2003. *A new agenda for forest conservation and poverty reduction: Making markets work for low-income producer*, Forest Trends Washington, DC, and CIFOR, Bogor.

Shanley, P., Pierce, A.R., Laird, S. & Guillen, A. (eds) 2002. Tapping the Green Market: Certification and management of non-timber forest products. *People and Plants Conservation Series*, Earthscan Publications Limited.

Sheil, D. & Wunder, S. 2002. The value of tropical forests to local communities: complications, caveats and cautions. *Conservation Ecology* 6(2): 9.

Sunderland, T.C.H & Ndoye, O. (eds). 2004. *Forest Products, Livelihoods and Conservation: Case Studies of Non-Timber Forest Product Systems*. Vol.2. Africa. CIFOR, Bogor.

Te Velde, D. W., Rushton, J., Schreckenberg, K., Marshall, E., Edouard, F., Newton, A. & Arancibia, E. 2006. Entrepreneurship in Value Chains of Non-timber Forest Products. *Forest Policy and Economics* 8 (7): 725-41.

UN-CSD. 1996. *Report of the Secretary General to the CSD ad hoc Intergovernmental Panel on Forests at its Second Session in Geneva*, 11-12 March 1996. E/CN.17/IPF/1996/5, 20 February 1996.

Wunder S. 2001. Poverty alleviation and tropical forests – what scope for synergies? *World Development* 29(11): 1817-1833.

Wollenberg, E. & Ingles, A. (eds) 1998. *Incomes from the Forest. Methods for the development and conservation of forest products for local communities.*, CIFOR, IUCN, Bogor.

Sources of further information and support

Food and Agriculture Organization of the United Nations (FAO)

An important source of further information on Non-Wood Forest Products and on validated production and trade data can be found in the vast range of publications by the FAO Non-Wood Forest Products Programme at:

<http://www.fao.org/forestry/site/nwfp/en>

under Publications: www.fao.org/forestry/site/13468/en.

In addition, extensive information on market analysis and development can be obtained from: <http://www.fao.org/forestry/site/43055/en/>

NWFPs from Temperate Broad-Leaved Trees is a source of extensive information, <http://www.fao.org/DOCREP/005/y4351e/Y4351e00.HTM>

Centre for International Forestry Research (CIFOR)

CIFOR's POLEX list server is an electronic monthly bulletin communicating articles and research outputs on a wide range of forestry, poverty, trade, governance and resource management and conservation issues. Subscribe by emailing k.kustiyawati@cgiar.org

<http://www.cgiar.org/cifor>

Rainforest Alliance

www.rainforest-alliance.org

People and Plants Initiative

The People and Plants Initiative (created by WWF International, UNESCO and the Royal Botanic Gardens Kew) carries out applied research projects, community workshops, exchanges and training courses with young ethnobotanists from developing countries who are interested in conservation and community development.

<http://www.rbgekew.org.uk/peopleplants>

International Centre for Research in Agroforestry (World Agroforestry Centre) (ICRAF)

<http://www.worldagroforestrycentre.org/>

Centro Agronomico Tropical de Investigacion y Ensenanza (CATIE)

<http://www.catie.ac.cr>

Centro International de Agricultura Tropical (CIAT)

<http://www.ciat.cgiar.org/>

Biodiversity International (formerly IPGRI)

www.biodiversityinternational.org

International Food Policy Research Institute

<http://www.ifpri.org/>

The European Tropical Forest Research Network (ETFRN)

www.etfrn.org/etfrn/topics/NWFP/index.html

Regional Community Forestry Training Centre for Asia and the Pacific (RECOFT)

<http://www.recoftc.org/site/>

The World Conservation Union (IUCN)

<http://www.iucn.org>

World Wildlife Fund for Nature (WWF)

<http://www.wwf.org>

International Network for Bamboo and Rattan (INBAR)

<http://www.idrc.org.sg/inbar>

Tropenbos Foundation

<http://www.tropenbos.nl>

AgroForestry Net Inc

<http://www.agroforestry.net>

<http://www.overstory.org>

Notes

THE AIM OF THIS DIVERSIFICATION BOOKLET IS TO RAISE AWARENESS - AMONG PEOPLE AND ORGANIZATIONS THAT PROVIDE ADVISORY, business and technical support services to resource poor small-scale farmers and local communities in low and middle income countries - about rural livelihood opportunities resulting from NWFP activities. It provides an insight into the sustainable and complementary contribution that NWFPs can make to livelihoods through subsistence and trade, and provides advice as to how the right support and services can help promote NWFPs as a successful livelihood option.

