NON-WOOD FOREST PRODUCTS 7

Non-wood forest products for rural income and sustainable forestry

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Foreword

An important recommendation of the International Expert Consultation on Non-wood Forest Products held in Yogyakarta, Indonesia, from 17 to 27 January 1995, was that FAO should develop and provide comprehensive guidelines for sustainable management and utilisation of these products. Preparation of such guidelines is a major and multidisciplinary task which needs to be approached in phases. It involves evaluation of existing knowledge and practices, assessment for their strengths and weaknesses, analysis of linkages of different aspects and influence of technological and institutional factors, development and testing of guidelines for component aspects, and consolidating of them into a compatible set of practical guidelines covering the whole field of NWFPs. This would need time.

Development activities on NWFPs cannot afford to be delayed till the whole process is completed. In fact, it is possible to compare the merits and demerits of selected cases and to develop general principles and approaches for the sustainable management and utilization of NWFPs, and to make them available for reference and use. The present publication: Promoting Non-wood Forest Products for Rural Income and Sustainable Forestry aims to do that. It is basically targeted at planners, practitioners and extension agents and its effects are expected to be filtered down to the benefit of local communities. It is also expected that this would encourage similar publications in local languages.

On our part, it is our intention to follow this publication on principles and approaches with detailed guidelines on specific aspects, and eventually to prepare consolidated and comprehensive guidelines for planning and developing NWFPs. Work is already under way on guidelines for management of non-wood forest resources and marketing of non-wood products.

Material for this publication was assembled and an initial draft prepared by David Taylor. A number of experts working in the field of NWFPs, both within and outside FAO, provided valuable inputs. The final version benefited from the detailed comments provided by Blaak, Braatz, Chipeta, Hoskins, Lintu, Souvannavong and Vantomme. The editing and organising of illustrations were done by Laura Russo. Elisa Rubini did the formatting and proofing. All activities leading to this publication were guided and coordinated by Cherukat Chandrasekharan, Chief, Non-Wood Products and Energy Branch. My thanks are due to all of them.

It is my pleasure and privilege to release this publication with the hope that it will be found useful by readers.

Karl-Hermann Schmincke
Director
Forest Products Division

Acronyms

ATI	Appropriate Technology International
CAMPFIRE	Communal Areas Management Programme for Indigenous Resources
CATIE	Centro Agronómico de Investigación y Enseñanza Tropical
CIGAR	Consultative Group on International Agricultural Research
CIFOR	Centre for International Forestry Research
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CONACNIE	Coordination of Indian Nationalities in Ecuador
CPC	Provisional Central Product Classification
FAO	Food and Agriculture Organization of the United Nations
F/FRED	Forestry/Fuelwood Research and Development
GATT	General Agreement on Trade and Tariff
GEF	Global Environmental Facility
HS	Harmonized Commodity Description and Coding System
ICRAF	International Centre for Agroforestry Research
IDRC	International Development Research Centre of Canada
IFPRI	International Food Policy Research Institute
IITA	International Institute for Tropical Agriculture
IPR	Intellectual Property Rights
ISIC	International Standard Industrial Classification of all Economic Activities
ISO	International Standards Organization
IUCN	World Conservation Union
NGO	Non-Governmental Organization
NWFPs	Non-Wood Forest Products
SITC	Standard International Trade Classification
TRAFFIC	Trade Record Analysis of Flora and Fauna in Commerce, a monitoring body of IUCN
TRIFED	Tribal Cooperative Marketing Development Federation of India
TRIPs	Agreement on Trade-Related Intellectual Property Rights
UNAC	Upland NGO Assistance Committee (Philippines)

UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
WHO	World Health Organization
WRI	World Resources Institute
WTO	World Trade Organization
WWF	World Wide Fund for Nature

Summary

This volume outlines the approaches for assessing the potential of NWFP activities in a particular area. It is mainly addressed to policy-makers, researchers, local extension workers, NGOs and others professionals to identify and pursue possibilities for better management of NWFPs. It is hoped that through better assistance and support, community-level producers and processors will be able to realize the sustainable potential of NWFP activities. An outline of the kind of technical, institutional and policy support required to promote NWFP activities, is also provided.

Chapters 2 and 3 describe methods of assessing the forest resource as a source of non-wood products, and its relationship to local communities. This assessment of the resource, its sustainable yield and current demands on it form the most basic steps in determining what level of forest use is sustainable in the long term. Yet this crucial information is often overlooked.

Chapter 4 outlines opportunities for improved and integrated forest management incorporating NWFPs, and discusses recent trends in wildlife management, research for medicines, and ecotourism.

Chapters 5-7 focus on enhancing local livelihood through local enterprises based on forest resources. In many cases, capturing an appropriate share of a product's added value closer to the source represents a way to ensure that the resource is valued properly in management decisions, and to distribute its added value more equitably through the market chain. Chapter 5 describes how to identify promising commercial opportunities, how to assess alternatives and what skills are needed for ensuring success of the ventures. Chapter 6 goes into more detail on specific types of NWFP processing enterprises. Chapter 7 outlines the crucial but often neglected areas of marketing and trade.

Chapter 8 addresses the issue of organizing local groups for harvesting, processing and marketing. Collective/participatory organization is an important factor in the success of local enterprises, both economically and environmentally.

Chapters 9 and 10, finally, describe the technical and institutional requirements for improved management of NWFPs.

The principles and approaches described here represent an early step on the path toward better understanding the role and use of NWFPs. Many gaps remain in our knowledge - on harvesting technologies, assessment of resources and harvest levels, as well as on the nature of non-wood forest resources themselves - that must be addressed in further research involving communities. For example, techniques for assessing forest herbs and vines lag behind those for assessing tree-based products; that gap is unavoidably reflected here. Likewise, sub-fields for which few sound guidelines exist, such as ecotourism, are suggested here for further study. The sections "For further reading" after each chapter provide sources of more information.

Appendix 1 lists contact addresses to promote networking among those working in the broad and varied field of NWFPs.

Correcting the neglect of this sector and integrating non-wood forest resources into overall development requires involvement by people from a wide range of backgrounds. This volume attempts to provide a common basis for this collaborative action.

As for Uncle Sanya, ... he was off into the woods on one pretext or the other ... Mushrooms and snails were the real goals, with the gathering of firewood used as the dutiful excuse.

> - Wolé Soyinka (Nigeria), *Aké: the years of childhood*

A large, red-leafed tree in a field caught Maan's attention. "What's that tree?" he asked

> ... "It looks a bit like a mango with its red leaves, but it isn't a mango."
>
> "That's a mahua[1/]," said the farmer ... He looked amused, as if he'd had to explain what a cat was.
>
> [1/] *Madhuca indica.*
>
> "Very handsome tree," said Maan.
> "Oh yes. Useful too," said the farmer...
>
> "The flowers ... are very light and fragrant ... Ferment them, and they'll give you a liquor ... Cook them, and they'll act as a vegetable. Boil them with milk, and they'll make the milk red and the person who drinks it strong. Mix them with the flour you use to make your rotis with in winter, and you won't feel the cold ... Feed them to your cattle,"

added the farmer. "It'll double their energy." ...

"What a wonderful tree!" said Maan, delighted ... The countryside, which so far had looked entirely monotonous to him, became interesting.

- Vickram Seth (India), *A Suitable Boy*

1. Introduction

In recent years forests have been increasingly recognized as rich reservoirs of many valuable biological resources, not just timber. The term non-wood forest product (NWFP) emerged as an umbrella term to recognize the products derived from these various forest resources as a group.

This volume originates from an International Expert Consultation on Non-wood Forest Products, cosponsored by the FAO Forestry Department and the Indonesian government in January 1995. It represents a first step taken by FAO to respond to that meeting's recommendation that FAO prepare guidelines for planners and entrepreneurs to use in developing NWFPs activities.

The definition of *non-wood forest products* used here is the one which was adopted at that meeting in Indonesia (FAO, 1995):

> NWFPs consist of goods of biological origin other than wood, as well as services derived from forests and allied land uses.

This definition is intended to encourage better accounting of NWFPs, of both plant and animal origin, as a group and their contribution to the national economic indexes which policy-makers use to decide development priorities and policy. As such, it admittedly does not cover many important cultural and environmental forest functions. The definition will no doubt continue to be refined as the field evolves.

Why are non-wood forest products important?

For most of recorded history, people have valued forests not for wood, but for other products. Ancient writings from China, Egypt and India record a wide variety of uses for forest plants, and compilations of botanical knowledge from Western Asia were prized by the ancient Greeks (Wickens, 1990). Whereas wood products have become major international commodities in modern times, NWFPs rank among the oldest traded commodities (Iqbal, 1993). Ancient Egyptians imported gum arabic from Sudan for use in paints and the mummification process. International trade in sandalwood oil dates back to the twelfth century A.D.

Through the experience of forest communities, forestry professionals have recently rediscovered the great importance of NWFPs (ranging from food, fruits and fibres, dye stuffs, flavours and medicines) for meeting people's needs. In recent years, a growing body of scientific research has suggested that, given certain basic conditions, NWFPs can help communities to meet their needs without destroying the forest resource.

The most commonly cited instances come from Latin America, where the term extractive reserves describes a system where forest is set aside for low-impact use by traditional communities in the area. No single model can suit all conditions, however.

Why have modern science and governments overlooked the importance of this non-wood forest wealth for so long? The answer is threefold. First, most of these products are used mainly for rural subsistence or local markets. They often go unrecorded in official statistics, which focus on nationally traded goods (Chandrasekharan, 1994). Second, because modern government administration has divided these products among forestry, agriculture and horticulture, statistics do not recognize even nationally and internationally important non-wood forest commodities as originating from the forest. The divisions between, and the lack of clear definition of, agriculture and forestry have created a large blind spot in the way we reckon our dependence on forests. Finally, modern forestry has favoured timber and large-scale enterprises, and has generally regarded non-wood products as incidental. However, studies show that forests produce many more types of products than wood products particularly in some tropical forests. (Toledo *et al*., 1992). Small-scale forest-based enterprises in Zimbabwe, which mostly are based on NWFPs, employed 237,000 people in 1991, compared to 16,000 employed in conventional forestry and forest industries for the same year (Arnold *et al*., 1994).

Who uses non-wood forest products?

For most of the world's rural households, NWFPs provide essential food and nutrition, medicine, fodder, fuel, thatch and construction materials, mulch and non-farm income. These products are particularly important in relieving the "hunger periods" in the agricultural cycle, and in smoothing out other seasonal fluctuations. Dealing in NWFPs can provide employment during slack periods of the agricultural cycle, and provide a buffer against risk and household emergencies.

Poor households, in particular, depend on these products for their livelihood because they usually have more access to the forest than to other resources.

For the same reason - greater dependence on open-access forests, for lack of other options women usually rely more than men on NWFPs for household use and income. In many places, women are responsible for the household activities that involve forest-based foods and medicine, as well as fuelwood. In this respect NWFPs are particularly important to women, addressing their needs for food security and nutrition.

In local, urban, national and international markets, forest foods and medicines contribute substantially to national economic growth.

NWFPs are therefore important to three main groups:

- *rural populations* (the largest group) who have traditionally used these items for livelihood and social and cultural purposes;

- *urban consumers* (a smaller group, but growing faster), who purchase these items;

- *traders*, and product processors, whose numbers in the NWFP sector increase as urban markets for these products grow.

A basis for sustainable forest management

NWFPs, by complementing wood-based management, offer a basis for managing forests in a more sustainable way. In fragile ecosystems, NWFP activities hold prospects for integrated forms of development that yield higher rural incomes and conserve biodiversity while not competing with agriculture (Sharma, 1995). An important concept in realizing these prospects is *adding value locally*, usually through some form of rural processing, to ensure that a fair portion of a product's market value accrues to the people who manage the forest resource.

Agenda 21, approved by the UN Conference on Environment and Development (1992) which provides a global plan for action, has recognized the role of NWFPs in sustainable forest management. UNCED highlighted the importance, already recognized by many governments, of informed participation by local communities in all aspects of forest management and planning.

Local participation is important for sustainable management of NWFPs for several reasons: (1) to recognize the full extent of local demands on the forest resource; (2) to fully consider the local knowledge of the resource that has developed over time; (3) to engage nearby communities as stake holders in managing the resource, ensuring their commitment to long-term management goals; (4) to engage the energies of local people in their own economic change, which can include decisions on social and cultural priorities that outsiders do not realize.

Involving communities in managing local resources is therefore not simply an equity issue; it is an issue of wise resource use. Failure to do so has broad consequences. Witness the case of Australia, which although home to more than 20,000 species of native flora, until quite recently produced no new food crop except macadamia nuts (*Macadamia* species), which were domesticated elsewhere. This singular failure is probably because European settlers refused to accept that the indigenous people knew any plants worth cultivating (Wickens, 1990). For more in-depth information on community participation, see FAO (1990).

A range of options

This publication aims to provide some principles and to outline approaches for action by producers of NWFPs and by the agencies that support them - government agencies, nongovernmental organizations (NGOs) and

research organizations.

It is important to recognize that it is not a choice of either timber **or** non-wood products. Traditional management systems of forest peoples and modern scientific experience with multiple-use management suggest that, with careful planning and monitoring, forests can yield both timber and non-wood harvests on a sustainable basis.

This publication builds on the premise that forests offer a variety of production activities for improving local incomes that do not jeopardize the forest ecosystem. Forest management for NWFPs can provide a continuing source of livelihood **and** help to maintain the forest resource for future generations. The focus here is on activities that produce items for subsistence and market use. It also considers several activities, such as *ecotourism* (environmentally and culturally sound tourism based on local scenic attractions) and environmental data gathering (also called "biodiversity prospecting"), which involve no harvest, just observation.

This volume points to the varied cultural roles of forests and their non-wood products, but a full assessment of these is beyond its scope. Rather, it concentrates on the decisions by which people choose to manage non-wood forest resources for livelihood purposes.

References

Arnold, J.E.M., Liedholm, C., Mead, D., and Townson, I.M. 1994. Structure and growth of small enterprises using forest products in southern and eastern Africa. OFI Occasional Paper No 47. Oxford Forestry Institute, Oxford.

Chandrasekharan, C. 1994. Non-wood forest products: a global view of potentials and challenges. Paper for the International Seminar on Management of Minor Forest Products, Dehra-Dun, India, 13-15 November, 1994. FAO, Rome.

FAO. 1990. *The community's toolbox: the idea, methods and tools for participatory assessment, monitoring and evaluation in community forestry.* Community Forestry Manual No. 2. FAO, Rome (English, French and Spanish versions).

FAO. 1995. *Report of the Expert consultation on Non-Wood Forest Products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Iqbal, M. 1993. *International trade in non-wood forest products: an overview.* FAO Forest Products Working Paper Misc/93/11. FAO, Rome.

Sharma, P. 1995. Non-wood forest products and integrated mountain development: observations from Nepal. In *Report of the Expert consultation on Non-Wood Forest Products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Toledo, V.M., Batis, A.I., Becerra, R., Martínez, E., and Ramos, C.H. 1992. Products from the tropical rain forests of Mexico: an ethnoecological approach. In Plotkin, M., and Famolare, L., eds., *Sustainable harvest and marketing of rain forest products.* Conservation International, Washington, D.C.

Wickens, G.E. 1990. What is economic botany? *Economic botany* 44:12-28.

2. Resource assessment and development

A first step in developing any viable forest enterprise is understanding the capacity of the forest resource. It is impossible to manage the resource wisely or profitably without knowing about its natural growth and production, and the human environment that affects it.

Many people assume that harvests of NWFPs have less impact on a forest than logging. However, this assumption is unfounded. Forest ecosystems have such complex interrelationships that harvests of some non-wood resources can affect plant (and wildlife) populations as negatively as logging. Without a sound knowledge of the resource and regular monitoring, harvests of certain non-wood resources can have a disastrous impact that is not noticed until it is too late to remedy.

For example, overharvesting of fruits or seeds of a tree species can drastically reduce regeneration to the point of local extinction without any visible effect. Large individual trees may remain and the system might appear undisturbed. Only years or decades later, when the large trees die and no individuals replace them, will the damage become evident (Peters, 1994).

This chapter describes the steps required to gain an understanding of an area's non-wood resource. Based on this, a community or enterprise can begin to prepare a plan for management. Chapter 3 describes the equally necessary step of gauging the existing nearby communities' dependence on the resource.

Determining tenure and access

Even before producers can assess the biological components of an ecosystem for management, they must understand the legal situation of the land in question. Legal title and the rights of harvest determine the scope of management options, the management objectives and the possibilities for resource inventory.

The first questions that must be answered in a resource inventory include: Who owns the resource? Who has the right to use the resource? What restrictions (e.g. licensing) apply to management?

Property rights can be divided into four categories:

- *private property* situations are fairly straightforward, although resolving conflicting land-use claims can be complex (see Chapter 8);
- *common property* resources have clearly recognized users who, although they may not own the resource, have recognized access rights and the ability to limit access to others (ATI, 1995). Many traditional communal systems for land use are common property systems;
- *open-access* resources, accessible to all, have no recognized users and are not easily controlled;
- *state or public property* often requires users to negotiate rights or obtain authorization for secure rights or access.

Successful extractive activities using NWFPs often have the features of common property management. Common property resources may often be mistaken for open-access resources, but common property resources are more widespread. If a resource is open-access, the resource manager(s) should seek to change this, because it is very difficult to manage an open-access resource sustainably and equitably (ATI,

1995).

The resource inventory

Once tenure is clarified, a resource inventory should ask certain key questions: What economic plant and animals species occur in the area? What are their ecological and biological characteristics? What products do they produce? How abundant are they and what is their capacity for regeneration? During which seasons are they harvestable? What local social and cultural values are associated with different parts of the forest? (Reds, 1995)

In tropical forests, one consequence of species diversity is extremely low densities for individuals of any given species. In inventories at two sites (one in Amazonia and one in Southeast Asia), less than 10 percent of the species had more than four trees per ha. Such low density causes difficulties in accurate inventory as well as in harvest management. Of course, there are many exceptions to this generalization. *Oligarchic forests* (in which one species predominates) exist in almost every region of the wet tropics and offer great promise for relatively easy sustainable harvests (Peters, 1994).

Advance planning

Planning helps to make inventories, which are expensive and labour-intensive, more efficient. Before the inventory, it is useful to answer the following questions, among others, for each major species (Peters, *op*. *cit*.):

- Where does the desired species occur in greatest abundance? Its distribution should be mapped as precisely as possible;
- is the species limited to a certain forest type, or is it fairly evenly distributed throughout the area?
- is the desired material produced by only one species or by several species? What is the exact taxonomic identity of these plants?
- has a product already been harvested from the area? For how long and how, and by whom? Heavily exploited areas and areas of selective planting or other management by local people should be noted on the map;
- do any good maps, aerial photos or satellite images of the region exist? Handheld, low-cost global positioning systems (GPS) now permit communities to locate boundaries fairly accurately using satellite data;
- has the area ever been inventoried, perhaps for another resource (timber, minerals, wildlife)? If so, for what kind of resource? Try to obtain copies of any information available.

In this advance work, no available sources of information should be overlooked, including: unpublished reports by local government officials, companies or projects; local export statistics; or specimens at a nearby herbarium (Peters, *op*. *cit*.).

Inventory methods

When all the above information has been collected, a professional inventory specialist or team should conduct the inventory. Conventional forestry methods for conducting inventories are geared to wood production and are not well suited to the task of assessing non-wood resources. Still, they provide a starting point for understanding the resource (see "For further reading" regarding inventory methods).

Peters (*op*. *cit*.) describes information that an inventory should provide:

- a reliable estimate of the *resource density* (i.e. total number of harvestable individuals per hectare for that species) in different forest types. For fruit and oil seed species, this means the total number of adult trees. For rattan, medicinal plants and species that produce latex, this may also include juvenile individuals;
- the current *size-class distribution* of adults. For trees, this means measuring the diameter at breast

height (DBH) of all stems. For herbaceous plants and small understorey plants, height measurements are used instead;

- a preliminary assessment of *species regeneration*. Are there enough small individuals to replace the older adult trees when they die or are removed? Answering this requires that smaller, non-productive individuals also be counted and measured.

The smallest diameter limit of trees to be measured depends on the size distribution of the species and it;, density in the forest. Using a smaller minimum diameter increases the useful information that the inventory will produce, but also makes it more expensive due to the added fieldwork required. For tree species that occur at relatively low densities, a minimum diameter of 10 cm DBH is useful; for more abundant species, a higher minimum might be used.

The overall sampling intensity (or pattern of sample plots used) also depends on the trade-off between inventory precision versus cost, and the species. For example, inventories of bamboo and rattan may measure all stems 3 m and longer in a 10-m radius plot. An inventory of nipa palm (*Nipa fruticans*) might use different sample plot sizes for different plant sizes: all seedlings shorter than 1.5 m may be measured in plots of 2-m radius; in 5-m radius plots, all plants taller than 1.5 m may be measured (Reds, *op*. *cit*.).

An inventory of non-wood resources in southern Ghana focused on a few forest products that were widely traded or otherwise subject to increasing pressure. These included climbers (such as cane), bamboo and some herbaceous plants. The inventory used a uniform 1-ha sample plot size throughout, but sampling methods varied depending on the species. For cane, the inventory recorded the numbers of mature, immature and cut stems. For herbaceous plants, the inventory noted the number of plant groups (clumps) per plot. (Falconer, 1992).

A useful inventory should take advantage of local knowledge. For this, the inventory team should include a knowledgeable local collaborator who can help record each plant's local uses (all plant parts used) and local harvest techniques (Reds, *op*. *cit*.).

Some innovative inventory procedures compare natural forest with locally managed forest plots (Salick, 1992). One inventory in Nicaragua compared species regeneration in both situations, using 5 x 2 m subplots within 1-ha plots. This study thus provided a resource inventory along with detailed comparisons with local management. These comparisons permitted a general assessment of the impact of current local harvests and management.

Recently, some new models of arrangements have been developed to carry out comprehensive inventories of biological resources. Examples of this "biological prospecting" are the INbio-Merck agreement in Costa Rica (see Chapters 4 and 10 for more details) and the grants organized by the US National Institutes of Health in Latin America and Africa (Sittenfeld and Lovejoy, 1994 and Grifo, 1994).

Importance of wildlife

Wildlife is often an important non-wood forest resource, particularly in Africa. Wildlife population characteristics should be recorded in a forest inventory. Even where communities do not use the wildlife resource, wildlife activity influences forest dynamics in important ways, for example, as seed dispersal agents.

Analyzing the results

Before analyzing the results of an inventory, it is necessary to divide the information following a suitable classification (e.g. species, size classes, forest types, use types). The data for each forest type can, for example, be translated into charts of size-class structure. Size-class divisions for these charts vary for different types of trees. For large canopy trees, 10-cm diameter classes are adequate. Smaller tree species may need to be divided into 5-cm diameter classes. For shrubs and small palms, Peters (*op*. *cit*.) suggests a 50-cm height interval. Each chart could include 8 to 12 size classes.

These charts provide a valuable baseline for assessing the impact of harvesting. They can show when a population presents a healthy distribution of different-aged trees, or in contrast, reveal a worsening situation where species regeneration is severely limited for some reason, with no established seedlings. Peters (1994) explains in more detail how to interpret these charts.

Reducing inventory costs

Inventories are expensive to conduct and most communities or enterprises cannot afford them by themselves. However, several groups interested in a forest's various wood and non-wood resources may work together to conduct an inventory and share the costs.

Alternatively, in some cases, an "indicator" species might be studied as a signal of forest health. An indicator species is one that is more sensitive to changes in forest conditions. Where such a species is recognized locally, a focused inventory could study this species to gauge the impact of harvesting on the ecosystem (FAO, 1995).

Other factors in resource assessment

The previous section summarizes the ecological aspects of resource inventory. At the same time, an overall assessment of prospects should also consider the following (Vantomme, 1995):

- *socio-economic information* on the nearby communities and the costs and benefits of managing the resource. Besides financial factors, economic values need to be assigned to otherwise non-monetized costs and benefits (see Chapter 3);
- *existing and future demand* for preferred species (including preferences on size assortment and quality), site conditions affecting harvesting costs, size and types of cottage industries, location of processing units and transport facilities, and scale of traditional and potential uses (Chapters 3-7);

- *operational information*, or factors that will affect the specific operations, such as protection, harvesting, nursery establishment and other logistics;

- *institutional information*, meaning the legal and policy framework and political forces influencing resource use. This includes local attitudes, existing and proposed policies, legal rights and obligations, and training and research support to communities (Chapters 8-10).

Species selection

With a good knowledge of the forest environment and the socio-economic environment, a community or enterprise can rationally decide on which species to harvest and utilise. This decision involves social and cultural preferences and economic and ecological factors.

For their own subsistence use, communities will likely have already developed *social preferences* for products through their history of extraction and traditional use. Likewise, certain taboos may have evolved prohibiting the use of other species.

For products intended for market, *economic criteria* play a larger role. Usually groups will choose to exploit higher-value resources first.

Ecological criteria should reflect the species' biological potential for being managed on a sustained-yield basis. Some species are inherently better suited to continual harvesting than others. For tree species, factors that determine this potential include (Peters, *op. cit.*):

- *life cycle characteristics*. A species that fruits annually and is pollinated easily is better adapted to regular harvests than one that flowers at unpredictable intervals. In general, the management of primary forest species, which tolerate shade as seedlings, has less ecological impacts than the management of fast-growing, light-demanding pioneer species that require large gaps in the canopy for seedling establishment;
- *type of non-wood resource harvested.* Harvests of vegetative structures (i.e. bark or roots) very often kill a plant.[2/] Harvests of fruits, leaves, oil seeds and latex do not necessarily kill the trees but can alter the population structure (in case of overharvesting of fruits and seeds); and although they can have negative impacts, these are relatively easier to address;

- [2/] This varies with species. For example, cork (*Quercus suber*) is unusual in that its bark regenerates itself after each peeling. In some areas, bark from certain species is traditionally harvested in

longitudinal strips; this can be a sustainable management practice and should even be promoted where appropriate (Ocampo, 1994). In Mali collectors of baobab (Adansonia digitata) fibres harvest only once every two or three years to avoid killing the trees (Montagne, 1985).

- *density in different forest types.* Species that occur locally in high densities are easier to manage sustainably than those that are scattered and involve more travel for harvests. Also, if a species is abundant only in a part of the forest that is seasonally inaccessible (e.g. due to flooding), it can be difficult to obtain a regular supply;

- *size-class distribution.* Even species that are abundant in the area can present problems if, for example, all the individuals are of roughly the same adult age and there is no evidence of regeneration. If compatible with social and economic criteria, species that show good natural regeneration are preferable over other types.

Table 2.1 summarizes major characteristics of tree species and their influence on the species' potential for sustainable harvests.

Table 2.1: Overall potential of non-wood forest resources for sustainable management, based on species characteristics

	Low potential	Medium potential	High potential
Type of resource	bark, stem, roots	some resins, seeds, fruits	latex, fruits, leaves
Yield/plant	low	medium	high
Species characteristics			
Flowers	few, large	intermediate	small, many
Fruits	few, large	intermediate	small, many
Seed germination	low viability	Intermediate viability	high viability
Sprouting capability	none	low	high
Population structure			
Size-class distribution	Type III curve	Type II curve	Type I curve
Plant density/ha	0-5 adults	5-10 adults	10+ adults
Spatial distribution	scattered	clumped	homogeneous
Regeneration guild	early pioneer	late secondary	primary
Flower/fruit phenology	unpredictable	supra- annual	annual
Reproductive biology			
Pollination	biotic, specialized vector	biotic, generalist vector	abiotic
Pollinator abundance	rare; bats, hummingbirds	intermediate; beetles, moths	common; small insects
Seed dispersal	biotic, specialized vector	biotic, generalized vector	abiotic
Disperser abundance	rare; large birds, primates	intermediate; small mammals	common; bats, small birds

(Source: Peters, 1994)

In most cases, obtaining all this information requires extensive discussions with local collectors and trips to the areas of production, preferably during the species' flowering or fruiting season.

Sustainable harvest levels

To determine what harvest level a resource can sustain without destruction, it is important to know the quantity of non-wood material that the species produces naturally. A major problem among non-wood forest

enterprises is that most of them do not possess this knowledge.

The type of non-wood harvest helps to determine sustainable harvest levels:

- harvests of *vegetative structures* (such as roots or bark) would have to be infrequent, if at all;
- sustainable harvest level of *fruits and seeds* depend on (1) the intensity of collection, (2) the means of plant pollination and dispersal and (3) the species' specific requirements for regeneration and growth (Peters, op. cit.). Harvesting commercial quantities of fruits and seeds can affect not only species regeneration, but genetic composition and quality of the resource, if only "inferior" fruits and seeds are left to regenerate. In harvests of wild fruits, the effect on wildlife populations must also be considered;

- harvests of *plant exudates* (latex, gums and resins) do not kill the tree or remove its seeds from the site. However, many techniques of tapping create destructive wounds and sometimes involve burning or felling;

Yield studies, regeneration studies and harvest assessments are important tools for evaluating sustainable harvest levels.

Yield studies

Yield studies focus on the total amount produced and the relationship between productivity and plant size. A simple yield study consists of three steps (Peters, *op*. *cit*.):

- Select a representative sample of healthy plants of different sizes from each forest type. Individual samples should be marked with paint for permanent field identification.
- Measure each plant's production of the selected product(s). Enlist local collectors to weigh, count or measure the amount they collect from each tree. For fruits and seeds, this must be complemented with estimates of the amount of marketable material left unharvested.

- Plot the data to form a yield curve for each forest type.

Yield studies should be repeated every few years with the same sample plants because annual differences in rainfall and temperature can cause variable yields.

Using the forest inventory and yield studies together, the forest manager can determine (1) the area's total production, (2) the portion produced by each size-class of plant, and (3) which forest types produce most.

Based on this information and the relative abundance of each species, forest managers can determine the boundaries of different management units and how each should be harvested. Marking these on a map is useful. Some indigenous groups manage non-wood resources using this kind of resource division (Reds, *op*. *cit*.).

Regeneration studies

Regeneration studies assess, in permanent regeneration plots, the impact of management on seedlings and saplings, the individuals most sensitive to adverse effects. Permanent plots should be re-inventoried at suitable intervals (e.g. every five years) to monitor the long-term impact of harvests on regeneration (Peters, *op*. *cit*.).

Harvest assessments

Visual appraisals of adult plants can help detect problems in regeneration before they become serious. Forest managers should periodically inspect the trees marked as sample plants in yield studies and note their vigour, damage from pests and insects, and yield variability (Peters, *op*. *cit*.).

The Kenya Indigenous Forest Conservation (KIFCON) project is conducting this kind of assessment in western Kenya indigenous forests. The project, begun in 1989 by the National Museums of Kenya, studies current ecological and socio-economic aspects of grazing, recreation tourism and the effect of bark-peeling for the construction of beehive coverings for local beekeeping.

Harvest assessments in combination with regeneration studies permit forest managers to find a sustainable

harvest level in one of two ways (Reds, *op. cit.*): (1) when studies suggest that collection has brought regeneration below replacement levels, collectors reduce harvest levels; or (2) managers identify a quantitative basis for sustainable yield using computer simulations and matrix models of population growth.

Scope for domestication of species

When yield, regeneration and harvest studies reveal that actual harvests exceed a species' ability to regenerate, collectors may have to supplement wild sources with domestication (Haeruman, 1995). Many forest species depend on the interrelationships of a forest ecosystem to survive, but others do lend themselves to domestication or cultivation.

There often is not a clear border between unmanaged and domesticated resources. Evidence suggests that at least 12 percent of Amazonian forests are under indigenous forestry and agroforestry systems for managing dozens of fruit and nut species (Leakey and Newton, 1994). These systems involving guided regeneration, or *enrichment planting*, practiced by many forest - dwelling groups are a form of domestication in the forest itself (Reds, *op. cit.*). This has been found true also for wildlife; ranch animals are considered an intermediate step between wild and domesticated stock (Redford *et al.*, 1995).

Domestication is therefore a tool that is flexible to match communities' preferences for managing a species.

Advantages and disadvantages

Domestication holds advantages and disadvantages. Advantages include the abilities to:

- help sustain steady and reliable production to meet market demands;
- help relieve pressure on natural forest stocks;
- provide local income and resources for subsistence;
- facilitate easier collection and harvesting;
- improve plant or animal growth rates;
- offer a crop of cultural familiarity and value (Wickens, 1991).

Disadvantages of domestication can include:

- increased species susceptibility to pests and diseases (particularly in monoculture plantations), often leading to dependence on potentially harmful pesticides;
- loss of some of the ecological functions played by the forest when plantations replace natural forests;
- heavy dependence on regular infusion of seed from wild sources, for better yield and resistance to diseases and pests;
- concentration of income-generating potential in larger corporate entities, often far from the forest and the communities, and causing further disadvantages for poor households and minority groups.

With an awareness of these advantages and disadvantages, a community can better manage the domestication process. For example, LeCup (1994) describes a medicinal plant programme in Nepal in which communities first assessed the ecological impact of harvesting, then developed a strategy based on the population density and market value of each species. As land tenure arrangements permitted, the communities established forest gardens and nurseries for cultivating the high-value, low-density plants. For lower-value plants that occurred more commonly in the wild, harvesters learned improved harvest techniques and placed stricter limits on harvest levels. This approach improved local management, maintained wild genetic resources, and helped to improve the predictability and quality of supply.

For wildlife species to be candidates for domestication, they must be amenable to some degree of human handling and grouping in a limited space for feeding and handling, the young must show fast growth, females must have a high reproductive output (live weight of young per year), and they must be amenable to reproduce on a fairly inexpensive diet (Redford, *op. cit.*). See also Chapter 4 for domestication strategies.

Text box 2.1: Species domestication and inequity

While domestication can initially give a community more control over supply of a market product (in terms of harvest, seasonality, etc.), it does not guarantee that the community can maintain control and gain benefits.

Historical patterns suggest that domestication contributes to the boom-bust pattern experienced by NWFPs in international markets. In this sequence, the local people often lose their advantage. Rubber and quinine provide two examples of this. When rubber's value on the international market rose significantly in the late 1800s, supply from cultivated sources in Asia began to replace wild sources in the plant's native range of Amazonia. The same pattern occurred with quinine. Producers in Asia were able to turn this to their advantage because:

• the species, when introduced into a new region, escaped the pests and diseases that had evolved with it (at least temporarily);

• as a result, the species could be planted in monoculture with (temporarily) less risk of crop failure and with greater economic efficiency;

• genetic improvement programmes in Asia led to further increases in yields.

As a result, wild Amazonian sources lost the international market for rubber and quinine (Clay and Clement, 1993).

Agroforestry

Agroforestry offers a flexible technology system, often indigenous, by which non-wood products can be domesticated gradually, in a way that is adapted to local conditions and practices. This has happened in Southeast Asia with local favourite species such as rambutan (Nephelium spp.), mangosteen (*Garcinia mangostana*) and durian (*Durio* spp.), and in West Africa with bush mango (*Irvingia gabonensis*), African pear (*Dacryodes edulis*) and kola (*Cola acuminata*, *C. nitida*) (Leakey and Newton, 1994).

For regionally important plant species, strategies for more intensive and systematic domestication might include a sequence of:

- screening of candidate species through species trials on farmland in collaboration with farm households;
- identification of preferred characteristics of chosen species to form an *ideotype*[3/] for improvement programmes;
  [3/] The concept of ideotype is used by plant breeders to define a plant model which then becomes the target for a breeding programmne. The ideotype specifies the ideal attributes of a plant for a particular purpose (Raintree, 1991).
- seed collection and distribution;
- study of interactions between genotype and environment;
- establishment of seed orchards.

This type of strategy is often best organized by a regional research institution (Leakey and Newton, op. cit.).

Summary

- Understand the rules of tenure and access that govern the non-wood resource and its use. Open-access resources should be converted to a common-property regime for better management accountability.
- Conduct a resource inventory to identify the ecological forest types, species and products of interest. To reduce the costs of forest inventories, plan carefully, and clarify the forest types and species of interest through review of existing information, including maps.
- For tree-based products, assess the density and size-class distribution of preferred species. This provides a gauge of the forest's general health against which to compare later management. Wildlife population size and trends should be similarly assessed.
- Assess each species' ecological amenability for harvesting, local cultural and social preferences for its products and the economic trade-offs. Higher-value products are usually the first to be managed.
- Monitor forest dynamics regularly using studies of yield, harvests and regeneration rates. When monitoring tools indicate that harvest levels exceed natural regeneration, either reduce the harvest level or begin supplementary measures to create new resources.
- Domestication is a tool for communities to supplement wild sources of NWFPs. Before intensifying

species management through domestication, communities should consider the trade-offs between more reliable supply and increased vulnerability to ecological decline of the resource material, and equity issues. A local strategy can combine production based on domesticated and wild resources to best advantage.

References

ATI. 1995. *Non-timber forest products manual.* Draft version. Appropriate Technology International, Washington, D.C.

Clay, J.W. and Clement, C.R. 1993. *Selected species and strategies to enhance income generation from Amazonian forests.* Forestry Working Paper FO: Misc/93/6. FAO, Rome.

Falconer, J. 1992. Non-timber forest products in southern Ghana: a summary report. ODA Forestry Series No. 2. London.

FAO. 1995. Group reports. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. Rome.

Grifo, F.T. 1994. Chemical prospecting: an overview of the International Cooperative Diversity Groups program. In J. Feinsilver, ea., *Emerging connections: biodiversity, biotechnology, and sustainable development in health and agriculture.* Pan American Health Organization, Washington, D.C.

Haeruman, H. 1995. Environmental dimensions of non-wood forest products. In *Report of the expert consultation on non-wood forest products* Yogyakarta, Indonesia, 17-27 January 1995. Non-Wood Forest Products 3. Rome.

Iqbal, M. 1993. *International trade in non-wood forest products: an overview.* FAO Forest Products Working Paper Misc/93/11. FAO, Rome.

Leakey, R.R.B., and Newton, A.C., eds. 1994. *Domestication of tropical trees for timber and non-timber products.* MAB Digest 17. UNESCO, Paris.

LeCup, I. 1994. The role of marketing of non-timber forest products in community development projects: Ayurvedic medicinal plants in Nepal. In Raintree, J.B., and Francisco, H.A., eds., *Marketing of multipurpose tree products in Asia: Proceedings of an international workshop held in Baguio City, Philippines, 6-9 December, 1993.* Winrock International, Bangkok.

Montagne, P. 1985. Contributions of indigenous silviculture to forestry development in rural areas: examples from Niger and Mali. *Rural Africana* 23-24 (Fall 1985-Winter 1986):61-65.

Ocampo, R.A. 1994. The present situation of non-timber forest products in Costa Rica. Project for the Conservation and Sustainable Development in Central America, Working Document No. 7. Centro Agronómico Tropícal de Investigación y Enseñanza (CATIE), Turrialba, Costa Rica.

Peters, C. M. 1994. *Sustainable harvest of non-timber plant resources in tropical moist forest: an ecological primer.* Biodiversity Support Program-WWF, Washington, D.C.

Raintree, J. 1991. Socio-economic attributes of trees and tree planting practices. Community Forestry Note 9. FAO, Rome.

Redford, K.H., Godshalk, R., and Asher, K. 1995. *What about the wild animals?: wild animal species in community forestry in the tropics.* Community Forestry Note 13. FAO, Rome.

Reis, M. 1995. *Resource development for non-wood forest products. In Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Salick, J. 1992. The sustainable management of non-timber rain forest products in the Si-a-Paz Peace Park, Nicaragua. In Plotkin, M and Famolare, L. eds., *Sustainable harvest and marketing of rain forest products.* Conservation International, Washington, D.C.

Sittenfeld, A., and Lovejoy, A. 1994. Biodiversity prospecting frameworks: the INBio experience in Costa Rica. Paper presented at a conference on Biological Diversity: Exploring the Complexities, held 25-27 March, 1994 in Tucson, Arizona. University of Arizona.

Vantomme, P. 1995. Information requirements and planning principles for managing non-wood forest resources in mangrove forests. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Wickens, G.E. 1991. Management issues for development of non-timber forest products. *Unasylva* 42 (165):3-8.

For further reading

Adlard, P.G. 1990. *Procedures for monitoring tree growth and site change.* Tropical Forestry Paper No. 23. Oxford Forestry Institute, Oxford, UK;

Avery, T.E. 1983. *Forest measurements*, 3rd edition. McGraw-Hill, New York.

Booth, F.E.M., and Wickens, G.E. 1988. *Non-timber uses of selected arid zone trees and shrubs in Africa.* FAO Conservation Guide 19. FAO, Rome.

Cunningham, A.B. 1993. *African medicinal plants*. People and Plants Working Paper No. 1. UNESCO, Paris.

Falconer, J. 1990. *The major significance of "minor" forest products: the local use and value of forests in the West African humid forest zone.* Community Forestry Note No. 6. FAO, Rome.

FAO. 1989. *Community forestry: rapid appraisal of tree and land tenure.* Community Forestry Note No. 5. FAO, Rome. (Available in English, French, Spanish.)

FAO. 1981. *Manual of forest inventory*. FAO Forestry Working Paper 27. FAO, Rome.

FAO. 1990. *Community Forestry*: *Rapid Appraisal*. Community Forestry Note 3. FAO, Rome.

FAO. 1994. *Tree and land tenure: rapid appraisal tools.* Community Forestry Manual No. 4. FAO, Rome.

FAO. 1995. *Selecting tree species on the basis of community needs.* Community Forestry Field Manual No. 5. FAO, Rome.

Forestry/Fuelwood Research and Development Project. 1994. Selecting multipurpose trees (module 1) and Species fact sheets (module 9). In *Growing multipurpose trees on small farms* (2nd ed.). Winrock International-FAO, Bangkok.

United Nations. 1990. *Forest resources of the temperate zones, the general forest resources information.* UN-ECE/FAO Forest Resource Assessment, vol. 1. UN Publications, New York.

3. Assessing local use of the resource

Why assess local use?

Having completed an inventory of the forest resource, why do forest managers need to study current forest use by nearby communities? How does this justify using scarce funds and skills that otherwise might help develop the resource?

There are two main reasons. First, successful improvements in forest management usually resemble and build on traditional activities already practiced in the area. Many attempts to switch suddenly to year-round, capital-intensive activities which differ drastically from local traditions have failed (Poole, 1993).

Second, if innovators do not understand local practices and know which local groups rely on which specific products, they may introduce innovations that are technically feasible but bring negative socioeconomic effects. Too often, the actual value that communities place on their non-wood resources is not fully understood until after the resource is gone (Wickens, 1991).

This chapter surveys the more widespread rural uses of non-wood forest resources, and describes how to determine subsistence and market uses of NWFPs in a locality. It also looks at the importance of local management systems and how they can provide a basis for sustainable forest use.

Local importance of non-wood forest products

The following paragraphs describe groups of NWFPs that are commonly important to local communities, particularly those living near the forest. But importance is location-specific and dynamic. The key to good forest management is to identify trends in use, not merely static facts.

Cultural values

Rural people use NWFPs for food, income and farm inputs but also for social, cultural and religious functions. The intangible, non-economic roles of NWFPs can be more important and even provide a foundation for the economic roles that development programmes usually address. In many cultures, communities maintain certain areas as sacred groves where harvesting is banned or carefully controlled (Arnold, 1995). Harvests are, in such cases, restricted to meet the needs for religious/socio-cultural ceremonies. In villages of northern Thailand, for instance, sacred groves form an integral part of an overall community system that combines farm and forest management (Uraiwan, 1993).

Certain species may play a crucial role in spiritual ceremonies, or have taboos associated with them that forbid certain harvests. In central Africa, parents plant a tree in the wild for a newborn child, and the child's growth is forever linked to the tree's growth (Vergiat, 1969 in Falconer, 1990). Other trees figure in burial rituals. Forest foods play a part in wedding rites, initiation ceremonies and other events. In many places, these cultural and spiritual roles are losing their importance, but in other places they persist and are even renewed in the face of encroaching values from outside the community.

Table 3.1 shows that in southern Ghana, people value intangible cultural and spiritual benefits from the forest as highly as physical products and services. It illustrates the wide variation of local values within the same society variation occurs even at the household level, and among individuals within households. Men, women

and children in the same household often cite different uses and needs for forest products.

Table 3.1: The highest valued forest benefits in eight villages in South Ghana (figures represent percentage of people who rank the benefit first).

	Banso	Betinasi	Essamang	Nkwanta	Essuowin	Koniyao	Kwapanin	Nanhini	No. of people ranking product first - all villages
Benefit from forest									
Pestle	28	9	27	33	45	31	38	24	71
Bushmeat	40	9	27	38	37	26	36	13	68
Canes	48	18	33	48	29	15	15	10	56
Building materials	24	18	13	33	8	15	30	10	43
Chewstick	40	9	13	38	18	5	15	7	39
Timber	20	9	2.7	-	32	21	19	-	39
Water	4	9	7	5	11	33	6	10	27
Medicines	16	9	13	10	5	5	6	27	24
Sponge	16	-	27	5	18	3	15	-	24
Gods	-	-	-	-	16	-	-	50	21
Land bank	-	-	-	24	3	10	13	7	18
Wrapping leaves	-	-	-	5	3	-	32	-	17
Fuelwood	20	-	13	-	3	8	6	7	16
Mortar	12	-	-	-	5	10	11	7	16
Fertility	8	9	-	5	3	13	13	-	16
Rains	4	18	-	-	5	5	11	10	15
Forest food	16	-	-	14	3	3	11	-	14
Raphia	16	9	7	10	3	3	4	-	12
Others	8	18	7	10	24	18	17	3	25
Total no. of people interviewed	25	11	15	21	38	39	47	30	226

Note: Some people named more than one benefit as most important (Falconer, 1994 in Arnold, 1995)

Household subsistence

Among all the many NWFPs, the most common worldwide are used for food, fodder, medicine, and construction materials. Other uses include, among others, farm tools, household baskets, sleeping mats, pillows, sponges and brooms (Arnold, 1995).

Rural families provide for their needs not just by growing crops but also with other household income. Therefore assessments of local dependence on NWFPs for food security must count local product sales as well as direct contributions to food and nutrition. A family often changes its strategy for food security as its economic options change. This can have varying effects; for example, more labour-intensive harvesting methods for a product could force women to spend less time cooking and caring for their children (Longhurst, 1987 cited in Arnold, 1995).

Food and nutrition

Foods from the forest include fruits, leaves, seeds and nuts, tubers and roots, fungi, gum and sap. Beekeeping for honey is often a forest-based activity. Wildlife is an important source of food, particularly in Africa. In West Africa, more than 60 wildlife species are commonly consumed (Falconer, 1990). In parts of Africa, bushmeat provides a major source of protein to people's diets. Smaller animals and invertebrates are more important food sources than larger game (FAO, 1995).

Forest: foods often provide essential vitamins, minerals, carbohydrates and protein (Table 3.2). Besides direct nutritional contributions, they provide variety and taste. Even where people consume only small amounts of forest foods, they play an important role by adding variety and spice and encouraging children, in particular, to eat more of otherwise bland foods that their bodies need.

Table 3.2: Contributions of forest foods to human nutrition

Type of forest food	Nutritional contribution(s)
fruits and berries	carbohydrates (fructose and soluble sugars), vitamins (especially C), minerals (calcium, magnesium, potassium); some provide protein, fat or starch
nuts	oils and carbohydrates
young leaves, herbaceous plants	vitamins (beta-carotene, C), calcium, iron
gums and saps	proteins and minerals
invertebrates (insects, snails)	protein, fat, vitamins
vertebrates (fish, birds, mammals)	protein

Source: FAO, 1995.

Leguminous *Parkia* species provides popular foods on three continents, yet this important food source is commonly overlooked in assessments of local resources and nutrition. People in Southeast Asia eat the whole pods of *Parkia speciosa* either raw or cooked as a vegetable. In West Africa, people from the Gambia to Cameroon ferment the beans of the savannah Parkia species to make a nutritious traditional food that provides protein and fat. Children eat the pericarp raw, and gain vitamin C. In the semi-arid Chaco region of South America, the fruit of the related carob tree is made into a flour or beverage that provides important calcium (FAO, *op*. *cit*.).

Attempts to gauge local use of forest foods must consider that harvests are seasonal, and depend not just on when the forest species fruits but also on the farming cycle. For example, harvests of forest -foods often peak not during the main fruiting season, but during the "hungry season" when staple agricultural crops are not yet harvestable and food reserves and/or household cash is scarce.

Within a single community, different groups rely on forest foods to varying degrees. Poor and landless people often depend more heavily on forest foods than others. In many areas, children tend to snack on forest fruits and seeds more than adults. This variation is important for gauging local resource use. Identifying key *indicator groups* that depend most heavily on NWFPs provides a tool for monitoring resource availability.

Gender and other variables also influence the processing of forest and tree foods. All family members might help with collection, but it is usually women who are responsible for processing these items. In southwestern Nigeria, for example, women process parkia beans, palm oil and soap (FAO, *op*. *cit*.).

Fodder and grazing

Forest fodder for stall feeding, in addition to widespread forest grazing is very important in many developing countries where rural families keep domestic animals, especially in arid and semi-arid areas. While fodder, almost exclusively, is used locally, uncontrolled fodder collection and grazing often can lead to forest depletion.

Medicinal uses

Use of medicines from the forest often overlaps with forest food use. People add certain items to foods for the dual purpose of improving taste and adding health tonic properties (Arnold, op. Cit.). Often these uses are

closely linked to cultural values, and integrate traditional and Western - style medicine. In Ghana, people in one study regarded diseases as caused by either "natural" or "supernatural" problems, using Western medicines for natural illness and traditional cures for supernatural problems.

Text box 3.1: Beekeeping in Zambia

In northwestern Zambia, beekeeping is an integral part of rural life and livelihoods. Nearly all beekeepers are also farmers, and the time they spend beekeeping is dictated by the farming calendar.

For a long time, foresters considered beekeeping to be damaging to Forests in northwestern Zambia, because many trees are felled to make hives and because honey-hunters sometimes cause indiscriminate burning of the forests. In the 1960s, however, foresters realized that beekeeping in the woodlands offered better livelihood than did timber production. Furthermore, beekeeping does not conflict with other land uses in Miombo woodlands. In some places, beekeepers and foresters have recognized common management goals, for example, in preventing unmanaged fire (which destroys flowers leading to reduced nectar flow}. In other areas, traditional beekeeping does not easily harmonize with increasing pressure on the forest. This requires innovation to integrate farming, beekeeping and overall forest management (Fischer, 1993).

Local trade

In local trade of NWFPs, women often play a major role. In two out of eight villages studied in Ghana, collecting forest leaves for wrapping food, sponge-making and basket-weaving (activities mostly done by women) provided the main sources of income (FAO, op. cit.). Local processing and trade of NWFPs is often seasonal. These activities offer a cushion of extra income in times of hardship.

How to study local resource use

Because local use of the non-wood forest resource varies greatly, prospective enterprise managers need to conduct their own assessments. This assessment also provides an opportunity to learn how local communities manage key non-wood resources and what practices they employ. Recording and studying this knowledge helps ensure that forest management plans consider all relevant information.

What information to collect

A study in Ghana illustrates the types of information to look for (Falconer, 1992):

- forest food consumption and its importance in the diet;
- local use of plant medicines;
- use of forest products for house construction, tools, fuel and fodder;
- relative use of on-farm and village trees, and attitudes toward forests;
- use of NWFPs in trade and processing;
- consumer demand for bushmeat and other items such as chewsticks, baskets, food - wrapping leaves and medicines.

For each activity, it is necessary to estimate numbers of people involved, the quantities traded or used, purchase and selling prices and transportation costs.

How to collect the information

In the past decade, a variety of methodologies have evolved for assessing rural community needs quickly and with their participation. These include Rapid Rural Appraisal (RRA), Participatory Rural Appraisal (PRA), and Diagnosis and Design (D&D). A number of excellent references explain how to use these information-gathering tools (see "For further reading").

These usually start with a background search of available literature from local government offices and other sources, such as research institutes. Studies that appear unrelated to non-wood products may still describe important local values concerning the forest or people's access to it. For example, a study on the impact of a pulp and fuelwood plantation in West Africa contained local people's complaints of reduced availability of forest produce and listed the most important types: bushmeat, chewsticks, canes, poles and other housing materials

(Falconer, 1990). Studies of nutrition, land tenure and agriculture can provide valuable indicators of local forest use.

This background search is usually followed by a combination of household and/or group interviews or surveys and mapping exercises. A survey in six Asian countries asked households to list the forest species they used, rank the species by preference based on their use-value, and list the different plant parts used (Mehl, 1991). Households can further help by keeping weekly estimates of the products they consume and sell, in quantitative terms.

Text box 3.2: Women's involvement in processing in Brazil

In Acre, women have responsibility for processing all plants intended for human and animal consumption: foods, beverages, spices, medicines and animal feed. Women in the area have refined skills in managing and exploiting some 150 species. Plants for food include wild and domesticated fruits and nuts, and field and garden crops. Processed products range from jams, chocolate and cooking oil, to coffees and herbal teas. The women use over 50 plants for medicines. Pest repellents also come from the forest. Both men and women make baskets, brooms, hats and other craft products. More than half of a group of women interviewed replied enthusiastically that if a market existed, they would make time to regularly prepare items for sale (Kainer and Duryea, 1992).

Local markets and prices can help to indicate what non-wood resources are important. Where local *market information systems* exist (see Chapter 7), they may, with some adjustments, help to gauge local harvest rates for key products. Market figures alone, however, do not supply the full picture. In Zaire, studies found that most small game was traded or exchanged locally or consumed within the household and not recorded (Redford *et al*., 1995).

Identifying target and indicator groups

For an accurate picture of local resource use, forest managers should identify the groups that depend most on the resource and monitor their use as a sensitive gauge. To optimize equity and stability, the managers should also consider how proposed activities would affect these groups.

The importance of women's concerns

Despite the fact that women tend to depend more on non-wood resources for household use and income than men, they frequently have less voice in resource management decisions than men, and their priorities are often overlooked. In Latin America women have large roles in hunting using certain technologies (nets, basket traps and poison fishing) but not in others; in some societies, women are the ones to identify and track animals (Redford, op. cit.). Assessments of local NWFP use should recognize these variations and make a special effort to include women and address their needs.

Other indicator groups

Other groups that tend to rely heavily on forest products for food and other subsistence needs include (FAO, 1989):

- *the landless poor*, who often depend on common property resources for fodder, fuel, handicraft materials and other needs;
- *forest dwellers and shifting cultivators*, who frequently lack secure land tenure and are squeezed out when pressures increase on forest resources;
- *small-farm families*, who may lack resources for subsistence production, and who experience declining fertility and shrinking farm-size through inheritance;
- *pastoralists and herders*, who are vulnerable to droughts and encroachment by cultivators and government programmes;
- *young children*, who depend on forest snacks for certain vitamins.

By identifying these vulnerable groups and the non-wood resources on which they rely, forest managers can anticipate and prevent (or reduce) conflicts and shortages caused by changes in forest management.

Subsector analysis for marketed products

For major marketed products, *subsector analysis* helps in understanding the commercial processes at work. A full subsector study can take a month or more to complete, but parts of it can be done in several days and provide useful information on local market flows.

A full subsector analysis uncovers a range of information, including (ATI, 1995):

- the local market's main functions, technologies, participants and product flows;
- a summary of participants and alternative channels for product flows, and trends among channels;
- regulations and policies that influence local product flows;
- the number of enterprises that market a product, sales value amounts, employment levels and increase in product value at each stage.

Text box 3.3: Adapting assessment methods: the example of mangroves

Assessing resources and how nearby communities use them is a site-specific task. Resources range from desert oases and semi-arid savannas to montane forests, from herbs and vines to wildlife. Resource managers must adapt the assessment methods to suit the local species, ecosystem and human environment.

Mangroves and other wetlands, for example, present a unique set of conditions for management and are subject to different pressures than land forests.

In mangroves, non-wood activities such as fisheries often generate much more income than timber harvests. Mangroves can also create income through algae cultivation (for example, for export) and producing salt from evaporating seawater (FAO, 1989). Mangrove products include tannin for leather curing, medicines, honey, vinegar, cooking oil, wildlife and fermented drinks. Mangroves contribute to local food security particularly through their support of coastal habitats for fish, shrimp, oysters, crabs, cockles and molluscs. They also provide plant - borne food, such as nipa palm fruits, and high-protein fodder from *Rhizophora* leaves.

Pressures unique to mangrove ecosystems include land reclamation efforts, destructive and unmanaged construction of fish and shrimp ponds, and harvesting for fuelwood and poles. Mangroves are also very sensitive to pollution from urban wastes, food-processing industries, power stations and dam construction.

To manage mangroves effectively, a manager needs to know the dynamics of water bodies and forest cover. Assessment of mangrove ecosystems and their products requires more interdisciplinary collaboration than for dryland forests. This makes it especially important to clearly define data needs before starting to collect them.

The general types of data needed are still the same as described in Chapter 2 (resource biology, socio-economic information, existing and future demand, and operational and institutional information), but mangroves involve a variety of particular trade-offs. For example, there are socioeconomic trade-offs between fisheries and timber harvests. Additional logistical considerations include river transportation and pond or canal construction (Vantomme, 1995).

Subsector analysis starts by defining the product's end market. In the case of rattan, for example, end market products could be furniture and handicraft for both local and export sale. After identifying the main end markets, the analysis should describe each step from growth to harvest to final consumer; this sequence is known as the product's *value chain* (ATI, *op*. *cit*.).

The analysis identifies the participants at each stage (collectors, processors, government agencies, NGOs, traders, market agents, etc.). For each stage, it lists all steps involved: What is required to complete each stage? What set of skills, equipment, and capital? Which participant performs which step?

When the information from this part of a subsector market analysis is combined with the results of the rapid assessment of subsistence use, a picture emerges of (1) who collects and uses NWFPs locally, (2) who gains by them and (3) a rough estimate of what quantities are involved.

Learning about local forest management

Few, if any, forest resources are entirely unmanaged. Even where the forest appears undisturbed, some form of management is probably taking place. For example, the Kayapo Indians of the Amazon basin plant species along forest paths and in natural forest openings for food, medicine, building materials, dyes and insect repellent. Damar forests in Sumatra, Indonesia, appear quite natural but have been managed for generations to obtain damar resin and other products.

In many cases, local forest management has *increased* the diversity of forest species for non-wood products. In West Kalimantan, Indonesia, Dalat communities have broadened distribution and increased the abundance of products, including illipe nuts (*Shorea* spp.) and fruits of durian (*Durio zibethinus*), rambutan (*Nephelium* spp.) and mangosteen (*Garcinia mangostana*), as well as a timber species, *Eusideroxylon zwagerii*. In Brazil's eastern Amazon, in the Ilha das Onças, people have maintained a variety of fruit and latex species as well as wood-producing species (Reds, 1995).

In these cases, local management strategies build on basic practices such as: selective weeding around valued plants; enrichment planting, and occasional selective harvesting of timber species to open the canopy and stimulate seedling growth. These elements form a sound basis for sustainable forest management (see Chapter 4). To learn what management practices exist in an area, prospective forest managers should interview older local people and forest dwellers (both men and women), spending time with them in the forest.

Summary

- Assess how communities near the forest already use the forest resource for non-wood products, and the influence of local cultural, spiritual, social and economic values. This helps to fully account for existing demand and prevent over-harvesting. It also helps to identify the types of improvements most likely to succeed locally.
- For this assessment, examine household subsistence uses. Review background materials and use *rapid appraisal* methodologies to gauge the priority household uses.

- Gauge the importance of NWFPs in local markets, for example using *subsector analysis*. This method helps identify who sells, who buys, and how the products flow through the market.

- Investigate *local management systems* for the resource. Interview older villagers, forest dwellers and forest medicine providers to uncover information on how people use these products. These systems can include selective weeding around valued species, enrichment planting of these species in the forest and selective felling. Even where the forest appears unmanaged, local management systems can be important and offer keys to sustainable management.

- Look for *indicator groups* within the community - people who especially rely on NWFPs - in order to understand people-resource dynamics. This allows a manager to monitor forest health and that of nearby communities.

- Ensure that women's interests and preferences receive full weight in plans for forest management, in recognition of their role in product collection, processing and marketing.

With a sound understanding of the biological resource and its relationship to the human environment, the forest manager or community is ready for the next step - identifying opportunities for improvement.

References

Arnold, J.E.M.. 1995. Socio-economic benefits and issues in non-wood forest products use. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

ATI. 1995. *Non-timber forest products manual.* Draft version. Appropriate Technology International, Washington, D.C.

Falconer, J. 1990. *The major significance of "minor" forest products: the local use and value of forests in the West African humid forest zone.* Community Forestry Note No. 6. FAO, Rome.

Falconer, J. 1992. *Non-timber forest products in southern Ghana: a summary report.* ODA Forestry Series No. 2. UK Overseas Development Authority, London.

FAO. 1989. *Forestry and food security.* Forestry Paper No. 90. FAO, Rome.

FAO/Food and Nutrition Division. 1995. *Non-wood forest products in nutrition. In Non-wood forest products for sustainable forestry, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Fischer, F.U. 1993. Beekeeping in the subsistence economy of the Miombo savanna woodlands of southcentral Africa. In *NTFPs - three views from Africa.* Rural Development Forestry Network Paper 15c. Overseas Development Institute, London.

Kainer, K.A., and Duryea, M.L. 1992. Tapping women's knowledge: plant resource use in extractive reserves, Acre, Brazil. *Economic Botany* 46(4):408-425.

Mehl, C.B. 1991. *Trees and farms in Asia: an analysis of farm and village forest use practices in South and Southeast Asia.* Report Number 16. Multipurpose Tree Species Research Network, Bangkok.

Poole, P.J. 1993. Indigenous peoples and biodiversity protection. In Davis, S., ed., *The social challenge of biodiversity conservation.* Working Paper No. 1. Global Environment Facility, Washington, D.C.

Redford, K.H., Godshalk, R., and Asher, K. 1995. *What about the wild animals?: wild animal species in community forestry.* Community Forestry Note 13. FAO, Rome.

Reis, M. 1995. Resource development for non-wood forest products. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Uraivan Tan-Kim-Yong. 1993. The Karen culture of watershed forest management: a case study at Ban Om-Long. Resource Management and Development Center, Chiang Mai University, Chiang Mai, Thailand.

Vantomme, P. 1995. Information requirements and planning principles for managing non-wood forest resources in mangrove forests. In *Report of the expert consultation on non-wood forest products. Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Wickens, G.E. 1991. Management issues for development of non-timber forest products. *Unasylva* 42(165):3-8.

For further reading

FAO. 1990. *The community toolbox: the idea, methods and fools for participatory assessment, monitoring and evaluation in community forestry.* Community Forestry Field Manual 2.

FAO. 1990. *Community Forestry: Rapid Appraisal.* Community Forestry Note 3. FAO, Rome.

FAO. 1991. *Non-wood forest products: the way ahead.* FAO Forestry Paper No. 97. FAO, Rome.

FAO. 1991. *Guidelines for integrating nutrition concerns into forestry projects.* Community Forestry Manual 3. FAO, Rome.

FAO. 1994. *Tree and land tenure rapid appraisal tools.* Forests, Trees and People Programme Manual 4. FAO, Rome.

FAO. 1995. *The gender analysis and forestry training package.* FAO, Rome

Montagne, P. 1985. Contributions of indigenous silviculture to forestry development in rural areas: examples from Niger and Mali. *Rural Africana* 23-24 (Fall 1985-Winter 1986):61-65.

Ocampo, R.A. 1994. The present situation of non-timber forest products in Costa Rica. Working Document No. 7, Project for Conservation and Sustainable Development in Central America. CATIE, Turrialba, Costa Rica.

4. Opportunities for improved management

Earlier chapters have described how to understand the current extent, use and management of a locality's non-wood forest resources. They have noted that many traditional systems that once were environmentally sound must now be adapted to handle increasing pressure on these resources for livelihood and income. This chapter begins to address how communities and enterprises can adapt systems for management that are culturally, economically and environmentally sustainable.

This chapter explores the following forms of adaptation:

• improving productivity;
• reducing waste in harvest and post-harvest treatments;
• improving multiple-use forest management;
• domesticating key species;
• innovations in management for production of goods and services (e.g. medicinal plants, wildlife); and
• ecotourism.

Chapters 5-7 will explore the closely related issues of better market linkages, processing techniques and business practices for *adding value locally* (usually through some form of rural processing) to ensure that a greater portion of a product's market value accrues to the people who manage the forest resource.

For the options discussed in this chapter, some key principles of management apply (Vantomme, 1995):

- wood and non-wood resources should be managed in an integrated way to meet subsistence and market needs;
- harvests should not exceed the resource's ecological carrying capacity, and should be planned to maintain the diversity of local biological resources;
- planning is a continuous, dynamic process and must respond to new opportunities and conditions, including improved data collection;
- the process for making decisions on resource management should be transparent and equitable in order for decisions to be effective.

Improving resource productivity

Chapter 3 identified several measures for improving plant productivity in forests, practiced by some forest-dwelling groups. These were:

- selective weeding around valued species;
- enrichment planting of these species in the forest;
- selective felling of trees to open the canopy and stimulate seedling growth.

The three practices are interdependent. For example, selective weeding (regular removal of all vegetation within a radius of about 1 m of the desired plants) succeeds only when selective felling has opened the canopy overhead.

Enrichment planting aims to increase the number of desirable plants in the forest with minimal disturbance to the forest ecosystem. Its success depends mainly on:

- adequate opening of the overhead forest canopy early in seedling growth;
- the amenability of the desired plant species: fast-growing, gap-filling species work well.

Experience suggests that the following (mainly timber) species, among others, are amenable to enrichment planting: in West Africa, *Terminalia superba* and *T. ivorensis*; in East Africa, *Maesopsis eminii*; in South America, *Cordia alliodora*, *Simaruba amara*, *Swietenia macrophylla*, *Cedrela odorata*, *Carapa guayanensis*, and *Virola species*; and in Asia-Pacific, *Toona ciliata*. Locally preferred species should naturally receive priority for testing.

Producers can improve forest plant yields by propagating seeds or cuttings from individual plants known to have good yields and superior growth.

The above measures can bring about relatively small increases in supply from wild sources. Often, more significant gains are possible by reducing waste in harvesting, storage and transport operations.

Improving harvesting methods

Harvesting - broadly including harvest planning, pre-harvest and post-harvest treatments - is the most important process in managing a resource. It directly affects both the yield and the health of the living resource. Improvements in the harvesting process can make the difference between a healthy forest and degraded land; they can also decide whether an enterprise returns a profit or loss (Table 4.l).

Table 4.1: Potential benefits to producers of improved harvest activities

Activity	Potential financial benefit
improve harvest techniques	increase income 10 percent or more
increase harvest efficiency in the forest	increase income 5-10 percent or more
reduce post-harvest losses through improved:	
forest storage and/or transport	reduce losses by 5 percent
local warehouses	reduce losses of 25 percent of product
transport to distant processing plants	reduce losses of up to 35 percent of product

Source: Clay, 1995

Pre-harvest preparations

Good harvesting requires good planning, linked closely to the resource inventory. Like an inventory, a good harvest strategy starts with a clear understanding of tenure and resource rights (see Chapter 2). It requires careful timing to optimize yield taking into consideration the transport, processing and marketing involved. For example, many fruits transport with fewer losses if they are harvested just before they fully ripen. Sound harvest planning covers logistics, training for harvesters in efficient harvesting techniques, and financing of operations.

Depending on the tenure regime, harvesting is typically arranged and funded in one of three ways (Reds, 1995):

• collectors with extractive rights harvest, often with some kind of patronage from a purchasing

agent;
• lease with collection rights hire contract labourers to harvest the material for a daily wage;
• resource- or lease-owners finance harvest, using credit.

Secure tenure can provide means (collateral) by which collectors can obtain credit for meeting harvesting costs (see Chapter 10), and incentive for using harvest techniques that maintain long-term supply. Collectors with only short-term rights (or no tenure rights) often find ecologically destructive harvests easier and more profitable than sustainable techniques.

To finance future harvest operations, producer groups should seek agreements with traders or manufacturers in order to establish and obtain royalty fees based on product resale. Few groups have already negotiated such agreements, by which they receive an *environmental premium* of five percent of sales or other royalties based on the value of sale to the end user or consumer. Five percent of the endvalue received by traders in New York or London markets can mean that producers receive nearly a third more income from the product (Clay, *op*. *cit*.).

Harvest techniques

Producers should learn about all available harvest technologies. They should assess them (perhaps with technical assistance) on the basis of:

- how much time and labour they demand;
- a comparison of costs and returns;
- their environmental impact.

Improved knowledge of species. Harvest planners can use knowledge of the species' biology to make harvests more efficient. For example, in Southeast Asia, harvest of the essence of gaharu (*Aquilaria malaccensis* and related species) depends on a fungal infection of the wood. Experienced harvesters say they can determine if a tree's wood is infected without destructive felling,, thereby saving effort and trees. Newcomers who lack this knowledge have destroyed large forest areas by felling trees to determine if they are infected; this waste can be reduced by having experienced harvesters train the newcomers.

Improved knowledge of technical options. For some products, harvest efficiency can be improved by harvesting fewer plant parts. In the Amazon, for example, harvest of pau rosa (*Aniba rosaeodora*) for its essential oil has almost always entailed felling the tree. However, the oil can be harvested efficiently and sustainably by removing only leaves and twigs, for example through coppicing (Clay, *op*. *cit*.). In Indonesia, the State Forest Corporation, Perum Perhutani, has improved the harvesting of *Melaleuca* species for cayuput oil by coppicing trees on a five-year cycle, permitting economically viable leaf harvests without killing the trees.

Improved equipment. Simple changes of equipment can reduce the impact of harvest. For example, a common brace and bit can make it possible to harvest the balsam of the same copaiba tree (*Copaifera multijuga*) for decades; by contrast, harvesting with an axe causes wounds that can kill the tree (Clay and Clement, 1993). In South America, buriti fruits (*Mauritia flexuosa*) are often harvested by felling the tree; "climbing bicycles" could improve access to the fruits for harvest without felling (Clay and Clement, *op*. *cit*.).

Post-harvest technologies

Post-harvest losses due to spoilage are common and rob producers of potential income. Fortunately, technologies that reduce these losses are often available and economical, including techniques for depulping fruits and drying plant materials (see also Chapter 5).

Better post-harvest storage further reduces losses. In many cases, research results describe what type of storage warehouse and conditions (temperature, airflow, moisture levels, etc.) are best for reducing spoilage.

Multiple-use management for wood and non-wood harvests

Combining harvests of a non-wood product with other NWFPs, or with timber harvests, can optimize overall forest management. This type of multiple and diversified uses, traditionally practiced by some forest dwellers, can ease the economic pressures on both wood and nonwood resources. In planning, resource managers should analyze the inventory information to determine complementary harvest strategies and uncover potential conflicts between wood and non-wood harvests. The local community should participate in prioritizing harvestable products and strategies.

Strategies for domestication

Chapter 2 discussed advantages and disadvantages of species domestication. In certain cases, maintaining the wild resource may require some kind of domestication strategy in order to reduce pressure on such wild resources. In West Africa, declining forest resources and increasing demand for certain products is causing people to rely more on trees growing on farmland (Falconer, 1990). The same trend appears in Asia.

Domestication can take place in several ways: (1) enrichment planting in forest areas, (2) smallholder cultivation, and (3) commercial or community plantations (Wickens, 1991). The range of combinations allows communities to adapt a domestication strategy to suit their needs and preferences.

Domestication helps to improve the NWFP resource in quantitative and qualitative terms. It is to be noted, however, that domestication calls for certain research issues to be addressed and information generated and analyzed before it can be widely adopted: can the species desired be domesticated?; if so, what are the specifics involved? is there variation in the desired characteristics?; if it exists, is this variation genetic in nature or caused by environmental factors?; can improvement in desirable characteristics be best achieved by genetic (phenotypic) selection, by silvicultural interventions, and/or by a combination of both?; is such improvement economically practical and feasible?; what parallel action will be needed to ensure the conservation of the genetic resources of the species? (Chandrasekharan, 1994)

Community forests

Community forest reserves of planted and volunteer species can provide forest products and relieve pressure on the natural forest. In Sumatra, Indonesia, farmers in the late 1800s planted areas with the resin-producing damar tree (*Shorea javanica*) and fruit species (mainly *Durio zibethinus* and *Lansium domesticum*). The damar produces a clear resin which is exported for use in paint and varnishes. These agroforests - now comprising roughly 65 percent damar trees, 25 percent fruit trees and the remainder wild trees for timber - continue to be managed by those farmers' grandchildren. Some plantations contain 39 tree species at a mean density of 245 trees per ha (Michon, cited in de Foresta and Michon, 1994).

Household-based agroforestry

For small-farm households, *agroforestry* (involving combinations of trees, other plants, livestock and/or farm crops) offers a viable way to manage non-wood forest production on farm land. Throughout the tropics, farmers have incorporated trees and other forest plants into their farming systems for centuries. Besides being familiar in traditional forms, agroforestry makes effective use of scarce resources (Leakey and Newton, 1994). It also can increase farm household security by diversifying on-farm produce.

Domestication strategies should address farmers' short-term needs by including proven species that yield some sort of produce fairly quickly. Usually farmers decide the composition and nature of their agroforestry systems themselves (Lescure *et al*., 1995). Support services should be directed by farmer demand for planting stock.

Local domestication can start by studying basic seed storage options, identifying promising cultivars, and establishing nurseries. Simple techniques can make big economic differences. In the Indian state of Andhra Pradesh, two small improvements in nursery procedure - the use of root trainers in place of polybags and culling of seedlings - could have saved tree-growing efforts an estimated US$ 73 to $ 127 million (Contreras-Hermosilla, cited in D'Silva and Appanah, 1993).

Text box 4.1: Integrated forest management in Mexico

The Plan Piloto Forestal (PPF) project in Quintana Roo, Mexico, has adapted integrated forest management

to local socio-economic conditions. Begun in 1983, the project has promoted forest conservation and local development by involving nearby communities in managing natural forest for wood and nonwood products. The project focused on two species: mahogany (*Swietenia macrophylla*) and chicle gum (*Manilkara zapota*). Chicle latex and honey production provide about half of the total forest income.

First, to ensure local participation, the project had logging rights assigned to the *ejidos*, or local communities. PPF then helped these communities to organize themselves for managing the forest in a way that would ensure they received the economic benefits.

Essentially, the PPF applied:

- better harvest planning and technology to reduce destruction of residual trees (e.g. directional felling);
- enrichment planting of logged areas;
- strictly controlled access to the permanent forest reserve (FAO, 1995).

Selection and breeding for farmers' preferences

In selecting species for agroforestry, farmers often aim to maximize stability - rather than quantity - of production. They also often select species for characteristics preferred for both subsistence uses and marketable produce.

In one study, farmers in six Asian countries identified breeding criteria for agroforestry species, according to their use of each species. Where one species provided several locally-used products, farmers preferred a combination of traits that accommodated all uses. But for species that had a clear primary use, farmers specified the characteristics of that use; farmers often ranked the characteristics of most valuable market use as most important (Raintree and Wickrarnasinghe, 1992).

Farmers' preferences for planting material vary depending on their farm size, cultural background, gender, wealth and market options. Any government or NGO strategy to support the local farmers should be formed in discussion with them, focusing on the most desired and promising species first.

Text box 4.2: Joint forest management in India

India's Joint Forest Management programme has revitalized the management of that country's forests by involving local communities. In the Gorela village, Rajasthan, this has allowed integrated management for timber and two forest products rarely considered by foresters - grass and fodder.

In Gorela, a variety of social groups engage in subsistence farming. At least 40 percent of the village households practice commercial dairying, with a secure market just 10 km away. Livestock include cows, buffalo and goats. Women traditionally collected fodder, fuelwood, gums and oils from the forest, and villagers grazed their animals on grasses there.

In 1980, the villagers grew concerned by increasing forage scarcity and began working with the Forest Department (FD) to replant and protect the resource. The table presents planting figures for six tree species in various campaigns, and shows how the emphasis on fodder species grew as the campaigns involved villagers more in the choice of species.

Table 4.2. Trends in number of seedlings planted for six species in tree-planting campaigns in Gorela

Species	Uses	1980	1985	1987	1990	1991	1992
Australian acacia	timber	-	4000	9090	-	-	-
Inga dulce	timber	-	40000	27849	-	-	-
khair (*Acacia catechu*)	fuel, fodder	4271	15000	10010	10000	10068	70000
desi babul (*A. nilotica*)	timber, fuel, fodder	-	-	14750	3000	5010	8000
amla (*Emblica* offic*i*nalis)	fruits fodder, small timber, fuel	-	-	-	-	325	2000
Neem (*Azadirachta* ind*i*ca)	medicine, oil, timber, fodder	-	-	2998	2500	3000	-
Sample survival rate		76	89	98	88	72	94

(percent)							
In 1992, the village and FD jointly formed a Forest Protection Committee, which organizes regular patrols, and meetings every other month. The FD manages timber harvests and shares proceeds with the village! Unauthorized felling and illegal grazing is punished with heavy fines, but villagers can collect fallen wood, fodder and other non-wood products. Despite the diversity of social groups, they all agree on the need for fodder from the forest. Joint management is addressing this immediate livelihood need for subsistence and income (Zutshi, 1994).							

Genetic conservation

Domestication and cultivation does not substitute for conservation of genetic diversity. If no provision is made for preserving the genetic variation found only in wild sources, domestication is often followed by the decline and even disappearance of wild populations (Nair and Merry, 1995). Because genetic improvement of domesticated species requires infusions from wild populations, domestication programmes should maintain in situ (natural or on site) and/or ex situ (planted elsewhere) stands of natural varieties. The agroforests of Sumatra described above combine the advantages of domestication with genetic conservation. So does the Nepalese project for medicinal plant products described in Chapter 2. Farm-based agroforestry can help to maintain some portion of this diversity by selecting genetic resources from a range of wild sources.

Commercial plantations

Commercial plantations are a common avenue of promoting domestication. They often allocate resources effectively for selection and improvement of superior individuals, but their high capital requirements tend to put them beyond the means of most rural producer groups. Often commercial plantations are managed and owned by large-scale entrepreneurs who do not plan sufficiently for local benefit-sharing, leading to inequity and land-use conflicts.[4/] Furthermore, the methods and equipment prevalent in commercial forestry tend to foster monoculture stands, which erode forest genetic diversity and greatly increase the risk of infestations by pests and disease.

[4/] There are a few notable exceptions to this pattern. The Paper Industries Corporation of the Philippines and Sabah Forest Industries of Malaysia provide examples of benefit-sharing agreements with local farmers (Awang and Taylor, 1993).

Innovative options in the use of medicinal plants

In recent years innovations in the promotion of the use of medicinal plants have shown potential to generate income for local communities and provide for long-term forest maintenance. These include:

- commercial development of traditional herbal medicines;
- research on bioactive compounds for pharmaceutical products (often somewhat inaccurately called *biodiversity prospecting*);
- *ethnobotanical* research (the scientific study of traditional knowledge and customs concerning plants).

All three fields are still evolving, so their long-term prospects are not fully known. Yet their rapid recent growth suggests that they should be considered as possible components of an overall strategy for forest management.

On a local and national scale, traditional healing is being re-appreciated and offers an underexploited market for NWFPs. The traditional medicine project in Nepal (see Chapter 2) created local markets and achieved a profit in just over two years. In Indonesia, companies like PT Jamu Air Mancur, which cites an annual income of US$ 10 million and employs 700 people, are growing with rising urban demand for traditional herbal medicine (FAO, 1995).

Biological and chemical compounds

The search for useful biological and chemical compounds has shown potential to increase local income and

in-country technical capability, and reduce forest destruction (see text box 4.3). Collaborations in this regard, if negotiated properly, can develop the source country's capacity to conduct sophisticated research on natural resources. Prospecting of bioactive material from plant and animal species can also assign monetary values to conservation of these resources to counterbalance the tendency for resource degradation. Besides Costa Rica, such research is being started in Argentina, Cameroon, Chile, Mexico, Nigeria, Peru and Suriname (Grifo, 1994).

Text box 4.3: Biological resources in Costa Rican forests

In 1991 :the National Biodiversity Institute of Costa Rica (INBio) signed a two-year agreement with the international pharmaceutical producer Merck and Co. In exchange for: preliminary research on biologically active compounds from forest plants! insects and: micro-organisms found in Costa Rican rainforests, Merck paid US$ 1 million to INBio. In addition, Merck agreed to return to Costa Rica a percentage of: any royalties generated by drugs developed as a result of the research (which probably could take 15 to 20 years to realize).

Through another agreement, Bristol-Myers Squibb is supporting research by INBio and Cornell University that will study tropical insects and related species for compounds that: could provide potential sources of drugs (Sittenfeld and Lovejoy, 19!34).

These agreements include important provisions for developing Costa Rican expertise in biochemical prospecting and maintaining: the biological conservation areas where the research takes place.

In these agreements, the concept of: intellectual :property rights serve as an increasingly important legal mechanism for returning an appropriate share of value resulting from discoveries such as: new: drugs to source communities and countries (see also Chapter 10).

Ethnobotanical research

Since the mid-1980s, Western-style medical research has rediscovered the usefulness of traditional healing systems as sources of knowledge on pharmaceutical products. Ethnobotanical research has been enhanced due to renewed fieldwork and the development of more sophisticated means of determining the bioactivity of plant compounds. This opens up possibilities for preserving local healers' knowledge through linkage with scientific pharmaceutical research. Because it builds on local knowledge systems that have developed over a long time, ethnobotany represents a more focused plantsurveying method than prospecting for bioactive material.

In the ethnobotanical approach, a professionally trained ethnobotanist works with a local healer for an extended period. With permission from the healer, village leader and other officials, the ethnobotanist sends samples of selected plants to a laboratory for study. Bioassays can quickly screen the effect of a plant sample on up to 60 distinct types of human tumour cells (Cox and Balick, 1994). Scientists examine promising specimens to compare their molecular structure with that of known chemicals. Molecules identified as *lead compounds* proceed through a series of evaluations leading to approval as a medicine, which can take 15 to 20 years.

Factors that determine a locality's promise for international ethnobotanical study include:

- a diverse flora (for example, tropical forest);
- permanent settlement for many generations (this suggests greater experimentation by local people with local species);
- a tradition of healers who transmit their knowledge from generation to generation, usually through apprentices (this offers effective screening through generations of repetition).

In realizing local benefits from ethnobotanical research, local healers and communities must rely on the commitment and efforts of the ethnobotanical researcher. In order to address the important question on how ethnobotanical research can be carried out as an equitable partnership, guidelines for ethobotanists have been developed, and they have been endorsed by the International Society of Ethnobiology. The research must respect the following obligations (Cox, 1995):

- design and direct the research aim accurately to the healer;
- respect the "sacred" or secret information provided by the healer;

- acknowledge the healer as source in academic papers;
- provide for indigenous-language abstracts of the research;
- protect the financial interests of the healer, either through increased return to the source community from royalties to the patent, or pre-payment;
- help conserve important source habitats of medicinal plants.

Ethnobotanical research also can help to restore or reinforce a group's traditional knowledge base: for example, the indigenous San Carlos Comanche of Arizona, USA, collaborated in an ethnobotanical survey for this reason (Davis and Dunn, 1994).

International ethnobotanical research is still not widespread because few scientists are trained to conduct ethnobotanical research, and it requires much fieldwork. But this field continues to grow with the increasing global importance of traditional medicine.

Ecotourism

Ecotourism aims to help local communities generate income with minimal impact on the local environment and culture. In 1994, ecotourism was the fastest growing sector of the world's US$ 3.4 trillion dollar tourist industry (IPS, 1995).

Ecotourism requires disciplined tour agencies to maintain strict practices that limit the impact on ecosystems and ensure that funds contribute to local employment and conservation. In theory, its smallscale nature makes it possible for local businesses to retain control over its development.

However, lack of long-term working models give rise to caution about ecotourism ventures. Even where pioneering efforts have developed a model appealing to local communities and governments, ecotourism can gain uncontrollable momentum and lead to foreign buy-ups of land, rising land and food prices, destructive levels of tourist visits and failure to comply with codes. Examples in Nepal and Thailand show that while ecotourism can generate considerable income, it can also lead to serious problems of garbage, waste disposal and firewood shortages (Braatz *et al*., 1992). Without careful preparation villages can easily find their lifestyles and values disrupted by powerful outside forces. The Kuna community of Panama managed to regain control over the tourist industry in their territory only after the destruction of two hotels that were built by outsiders without Kuna consent (Poole, 1993).

Text box 4.4: The Terra Nova ethnobiomedical reserve in Belize

The Belize Association of Traditional Healers (BATH), with support from the IxChel Tropical Research Foundation and the New York Botanical Garden, established the world's first forest reserve specifically intended to ensure the availability of medicinal plants for local use. BATH will manage the 2,400-ha Terra Nova reserve in the Yalbak region of Belize to obtain medicinal plants and to teach young people about their uses (Cox and Balick, 1994). Researchers will work with the healers to ensure that the plants are harvested on a sustainable basis. This arrangement represents one way to ensure preservation of local knowledge systems while maintaining the forest base.

For ecotourism to achieve its potential, the local and provincial/national governments must show strong political commitment to creating a working model and enforcing codes needed to handle the powerful forces which can lead to harmful effects on local culture and ecology (see Chapter 10).

Local wildlife management

Local wildlife management can sustain village nutrition, generate local income and maintain wildlife populations. Particularly in Africa, there are many examples of good wildlife management. In Zambia, more than a decade of government attempts to limit poaching by enforcing punitive laws failed; but a new policy, based on local participation in wildlife management, reduced elephant poaching by over 90 percent in just three years. In Zimbabwe, the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) has enjoyed remarkable success. In CAMPFIRE, rural communities took full control of wildlife management in conservation areas (Reds, *op. cit*.; see also text box 10.2).

Redford *et al*. (1995) describe examples of community-managed wildlife efforts in Africa, Latin America and Southeast Asia and the Pacific (see Chapter 2 for the criteria developed in that report for deciding when improved wildlife management is feasible). Many wildlife ventures yield overall benefits, but communities should carefully consider questions such as the following:

- *does the species biology, habitat needs and local socio-economic situation permit management of the species?* Wildlife ventures should focus on species already in the locality; introducing wild animals to new environments often leads to major ecological problems;
- *can the benefits be shared equitably among interested groups?* Domesticating certain animals with high reproduction rates could, :For example, cause damage to home gardens and therefore negatively affect women, who manage the gardens. Powerful cash incentives to sell game meat previously consumed in the household can undermine the nutritional status of hunter groups and, perhaps less noticeably, disrupt their social customs (for example, in sharing hunted meat);
- *will animal farming encourage wise management of wild populations of that species, or overexploitation?* Often captive breeding, by opening legal trade in animal products of a species, has a negative effect on wild populations of that species, by lending cover to illegal hunting and rendering conservation efforts seemingly less urgent.

Some indigenous groups have generated income through controlled sports hunting. In Canada, for example, the Inuit have accommodated sports hunters who want to experience traditional Inuit hunting. Regulations enforce strict quotas and ensure that Inuit guides receive reasonable fees from sports hunters. A similar scheme has replenished snow leopard populations in a mountainous area of Pakistan (Poole, *op*. *cit*.).

Farmer-led initiatives

To help communities fully explore the range of their management options, there is need for research to look at problems from a comprehensive, interdisciplinary perspective. Researchers need to address rural problems as rural people themselves perceive them, and consider the people's preferred initiatives. By involving rural people as research partners, the search for better resource management options can go beyond conventional scientific research, which has often focused almost exclusively on increasing productivity.

This participatory approach has been gaining momentum. Working with local people on research requires more time and resources for training and data collection, but researchers find that if they accurately explain research objectives and these are consistent with local interests, people collaborate enthusiastically. In the Canadian Inuit example mentioned above, local communities have conducted their own harvest studies, which have produced valuable information on environmental impact and seasonal changes in wildlife patterns (Poole, 1989; see also Chapter 9).

This approach requires that research managers make important changes in the nature of incentives for researchers. Typically, researchers are rewarded mainly for presenting their work in scientific publications or conferences. These criteria do not ensure any link to rural practices. Research institutes should reward time and effort dedicated to:

- involving rural people in the research process;
- including them as co-contributors to published results;
- publishing abstracts in local-language and adapting techniques locally.

Research with community partners might explore a broader range of subsistence issues and strategies, multiple-use management, development of new marketable products, and market research (Nair, 1995). See Chapter 9 for more on research.

Summary

- Sustainable forest yield can be improved through:

  (a) better harvest planning and operations - including selective weeding, selective felling, improved inventory and planning for integrated harvests of non-wood and

wood products;

(b) reduction of harvest and post-harvest losses - through better knowledge of species biology and available equipment and technologies;

(c) enrichment planting - based on species amenability (for example, tolerance of shade);

(d) better market linkages - including scheduling of harvests to coincide with market or processing demand, more efficient transport and storage arrangements, and provisions for an environmental premium to be paid to producers to support forest management.

- When wild sources of a product need to be supplemented with cultivated supply to meet demand, ensure that a selection and breeding program accounts for farmer- and market - preferred traits. Agroforestry species should be chosen to provide relatively quick returns to farmers; activities can start with community or private nurseries. Plan to conserve the genetic variation of wild populations through *in situ* and *ex situ* measures.
- For wildlife management, considerations include the effects on other domesticated species, the effect of domestic breeding on wild populations and equitable sharing of benefits.
- Explore innovative approaches and new areas of resource management. Promising areas include commercial development of traditional/natural medicines, ethnobotanical research and prospecting for bioactive compounds.

(a) Commercial processing of *traditional medicine* requires quality control and cooperation with local healers regarding the standards and dosage;

(b) *Ethnobotanical research* involves inventory of traditionally used medicines, scientific study of physical and chemical properties, and close collaboration between local healers and professionally trained. ethnobotanists; and respect by the researchers of certain obligations to the local healers;

(c) *Prospecting for bioactive* materials generally requires more centralized coordination and more resources for long-term study, but offers potential for improving the technological capacity of the source country.

- For *ecotourism* to improve long-term forest management, there should be strong political commitment for creating a working model and enforcing codes needed to ensure its proper functioning.

References

Awang, Kamis and Taylor, D.A., eds. 1993. *Acacia mangium growing and utilization*. Winrock International and FAO, Bangkok.

Braatz, S., Davis, J., Shen, S., and Rees, C. 1992. *Conserving biological diversity: a strategy for protected areas in the Asia-Pacific region.* World Bank Technical Paper No. 193. World Bank, Washington, D.C.

Chandrasekharan, C. 1994. Issues involved in the development of non-wood forest products. In *Proceedings of the Expert Consultation on Non-Wood Forest Products for English speaking African countries, held in Arusha, Tanzania 17-22 October 1993.* Technical Paper 306. Commonwealth Science Council, London.

Clay, J.W. 1995. An overview on harvesting, fores processing and transport of non-wood forest products. in *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Clay, J.W. and Clement, C.R. 1993. *Selected species and strategies to enhance income generation from Amazonian forests.* Forestry Working Paper FO: Misc/93/6. FAO, Rome.

Cox, P.A. 1995. Conservation: indigenous peoples and medicinal plants. Paper presented at a conference on

Biodiversity and Human Health, held in Washington, DC, 3-4 April. National Institutes of Health, Bethesda, MD, USA.

Cox, P.A., and Balick, M.J. 1994. The ethnobotanical approach to drug discovery. *Scientific American* 270 (6):82-87.

D'Silva, E. and Appanah, S. 1993. *Forestry management for sustainable development.* EDI Policy Seminar Report No. 32. The World Bank, Washington, D.C.

Davis, R. and Dunn, W. 1994. Report on the international workshop on natural resource management on tribal lands, held in Phoenix, Arizona, January 1994. US Forest Service, Washington, D.C.

de Foresta, H., and Michon, G. 1994. Agroforests in. Sumatra: where ecology meets economy. *Agroforestry Today* 6(4): 12-13.

Falconer, J. 1990. *The major significance of "minor" forest products: the local use and value of forests in the West African humid forest zone.* Community Forestry Note No. 6. FAO, Rome.

FAO. 1995. *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Grifo, F.T. 1994. Chemical prospecting: an overview of the International Cooperative Biodiversity Groups Program. In Feinsilver, J., ea., *Emerging connections: biodiversity, biotechnology, and sustainable development in health and agriculture.* Proc. of Pan American Health Organization Conference, San Jose, Costa Rica. PAHO, Washington, D.C.

IPS. 1995. Environment-tourism: green goals trampled by commercial concerns. Inter Press Service, February 11.

Leakey, R.R.B., and Newton, A.C., eds. 1994. *Domestication of tropical trees for timber and non-timber products.* MAB Digest 17. UNESCO, Paris.

Lescure, J.P., Pinton, F., and Emperaire, L. 1995. People and forest management in Central Amazonia: the multidisciplinary approach of extractivism. In *Extractivism in the Brazilian Amazon: perspectives on regional development.* MAB Digest No. 18. UNESCO, Paris.

Nair, C.T.S. 1995. Status of research on non-wood forest products: the Asia-Pacific situation. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Nair, C.T.S., and Merry, F.D. 1995. Status of research on non-wood forest products through agroforestry: issues and strategies. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Poole, P.J. 1989. *Developing a partnership of indigenous peoples, conservationists, and land-use planners in Latin America.* Environment Policy, Planning and Research Working Paper. World Bank, Washington, D.C.

Poole, P.J. 1993. Indigenous peoples and biodiversity protection. In Davis, S.H., ea., *The social challenge of biodiversity conservation.* Working Paper No. 1. Global Environment Facility, Washington, D.C.

Raintree, J.B., and Wickramasinghe, A. 1992. Summary of findings, in Raintree, J.B., and Taylor, D.A., eds., *Research on farmers' objectives for tree breeding.* Winrock International, Bangkok.

Redford, K.H., Godshalk, R., and Asher, K. 1995. *What about the wild animals?: wild animal species in community forestry in the tropics.* Community Forestry Note 13. FAO, Rome

Reis, M. 1995. Resource development for non-wood forest products. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Sittenfeld, A., and Lovejoy, A. 1994. Biodiversity prospecting frameworks: the INBio experience in Costa Rica.

Paper presented at a conference on Biological Diversity: Exploring the Complexities, held in Tucson, Arizona, USA, 25-27 March, 1994.

Vantomme, P. 1995. Information requirements and planning principles for managing non-wood forest resources in mangrove forests. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Wickens, G.E. 1991. Management issues for development of non-timber forest products. *Unasylva* 42 (165):3-8.

Zutshi, P. 1994. Securing a livelihood: a good basis for protecting forest resources. *Forests, Trees and People* Newsletter 22:43-47.

For further reading

Anon. 1993. *Ethics, ethnobiological research and biodiversity.* World Wildlife Fund, Washington, D.C.

Forestry/Fuelwood Research and Development Project. 1994. *Growing multipurpose trees on small farms* (2nd ed.). Winrock International, Bangkok. Write to: MPTS Research Network, P.O. Box 1038, Kasetsart Post Office, Bangkok 10900, Thailand.

Greaves, T., ed. 1994. *Intellectual property rights for indigenous peoples: a source book.* Society for Applied Anthropology, P.O. Box 24083, Oklahoma City, OK 73124, USA. People and Plants Initiative. Forthcoming. *People and Plants Handbook: sources of information on the management of biological resources, conservation and community development.* UNESCO, Paris.

Reid, W.V. Laird, S.A. Meyer, C.A, Gamez, R., Sittenfeld, A. Janzez, D.H., Gollin, M.A. and Juma, C. eds. 1993. *Biodiversity prospecting using genetic resources for sustainable development.* World Resources Institute, Washington, D.C.

5. Exploring commercial options

This chapter focuses on characteristics and strategies that help enterprises succeed, and on how to diagnose and address the common problems that small-scale producers face when entering commercial trade. It outlines an approach for planning an enterprise, reducing the risks involved and improving entrepreneurial skills. Finally, it looks at credit needs and options for *adding value locally*, often through local processing, for greater rural income.

Many small-scale enterprises start without adequate information or planning, and, as a result, many of them fail. Small (often household) enterprises can comprise up to 70 percent of a country's forest-based manufacturers (Chipeta, 1995). But studies have found that only about 20 percent of new small-scale enterprises succeed in the long run (FAO, 1995).

What do these statistics mean? In part, they signal that small enterprises can enter markets selling forest products relatively easily, but only a small portion of these enterprises manage to adapt to the changing circumstances of supply, market demand and competition.

What types of enterprises succeed? What do they have in common?

Characteristics of successful small enterprises

Successful forest-based small-scale enterprises generally share the following characteristics:

- *able entrepreneur* - a resourceful and capable manager can overcome many obstacles;
- *marketable product* - the entrepreneur must continually assess the future of the product's market: Will price trends for the product (and its substitutes) cause its market to grow or decline? What new products threaten to replace it?

- *reliable supply of materials* - processors and traders need a predictable and stable supply for maintaining markets. Forest degradation can threaten an enterprise's supply of materials and its credibility with traders and consumers;

- *favourable infrastructure and access to credit* - access to transportation, utilities and credit for capital investment heavily influence an enterprise's chances for success. Small enterprises can overcome the conditions that favour larger operations by grouping together.

Elements of a successful enterprise strategy

With the factors described above, combined with a good knowledge of the resource, producers can explore ways of increasing their income from NWFPs. Figure 5.1 illustrates how the improvements outlined in Chapter 4 contribute to an enterprise strategy for increasing income. Experience with small enterprises suggests the following lessons (Clay, in press):

- *start with products for which a local market already exists.* Entering an existing market allows producers to start repaying costs immediately, but creating markets for new products takes time;
- *improve harvesting techniques and reduce post-harvest losses* (see Chapter 4). This includes storing a product until the "off" season, when it can fetch a higher market price, and relatively low transportation costs;

- *increase the product's competitiveness by:* (1) reducing costs of production, (2) creating a niche market, or (3) improving management of the resource (for example, by enrichment planting for better yields and easier harvesting);

- *adopt a simple strategy.* Complex production/marketing strategies permit more unforeseen difficulties. Management ability is the biggest challenge for most rural entrepreneurs; simpler management strategies favour them;

- *start with one product and gradually diversify.* First, choose the easiest product that yields a good revenue for the time involved. Invest profits in the processes required to produce a second market item. The income from the first product can also leverage credit for a larger operation;

- *diversity the markets for each product.* Before expanding from local to regional or national markets, estimate the added costs and benefits. Stay informed about research on new products and on changes in populations and preferences. Nostalgia markets are growing in most countries (see Chapter 7);

- *add value locally*, usually through processing. Subsector analysis (see Chapter 3) helps to identify how much value accrues at each stage in the production-market chain and which stages are most profitable;

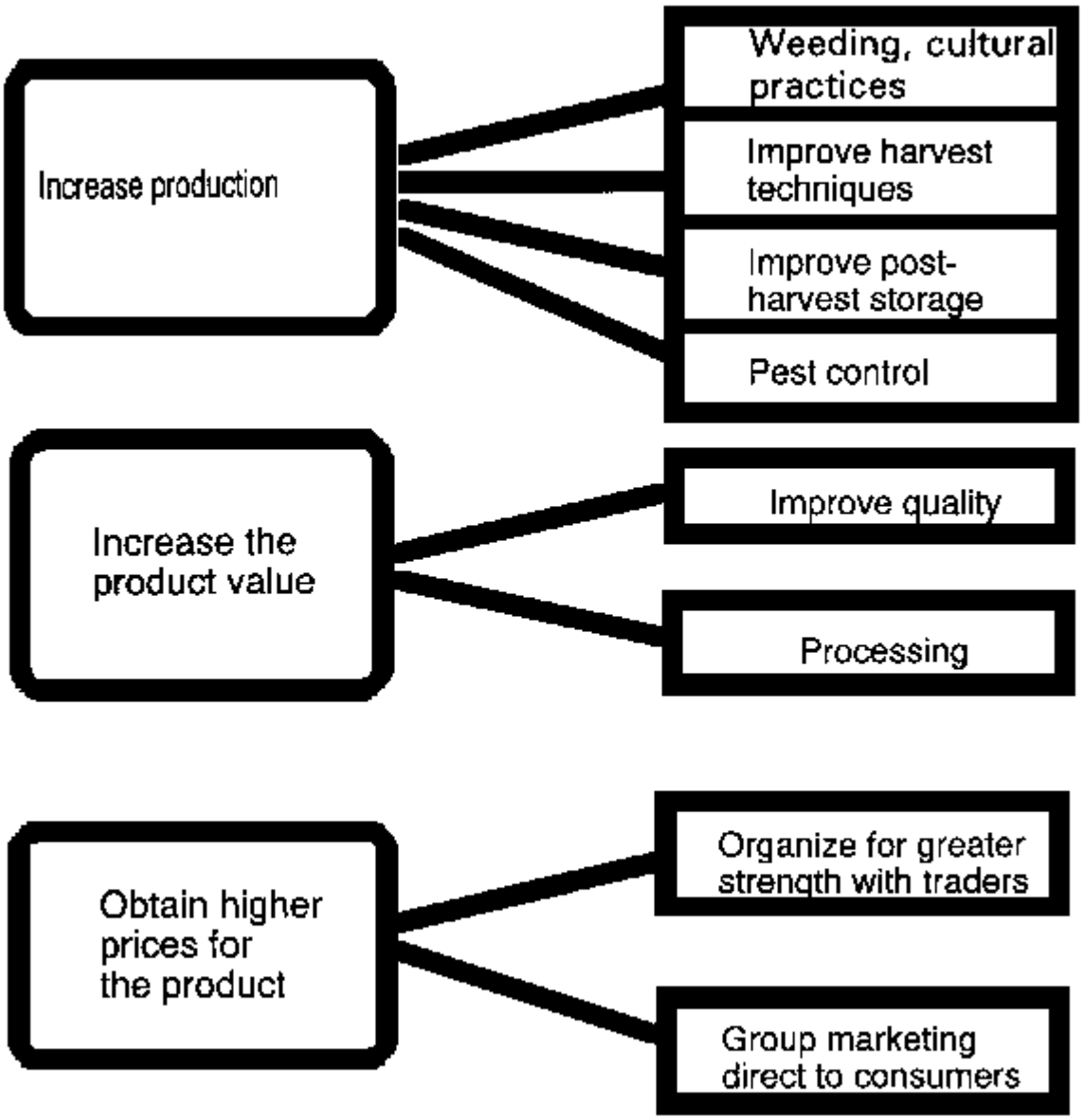
- continually *study the available technology* for potential improvements;

- *know the quality standards required* by buyers, and the standard of the enterprise's product. Products such as food, soap, shampoo and cosmetic products often must meet health and safety requirements. Learn about those minimum standards, and decide how to have the product evaluated;

- *organize with other producers* for collective strength. This helps to reduce each producer's costs for transportation, storage or materials, and also helps in negotiation with manufacturers in downstream processing (See Chapter 8);

- *demonstrate the ecological viability* of the enterprise. Use results of regular harvest impact assessments (see Chapter 2) to appeal to environmentally-minded consumers.

Figure 5.1. Diagram illustrating how small-scale NWFP producers can increase their incomes (adapted from ATI, 1994)



Examples

Remove competing vegetation
Harvest more selectly, learn about better equipment use
Construct ventilated store room, dry fruits for shipping
Monitor insect damage, use big-pesticides when needed
Sort produce by quality grades
Assess processing options, install processing facilities, packaging
Group sales to traders at standard prices based on quality
Collectively rent transport for taking products to market; obtain credit for members; store product for off-season price benefits

Problems commonly faced by small enterprises

In local markets, the most prominent NWFPs will usually be readily apparent. Where local markets are not developed, however, a first problem that enterprises encounter is identifying a marketable product.

Other problems faced by rural producers include the following (Pswarayi-Riddihough and Jones, 1995; FAO, 1987):

- *lack of marketing information.* Producers often lack information on: (1) the price of their products, both in local markets and as inputs to downstream processing, (2) product volume required by the market and how much competitors provide, and (3) quality standards;
- *unreliable source of raw materials.* Small-scale producers often have little land area and poor-quality growing stock;
- *post-harvest losses.* Poor transport and storage facilities can cause producers to lose 25-50 percent of a harvest, losses compounded by wasteful processing;
- *lack of processing.* Many producers do not process their items further, either because they lack information or equipment for processing or they doubt that processing will significantly improve their earnings;
- *transportation and infrastructure.* In remote areas, high transport costs and poor infrastructure (for example, roads or inter-island ferry service) reduce many producers' ability to compete in markets;
- *lack of effective credit.* Lacking collateral or flexible lending terms, many producers cannot get credit for working capital from formal financial institutions. They then rely on informal channels, such as local merchants, who usually command high interest rates;
- *unfavourable policies.* Policies governing imports, exports and pricing can create high economic barriers for producers.

Many of these problems are due to information gaps that producers can bridge. Others require institutional changes that only a committed government can bring about.

An example from Indonesia: Rattan

Forest dwellers in Indonesia have traded rattan through channels leading to international markets for nearly fifteen centuries. Until the mid-1960s, East Kalimantan, on the island of Borneo, exported more rattan than timber. Rattan continues to be Indonesia's most important NWFPs.

In East Kalimantan, hundreds of small-scale rattan enterprises trade with exporters. Rural households work in rattan and rattan handicrafts because these enterprises use relatively simple technology, rely on raw materials that have traditionally been abundant, require little capital, and provide jobs for skilled and unskilled labour (Hadi, 1991).

Most of the island's interior lowland forests are divided among more than 100 timber concessions (Peluso, 1991). Rattan collectors pull the rattan from the treetops, then use machetes to cut it and remove the thorny sheath. Next, they fold it in bundles of 4-6 m lengths, pack the bundles in units of about 28 kg each and air-dry them, sometimes removing the stem's outer coating. Each generation of forest dwellers has passed on the knowledge of how to collect and cultivate rattan.

The collector sells his produce to a river trader, who takes it by boat to a first-stage processing centre. Processors wash and sand the rattan and then air-dry it in the sun for 1-2 weeks. It is then graded by size and treated (either by smoking or boiling) to improve its colour and protect against pest damage. Wholesalers and retailers then buy the sorted rattan. At a further processing stage (either in East Kalimantan or on Java), cottage industries work the rattan into handicrafts and furniture. Furniture is also produced in large scale mechanised units.

The rattan trade as it has evolved tends to dictate specific niches for the ethnic groups involved. The collectors are mostly tribal groups such as the Dayaks and Kenyahs, mainly rural swidden agriculturalists. In the river trade, Muslim groups such as the Bugis and Banjars predominate. Chinese-Indonesian traders dominate the coastal, inter-island and international trade.

The rattan industry continues to keep rural collectors involved, but even in this well-established sector they encounter most of the problems mentioned above. Table 5.1 illustrates how these problems can be diagnosed, and what measures might address each problem.

Table 5.1: Problems in rattan production in East Kalimantan, with possible improvements

Problem type	Specific situation	Possible remedy
Low production	Over-exploitation: rampant over-harvesting, traditional checks have lost their force, and misuse of logging concession rights that wastefully destroy rattan-growing systems	Rattan garden cultivation, as initiated by Dayak and Kutai; creation of more diverse village agroforestry systems; better enforcement and/or coordination with logging operations
	Seasonality: only collected between agricultural activities; can be transported by river only during certain seasons	Improve storage (see below)
Post-harvest losses	Discoloration of rattan and fungal growth caused by immersion in river or exposure to rain; other losses caused by powder post-beetle, black water spots, rot and uneven colour	Improve storage through collective organization; create first-stage processing centres closer to collection sites
Lack of processing	Access to more advanced technologies limited by ethnic connections	Create processing centres upriver at bulking villages, closer to collection sites; obtain instruction in furniture making skills
Weak managerial and trade skills	Varies by ethnic tradition: Bugis, Banjar and Chinese have strong trade experience; Kenyah, Busang and Pasir are uncomfortable in business environment due to a more democratic social tradition, not profit-oriented	Increase marketing contacts with overseas importers, for example through trade shows
Market information	Downstream preferences not known	Increase marketing contacts
Labour costs	Wages are relatively high (3 times Java wages), competing with sawmills and plywood factories	Increased local processing would make high wages effective
Transportation	Dominated by traders; competes with less bulky, higher-priced cargoes such as plywood	Higher-value processed products will be better able to compete
Credit	Obtained mainly through shopkeepers, setting up ties of long-term obligation	Create credit alternatives

Source: Peluso (1991).

Planning NWFP enterprises

Planning is a major part of modern approaches to management. Planning builds on the assumption that anticipating a range of possible events enables the manager to respond to events as they occur. In some traditional cultures, however, long-term planning is a foreign concept, and can be considered arrogant or presumptuous. The Navajo language contains no word for *planning*. Attempts to build commercial enterprises in NWFPs must consider this cultural issue and its influence.

People starting an enterprise (particularly a group enterprise) should clearly identify their short-and long-term goals for the enterprise, and then review what experience and resources (cash, credit, equipment, land) each person brings to the enterprise.

Next, the entrepreneurs should review their past experience for activities that have made up their strengths, and weaknesses that need improvement. What problems have the members encountered in previous production, harvesting, processing and marketing activities? How have they dealt with them?

Prospective entrepreneurs should particularly consider their experience and lessons in the following areas (ATI, 1995):

- *raw material supply* - How will the enterprise ensure an adequate supply of materials to meet buyers' demands? Can sustainable harvests from wild sources meet this demand, as estimated by subsector

analysis (see Chapter 3) and marketing information? (see Chapter 7)

- *legal control/access to the natural resource* - What other communities/organizations or individuals claim access to the resource? By what arrangements will the enterprise share benefits with them, and among enterprise members?

- *markets for the forest product* - What markets exist for the product as harvested? What are other markets for possible processed products? (See Chapter 6) What is the level and nature of access to each market? Who are the competitors? (See Chapter 7);

- *appropriate processing technology* - Which technologies permit the enterprise to start simple and then become more sophisticated? Which are adequate/efficient? What equipment is needed? What energy and/or water sources does the technology require? What skills? What storage and transport facilities?

- *good management* - Who has experience with management of similar ventures? What roles do deal-making and record-keeping skills play?

- *financial requirements* - What capital does the enterprise possess? What is required for the first six months? What formal (banks, extension services) and informal credit sources exist? What are their terms?

Finally, when enterprise has identified the areas where it lacks experience, it should explore what outside services can help improve skills in these areas. Government and university extension services, agricultural marketing services, NGOs and development agencies are all potential sources of training and other forms of assistance.

Managing risk

Before embarking on a commercial enterprise, everyone involved should clearly understand the risks and have a plan that would address them. Four measures for managing risk in an enterprise were mentioned earlier: (1) start with products for which a local market already exists; (2) adopt a simple strategy; (3) start with one product and gradually diversify; and (4) diversify the markets for each product.

An enterprise can minimize risk by starting with small, pilot-scale commercialization, based on known markets and their preferences for the specific product. Pilot-scale production and sale allow the enterprise to get a more accurate picture of the market, make adjustments while costs are relatively low, and refine its marketing plan.

The level of risk varies with the nature of the enterprise and the type of markets. In general, distant markets involve greater risks to the producer than nearby markets (see Table 5.2).

Table 5.2: Comparison of risks and benefits of three levels of NWFP trade

Type of market	Relative risk to producer	Nature of trade
Local rural markets	Low: low transport costs; market preference information easily accessible	Can experience slow growth, linked to agricultural activity; demand for NWFPs declines with increased exposure to cheap manufactured products
Urban and national markets	Medium: transport costs higher; information on market preferences less accessible	Potentially fast growth, due to growing urban migration of rural people who bring customary tastes to the city; for traditional products, urban markets can be larger than international ones
Regional markets (neighbouring countries)	Somewhat higher: higher transport costs; more information needed not only on regional markets but on export-import regulations and duties	Potentially strong within regions with shared ecological and cultural characteristics; deserve more study
International markets	High: frequently requires intermediaries to gain information on product standards;	Historically, tend to experience boom bust sequences of quickly rising demand,

	more sophisticated market preferences (which often cause higher production costs) and international trade rules	followed by swift decline as technologies for making cheaper substitutes become available

(Source: FAO, 1995)

As Table 5.2 indicates, international trade in NWFPs involves more risk. Historically, NWFPs that attract international markets have quickly become the focus of intensive efforts to replace forest sources with domestic sources and/or cheaper synthetic substitutes. This risk is compounded by the greater need to meet international standards, ensure reliable high-volume supply, track distant market trends and cover high advertising costs. Figure 5.2 illustrates the fluctuations for three internationally traded NWFPs: gum arable, *lac* and rattan.

To reduce the risk of producing an export item, an enterprise could select a product that the source country currently imports. This strategy can divide the risk between two markets, assuming that the export and national markets have comparable preferences and standards (De Silva and Atal, 1995).

Building entrepreneurial and management skills

In a commercial venture, good management and entrepreneurial skills are as important as good planning. Plans are useful as reference points and for clarifying goals. Good management adapts plans to respond to changing conditions and opportunities.

Entrepreneurial ability is rare among small-scale NWFP producers entering the business world. This is a problem in all countries; small enterprises in industrialized countries such as the United States fail as frequently as enterprises in Botswana - around 80 percent over a five-year period (FAO, 1995).

Entrepreneurial training for producers

Some development agencies and NGOs offer training in deal-making and other entrepreneurial skills for NWFP enterprises. The USAID-funded Biodiversity Support Program has linked small-scale enterprises and cooperatives in southern India with sources of information on business management, biological resources and social issues (FAO, 1995). The international NGO, Conservation International, has a group of experienced business professionals who help local enterprises get established and make market linkages for forest-based products, including oils, palm products, nuts and foods. In particular, they help local enterprises in the areas of management, market development and finance (Conservation International, 1994).

Marketing training for producers, extension workers and policy-makers

Among enterprise skills, marketing is often a serious blind spot. This is because: (1) more than other activities, marketing requires information from outside the producer's domain, (2) in extension, marketing has received less emphasis than production, and (3) many rural producers have little experience in a market economy.

Text box 5.1: Matching technology and markets: Examples in Brazil and Kenya

Safrole oil production in Brazil

A project in the Brazilian Amazon shows how to reduce risk by identifying an appropriate processing method and markets at the same time. With research support from the Natural Resources Institute of the UK, the project evaluated native aromatic plants as candidates for cash crops which farmers could grow in sustainable agroforestry systems. The project used criteria of marketability and ease of domestication.

The project first considered processing plant oils as ingredients for the international perfume industry, but the risks of uncertain supply, complex quality standards and competitive pricing proved too great to justify the investment.

Next, a pepper shrub (*Piper hispidinervium*) showed promise for making products with less-demanding technology and greater market potential. The shrub's leaf contained high concentrations of the chemical

safrole, the starting material for two products: an industrial fragrance material (heliotropine) and a biological insecticide ingredient, piperonyl butoxide. Furthermore, the pepper shrub yielded safrole in a more environmentally sound manner than existing sources, which involved destructive harvests of natural forests in Brazil (for *Ocotea pretiosa*) and in Viet Nam and China (for *Cinnamomum camphora*). From the market point of view, the shrub offered access to an existing market without major risk of being replaced by a synthetic substitute.

From the perspective of "keeping it simple", the pepper shrub scored highly for three reasons: (1) its weed-like growth suggested it could be easily domesticated for repeated harvests, (2) the plant's essential oil could be extracted relatively easily and sold as a valued industrial chemical for its safrole content, and (3) product quality depended on the genetic trait of leaf-oil content, and not on complex cultivation and harvest techniques. Three years of cultivation and pilot-scale processing (including market testing of the oil) have yielded promising results.

Gum arabic processing in Kenya

NRI also conducted research for a Kenyan NGO interested in producing value-added gum arabic products for the international printing and pharmaceutical industries. Discussions with these industries in the UK revealed that production technologies for spray-dried or formulated products were very complex. However, a simpler process, which would reduce the larger lumps of gum to smaller pellets (known as *kibbling*), proved feasible and would yield profits through value addition to the Kenyan producers. This illustrates the lesson that the processing approach that at first appears most attractive may not be the appropriate option (Coppen *et al*., 1995).

To address this, producers and extension workers should receive training in marketing skills (see Chapter 7). To improve government support for enterprises, middle- to upper-level officials should receive training in providing incentives and market information links. Surveys of training needs can pinpoint offices and training topics that will produce the greatest effect, as they have in Indonesia (Ollikainen, 1991) and the Philippines (Lintu, 1991). The Regional Community Forestry Training Centre (RECOFTC) in Thailand offers short-term training courses in the marketing of NWFPs.

Training successful entrepreneurs in other fields to make them aware about the benefits from linkages with NWFP enterprises can improve the entrepreneurial capability in the NWFP sector. An example of this comes from India where the Canadian International Development Research Centre (IDRC) has sponsored such linkages with entrepreneurs in the medicinal products sector (IDRC, 1994).

Credit support for small enterprises

To understand the high failure rate for small enterprises, one must distinguish between lack of skills and lack of conditions that permit enterprise success. An underlying factor in the failure of many small enterprises is their narrow margin for absorbing risk. In Africa, for example, small-scale ventures may fail in situations where a minimal infusion of credit could lead to success. Credit for rural enterprises can be made more flexible (for example, in terms of collateral guarantee), and development agencies supplying credit for new enterprises should share the financial risk as partners. Credit institutions should also offer greater support to women's groups, which frequently lack access to credit. Chapter 10 explores forms of institutional support that promote growth.

Overview of processing options

NWFPs offer the full range of processing options, from little or no processing (fresh foods, nuts and spices), to relatively simple technologies (preserved foods and handicrafts), to intermediate processing (traditional medicines, vegetable oils, sweeteners, dyes, waxes and tannins) to more complex, expensive processes (such as for essential oils, gums, and balsams) that usually require centralized facilities (De Silva and Atal, 1995).

To choose the right processing technology, an entrepreneur needs information on (1) the characteristics of the resource and the raw material, (2) potential markets and (3) the enterprise's capacity and technology.

Chapter 6 looks at processing options in more detail.

Summary

- To increase the competitiveness of small rural enterprises in NWFPs, entrepreneurs should:

  - improve production and its reliability;
  - reduce losses through improved harvest and post-harvest techniques, including transport;
  - inform themselves of marketing and processing options;
  - start with an existing product and a simple strategy.

- Review the strengths, weaknesses and sources of support for the enterprise.

- Keep risks to an acceptable minimum with a considered management strategy that monitors the risks associated with different markets, and starts with pilot-scale production.

- Improve skills and capabilities through training and review of experience.

- Improve profitability and sustainability with some form of local processing, or local value addition. The key factors in this decision are: (1) know what processing options are feasible for the given resource and abilities, (2) know what market opportunities exist, and (3) match the processing technology with the market prospect, perhaps starting on a pilot-scale basis.

References

ATI. 1995. *Non-timber forest products manual.* Draft version. Appropriate Technology International, Washington, D.C.

Chipeta, M. 1995. Making non-wood forest programmes succeed: what lessons from the small-scale forest-based enterprises world? In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Clay, J.W. and Clement, C.R. 1993. *Selected species and strategies to enhance income generation from Amazonian forests.* Forestry Working Paper FO: Misc/93/6. FAO, Rome.

Clay, J.W. In press. *Generating income and conserving resources: twenty lessons from the field.* World Wildlife Fund, Washington,, D.C.

Conservation International. 1994. Conservation Enterprise Development: an overview. Mimeo. CI, Washington, D.C.

Coppen, J.J.W., Green, C.L., Gordon, A., and Hone, G.A. 1995. Markets and the public/private interface: their importance in NWFP development. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

De Silva, T. and Atal, C.K. 1995. Processing, refinement and value addition of non-wood forest products. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Durst, P.B., Ulrich, W., and Kashio, M., eds. 1994. *Non-wood forest products in Asia.* RAPA Publication 1994/28. FAO-RAPA., Bangkok.

FAO. 1995. *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

FAO. 1987. *Small-scale forest-based processing enterprises.* FAO Forestry Paper No. 79. FAO, Rome.

Hadi, S. 1991. Forest-based handicrafts in Indonesia. In Campbell, J.Y., ed., *Case studies of forest-based small-scale enterprises in Asia: rattan, matchmaking and handicraft.* Community Forestry Case Study No. 4. FAO, Rome.

IDRC. 1994. Medicinal plants network information. International Development Research Centre, New Delhi.

Lintu, L. 1991. *A survey of training needs in marketing of forest products in the Philippines.* FAO, Rome.

Lintu, 1995. Trade and marketing of non-wood Forest Products. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Ollikainen, T. 1991. *Training needs in marketing of forest products in Indonesia.* UTF/INS/069/INS. Field Document No. 1. Ministry of Forestry, Government of Indonesia and FAO, Jakarta.

Peluso, N.L. 1991. Rattan industries in East Kalimantan, Indonesia. In Campbell, J.Y., ea., *Case studies of forest-based small-scale enterprises in Asia: rattan, matchmaking and handicraft.* Community Forestry Case Study No. 4. FAO, Rome.

Pswarayi-Riddihough, I., and Jones, N. 1995. Some marketing problems faced by agroforestry farmers in Asia. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

For further reading

ATI. 1994. Evaluating the management of group enterprises. In *Opportunities in the coconut subsector: selected coconut processing options for small-scale producers.* Appropriate Technology International and the University of the Philippines at Los Baños, Washington, DC.

FAO. 1991. *Women's role in dynamic forest-based small-scale enterprises: case studies on uppage and lacquerware from India.* Community Forestry Case Study No. 3. FAO, Rome.

Iqbal, M. 1993. *International trade in non-wood forest products: an overview.* Forest Products Working Paper 11. FAO, Rome.

Richards, E.M. 1993. *Commercialization of non-timber forest products in Amazonia.* Socio-Economics Series No. 2. Natural Resources Institute/Overseas Development Authority, London.

6. Processing ventures

This chapter gives an illustrative overview of the range of processes by which enterprises can convert nonwood forest resources into market items, proceeding from less complex technologies to more sophisticated, capital-intensive processes. Readers should explore references in "For further reading" for more possibilities.

Evaluating options for processing requires up-to-date information on the natural resource, markets, processing technologies, and trade practices and regulations. It also requires a review of access to the resource for harvesting different products and the relative socio-economic and environmental impacts of different harvesting combinations (Lintu, 1995). For example, neem (*Azadirachta indica*) can be managed for leaves and seeds to produce many marketable products from soap to big-insecticide; cultural preferences and the biological resource might dictate an optimal product combination.

Simple-technology processing: foods and handicrafts

Food processing and handicraft production can employ local skills and require low capital investments.

Foods

Forest: fruits, nuts, tubers, palm heart, tender shoots, wildlife and insects provide many foods for which little or no processing is required for local sale. But with relatively simple techniques for drying, preserving, shelling, storing, etc., producers can increase the value of these items and reduce seasonal fluctuations in supply.

These processes also permit a rural enterprise to reach urban markets (see text box 6.1). In cities where consumer's environmental awareness allows niche markets to develop, an enterprise can increase its revenues by demonstrating the ecological soundness of its operation and meeting market preferences.

Handicrafts

The example of rattan handicrafts in Chapter 5 showed how local processing can improve producers' return from these products.

Silk-making from silkworms raised on leaves from mulberry (*Mows alba*) and other trees is a widespread cottage industry (Iqbal, *op. cit.*). Raw materials are tree-leaf fodder and the worms themselves (for mulberry silk, *Bombyx mori*). Silk production also opens a wide range of other products: mulberry produces edible fruits, a fine wood and branches useful for basketry. Other silkworms include eri (*Philosamia ricini* and *P. cynthia*) raised on castor leaves, and tassar silkworms (*Antheraea* spp.) raised on *Terminalia* sp., oak and other species. Silk and silk products make up a significant international trade, with China being the largest exporting country. Some Asian silk industries are seeking new sources of raw silk in developing countries, particularly in Africa (Iqbal, *op. cit.*).

Text box 6.1: Processing forest fruits for urban markets

The Kalahan Educational Foundation of northern Luzon, Philipphines, founded in 1973, represents members of the Ikalahan tribal communities. Through the first-ever community forest stewardship agreement with the Philippine government, the Foundation secured legal rights to Ikalahan ancestral forest lands. With this incentive for forest protection, the community decided to produce needed cash from rather than convert it to agriculture.

The foundation selected two wild forest fruits to develop three products: jelly, jam and butter. From the start they have developed 15 recipes of preserves of wild and cultivated fruits.

With the help of the Asian Institute of Management, they identified markets in Manila and consumer preferences for packaging, container size, and volume. Their product line grew to include a jelly made from a small grape-like fruit as well as ginger, tamarind and passion fruit.

The processing operation requires much planning, capital, storage space and careful attention to quality control and product standardisation. Recipe development varied from year to year as variable weather conditions cause differences in acid, sugar and pectin contents of the fruits.

The enterprise has enhanced the forest's local value, encouraged enrichment planting, and provided local employment for skilled labour (Rice, 1994).

Intermediate processing: medicines, vegetable oils, food colorants, tannins and gum naval stores

With somewhat more investment and skills, rural processing centres can produce medicines, vegetable oils, food colorants, dyes and tannins.

Medicinal plant products

More than 80 percent of the world's people depend on traditional medicinal plants for their health care. Furthermore, about 20 percent of the drugs in modern allopathic medicine are derived from plant sources. Most plants used in traditional medicinal systems are still collected from wild sources. In some cases, this industry has caused local extinction of species (De Silva and Atal, *op. cit.*; Zuhud, 1995). Where communities take steps to improve and control harvesting practices, however, medicinal plants can provide sustainable employment and improved community health.

Traditional medicines for ingestion are usually prepared using the simple methods of (De Silva and Atal, *op. cit.*):

- extraction in hot or cold water;
- crushing an item to express the juice;
- powdering dried material;
- formulating powders into pastes using water, oil or honey;
- fermenting.

In preparing dosage forms, it is important to control quality and document traditional healers' standards (see Chapter 4).

Plants with medicinal properties can also provide raw materials for downstream processing operations in the pharmaceutical industry. *Rawolfia serpentina* and *Strychnos nuxvomica* are examples. The resin of *Virola* species in the nutmeg family is used in Colombia, Ecuador and Surinam to treat fungal infections for which modern allopathic medicine has no real cures (Shultes, 1992). Research suggests that Virola may provide the basis of an international anti-fungal ointment.

Text box 6.2: The package is the product: leaves and cane baskets in West Africa

Producers explore all options for non-wood items, including packaging for other products. In Ghana, leaves for wrapping food and cane baskets as container for other products are important commercial items.

Food-sellers and other traders commonly use leaves from three main species of herbaceous forest plants as packaging. they are preferred for their strength, durability, impermeability and ability to withstand heat. Fish, vegetables, cola nuts, soap and salt, all come wrapped in these leaves. They are also the exclusive wrapping material for cooked rice, yams, beans and fried plantains. Gathering these leaves offers a means of cash for surviving hardships, as it requires little investment and has a ready market. In some villages, leaf-collecting is the main source of income for most households. Women dominate the trade at all levels.

Cane baskets also have a strong and growing demand as containers, both in local subsistence and commercial use, by rural and urban people alike. Most traded cane goes to processors in cities and neighbouring countries. In Kumasi, cane processors provided full-time jobs for 70 people in 1992. In a village of 720 people, basket weaving was a major source of livelihood for more than 100 households. Women dominate the cane trade, although most gatherers, weavers and furniture makers are men.

Demand for baskets fluctuates seasonally. In urban markets, demand can depend on markets for other products, such as fish. Rural markets for baskets fluctuate with the farming calendar, increasing during cocoa harvests. While overall demand continues to grow, little has been done to manage the resource (Falconer, 1992).

Vegetable oils

Many forest trees produce seeds that contain fatty oils; these can be processed into vegetable oils for use in cooking, food industry and soap-making, and also as fuel. Producing fixed oils is a simple process and can be done locally, with locally made equipment. In the first stage, the oil is extracted from the seeds by dry expression or by boiling the crushed raw material in water.

Vegetable oils also provide inputs to the more complex detergent industry, which uses fatty alcohol derivatives of lauric oils, which currently come mainly from palm kernels - primarily coconut (*Cocos nucifera*) and African oil palm (*Elaeis guineensis*), with smaller amounts from wild stands of babassu palm (*Orbignya* sp.) (De Silva and Atal, *op. cit.*).

Dyes and food colorants

As with many processed NWFPs, synthetic substitutes have restricted the use of natural dyes and colorants. Still, markets for certain natural food colorants have increased (De Silva and Atal, *op. cit.*). The annatto plant (*Bixa orellana*) produces a seed from which a reddish-orange food colorant, bixin, is derived. The international market for annatto has fluctuated widely in recent years but consumption in Japan, for example, has increased steadily (Iqbal, *op. cit.*). Native to tropical America, annatto is now also grown for export in Africa and Asia. It is important to know market quality standards: the international annatto market demands seeds with bixin contents of 2.7-3.5 percent, which disappointed many growers of varieties with lower bixin contents.

Tannins

Besides curing leather, tannins also go into dyes, inks, antioxidants, drugs and lubricants (including a viscous agent in oil drilling). Processing tannin extracts and powder from beans, nuts, fruits, galls, barks and stems is not complex, but it requires careful monitoring and control of conditions. Important tannin-producing tree species include: *Terminalia chebula*, *Rhus* sp., *Cassia auriculata* and *Uncaria gambler* in Asia; mangrove (*Rhizophora mangle*) in west Africa and Latin America; *Schinopsis lorentzii* and *Caesalpinia* spp. in Latin America and the Caribbean; and *Acacia* species worldwide.

Turpentine and other naval stores

Naval stores is the broad term covering pine oleoresins and their derivatives, such as turpentine. (The term comes from centuries when pine resin and pitch prevailed in ship building and repair.) Turpentine and *rosin* (a solid resin) are two constituent of pine oleoresins obtained by tapping of living pine trees. Producing gum naval stores requires plentiful labour (which comprises 50-80 percent of production costs); this particularly favours developing countries.

Carefully tapped trees can yield exudate for 15-20 years before being harvested for wood. In some developing countries, pine plantations and distillation facilities have been developed to produce gum rosin and turpentine. In one type of processing facility, pine resin is placed in a tank, where it is mixed with solvents and poured into decanters, after which it proceeds to an evaporator. The rosin is then packed in aluminum drums. The portion intended for turpentine is passed through a separator and on to a storage tank.

In most countries, these products are mostly for national markets, with about a third of all rosin going to international trade. If supply and stable prices can be ensured, natural rosin products appear safe from the threat of synthetic substitutes (Iqbal, *op. cit.*).

Complex processing: essential oils, waxes and other products

Essential oils, balsams, sweeteners, gums and waxes are all produced with more complex, capital-and technology-intensive processes.

Extraction processes for these products favour centralized, large-scale operations that use products from intermediate processing operations, as inputs. Because they remove operations further away from the household level and require full-time employment and specialized skills, such processing operations tend to disfavour women compared to the processes mentioned above.

Essential oils

Essential oils are volatile aromatic compounds located in many plant parts. They are used in many industries for adhesives, pharmaceuticals, cosmetics and toiletries, paints, paper and printing, insecticides, textile making, polishes, solvents, rubber and plastic products, and food and beverages (De Silva and Atal, *op. cit.*). The common method for extracting essential oils is steam distillation, although some, like citrus oils, are processed by cold expression. Steam distillation involves generating steam with a separate boiler and passing it through the plant material in order to carry off the volatile constituents.

Extraction with solvents or essential oils from flowers, or oleoresins from spices (for example, ginger, pepper and cardamon) requires an additional step of separation.

A plant's yield of essential oil depends on harvesting and post-harvest operations, including (De Silva and Atal, *op. cit.*):

- stage of harvesting (maturation, flowering stage);
- time of day when harvested;
- rate of drying;
- temperature of drying;
- moisture content after drying;
- storage conditions;
- storage time before processing.

The requirements are beyond the means of most rural enterprises, but in some developing countries the government operates processing centres to feed national industries (Table 6.1).

Table 6.1: Essential oils obtained from wild and cultivated forest species, in main producing countries

Product	Botanical source	Main origin
Amyris	*Amyris balsamifera*	Haiti
Anise/star anise	*Pimpinella anisum*	Spain, Poland, former Soviet Union
Anise, star	*Anisum verum*	China, Viet Nam
Bay/laurel leaf	*Pimenta racemosa/Laurus nobilis*	Dominica, Turkey, Italy, Côte d'Ivoire
Cabreuva	*Myrocarpus frondosus*	Brazil
Caraway seed	*Carum carvi*	Many Asian, Western European and North African countries, USA
Cedarwood	*Cedrus spp./Juniperus* spp.	India, Sri Lanka, Guatemala, USA, China, Kenya
Cinnamon/cassia	*Cinnamomum verum/C. cassia*	Sri Lanka (cinnamon), China (cassia)
Citronella	*Cymbopogon* spp.	Indonesia, China, Sri Lanka, India, Taiwan, Guatemala

Davana	*Artemisia pallans*	India, Pakistan
Eucalyptus	*Eucalyptus* spp.	China, Portugal, Spain, South Africa, Brazil, Australia
Lavender	*Lavendula* spp.	France, Italy, Spain, Hungary
Lemon grass	*Cymbopogon flexuosus*	India, Guatemala, China
Litsea	*Litsea cubeba*	China
Muhuhu	*Brachylaena hutchinsii*	Tanzania UR
Nutmeg/mace	*Myristica fragrans*	Indonesia, Grenada, Sri Lanka
Palmarosa	*Cymbopogon martini)*	India
Patchouli	*Pogostemon cablin*	Indonesia, China
Pimento (allspice)	*Pimenta dioica*	Jamaica, USA
Rosewood	*Aniba rosaeodora*	Brazil, Peru
Sandalwood	*Santalum album*	India, Indonesia
Sassafras	*Ocotea pretiosa*	Brazil
Tagetes	*Tagetes glandulifera*	Eastern and Southern Africa
Thyme	*Thymus vulgaris*	Spain
Vetiver	*Vetiveria zizanioides*	Haiti, Indonesia, China, Reunion Is.
Ylang-ylang	*Cananga odorata*	Comoro Is., Madagascar, Indonesia

(Source: Iqbal, 1993)

For example, in Indonesia *cayuput* oil is extracted from the leaves of *Melaleuca* sp. (cayuput) for sale as a medicinal unguent, mainly within Indonesia. The State Forest Enterprise in Java (Perum Perhutani) manages 12 distillation centres for extracting the oil, and 9000 ha of Melaleuca plantations. In 1993, cayuput oil production was 279,800 kg, accounting for a considerable portion of the State Forest Enterprise's total income.

Farmers manage cayuput trees in agroforestry systems. Starting in the fourth year, the fanners coppice the trees, strip the leaves from branches and bag them for transport to a nearby facility. There the leaves are boiled and the leaf oil passes through separators. Waste leaves are used to fuel the boilers, and for organic matter. An eight-boiler cayuput distillation plant produces about 78000 litres of oil annually, from almost 9 thousand tons of cayuput leaf (FAO, 1995).

Waxes and other products

Natural waxes from forest sources are used in making candles, varnishes, pharmaceuticals and cosmetics. Some waxes are collected, melted and shaped into cakes. Others are obtained by solvent extraction. Natural waxes suffer from heavy competition with cheaper synthetic substitutes, but some of its specific properties help to maintain a demand. Processing of wax oils can be simple, but requires rigorous quality control.

Some plant residues can be used to produce market items. For example, in the Himalayan region of India pine needles under natural pine forests are collected, baled and processed as boards (De Silva and Atal, *op. cit.*).

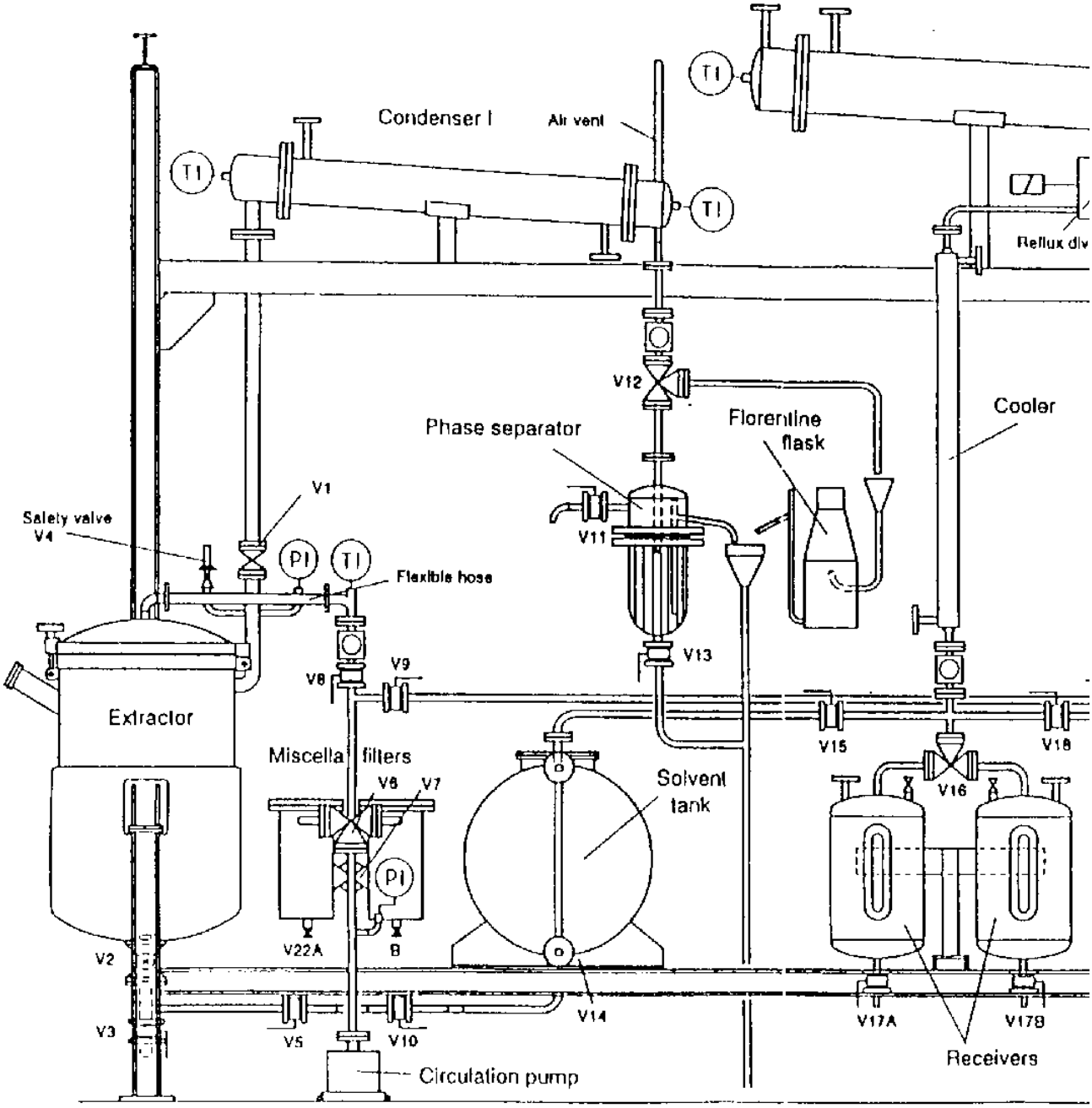
Steps in processing

The steps involved in developing a processing operation are the following:

- Select non-wood product(s) for processing based on available resources, facilities and marketability.
- Start small-scale pilot production to test the feasibility of the process, product quality and market preferences. Gain a clear understanding of quality goals. For pilot-scale testing of medicinal and aromatic plants and spices, producers can use a transportable, small-scale plant, such as the polyvalent pilot plant designed by UNIDO (De Silva and Atal, *op. cit.*). This portable plant is intended as a tool for collaboration between researchers and producers (Figure 6.1). At this pilot stage, facility design should consider how to accommodate production of several products (for example, from plant parts produced in different seasons).
- Determine the cultivation, harvesting and/or post-harvest treatments best suited for the enterprise and to ensure sustainable supply (see Chapters 4 and 5).
- Make or purchase equipment and arrange for the space, utilities (water and energy) and human resources for production. Plan for storage and transport. This step often entails preliminary estimation of production volume and unit price, and arrangements to obtain credit for capital investments.
- arrange for training staff in processing methods and quality control. Establish measures for ensuring continual monitoring of these.
- start processing operations with technical assistance as needed. Continue to review estimates of production capacity, costs and product price.

Processing requirements can include steady supplies of water (for example, in steam distillation or cooling engines) and/or energy. Where running water is scarce, condensers can be air cooled instead. Where electricity is not available, alternatives may include fuelwood or other material; if so, the enterprise should promote fuelwood plantations early to supply its needs.

Figure 6.1. UNIDO polyvalent pilot plant for processing medicinal and aromatic plants and spices. (De Silva and Atal, 1995).



Quality standards

Processed products are frequently subject to national (and sometimes international) minimum standards for quality. Particularly for items intended for personal use or ingestion, such as soaps or medicines, these standards are important. They often cover processing operations and screening of raw materials (for example, to ensure good-quality genetic stock and post-harvest treatment that prevents contamination).

For products destined for international markets, the norms of the International Standards Organization (ISO) apply, usually the ISO 9000 series of specifications, which aim to ensure safety for workers, the environment and consumers. Compliance also has benefits for the processing enterprise: companies with ISO 9000 certification report that this has saved them money and yielded marketing benefits (De Silva and Atal, *op. cit.*).

Producers intending to sell to urban and national markets should consult government agencies and regulatory institutions concerning specifications, including limits on pollutants emitted by the processing facility.

The World Health Organization has prepared international guidelines for countries to evaluate quality, safety and effectiveness of long-term use of herbal medicines. The guidelines cover pharmaceutical assessment, crude plant material, plant preparations such as powders, extracts, tinctures and oils, descriptions of the finished product, testing of stability and safety in long-term use, toxicology, and assessment of efficacy. They also suggest criteria for product labelling and promotion (WHO, 1991).

New product development and research support

Research for identifying good processing options for non-wood resources can proceed in several ways. For aromatic and medicinal plant products, one way is the kind of collaboration mentioned earlier for trial distillation and chemical analysis. Other international agencies can similarly support research and collaborate with entrepreneur groups. Text box 5.1 illustrated examples of such support for studies on processing, export marketing, product quality and laboratory evaluation.

In South Asia, the Medicinal Plants Network established by the Canadian International Development Research Centre (IDRC) supports research and small-scale activities related to medicinal plants. The Network aims to document traditions in plant-based health care, protect and conserve medicinal plants (including cultivation), and share technology, standards, quality-control measures and studies on the impacts of medicinal plant trade (IDRC, 1994).

In many countries, consortiums of NGOs, universities and the private sector are evolving to bridge the information gap between forest-product research and producers. These consortiums can help evaluate new processing opportunities and disseminate valuable information on new technologies - those that rural enterprises can use and, equally important, those that may compete with them. Effective consortiums have grown up in Australia, the Philippines and Zimbabwe (see Chapter 9 and 10).

As regional centres of excellence emerge, they should further help to explore processing options for key species common to several countries, with reduced burdens to each country's scarce research resources (see Chapter 9)

Summary

- If there is predictable resource availability and good marketing information, explore processing options near the location of forest resource to increase the value that producers receive for their product. For urban markets, explore market niches that a processed product might fill.
- Identify the scale of processing appropriate to the resource, product and enterprise skills. Household-scale processing options include food-drying and -packaging and handicrafts. Community-scale operations can process medicinal products, vegetable oils, soaps, dyes and tannins. Still more complex rural processing centres can produce turpentine, waxes and inputs for downstream industries.
- Start with pilot-scale production to test the process, product quality and market preferences. A pilot trial can also help in designing flexible facilities for processing several products, reducing costs for each one.
- Before starting a processing venture, learn about the regulations and quality standards to which processed goods are subject. Establish means for monitoring product quality. Public - private consortiums can transfer important information on standards and processing technologies from researchers to producers.
- Stay informed on processing research relating to the enterprise's product and substitute products. Pilot processing plants, information networks, national consortiums and regional research centres all provide options for this.

References

De Silva, T. and Atal, C.K. 1995. Processing, refinement and value addition of non-wood forest products. In *Report of the expert consultation on non-wood forest products.* FAO, Rome.

Falconer, J. 1992. *Non-timber forest products in southern Ghana: a summary report.* ODA Forestry Series No. 2. UK Overseas Development Authority, London.

FAO. 1995. *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

IDRC. 1994. Medicinal plants network information. Xerox. International Development Research Centre, New Delhi.

Iqbal, M. 1993. *International trade in non-wood forest products: an overview.* Forest Products Working Paper 11. FAO, Rome.

Lintu, L. 1995. Trade and marketing of non-wood forest products. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Rice, D. 1994. Marketing multipurpose tree products: the Ikalahan experience. In Raintree, J.B. and Francisco, H.A., eds., *Marketing of multipurpose tree products in Asia.* Winrock International, Bangkok.

Shultes, R.E. 1992. Ethnobotany and technology in the Northwest Amazon: a partnership. In Plotkin, M. and Famolare, L., eds., *Sustainable harvest and marketing of rain forest products.* Conservation International, Washington, D.C.

WHO. 1991. Guidelines for the assessment of herbal medicines. Programme on Traditional Medicines, World Health Organization, Geneva.

Zuhud, Ervizal A.M. 1995. Sustainable utilization of medicinal plants and animals diversity in Indonesian tropical forests. Paper contributed to an FAO Expert Consultation on Non-Wood Forest Products, 17-27 January 1995, in Yogyakarta, Indonesia. Indonesian Tropical Institute Secretariat, Bogor, Indonesia.

For further reading

ATI. 1994. *Opportunities in the coconut subsector: selected coconut processing options for small-scale producers.* Appropriate Technology International and the University of the Philippines at Los Baños, Washington, DC.

Coppen, J.J.W. and Hone, G.A., eds. 1992. *Eucalyptus oils: a review of production and markets.* Bulletin 56. Natural Resources Institute, Kent, UK.

FAO. 1987. *Small-scale forest-based processing enterprises.* Forestry Paper No. 79. FAO, Rome.

FAO. 1988. Silkworm rearing. Agricultural Services Bullettin No. 73/1.

FAO, 1988. Silkworm rearing. Agricultural Services Bullettin No. 73/2.

FAO. 1993. Chemical processing and utilisation of *Acacia catechu*. FAO/RAPA, Bangkok.

UNIDO. 1991. *Design options for a polyvalent pilot plant unit for the distillation and extraction of medicinal and aromatic plants.* Department for Industrial Promotion, Consultations and Technology. UNIDO, Geneva.

Zinkel, D.F. and Russell, J., eds. 1989. *Naval stores: production, chemistry, utilization.* Pulp Chemicals Association, New York. 1,060 pp.

7. Markets, marketing and trade

This chapter takes a closer look at two major forces playing in any effort to link rural economic development to non-wood forest resources: markets and the means to reach them. For this chapter, *marketing* is defined as an information-based technology that producers can use to (Lintu, 1995):

- identify market opportunities in the form of market needs and wants;
- analyze competition;
- develop appropriate approaches to reach identified markets;
- make a profitable income.

Proper marketing starts with linking the resource and product development to market preferences. In sustainable forestry, the role of marketing is to create effective linkages between resource managers, processors, and end users.

This chapter will discuss the basic aspects of marketing to meet customer preferences: product, place (channels of distribution), promotion and price. It will look at the role of intermediaries in distribution channels, and the *trade environment* formed by social and economic, technological, political, regulatory, legal, and institutional factors, particularly for national and international markets.

Markets

NWFPs are sold in various markets: local, urban, national, regional and international. In Costa Rica, products from the bitterwood tree (*Quassia amara*) are marketed in local markets (as a medicinal substance), national markets (processed as herbal teas or medicinal drops), and on a pilot scale in international markets (as a pesticide). In many places, daily markets focus on local demand, while weekly markets can address both rural retail and wholesale demands (Falconer, 1992).

Each market holds a different set of values, even for the same product. Consumers in an industrialized country may purchase cane baskets from West Africa for their *environmental* value if they know that the cane harvest did not destroy the forest, or for their *aesthetic* value as "exotic objects". An urban consumer in West Africa may purchase the basket for its *functional* value, or if cheaper than plastic baskets, for its *economic* value. Good marketing involves knowing which values a particular market seeks, and making one's product more desirable than competing products based on that information.

Each market place also involves different influencing factors relating to the product, promotion, and price. (See Chapter 5 on the relative risks associated with each type of market.) For example, selling herbal medicine in a local market may involve no packaging, broad quality categories, and few transport costs. However, marketing the same product in a city can require precise identification of quality standards, more sophisticated packaging and advertising, and incorporating transport costs into the product's price.

In many countries, urban markets for traditional rural products are growing as people move to the city, but retain rural customs. Markets for traditional forest-based medicines in Indonesia, for example, have grown; the number of companies producing these items has doubled in twenty years. To exploit this trend of *nostalgia markets*, producers must identify which customary products are in demand and in what form (package size, packaging, etc.) they are desired.

Each market also entails different levels of ecological constraints. For example, plant species in tropical forests that occur at very low densities may yield enough material to support local demand for a product, but not the volume needed to cover costs of processing for national marketing. In this case, producers should recognize at the start that it is not financially or ecologically feasible for them to expand their market.

Downstream processing can serve as markets for primary products. The same principle of learning conditions and demands applies to them. If a soap manufacturing firm is the market for coconut, coconut producers must know what quantities the soap factory requires, its production schedule and what criteria the manager uses to buy coconuts for soap-making.

Neighbouring countries may share cultural or ecological features that make regional markets worth exploring. In Asia, for example, the rattan furniture manufacturing industry in the Philippines and India's essential oils industry benefit from the existence of a regional market (Cubberly, 1995). The Costa Rican tea industry has begun small-volume exportation of a packaged tea to other Central American countries using plants valued throughout the region (Ocampo, 1994). In West Africa, regional markets are important in the trade of cane baskets (see text box 6.2).

International markets require more complex research on preferences, prices and trends. They also typically have more exacting standards and require stable supply of at least a specified minimum volume.

Table 7.1 presents several methods for evaluating markets. Producers should also talk with private firms and NGOs that have experience in marketing related products, development agencies, universities and other information clearinghouses.

Table 7.1: Methods for evaluating markets, by type of product

Type of product	Type of market	Method of evaluation
Established	Local	Conduct a simple survey of shops (at least 5-10) to identify current products being sold and their prices. Shopkeepers might indicate how much they sell each month.
Established	Local	Survey households in the target area (preferably at least 30-50 consumers) to find out how much of various products they use in a week or month. Speak to people who actually do the buying (often women). Note household size and income class (high, middle, low). Use local government statistics to determine number of households and income levels. Then multiply the average usage per household by the number of households (per income class) to get a rough estimate of the total local demand.
Established	Manufacturing industry and/or export	Survey industry representatives (3-5) to find out product demand and prices. Ask them if they would consider purchasing from a new supplier, and under what terms of price, payment, quantity, quality and packaging.
Not established	Local consumption	Identify who would be most likely to buy the product. Interview them to gauge their potential interest and what level of price, quality, packaging and quantity they desire.
Not established	Manufacturing industry and/or export	Identify who would be most likely to buy the product. Inquire from the agency concerned with trade about what companies might be interested in the product, and what quality regulations apply, if any. Then contact those companies directly to learn their potential interest and preferences.

(Based on ATI, 1995)

Once an enterprise has learned about a prospective market and its requirements, it should further narrow the scope to a target market (ATI, *op*. *cit*.). How large is the target market? Who are the competitors for that product? What is their current share of the market and how fast do they plan to expand? Answering these questions may identify ways to raise the product's value. For example, a purchaser may be willing to pay a higher price for a product sorted by grading categories that guarantee consistent quality, and this may require packaging and storage. Purchasers of morel mushrooms, for example, can be willing to pay a higher price for morels that have been cleaned (Iqbal, 1993).

Once an enterprise has identified a target market and the scale of production, it may choose to organize local groups for processing and/or marketing into cooperatives (see Chapter 8). Collective organization can also be effective at the national level, where producer associations can together supply the high volumes needed to enter international markets , organize trade shows and exchange information on international trade.

Text box 7.1: Women in the marketplace in Ghana

In Ghana's largest daily urban market, more than 90 percent of the traders are women. There, trade in NWFPs involves 700 people on a full-time basis, including:

- 100 traders of leaves for wrapping foods (monthly sale value exceeds US$ 47,000)
- 100 medicine traders, mostly women
- 25 full-time basket traders (selling 1,000 5,000 baskets/month)
- 50 full-time traders of smoked bushmeat and 15 for fresh meat (annual sale value of US$ 209,000).

In the market for bushmeat soften identified as tile most important forest product), women are the main traders; men are involved mainly as hunters, butchers and chop bar owners. Wholesalers control the trade and set prices for both suppliers and retailers. A wholesaler ensures continual supplies by providing credit services to the hunters (Falconer, 1992).

Key factors in marketing non-wood products

This section provides a quick review of the most essential aspects/factors that producers need to understand in selling their product - the "Four P's" of product, place, promotion and price. Producers should determine these factors at the beginning of an enterprise, and develop a marketing mix that balances the four factors to strengthen their enterprise to be capable of meeting any competition. This evaluation should be repeated regularly once the business is under way, and the *marketing mix* adjusted in response to changes (ATI, *op. cit.*).

Product

Selling a product requires the producer to understand the values that a buyer attaches to the product. From the buyer's viewpoint, the product includes not just the physical product but also the economic, moral, aesthetic, and other values associated with it, as mentioned above; these values vary depending on how it is marketed (Lintu, *op. cit.*).

The first question that a producer should ask is: is the product already established in the market or not? In general, established products involve less risk than new products. Also, more marketing information will exist for established products.

A product that is established in one country or even locality may not be desired or demanded in another place. If several traders already deal in the product, then it is most likely an established product (ATI, 1995).

Other questions about the product, among others, are: is it available throughout the year or only during a certain season? In what quantities is it produced in the area? What are the factors that determine its quality as perceived by customers - are these factors in producer's control, or not?

Place and the role of intermediaries

Place refers to channels of distribution and marketing through which products and information move between producers and consumers (Lintu, 1995). This factor of marketing involves transportation and intermediaries in distribution.

Intermediaries, or *middlemen* can serve important roles that can either help or hurt small-scale producers of forest products. In many places middlemen keep a strong grip on markets because they provide producers with three essential services: quick credit, quick and non-bureaucratic payment for products and good organization (Pswarayi-Riddihough and Jones, 1995). Middlemen can also be essential for centralizing supply among dispersed producers and helping to absorb risk in markets that require product volumes too large for individual producers to provide (e.g. industries for gums, resins and essential oils).

On the other hand, middlemen can, and often do, unfairly exploit producers' weakness and ignorance of market factors in order to claim a disproportionate share of the product's value for themselves.

An example from Peninsular Malaysia illustrates both situations. In one village, coconut and cocoa producers had difficulty entering the market directly because this involves large initial capital investment (for a van or other form of transport) and heavy competition. This competition kept middlemen's profits relatively low, and producers did not complain of being exploited. On the other hand, in the village of Kampung Bandar Terai, producer-gatherers of durian fruits (*Durio zibethinus*) and petal (*Parkia speciosa*) found that entering the market required little investment for them and offered significantly greater returns than dealing through middlemen (Table 7.2).

Producers can avoid unfair exploitation by middlemen by:

- educating themselves about market conditions;
- organizing themselves into groups for greater collective strength; and
- pressing for market channels that are *transparent* (that is, traceable in terms of transactions and profit margins).

Table 7.2: Farmers' access to markets in two locations of Peninsular Malaysia in 1990

	Sungai Burung		**Kampung Bandar Terai**	
Products	Coconut, cocoa		Durian, petai	
Investment	Overhead, manpower		Minimal	
Product price	Relatively fixed		Flexible	
Marketing channel	Well established		Loose	
Average selling price	coconut	cocoa seed	durian	petai
to middleman	US$ 0.06 ea.	US$ 0.24 /kg	US$ 0.40 ea.	US$ 5.60/100
to urban consumer	US$ 0.20-0.24	-	US$ 1.60	US$ 7.20
Market entry	Difficult		Easy	
Potential for direct farmer	Poor		Good	
involvement in marketing				

(Adapted from Lim and Woon, 1994)

Promotion

Promotion involves advertising or other ways of raising purchasers' awareness of the product. Key questions in promotion for a target market include:

- Why would consumers buy the enterprise's product instead of a competitor's, or a substitute?
- How will purchasers learn of the product? What are the costs and expected effectiveness of advertising options for reaching the target market?
- Should any labelling or brand name be used to identify the product?
- Do purchasers expect a certain kind of packaging (size, durability, attractiveness) or other characteristics?

In rural markets, word-of-mouth recommendation can be the most effective promotion. Urban and national marketing likely require more formal campaigns. New products, or established products in new niches, require more resources for promotion. For example, an effort in Nepal to create a larger market for Ayurvedic medicine required a great deal of advertising to overcome consumer bias in favour of Western-style medicine (LeCup, 1994). A supplier's reputation for reliability is also a favourable factor for promotion.

Price

To arrive at a competitive price that compensates production effort (including promotion), an enterprise must

consider a variety of questions, including (ATI, *op. cit.*):

- What is the local availability and cost of raw materials, including packaging?
- What is the cost of equipment and operations (including maintenance and repair) needed to produce the item ? What are the labour costs? What are the infrastructural costs of energy, workshops and storage?
- What are the costs associated with maintaining market specifications of quality (for example, inspectors, testing equipment)?
- How much transportation cost is required? How far away are the target markets?
- What costs are involved in product marketing and promotion? Who will bear these costs - the producer or distributor?
- What are the costs and benefits of using intermediaries for marketing?
- What are the financing costs (for example, loan repayment)?
- How many days per year will the enterprise operate with available supplies of labour, raw materials, product demand, energy and water? How much time will equipment repairs and maintenance take?
- In view of the above expected costs and the volume of demand, can the products be sold at a competitive price?

Once the costs are calculated, the enterprise should again compare the benefits of the production effort with alternatives, to make sure that the venture offers the best return to its labour and resources. Producers should regularly calculate the enterprise's profitability compared to other investments. This highlights the need for good record-keeping of costs and transactions.

Text box 7.2: Matching markets and processing technology

As with matching appropriate technology to market demand (see text box 5.1), producers must learn to recognize processing solutions to marketing problems. Decentralized shelling and grading of Brazil nuts, for example, reduces production and transport costs and can therefore increase the product's competitiveness in the international market.

Countries can improve their producers' ability to meet international-scale market demands for NWFPs by providing incentives for investing in crop management and new plantings. Clear and secure land- use rights is a particularly effective incentive (LaFleur, 1992).

At the enterprise level, producers should maintain a marketing strategy that considers the four areas of: (1) growing/managing raw material resource, (2) enterprise organization, (3) market environment, and (4) marketing plan effectiveness (Charit, 1994). Questions to consider in a marketing checklist include the following:

<u>Raw material resource</u>

- What is the outlook for the next 10-20 years for resource availability, (based on soil fertility, rainfall and other factors)?
- What changes are likely in growing patterns and use of different varieties? What new cost-effective processes can increase productivity?
- What new laws or regulations might affect production (e.g. price controls, subsidies, tax incentives)?
- What does the nearby community think of the enterprise? Can anything be done to improve its involvement?

<u>Enterprise organization</u>

- Are there problems with the enterprise's cash flow or access to credit?

- Are any significant changes taking place in how the enterprise obtains raw materials?

Market environment

- What changes in market prices should the enterprise consider in its marketing plan?
- Is competition among buyers likely to increase?

Marketing plan effectiveness

- Does the enterprise know why buyers buy its products?
- Do the marketing objectives cover everything from species selection to product delivery?
- Do the marketing objectives match resources and market opportunities?
- Are adequate resources allocated to marketing?
- Is the costing of the product accurate? Is labour included?

Placing a value on sustainable supply

Proper valuation of long-term supply poses a problem in sustainable forestry. Producers who employ wise management will often have to compete with others who do not. This can mean that the sustainable enterprise must: (a) distinguish itself from others through promotion and public education efforts on environmental problems, or (b) find other ways to reduce costs so that it can sell the product at the same or lower price as their competitors. The decision depends on consumer attitudes and public awareness of the importance of sustainable forest utilization.

Market information systems

Effective marketing depends on reliable, up-to-date marketing information on the Four P's. Once an enterprise is started, how does it update information on market demand, competition and trade factors on a regular basis? *Market information systems* are the answer.

National and regional systems

Market information systems for agricultural products are better established than those for NWFPs and some efforts to provide NWFP producers with market information have started through the agricultural sector. Examples include (Lintu, *op*. *cit*.):

- *Tribal Cooperative Marketing Development Federation of India, Ltd. (TRIFED).* TRIFED disseminates price information from Indian national and export markets to member cooperatives in a bi-weekly mimeograph. It focuses on agricultural products but also covers some NWFPs;
- *Indonesian Agricultural Market Information Service.* This service gathers price information at markets throughout Indonesia, enters it into computers and disseminates it by radio and local blackboards;

- *Marketing Information System of Ghana.* This government-run system provides wholesale and retail prices for 30 agricultural commodities on a bi-weekly basis, mainly for government use.

In India, an ambitious plan by the National Wastelands Development Board uses regional radio and television centres to provide farmers with information on agricultural commodity prices (Issar, 1994). All Indian newspapers now devote one page each week to agricultural commodity prices and articles on trends. States such as Haryana and Punjab have organized state marketing boards that provide intra-state price information.

Government trade offices and universities may possess information on market factors which are less accessible to entrepreneurs. Where market research services exist, producer groups may organize collectively to commission a market study and share the cost.

FAO has published a *Compendium of computer-based databases of relevance to forest-products marketing,* and is currently testing it with potential users with the aim of revising it for wider distribution (FAO, 1995).

Local market systems

Producers can create information systems for tracking local markets relatively easily with assistance from extension workers. FAO has developed a method for developing such a system in collaboration with the Philippines government for use by local producers, extension workers, and NGOs involved in community forestry. The guidelines were tested in the Philippines, Uganda, Peru and the Solomon Islands, and are now being published by the Community Forestry Unit of FAO. In outline, the process consists of the following steps, to be adapted to each local situation:

- *a pre-feasibility study* assesses the appropriateness of a market information system based on local perceptions, existing information sources, products and market access;
- *a local situation analysis* identifies local markets and current sources and uses of market information;

- *system establishment* determines the system's scope, selects and trains data collectors, prepares guidelines for record-keeping, and selects the most appropriate media (blackboards, newsletters, radio broadcast);

- *monitoring and evaluation* seeks input from people who use the system and from those who do not use the system, and evaluates the use of the information.

Data gathering for market information systems, like other NWFP research, should account for the effects of non-economic factors, such as cultural preferences, taboos and the existence of ethnic or kinship links in market chains.

Information on international markets

In international markets, accurate information is vital because more variables are beyond producers' control and trade fluctuations for commodities can be more pronounced and faster paced. Information on international markets is more difficult to obtain because sources of consumer preferences, import regulations and policies are more distant and often closely guarded by agents or intermediaries. Some of this information for NWFPs is available from the International Trade Centre, FAO, and others listed in Appendix 1.

Green marketing

Green marketing is an environmental niche in NWFP marketing that has grown in recent years. Green marketing is based on the understanding that a growing number of consumers (particularly in industrialized countries) are more likely to purchase a product if they know that its production is environmentally sustainable (see text box 7.3). Generally, green marketing ventures require rural producers to work through international intermediaries with offices in the destination countries, which can more easily collect market information and promote the product in these markets. Some mail-order catalogues managed by non-profit organizations also link producers in developing countries with overseas consumers of environmentally - safe products with lower transaction costs.

It is too early to know if optimism about green marketing is entirely justified, but public education about the need for sustainable forest management can help improve its prospects.

The trade environment

Market transactions are influenced by trade regulations and other related factors and trends. Although a full discussion of these factors is beyond the scope of this volume, this section briefly reviews their effect on producers entering NWFP markets.

National and local trade

Policies and regulations governing NWFPs are often confusing. Because these products can originate from either domesticated sources or natural forests, they can come under agricultural, forestry and/or other government policies (see Chapter 10). In India, tree-farmer cooperatives knew the obstacles posed by laws forbidding transport of tree products across state borders, and managed to negotiate better legal terms (see Chapter 8).

Text box 7.3: Some lessons in green marketing

The "Tagua Initiative" managed by Conservation International aims at marketing "vegetable ivory" from the tagua palm of Ecuador and Colombia to garment manufacturers in the United States for use as buttons. In its first year, the project generated sales of US$ 500,000. The project promoted tagua as a high-quality material and its sale as a way to conserve tropical forests through sustainable community development. After almost three years, lessons learned included:

1. The conservation impact is greatest when integrated with community development, scientific research, education, and policy work.
2. International marketing of NWFPs brings together at least two very different cultures and economies. To succeed, projects must be carefully designed to accommodate the distinct needs of these disparate worlds, and good communication among all parties is a must.
3. Community - level enterprise development must be geared to local development.
4. The products must be profitable for every player in the economic chain.
5. Local enterprises should be supported with loans rather than grants, wherever possible, to encourage focus and a sense of ownership.
6. Options for local processing should be pursued.
7. Opportunities in local and national markets, in addition to international markets should be explored (Tangley, 1993).

Cultural Survival Enterprises, also begun in 1990, has worked with groups in the Brazilian Amazon to market NWFPs in the United States. In its first two years it averaged 400 percent growth. Further lessons in green marketing from its experience include:

- Start with products already on the market. Introducing new products can take up to five years for foods, 10 for personal-care products, and 20 for pharmaceuticals.
- Organize for strength in numbers.
- Monitor the sustainability of production. Green-market consumers are interested in protecting ecosystems, not the people who live in them (Clay and Clement, 1993).

Regional and international trade

Neighbouring countries in a region often have similar resources and markets. Table 7.3 shows some internationally traded species common to Latin American countries and the non-wood products they yield. Producers of NWFPs in Asia have begun to explore the species and technology they use in common (Durst *et al*., 1994). Where this kind of overlap exists, neighbouring countries can benefit from collaborative research in harvesting and processing, and in negotiating trade terms.

Table 7.3: Amazonian forest species with market potential in agroforestry and sustainable NWFP management systems

Species name	Uses[1]	Current markets[2]
Assai (*Euterpe oleracea*)	F,B,Ph,H	F,L,N,I
Buriti (*Mauritia flexuosa*)	F,B,H	F,L
Patauá (*Jessenia bataua*)	F,B,O	F
Pejibaye (*Bactris gasipaes*)	F,B,O, Ph	F,L
Piqui (*Caryocar villosum*)	F,O,T,Ch	F
Brazil nut (*Bertholletia excelsa*)	N,O,T,Ch,H, N	F,L,N,I
Pendula nut (*Couepia longipendula*)	N	F
Bacuri (*Platonia insignia*)	F,N,T,Ch	F,L
Camu-camu (*Myrciaria dubia*)	F	F,L
Cupuassu (*Theobroma grandiflorum*)	F,O,C	F,L,R,N,I
Copaíba (*Copaifera multijuga*)	O,P,M	F,L,R,I

Jatobá (*Hymenaea courbaril*)	F,R,T	F
Andiroba (*Carapa guianensis*)	O,M,T	F,R
Babassu (*Orbignya phalerata*)	O,Ch	F,L,R,N
Ucuúba (*Virola surinamensis*)	T,O	?
Cumaru (*Dipteryx odorata*)	O,E,P,T	F,L,I
Rosewood (*Aniba ducked*)	E,P,I,H	I
Sacaca (*Croton cajucara*)	M,E	F,L
Tagua (*Phytelephas aequatorialis*)	N,H	F,N,I

[1]Uses: B=beverage; C=cosmetic; Ch=charcoal; E=essential oil; F=fruit; H=handicrafts; M=medicinal; N=nut; P=perfurne; Ph=palm heart; R=resin; T=timber; O=other.

[2]Current markets: F=family; L=local; R=regional (subnational); N=national; I=international.

(Clay and Clement, 1993)

Trends in international NWFP trade

Table 7.4 summarizes the most economically important NWFPs in world trade, totalling about US$ 11 billion annually. These products originate from a wide variety of geographic sources, but a significant portion come from the forests of Southeast Asia, especially fruits, resins, fungi, wild honey, medicines, aphrodisiacs, sandalwood, bamboo and rattan ware. China processes and trades in more products from wild sources than probably any other country, and now dominates world trade in NWFPs (Iqbal, 1995). Other major suppliers to world markets include India, Indonesia, Malaysia, Thailand and Brazil.

Table 7.4: NWFPs most prominent in world trade*, with three main markets

Item

	Total imports (US$ million)	**EEC**	**USA**	**Japan**
Other plants used in pharmacy	689.92	171.23	88.59	91.96
Other fresh fruits (including, i.a.jujubes)	685.22	263.22	51.30	127.91
Natural rubber latex in primary forms	519.92	109.24	84.08	37.09
Essential oils, resins	312.52	95.53	108.54	22.43
Ginseng roots	389.34	11.90	11.10	39.89
Mats, mattings and screens of vegetable materials	215.95	22.03	17.13	135.12
Other live animals	183.92	61.67	43.48	8.05
Natural honey	268.18	143.39	53.92	35.12
Edible products of animal origin	80.38	6.75	4.02	1.46
Ambergris, castoreum, civet, musk	134.08	44.48	3.02	42.92
Brazil nuts, fresh or chilled	44.34	22.11	16.78	0.20
Walnuts in shell	115.33	91.11	0.03	1.26
Walnuts without shells	100.56	37.68	0.27	13.03
Chestnuts	109.95	2.01	10.46	64.14
Other nuts	222.91	21.01	91.68	24.39
Mucilages, thickeners derived from locust beans, locust bean seed or guar seeds	141.33	34.02	45.35	25.95
Cinnamon and cinnamon-tree flowers	95.62	10.05	28.91	2.58
Nutmeg	24.16	12.56	2.51	2.58
Other spices	48.34	5.65	20.85	2.22

Flour and meal of sago	18.06	0.77	0.92	0.33
Liquorice roots	33.45	5.74	9.39	7.54
Locust beans	22.39	18.30	0.45	0.18
Lac	25.28	4.67	9.37	2.38
Gum arabic	101.31	53.74	18.89	6.18
Other natural gums, resins, balsams	92.75	29.95	11.00	2.14
Liquorice sap	57.27	22.79	15.48	5.38
Bamboos	37.56	12.57	3.13	7.58
Rattans	118.98	13.75	5.44	6.53
Other vegetable materials for plaiting	39.67	20.90	4.73	8.33
Kapok	11.92	1.45	0.73	5.23
Vegetable materials esp. for brooms, brushes	28.11	10.20	8.59	3.96
Raw veg. materials esp. for dyeing, tanning	31.06	9.40	2.03	2.48
Other vegetable products (doum palm flour, Panama bark, bidi leaves, etc.)	63.85	18.43	11.49	20.29
Tung oil and its fractions	49.59	4.53	9.36	11.86
Jojoba oil and its fractions	11.59	7.61	2.29	0.42
Other fixed vegetable fats and fractions	98.90	33.73	8.67	10.06
Vegetable waxes	44.02	13.49	13.08	6.13
Beeswax, other insect wax	19.14	8.65	2.38	2.77
Maple sugar and maple syrup	43.63	9.64	28.09	1.30
Quebracho extract	51.93	20.66	6.36	0.98
Wattle extract	63.87	15.41	8.07	5.49
Tanning extracts of vegetable origin	20.51	1.54	7.59	0.66
Colouring matter of veg. and animal origin	152.08	32.21	31.80	12.94
Resinoids	61.35	7.92	34.88	3.01
Concentrates of essential oils in fats	39.95	9.23	7.30	3.71
Gum, wood or sulphate turpentine oils	31.23	12.16	2.12	7.84
Balata, gutta-percha	26.72	5.25	4.87	6.71
Corks and stoppers of natural cork	157.16	17.45	59.26	6.18
Other articles of natural cork	13.71	2.81	3.05	1.30

* Categorized by Harmonized Commodity Description and Coding System (HS) codes.

(Source: Iqbal, 1995)

A striking pattern in international trade of NWFPs is that developing countries are the major producers and exporters of raw or semi-processed products; and developed, industrialized countries are the major importers (Iqbal, 1995). Just three markets (the European Community, the United States and Japan) comprise about 60 percent of the world trade. Table 7.5 shows the direction of trade for some of the most-traded products.

Table 7.5: Directions of international trade for major NWFPs

Product	Main source countries	Main markets
Brazil nuts	Brazil, Bolivia, Peru	USA, UK, Germany, Australia, Canada
Pine nuts	China, Afghanistan, Pakistan	Middle Eastern countries
Pignolia nuts	Spain, Portugal	USA, Canada, Hong Kong, Japan, EEC
Walnuts	China, India, Afghanistan, Pakistan	EEC, Japan, Canada, Switzerland
Morels	Pakistan, India, Afghanistan	France, Switzerland, Germany
Pine mushrooms	Chile	USA, France, Peru, Netherlands, Switzerland

Bamboo shoots	China, Thailand, Indonesia	USA, Japan, UK, Germany, Australia, the Netherlands, France, Korea
Sago	Indonesia, Malaysia	Japan, Hong Kong, Singapore
Shea nuts	West and central African countries	Japan, Sweden, EEC
Nutmeg and mace	Indonesia, Grenada	USA, EEC, Japan
Cinnamon and cassia	Sri Lanka, Seychelles, Madagascar	USA, EEC, Japan
Gum arabic	Sudan, Nigeria	USA, EEC (UK and Germany), Switzerland, Scandinavia, Japan
Gum tragacanth	Iran, Turkey	EEC, USA, Japan, CIS*
Gum karaya	India	USA, Japan, France, Germany, UK, Belgium, UAE, Netherlands
Carob gum	Spain, Italy, Portugal	Western Europe, USA, Japan
Annatto	Peru, Kenya, Brazil	USA, EEC, Japan
Gum rosin	China, Indonesia, Portugal	Japan, Western Europe
Rattan	Malaysia, Indonesia, Viet Nam, China	Europe, USA, Egypt, Japan, Thailand
Bamboo	China, Southeast Asian countries	France, Germany, Netherlands
Cork	Portugal, Spain, Morocco	EC countries
Lac	India, Thailand	Germany, Egypt, Indonesia, USA
Natural honey	CIS, China, USA, Mexico, Turkey	Germany, USA, UK, Japan
Beeswax	China, Tanzania, New Zealand, Canada, Netherlands	EC countries
Mulberry and non-mulberry silk	China, India, Brazil	EC countries, Japan, Korea, Hong Kong
Liquorice roots	China, Western Asian countries, Russia	USA, Japan, EEC
Ginseng roots	Japan, China, Taiwan, Singapore, EEC	USA, Korea, Canada, China
Medicinal plants	China, Korea, USA, India, Chile, Egypt, Argentina, Greece, Poland, Hungary, Zaire, Czech Republic, Albania	Japan, USA, Germany, France, Italy, Malaysia, Spain, UK
Essential oils	China, India, Indonesia, Brazil	EEC, USA, Japan
Cochineal	Peru, Canary Islands	EEC, USA, Japan
Truffles	France, Italy	USA
Birds' nests	Malaysia	Hong Kong, Singapore, Japan, Taiwan
Bidi leaves	India	Pakistan, Sri Lanka

* Commonwealth of Independent States (part of States of the former USSR).

(Source: Iqbal, 1995)

Importing and exporting countries use tariffs and other measures to influence trade. Developing countries commonly tax exports to raise government revenue. Industrialized countries use tariffs, standards and safety regulations to control NWFP imports. In general, industrialized countries keep tariffs on NWFPs very low in order to ensure a sustained supply for their markets. These countries usually feel no need for "protection" against competition because they do not produce these products and because collecting and processing NWFPs is often a labour-intensive sector for which they do not aim to protect jobs (Iqbal, 1995).

International trade agreements

- International agreements have a great effect on the international market prospects for certain products. So far, only one study has addressed these impacts on producers (Iqbal, 1995). Key conventions are described below.
- *General Agreement on Trade and Tariffs (GATT).* This series of agreements aims to deregulate international trade by reducing tariffs and encouraging multilateral negotiation of trade issues. It paved the way for establishment of the World Trade Organization (WTO) in 1995 as a more powerful organization for resolving disputes. WTO aims to provide intellectual property rights (patents, trade secrets, trademarks, etc.), and measures for enforcing these rights (see Chapter 10).
- In 1987, the Brundtland Commission called for reform of GATT for greater environmental equity and sound management, noting that the goal of unregulated international trade conflicts with national

policies that would account for environmental costs of resource degradation. Some claim that "a country that internalizes environmental costs into its prices will be at a disadvantage, at least in the short term, in unregulated trade" with countries that do not (Daly and Goodland, 1994). This argues, for instance, in favour of applying import tariffs on products from countries that would price their forest resources low, in order to be capable of facing external competition.

- *Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).* Ratified by more than 111 nations, CITES establishes lists of endangered species for which international trade is either prohibited or strictly regulated. Examples of NWFPs which are restricted are ivory and rhino horn. Placing a species in the most restrictive categories requires approval by two-thirds of the signatories; the least restrictive categories can be made by a single signatory. Each signatory nation designates management and scientific authorities for granting and reviewing the Convention permits. The UN Environment Programme (UNEP) hosts the CITES Secretariat. TRAFFIC International, a monitoring body of the World Conservation Union (IUCN) and WWF, coordinates an international network to track wildlife trade and compliance with CITES, and produces a journal, TRAFFIC Bulletin.
- *The Agreement on Trade-Related Intellectual Property Rights (TRIPs).* Like WTO, TRIPs provides more enforceable protection for trade-related intellectual property rights. In this, it encourages developing countries to conduct more research and innovation, and helps better access to new technology, including environmental technology. An important provision permits a country to exclude an invention from patent protection if that invention's commercialization seriously endangers the environment.
- *Convention on the Conservation of Migratory Species of Wild Animals.* This Convention obligates countries to protect endangered migratory species and precludes commercial trading of some 51 listed species, including antelopes, 24 bird species and 6 marine turtles.
- It encourages species conservation and international action. UNEP provides the Secretariat (Braatz *et al*., 1992).

Summary

- Use market studies as a tool to identify commercial opportunities in resource utilisation and match supply to demand. Used properly, marketing tools can improve an enterprise's potential for economic and environmental sustainability.
- Develop a proper plan for marketing a product based on study of key market factors (the "Four Ps"): *product*, *place* (that is, channels of distribution and marketing), *promotion* and *price*.
- Use information on markets and transport costs to assess and decide when intermediaries (*middlemen*) are useful. Where an intermediary is useful (for example, in helping to absorb risk or coordinating transport), producers should use market information and group organization to prevent unfair exploitation.
- Use market information available from existing agricultural marketing systems. Where necessary, organize marketing information systems for local markets.
- International marketing requires more specialized information which is often difficult to obtain. Rural producers can reach foreign markets by joining national associations (for trade fairs, etc.) and/or *green marketing* ventures with international non-governmental organizations.
- Obtain information on trade regulations and the trade environment (national and international), which affect commercial options in all markets. Both producers and support service staff (extension agents and others) need familiarity with these.

References

ATI. 1995. *Non-timber forest products manual.* Draft version. Appropriate Technology International, Washington, D.C.

Braatz, S., Davis, J. Shen, S., and Rees, C. 1992. *Conserving biological diversity: a strategy for protected areas in the Asia-Pacific Region.* World Bank Technical Paper No. 193. World Bank, Washington, D.C.

Charit Tingsabadh. 1994. Selling tree crops. Module 7 of *Growing multipurpose trees on small farms.* Winrock International-FAO, Bangkok.

Clay, J.W. and Clement, C.R. 1993. *Selected species and strategies to enhance income gene ration from Amazonian forests.* Forestry Working Paper FO: Misc/93/6. FAO, Rome.

Cubberly, P. 1995. Value chain information. ATI Bullettin 26. Appropriate Technology International, Washington, D.C.

Daly, H., and Goodland, R. 1994. An ecological-economic assessment of deregulation of international commerce under GATT. *Ecological Economics* 9:73-92.

Durst, P.B., Ulrich, W., and Kashio, M., eds. 1994. *Non-wood forest products in Asia.* RAPA Publication 1994/28. FAO-RAPA, Bangkok.

Falconer, J. 1992. *Non-timber forest products in southern Ghana: a summary report.* ODA Forestry Series No. 2. UK Overseas Development Authority, London.

FAO. 1995. *Compendium of computer-based databases for relevance to forest products marketing.* FO: Misc/94/10. Working Paper. FAO, Rome.

FAO. Forthcoming. *Guidelines for the creation of community-managed marketing information systems for non-timber forest products.* FAO, Rome.

Iqbal, M. 1993. *International trade in non-wood forest products: an overview.* Forest Products Working Paper 11. FAO, Rome.

Iqbal, M. 1995. A study of trade restrictions affecting international trade in non-wood forest products. FAO, Rome.

Issar, R. 1994. Development of market intelligence and infrastructure for agroforestry in India. In Raintree, J.B., and Francisco, H.A., eds., *Marketing of multipurpose tree products in Asia: Proceedings of an international workshop held in Baguio City, Philippines, 6-9 December, 1993.* Winrock International, Bangkok.

LaFleur, J. R. 1992. *Marketing of Brazil nuts: a case study from Brazil.* Forest Products Division, FAO, Rome.

Le Cup, I. 1994. The role of marketing of non-timber :Forest products in community development projects: Ayuverdic medicinal plants in Nepal. In Raintree, J.B., and Francisco, H.A., eds., *Marketing of multipurpose tree products in Asia: Proceedings of an international workshop held in Baguio City, Philippines, 6-9 December, 1993.* Winrock International, Bangkok.

Lim Hin Fui and Woon Weng Chuen. 1994. Marketing of agroforestry products: some Malaysian experience. In Raintree, J. B., and Francisco, H. A., eds., *Marketing of Multipurpose Tree Products in Asia.* Winrock International, Bangkok.

Lintu, L. 1995. Trade and marketing of non-wood forest products. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Ocampo, R.A. 1994. The present situation of non-timber forest products in Costa Rica. Working Document No. 7, Project for Conservation and Sustainable Development in Central America. CATIE, Turrialba, Costa Rica.

Pswarayi-Riddihough, I., and Jones, N. 1995. Some marketing problems faced by agroforestry farmers in Asia. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Tangley, L. 1993. *Marketing biodiversity products: the tagua initiative.* Conservation International, Washington, D.C.

For further reading

IFPRI. Forthcoming. Proc. of a workshop on Non-Timber Tree Product (NTTP) Market Research, held December 12-14, 1994, Annapolis, Maryland, USA. International Food Policy Research Institute, Washington, D.C.

Lewington, A. 1993. *Medicinal plants and plant extracts: a review of their importation into Europe.* A TRAFFIC

Network Report. TRAFFIC International, Cambridge, UK.

8. Organizing producer groups

Previous chapters have mentioned advantages that rural producers can gain through organized efforts. The three main advantages are:

- *greater leverage for enterprise success,* including: greater economies of scale in production, transport and marketing; a stronger basis for negotiating with middlemen and others in the processing-market chain; and a better basis for competing with larger-scale producers;
- *better prospects for sustainable harvesting* through agreement by all local users of the forest resource, thus helping to ensure sustainable supply;

- *more equitable sharing of benefits* from common property resources. This is important to foster the general perception of fairness in using a resource traditionally viewed as "open access".

This chapter describes factors involved in successful local organization for resource use and some tools for organizing communities for processing, marketing and resolving conflicts.

Factors in successful organization

Successful community organizations for natural resource management often share similar characteristics related to the local user group and the natural resource (ATI, 1995). User group here means the community with local access rights to the forest resource.

The user group

The characteristics of user groups that generally promote good community organization, which are often found in indigenous systems for common property management, include (ATI, 1995):

- *identification as a group.* The group recognizes its members, and outsiders see the group as distinct. Not all the group's members may actively use the group's access rights; in this sense there may be "user sub-groups";
- *group size*. The group should be large enough to support harvesting and processing at the threshold of economic sustainability. On the other hand, it should be small enough to manage common property resources effectively. In shifting from subsistence to commercial resource use, the sub-groups that use access rights may change size. This involves important dynamics of sustainable harvest rate and the threshold at which a member's benefits make participation in the group worthwhile;

- *control over resource*. The group must have access to the non-wood resource that is recognized by legal rights or customary law. The group should be able to enforce exclusive authority over the resource and guarantee continued rights for subsistence uses even when it acquires commercial value;

- *mitigating income effects*. Poorer community members should be represented in any change in resource use. Poorer households should have equal rights to participate in the enterprise and receive their fair share of benefits;

- *recurrent interaction*. Frequent meetings of group members promote cooperative behaviour and adherence to the group's rules. They also make it more likely that the group will identify and penalize violations;

- *reciprocity*. Group members realize that they will receive benefits only if they fulfil their obligations to the group. This condition, particularly in smaller groups, promotes internal self-monitoring;

- *disciplinary mechanisms*. The group can impose sanctions or penalties that have a real deterrent effect.

The natural resource

In general, the forest resource managed by the group should be:

- *clearly defined*. Clearly defined systems are easier to manage sustainably;
- *recognized by the community as valuable.* Often, user groups will agree to the added effort of sustainable management only if they see that destructive over-use threatens the resource. There is generally a time lag between when resource degradation starts and when it is noticed by the community. Organizing for sustainable use should be based on the perceived value of the resource to the community.

Some tools for organizing

A number of references describe :how to organize communities to manage their resources (see "For further reading"). The tools include group meetings, land use mapping and community education.

Community meetings

Repeated group interaction develops a forum that builds cooperation and common values. As this forum develops through repeated meetings, shared problems can be identified and discussed and possible solutions proposed. Depending on an area's social norms regarding gender roles and public gatherings, special arrangements may be needed to ensure that women's concerns are represented in such forums.

Land-use mapping

Mapping is a tangible tool that community groups frequently find useful in organizing themselves. Maps of local land use capture geographic information that communities often need to assess efficiency of management and plan adjustments. Chapter 2 explained how mapping helps in inventories of non-wood forest resources. Mapping can also help to identify potential conflicts in land-use claims before they become confrontations. Furthermore, mapping can help forge a clear political and social identity for community members (Brown et al., 1995). Local groups often can use maps to plan and defend their land use with government agencies, funding organizations and credit institutions.

In some countries, satellite images of localities are available from government agencies in charge of cartography or natural resources. Using images of particular infrared bands, communities or supporting agencies can identify the forest and its borders with community or household clearings, water courses, etc. Once these clearings are identified, residents can help in naming them and matching land-use units with the image.

Community education

Community education develops future capacity for informed participation. In Colombia, for example, an NGO worked with communities near the La Planada Wildlife Refuge to manage a curriculum for practical instruction on community-scale development and a mobile environmental educational unit. The education was designed for adults, children, indigenous Amerindians and recent settlers (Poole, 1989). If public education successfully changes attitudes of those in and around the reserve (and in the national government), it can reduce the long-term costs of protecting an extractive reserve.

Where it is promoted by an outside organization, public education efforts must avoid eroding local language and culture, for example by providing bilingual instruction. Efforts should achieve technical and scientific advances that are in tune with local world views, and appropriate to the student groups (IAITPTF, 1992).

Organizing producers for marketing and processing

Organizing groups to market non-wood products employs the same tools used in organizing for resource management or enterprise formation (see Chapter 5). Often, a shared problem provides the focus for group formation; for example, a desire to reduce unfair treatment from market intermediaries. In respect of each problem, the new group should clarify (ATI, 1994):

- why the current situation is unacceptable;
- the root causes, including those which are in the group's control;
- options, obstacles and trade-offs to be considered in deciding how to change the situation;
- resources and information needed for individual and group action.

Experience from tree-growing and marketing cooperatives in India (Patil, 1992; see text box 8.1) suggests the following factors for ensuring success of producers' organizations:

- *cooperative discipline among members.* Often this emerges from village or ethnic traditions of collective organization;
- *credible leadership.* Group leaders should have expertise in management, consensus building and entrepreneurship. They should also recognize the interests of poorer members;

- *credible and efficient marketing system.* A group's marketing structure/arrangement must ensure compensatory prices to its members;

- *appropriate technical support.* The group should have access to enough technical knowledge to advise members and to enable them to make informed choices on species and products;

- *pragmatic and prompt institutional support.* In particular, producer groups need to find flexible credit sources. In groups, producers are better able to negotiate customized mechanisms for collateral guarantee, for example. The group should identify other groups with shared interests and join with them to advocate for unbiased production incentives and harmonized regulations;

- *demonstrable success.* Clearly observable success in a resource management or marketing strategy builds confidence in the group venture, ensures unified effort and makes members comfortable with justified risk-taking later. A group should carefully choose its first activities for greatest chance of success.

Text box 8.1: Tree-growing cooperatives in India

The Agroforestry Federation of Maharashtra, based in Nasik, consists of 25 district-level tree-growers cooperatives! It provides marketing and technical support to its member cooperatives and individual farmers, mainly for marketing eucalyptus wood and oil seeds of Jatropha curcas. To join a cooperative, farmers pay an entry fee of about US$ 100 per hectare of land they farm; poor farmers pay a reduced fee of about US$ 5 per ha.

The Nasik Tree Growers' Cooperative Society obtains for its members a 30 to 40 percent higher return than what they could get individually. Other benefits to members include:

- advice on market conditions at the district, region, and national levels
- lower transportation costs through combined loads
- technical advice on harvest timing and methods
- greater responsiveness to changes in regulations
- economies of scale for storage of produce at optimum locations
- collective bargaining and even cash advances during periods of storage

The cooperative coordinates members' harvests for bulk transport and efficient use of labour. Records document each member's harvests and the return. The cooperative manages a sales depot, where products are sorted by several grades of quality and sold at a fixed price for each grade. This standardization benefits members, who receive US$ 80 per tonne of produce compared to US$ 28 per tonne received by individual farmers at auction. It also benefits local retail consumers. Wholesale traders have slowly adjusted to the reduced profit margins resulting from this arrangement (Issar, 1994).

Organizing producers for processing ventures makes possible similar gains for producers. In Xapuri, Brazil, producers in 1990 organized the first shelling factory owned by Brazil nut collectors. Credit arrangements included US$ 60,000 :For the factory plus salaries for the factory manager and technical assistance (which in many processing ventures costs more than the facilities and equipment). The factory has made a tremendous difference by (Clay and Clement, 1993):

- reducing spoilage of the nuts;
- eliminating intermediaries' profits;
- providing local employment;
- dramatically increasing the price paid to nut collectors.

Organizing for conflict management

Conflicting demands on a resource can emerge when different groups compete for the same resource (for example, loggers competing with gatherers of non-wood products), or when people interested in a resource are unable to participate in managing. Such conflicts can occur within a community, between neighbouring communities, or between communities and outsiders.

Conflict management, alternative dispute resolution and resource sharing are all terms that refer to a strategy that has developed in the last few decades as a way to address conflicting claims over natural resource use. Conflict management in managing forest resources offers a means by which community groups can peacefully resolve land-use conflicts.

Different societies have different ways for dealing with conflict. In conflict management, the aim is to reach a mutually agreeable solution by using the institutional means available within that society together with an understanding of the interests of everyone involved in the conflict. In general, conflict management employs negotiation and/or mediation by a neutral third party using the following principles (Pendzich *et al*., 1994):

- any attempt to resolve conflicting claims must include the informed participation of all who have a stake in how the forest resource is used;
- identify the true source of the conflicts. This permits a better understanding of each party's interests and the incentives that could lead to resolving the conflict;

- each side involved in negotiating a solution must believe that negotiating is in their best interest and should do so in good faith.

The example in the following paragraphs, summarized from Villareal (in Pendzich *op*. *cit*.), illustrates the role and importance of community organization in resolving land-use disputes. It also shows how local organizations can develop from very little formal foundation. Chapter 9 describes sources of technical and information support that groups should seek and use to develop their strengths.

Example: Creation of the Awá Indian territory in Ecuador

The Awá people inhabit a forest that straddles the border between Ecuador and Colombia. In Ecuador, the Awás' biologically rich forest is highly coveted by the surrounding communities of poor farmer groups and lumber and mining companies. In 1984 a process known as Plan Awá began to help Awá people secure rights to the area for their management.

Plan Awá faced enormous obstacles, including:

- lack of formal Awá organization for defending their rights from outside threats;
- high illiteracy among Awá (nearly 63 percent, compared to a national rate of 14.8 percent);

- competing claims on Awá lands by poor peasant communities, commercial interests, and conflicting government interests (particularly for road construction and mining);

- lack of recognition for the Awá by the national society, and lack of social or biophysical information;

- a tendency by the Awá to abandon their language and culture in the face of pressures from the

dominant national society.

Yet despite these, a strategy of conflict management and gradual organization by the Awá successfully helped them to secure their rights to manage the forest.

A commission formed by the Ecuadorian government to coordinate support activity in the Awá region, financed by a small grant from the US-based group Cultural Survival, began to develop a plan for conserving and developing the Awá region. The first goal was to establish an Awá Indian territory, with the longer-term aim of conserving the natural resource and alleviating the poverty in the area.

The National Board for Coordination of Indian Nations of Ecuador (CONACNIE), later called the Federation of the Indian Nations of Ecuador, became involved. CONACNIE provided a voice of advocacy for the Awá and helped to guide the communities toward forming their own organization. Important elements and lessons from that five-year process are described below.

Prioritize a strategy. Plan Awá identified three priorities: (1) generate public and political support for recognition of the Awá's rights, (2) demarcate and gain legal appropriation of the Indian territory and (3) strengthen Awá capacity for participation in the process.

Build institutional support. Plan Awá launched a campaign among government agencies to include the project in the strategies for stronger national sovereignty in border regions. By identifying the Plan with this government goal, it gained support and a basis for inter-agency cooperation. A census of the Awá confirmed an overwhelming majority had been born in Ecuador (counter to opposing arguments). This led to steps to get their citizenship officially acknowledged.

Demarcate and gain legal appropriation of Awá lands. First, the commission outlined the Awá territory on a map in its office. Correcting flaws in that information required two years of fieldwork in difficult terrain.

During this time, the Awá faced four main conflicts over their land: (1) with an association of outside farmers, (2) with a pre-cooperative of wealthy landowners, (3) with lumber companies and (4) with government in creating a basis for an Indian territory. In managing these conflicts, the Awá learned to:

- *define the source of conflict*. In one case, Awá prevented neighbouring communities from panning for gold in Awá lands because the outsiders did not abide by Awá rules prohibiting sale of timber, animals or fish in outside markets. The two sides sat down with a facilitator and defined the problem from both perspectives. They reached a solution in which the miners were allowed to pan for gold on Awá lands provided they abide by Awá rules of resource use. This simple solution averted an escalation of conflict;
- *use the power of information in an unfavourable negotiating environment.* When timber companies violated agreement conditions of forestry management on Awá lands, the Awá brought forth compelling documented evidence of negative impact caused by companies' activities on the region's ecosystems, exploitation of indigenous people, violations of national policies and blackmail of officials. The evidence convinced authorities to suspend logging in the area and helped to turn public opinion against the guilty companies;

- *separate conflicts.* By dealing with each competing land claim in separate negotiations, the Awá achieved greater success than if they had attempted to settle all at once.

Strengthen Awá participation. At the start, the Awá had no clearly identifiable leaders and no process for involving all of the community in analyzing their problems, except for certain spiritual rites that gathered small groups. The non-Awe commission members promoted large meetings of the Awá Pre-federation to raise awareness, build local capacity, and provide a way for the commission to consult with the Awá The Awá developed capacity for participating in conflict resolution by debating the need for Forming a representative organization. This debate took place at the local level and in large meetings of the Awá Prefederation. In these meetings, a group decision emerged to defend their lands against competing claims, creating a focus and, purpose for their organization. Until their own organizational structure developed, they adopted the guardianship of CONACNIE.

Later, the Awá elected a Director for their Pre-federation and the organization developed a stronger parliamentary practice. Gradually the Awá population recognized the pre-Federation's authority and its leaders no longer relied on the advice of intermediaries.

Summary

- Organize local groups to provide the NWFP producers the benefits of greater economic leverage, better means for ensuring wise forest management and more equitable sharing of benefits from commercial enterprise. Organizing is easier in communities where there is a clear group sense of identity, patterns of cooperative behaviour and established rights to a clearly bounded resource.
- Use the tools of regular group meetings and mapping of local land-use patterns. These can form a basis for group planning, action and dealing with outsiders.

- Depending on the situation, producers may first need to organize to obtain harvesting rights. Where local organizations are not well developed, intermediaries such as NGOs may help the community build its own organization. Producer groups should develop good management skills and access to technical information, training and resources.

References

ATI. 1994. *Selected coconut processing options for small-scale producers.* Appropriate Technology International and the University of the Philippines at Los Baños (UPLB), Washington, D.C.

ATI. 1995. *Non-timber forest products manual*. Draft version. Appropriate Technology International, Washington, D.C.

Brown, I.F., Alechandre, A.S., Sassagawa, H.S.Y., and Aquino, M.A. de. 1995. Empowering local communities in land-use management: the Chico Mendes Extractive Reserve, Acre, Brazil. *Cultural Survival Quarterly* Winter 1995:54-57.

IAITPTF. 1992. Charter of the indigenous-tribal peoples of the tropical forests. International Alliance of the Indigenous-Tribal Peoples of the Tropical Forests, Penang, Malaysia.

Issar, R. 1994. Development of market intelligence and infrastructure for agroforestry in India. In Raintree, J.B., and Francisco, H.A., eds., *Marketing of multipurpose tree products in Asia.* Winrock International, Bangkok.

Patil, V. 1992. Farm forestry cooperatives in Maharashtra: reasons for success and failure. In Taylor, D. A., ea., *NGOs and tree-growing programs: working between farmers and governments.* Winrock-IDRCFAO/RAPA, Bangkok.

Pendzich, C., Thomas, G., and Wohlgenant, T. 1994. *The role of alternative conflict management in community forestry.* Forests, Trees and People Programme II Working Paper No. 1. FAO, Rome. (Contains The creation of the Awá Indian Territory - Ecuador, by Carlos Villarreal, 1993)

Poole, P.J. 1989. *Developing a partnership of indigenous peoples, conservationists, and land-use planners in Latin America.* Environment Policy, Planning and Research Working Paper. World Bank, Washington, D.C.

For further reading

Clay, J.W. and Clement, C.R. 1993. *Selected species and strategies to enhance income generation from Amazonian forests.* Forestry Working Paper FO:Misc/93/6. FAO, Rome.

Davis, R., and Dunn, W. 1994. *Report of the international workshop on natural resource management on tribal lands, January 1994.* US Forest Service, Washington, D.C.

FAO. 1990. *The community's toolbox: the idea, methods and tools for participatory assessment, monitoring and evaluation in community forestry.* Community Forestry Manual No. 2. FAO, Rome (English-French-

Spanish).

Fisher, R.J. 1994. Indigenous forest management in Nepal: why common property is not a problem. In Allen, M., ea., *Anthropology of Nepal: people, problems and processes.* Mandala Book Point, Kathmandu.

9. Research and extension

In this chapter and the next, the focus shifts from local producers' activities to the kinds of technical support, infrastructure and policy that can meet their needs. These two chapters are thus intended primarily for researchers and policy-makers, and describe approaches by which they can collaborate with local producers to improve forest management.

Although research on non-wood forest resources and products is growing, this field still receives little support in most national institutes. In an informal survey in the Asia-Pacific region, less than 4 percent of forestry researchers cited NWFPs as an area of their specialization (Nair, 1995). Less than 17 percent of 137 research institutions responding to a separate FAO survey in that region cited NWFPs as a priority area of research. Among institutions working on non-wood products, coverage is extremely skewed toward major international commodities.

The scarcity of research resources dedicated to non-wood resource management makes it essential to involve local producers in focusing on the most urgent problems and the search for technical solutions. This is an opportunity for innovative partnerships between researchers and producer - clients, and among government agencies, NGOs and the private sector.

Involving producers in problem-solving research

Collaboration between local groups and supporting agencies starts by clearly recognizing that local producers are the clients of research and partners in managing the resource. Scientists conducting research on rural areas should make it a point to consult with rural people to identify problems or priorities. In this regard, researchers can facilitate discussion, but should be attuned to producers' points and refrain from imposing their own professional interests. (See "For further reading" on rapid rural appraisal, following Chapter 3.)

Scientists should also review the literature for existing research findings that might relate to the communities' problems, and identify gaps where small-scale studies could lead to potential solutions. In situations where the priorities are socio-economic in nature it could be beneficial to involve sociologists and economists in defining research problems and approaches.

In building the researcher-producer collaboration, producers should be involved in data collection and analyzing observations (for example, in harvest assessments as in Chapter 2). Public-private coalitions can help supply communities with support services for building local capacity for adaptive research, and influencing policy decisions.

Technical support should aim to build local capacity to the point where local groups can conduct their own studies on topics that serve their interests (see text box 9.1).

National research efforts

Adaptive research depends on high-quality support from national and sub-national research institutes. The resources dedicated to research related to NWFPs are extremely limited. The research that is underway can

be generally categorized as (Nair, *op. cit*.):

- status surveys to gauge the understanding, uses and availability of various products (including ethnobotanical studies);
- technology development studies for better production (including domestication of commercial species), utilization and processing;
- socio-economic studies, including marketing.

Text box 9.1: Local research capacity in Canada

In 1982, the Makivik Research Laboratory in Kuujjuac, Arctic Quebec, came about as a result of the Inuit Land Claim Settlement. Its objectives were to:

- develop indigenous scientific capacity for conducting wildlife research and management, incorporating local knowledge;
- collect, analyze and disseminate relevant scientific and technical information to Inuit communities;
- provide a base for training Inuit communities in wildlife research and management;
- provide an information centre on environmental and wildlife research and management issues.

Now called the Kuujjuac Research Centre, it monitors subsistence and commercial fisheries, conducts community harvest studies to record individual hunters' takes and assesses populations of salmon, ducks and caribou. The centre produces management manuals in English and in the local language. Staffed by non-Inuit scientific instructors and Inuit manager/technicians, the centre has trained young Inuit to conduct field measurements, laboratory analysis and map-making.

Inuit-conducted field surveys of eider duck have produced valuable information on environmental impact and seasonal changes in patterns of wildlife harvest. Study results are entered into a computer-based geographic information system (GIS). Current information technologies are well-suited to such local research efforts.

Many developing countries could benefit by sharing with Inuit researchers their expertise in capacity-building and local research (Poole, 1989; 1993).

Of these, socio-economic studies tend to suffer most neglect, with market research severely lacking. Information on trading channels and pricing at each stage in the chain - information which would greatly enhance producers' bargaining power - is rarely available. Because of this, many developing countries forfeit a sizable advantage to industrialized countries that import raw materials.

National research bodies should seek to address other imbalances in the current research situation, including (Nair, 1995):

- *neglect of traditional sector*. Research agendas tend to be determined by national economic development goals (vs. actual local use). For NWFPs, this can skew research away from sustainable systems for local subsistence and local markets;
- *over-emphasis on commercial products and under-emphasis on sustainable production systems.* Most research has understandably focused on improving commercial production, often using the model of the plantation system. However support services could better appreciate all options and resource potentials if the goal were a more self-sufficient rural system that optimizes subsistence with marketable surplus;
- *lack of problem-solving orientation.* Research tends to focus almost exclusively on increasing production. As a result, much national research neglects producers' important questions, such as: How to best manage forest resources for multiple uses? How to select best alternative from processing options? What dynamics affect product markets?
- *lack of linkages between institutions.* This results in unnecessary duplication of research and under-utilization of research findings.

Research organizations need clear goals for assigning priorities. Such a priority system should employ criteria of usefulness of research results and responsiveness of it to problems perceived by producers.

Responding to farmers' problems and their complex trade-offs requires more cross-disciplinary thinking. It also requires more linkages like those fostered through the consortiums described below.

For research findings to be more applicable, they need to be available to the communities that need them. Local-language abstracts and manuals are essential to reach rural audiences. Short radio and television programmes can also be cost-effective ways of communicating with rural groups (Mody, 1991).

National extension services

At one time, forest services in many countries had mainly an enforcement role. Foresters protected state-owned forests and this was done through a system of fines and penalties. Now, however, foresters in some cases have assumed the role of extension workers, helping farmers to adapt technological innovations from research.

This shift is improving the relationship between forest services and rural communities in many countries. In this new role, foresters work with communities as partners and advisors in forest management, rather than as adversaries. Foresters are becoming extension workers also in agroforestry, which previously was left neglected in between agriculture and forestry.

Besides technology transfer, forestry's rapid evolution has involved field foresters in documenting indigenous technologies, developing new technical solutions with farmers, communicating policies and resolving land-use conflicts. Field foresters now need to understand disciplines that earlier generations of foresters did not, including anthropology, economics and conflict resolution. When forestry projects began using terms like *people's participation and community organizing*, neither forestry officials nor villagers knew what they meant (Shrestha, 1993). Table 9.1 shows several ways of providing the needed training for foresters in the area of NWFPs.

This gap between what forestry training schools have traditionally offered and what field foresters now need creates a tremendous challenge and some confusion. In this transition, non-wood products have generally suffered neglect, but the transition itself signals better prospects that rural producers will receive the type of technical support that non-wood forest enterprises require.

Training centres, such as the Regional Community Forestry Training Centre in Thailand, are equipping field foresters with new tools of rapid rural appraisal and techniques for conflict resolution and market research. These skills make them better able to support the range of activities involved in developing all forest resources, including non-wood products.

Table 9.1: Suggestions for enhancing forestry education and training in NWFPs

Education/Training Level	Suggestions
Specialization	Increase the areas of specialization to include NWFP topics and interrelationships
	Promote research related to NWFPs in universities
	Support multidisciplinary approaches and programmes in specializations
	Encourage pre- and in-service specializations in NWFP areas
Pre-Service Professional/ Managerial	Incorporate relevant NWFP topics
	Establish facilities for teaching NWFP-related subjects, including materials, improved methods and qualified teachers
	Widen the base for student selection, allowing diverse skills into forestry
	As part of instruction, incorporate NWFPs in planning and policy analysis at the sectoral level and in studies related to inter-sectoral linkages
Technical and Vocational	Establish new facilities for training in aspects of NWFP management and utilization, and for specific products in the area
	Improve existing facilities in polytechnic institutes and forestry schools, incorporate

	courses on NWFPs
In Service Professional/ Managerial	Upgrade training to keep up with technical and methodological developments
	Refresher training
Technical and Vocational	Short training programmes on specific aspects of NWFP or technology related to
	specific non-wood products
	Retraining in the use of tools and techniques
Extension and Public Information	Strengthen the system of extension and information dissemination including materials and methods related to conservation and sustainable development, cultivation and management, harvesting, processing, marketing and trade of NWFPs. Target groups include rural producer groups, processors, trading organizations and academic community

(Chandrasekharan, 1993)

National programmes in countries such as Zimbabwe and Indonesia are addressing the gap between conventional training and practical needs in collaboration with NGOs that have experience in providing training in these areas (see text box 9.2).

Consortiums for research and training

Consortiums of public and private institutions have emerged in recent years as powerful forces for linking rural producers to the technical information they can use to better manage their natural resources.

These consortiums have emerged in various ways. In the Philippines, the Upland NGO Assistance Committee (UNAC) resulted from a 1990 meeting of organizations on Problems and Issues of Upland Development. Member groups included NGOs, professional organizations of business people and lawyers, four university institutions and a government agency. The discussions at the 1990 meeting identified three major priority areas for upland farmers: agroforestry (including technical information, transfer of skills and financial resources), land tenure, and marketing (including producers' organizations and post-harvest technology). These three areas became the basis for UNAC's agenda. UNAC's members identified their relative strengths for training, information and research support. The lawyers association developed training for NGOs on landtenure issues; the business people's foundation provided training in entrepreneurship and management.

In addition to collaborative research and training, UNAC provides a forum for grassroots dialogue with government officials. These activities, coordinated by UNAC, received funding support from international development agencies (Bañez, 1992).

The consortium approach has also proven successful for supporting community-based wildlife management in Zimbabwe (see text box 10.2) and elsewhere.

As they develop, these consortiums sometimes discover the need to create provincial or state subgroups to provide training to communities and groups far from national centres. The state or provincial level is the crucial one for policy and programme implementation. It is also the level where ecological differences can be clearly recognised (Haeruman, 1995).

Scope for regional and international research

Collaboration among neighbouring countries can give a boost to national and private research. This collaboration can:

- distribute the cost of research among the client countries;
- reduce duplication of research effort;
- foster collaboration in other areas, such as policy readjustment and communication of results.

Regional centres of excellence could emerge from among existing research institutions. With supplemental resources from donors and member governments, these can develop regionally appropriate inventory methods, processing techniques and/or market research studies. They could also be focal points for North-South transfer of sophisticated technologies, such as those used in bioprospecting for pharmaceutical products in Costa Rica (FAO, 1995).

International research centres in the Consultative Group for International Agricultural Research (CGIAR) have a mandate to work through regional research networks. These could delegate regional studies to national research institutions based on a review of each institution's relative strengths. International development agencies should seriously consider support for such networking arrangements.

International organizations could support non-wood forest resource development by:

- *compiling and disseminating, directories* of available databases on non-wood forest resource development (including marketing and processing) and environmental dimensions;
- *funding research on methodologies* for internalizing environmental costs and benefits of developing forest resources, and for conducting cost-effective inventories of plant and animal resources, as well as ecotourism options;
- *refining policy guidelines and policy-related linkages*, including efforts for classifying NWFPs in international systems of statistics and systems of national accounts.

A number of industrialized countries are providing specialized bilateral technical and networking support for NWFP development (Doran, 1995).

Text box 9.2: In-service training for foresters in Indonesia:

Perum Perhutani, a State Forest Enterprise' manages forest areas in Java, Indonesia. It also manages many non-wood enterprises that produce silk, turpentine, medicinal extracts and honey. In the mid-1980s, Perhutani recognized the need to link forest management with improved opportunities for nearby communities. Perhutani launched a programme called Java Social Forestry, which involves communities more actively in forest management through forest farmer groups. Forest farmer groups work with field foresters to improve community self-reliance and income.

In launching Java Social Forestry, the Indonesian government had to grapple with the obstacle of earlier forest-use conflicts between Perhutani and communities. In 1986, Perhutani engaged a national NGO, Bina Swadaya, to provide training for its field foresters in community development. The courses instructed field foresters in rapid rural appraisal and design of community projects. Other courses for forest farmer groups, forest guards and foremen, and administration assistants covered topics of organizing farmers' groups for self-sufficiency, community motivation and management procedures (Yuniati, 1993).

Some priority research areas

While priorities for technical support and research vary with local needs, the following general priorities emerged at the international Expert Consultation on Non-Wood Forest Products held in Yogyakarta, Indonesia in January 1995 (FAO, 1995):

- develop mechanisms for involving local producers/stakeholders in planning, implementing and monitoring research on NWFPs. These should reward local technical know-how and facilitate its refinement;
- document and disseminate fast disappearing local knowledge of non-wood resources;
- conduct inventories of non-wood forest resources and practices governing production, processing and marketing;
- increase product quality through better harvesting, processing and handling, and identify opportunities for local processing;

- study management systems and their environmental and socio-economic impacts on local communities;
- improve methodology for valuation of all benefits of NWFPs and their trade in informal and formal markets;
- pay more attention to socio-economic, cultural and spiritual issues associated with NWFPs in all areas, including marketing and technology;
- communicate research findings to producers and other interested parties in local-language formats.

For better research-policy linkages, market researchers, for example, need a clear idea of policy - makers' priorities and should review these in an iterative way. Empirical tools of rapid appraisal can make market studies more situation-specific and valuable for policy (Vosti and Witcover, 1995).

At the Expert Consultation in Indonesia, the following emerged as important regional needs (FAO *op*. *cit*.):

Asia-Pacific

- Conduct research on local (formal and informal), national and regional markets;
- study technologies for improved natural regeneration and sustainable cultivation of key species identified through assessments of community perceptions, biological amenability and market demand;
- translate research abstracts and relevant manuals into local languages for use by local producers;
- use geographic information systems (GIS) to map resource patterns and to coordinate research;
- in Asia-Pacific (and other regions), an overriding equity issue is the need for greater local involvement in decisions on resource management. Policy research should address means for gaining greater local participation in these decisions and implementation, including tenure policies.

Some of the plant species of regional importance for NWFPs in Asia-Pacific are *Artocarpus heterophyllus*, *Acacia catechu*, *A. nilotica, Aegle marmelos, Azadirachta indica, Bambusa* spp., *Calamus* spp., *Ceiba pentandra*, *Cinnamomum* spp., *Dendrocalamus* spp., *Diospyros melanoxylon*, *Juglans regia*, *Madhuca* spp., *Morchella* spp., *Moringa oleifera*, *Nephelium lappaceum*, *Nypa fruticans*, *Parkia speciosa*, *Pinus roxburghii*, *Pterocarpus* spp., *Shorea robusta*, *Tamarindus indica*, *Terminalia* spp., *Toona ciliata* and *Zizyphus* spp. (Durst *et al*., 1994).

Latin America

- Forest products harvested from the wild have been subjected to international market boom bust patterns, causing destruction of resources and cultures. Improved classification of these products can facilitate better marketing studies at the national and international levels;
- develop more appropriate harvesting and processing options for adding value locally, perhaps through South-South cooperation;
- ethnobotanical studies should further explore the region's rich indigenous knowledge systems as a basis for integrated, sustainable management of non-wood forest resources.

See Table 7.3 for a partial list of important NWFP species in Latin America.

Africa

- Conduct research on grazing/pastoral and wildlife systems, which are particularly important in the region;
- The fragility of semi-arid ecosystems in Africa make it important for research to improve strategies for avoiding risk, both economic and environmental;
- Africa has a proportionately larger rural population than other regions, reliying more on subsistence uses of NWFPs than on marketing the products. Research studies should recognize this in assigning priority;
- Research should not assume privatization of resources, as common property regimes are widespread in

Africa.

Some of the plant species of regional importance for NWFPs in West Africa are *Afzelia* spp., *Alchornea* spp., *Anacardium occidentale*, *Brachystegia* spp., *Ceiba pentandra*, *Cola* spp., *Elaeis guineensis*, *Ficus* spp., *Garcinia* spp., *Irvingia gabonensis*, *Gnetum* spp., *Maesobotrya* spp., *Monodora* spp., *Parkia* spp., *Pterocarpus* spp., *Tamarindus indica* and *Terminalia* spp. (Falconer, 1990).

Gender-sensitive research and extension

Research and extension efforts can show greater impact if they consider the effect of gender on activities related to NWFPs. If a programme's design gives full weight to gender considerations, its implementation will more likely support women's actual roles as NWFP producers, processors, traders and household food providers. For instance, women often notice pest and insect damage earlier than men, who are sometimes involved only in harvesting and planting (Stoney, 1992). In that case, a programme that aims to improve monitoring of plant health would show best results if it identified women as a target group.

Gender-sensitive research can also help to select species or cropping systems that minimize additional drain on household resources. In noting desired plant traits, plant-breeding programmes should seek the preferences of women and men, and understand who is responsible for harvesting, processing and trade (see text box in 3.2).

Designing gender-sensitive research requires researchers to be aware of cultural barriers to women's participation in research studies. For example, restrictions on male field workers' ability to interview rural women frequently makes it necessary to employ female researchers and extension workers. Other constraints usually dictate that the NWFP activities where women participate mostly take place close to the households. Training in participatory research is more effective when carried out in a village (Stoney, *op. cit.*).

Gender-sensitive research also benefits researchers by making their findings more applicable. Research managers, however, should ensure that researchers receive more immediate incentives for any added time and costs involved (Warren, 1992).

Summary

- In view of the scarcity of research resources, it is especially important that research on NWFPs:
  - involve producers in clearly defining research problems;
  - focus research on problem-solving; and
  - communicate results to the target rural groups, in local language.
- Establish collaborative modes of consortiums and centres of excellence for interdisciplinary research and reduced duplication of effort.
- Customize in-service training and improve forestry curricula to provide field foresters and other extension workers with the skills they need to work with communities and producer groups.
- For results that are applicable for rural target groups, ensure that studies take the gender issues into account in design, data collection and analysis. This requires training and appropriate incentives for the staff involved.

References

Bañez, G. 1992. NGOs supporting each other: the Upland NGO Assistance Committee. In Taylor, D.A., ea., *NGOs and tree rowing programs: working between farmers and governments.* Winrock International-FAO, Bangkok.

Chandrasekharan, C. 1993. Non-wood forest products in forestry education. Paper presented to the FAO Advisory Committee on Forestry Education, Bangkok, Thailand 13-15 December 1993. Rome, FAO.

Doran, J.C. 1995. Non-wood forest products research at CSIRO Division of Forestry. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products :3. FAO, Rome.

Durst, P.B., Ulrich, W., and Kashio, M., eds. 1994. *Non-wood forest products in Asia.* RAPA Publication 1994/28. FAO-RAPA, Bangkok.

Falconer, J. 1990. *The major significance of "minor" forest products: the local use and value of forests in the West African humid forest zone.* Community Forestry Note No. 6. FAO, Rome.

FAO. 1989. *Women in community forestry: afield guide for project design and implementation.* Community Forestry Guidelines No. 1. FAO, Rome (English-French-Spanish).

FAO. 1995. Summary of recommendations. *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Haeruman, H. 1995. Environmental dimensions of non-wood forest products. In *Report of the expert consultation on non-wood forest products, Yogyakarta Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Mody, B. 1991. *Developing messages for development communication: an audience participation based approach.* Sage Publications, New Delhi and London.

Nair, C.T.S. 1995. Status of research on non-wood forest products: the Asia-Pacific situation. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Poole, P.J. 1989. *Developing a partnership of indigenous peoples, conservationists, and land-use planners in Latin America.* Environment Policy, Planning and Research Working Paper. World Bank, Washington, D.C.

Poole, P.J. 1993. Indigenous peoples and biodiversity protection. In Davis, S.H., ea., *The social challenge of biodiversity conservation.* Working Paper No. 1. Global Environment Facility, Washington, D.C.

Shrestha, N.J. 1993. A common-sense framework for developing non-formal training curricula. In *Developing curricula for agroforestry and community forestry in Asia-Pacific.* APAN Report No. 8. Asia-Pacific Agroforestry Network, Bogor, Indonesia.

Stoney, C. 1992. Applications of gender analysis. *Farm forestry news* 5(4):8.

Vosti, S., and Witcover, J. 1995. Non-timber tree product market research workshop - an Overview. Draft. IFPRI, Washington, D.C.

Warren, S. 1992. More practice and less exhortation. *Farm forestry news* 5(4):6.

Yuniati, S. 1993. Bina Swadaya's experiences in training for social forestry in Java. In *Developing curricula for agroforestry and community forestry in Asia-Pacific.* APAN Report No. 8. Asia-Pacific Agroforestry Network, Bogor, Indonesia.

For further reading

FAO. 1990. *The community toolbox: the idea, methods and tools for participatory assessment, monitoring and evaluation in community forestry.* Community Forestry Field Manual 2. FAO, Rome.

FAO. 1995. *The gender analysis and forestry training package.* FAO, Rome.

ICRAF. Forthcoming. Proceedings of an Interregional Meeting on Agroforestry Research, Development and Education for Africa, Asia and Latin America, held in Nairobi, Kenya, May 1994. International Centre for Research on Agroforestry, Nairobi.

MacDicken, K. G. and Lai, C.K. 1993 . *Agroforestry training approaches*. APAN Field Document No. 2.. FAO Asia-Pacific Agroforestry Network, Bogor, Indonesia.

10. Institutional and policy support

Although the topic appears last in this volume, the policy and institutional environment is often the most influential force shaping the potential for sustainable resource management. This chapter suggests how the institutional background which shapes local enterprises can promote improved management of non-wood forest resources. This is the area where rural producers have least control; however, by informing themselves, combining their resources and forming themselves into producer groups, they can sometimes influence policy changes.

This chapter describes actions that governments can take to promote better use of NWFPs. It examines (1) patterns in the growth of NWFP sector and their implications for policy interventions, (2) areas for direct institutional support and (3) areas for international support.

Public education

A first obstacle to the improving the prospects of NWFPs is a widespread negative view about traditional rural ways. Because many non-wood forest products are linked to customs that have conflicted with "modern" development, they are often considered "backward". This bias influences institutional responses at all levels: field foresters, government officials, credit institutions, politicians and development agencies.

Public-awareness campaigns, tailored for target audiences, can change these negative views. Radio and television spots can dramatize the environmentally "progressive", cultural and economic benefits of NWFPs to a society. Campaigns for consumer education can raise products' environmental value and foster wise resource management. Nutrition programmes should consider the role of local forest foods and promote their use to reduce reliance on foods which may not be available locally (FAO, 1995a). Programmes that provide credit and technical support for small enterprises should distribute posters and brochures, explaining the benefits of well-managed NWFP enterprises.

To give forest produce and traditional customs greater value in the eyes of the public, campaigns might employ traditional/cultural as well as audio-visual media to highlight the forest's values for sustenance, health, shelter, income, food security - in a new context of environmental awareness.

Patterns of economic change and implications for policy

In many countries, policies governing NWFPs are scattered over many sectors: agriculture, forestry, health and industry. Because these policies were often not formulated to address non-wood forest enterprises or rural livelihood, they often fail to provide adequate incentives and often provide *dis*incentives, often conflicting in ways that cause stagnation.

If policies are harmonized and redefined with an aim of stabilizing rural economies and promoting rural enterprise, communities could become more self-reliant *and* generate surplus for export.

Policy reformulation to promote non-wood forest enterprise should be guided by the experiences of local groups and enterprises, and good market information (FAO, 1995b). The following paragraphs trace several

common patterns of commercialization in NWFPs and their implications for policy adjustment.

Changes in local and urban markets

People's involvement in non-wood forest enterprises changes as economies grow and opportunity costs change (Arnold, 1995). Small processing enterprises predominate in conditions where:

- *factors favour local processing* (e.g. widely-scattered raw materials, small markets or high transport costs);
- *economies of small scale exist*, as in handicraft production;
- *subcontracting* is *preferable* to integrated operations.

Rural markets for non-wood products are linked to the rate of agricultural change. These markets are large in aggregate, tending to grow slowly. A more significant source of growth in the NWFP sector is growing urban demand. Urban markets for these products in developing countries tends to grow quickly as rural people migrate to cities and bring preferences for customary products of their rural background (nostalgia markets) (Arnold, 1995).

Inequities. Unmanaged commercialization tends to work against small enterprises, disadvantaged groups, and women. As the value of trade grows, urban traders seek to gain more control over supplies through vertical integration, by-passing rural gatherers (Arnold, *op*. *cit*.). Likewise, men tend to take over trade from women as it becomes more commercialized. Small enterprises find themselves unable to obtain credit and other services, which often favour larger operations.

Growth in forest-product trade increases pressure on a resource and tends to restrict traditional rights of access to that resource. In some cases, however, communities have reinforced traditional common property systems in the face of intensifying pressure. Conditions that help community groups maintain collective control against mounting pressures include (Arnold, *op*. *cit*.):

- a legal system which is able to help the group enforce its rights;
- strong social institutions;
- well-defined rights of use;
- small homogeneous groups of users;
- rapid returns to investment in collective management.

Increased competition. Improvements in rural infrastructure are, for rural producers of NWFPs a double-edged sword. Roads and communication linkages improve the flow of their goods to urban markets, but also cause competition in local markets from urban manufacturers. Cheaper factory-made items begin to replace forest-based products in rural markets. In Indonesia, for example, Hadi (1986) found that mass-produced metal and synthetic products quickly displaced home-made bamboo umbrellas and wooden clogs which were once sold in rural markets. Commercialization also attracts new producers to compete in the market; crafts that require complex skills, such as wood-working, are less affected than sectors that use basic skills, such as mat-weaving (Arnold, *op*. *cit*.)

Types of change. In general, small enterprises gain importance in three types of economic change (Arnold, *op*. *cit*.):

- *where per capita income is effectively declining*, people with fewer employable skills turn to low-return, labour-intensive tasks in cottage industries such as mat-making;
- *where per capita incomes are rising*, small enterprises are likely to emerge in growth related, higher-return ventures; small enterprises in low-return activities are likely to decrease;

- *in times of growth and change*, small enterprises play an important buffer role, providing income for facing natural or economic crises.

Disruption in resource supply. When harvest rates outstrip natural regeneration/replenishment rates to satisfy growing market demand, the supply in natural forest declines. Without coordination, timber harvests in natural forests will likely disrupt harvests of non-wood products. This disruption can be compounded by policies and enforcement that favour timber production, or by complicated license requirements. As a result, NWFP producers are likely to shift their harvesting operations to forest fallow and domesticated sources (Arnold, *op*. *cit*.).

Boom-bust patterns in international and export markets

Chapter 5 showed how NWFPs that attract international markets tend to experience a boom-bust pattern. This can have particularly damaging long-term effects. In the Amazon in the 1890s, for example, rubber from natural forests experienced a tremendous growth in trade before ultimately being replaced by domesticated sources elsewhere. This short-lived, unmanaged exploitation proved to benefit only urban-based traders. In the forest areas where rubber was native, landuse conflicts ravaged the resource and caused many deaths among Amazonia's indigenous population (FAO, 1995b). A sound policy framework could have promoted balanced rural and urban growth.

Effects of subsidies. When exports of forest products (both wood and non-wood) command high prices in international markets, government forest services often become producers to earn government revenue. This can interfere with local forest use. In effect, the forest service becomes a subsidized competitor of private producers; and this discourages private enterprise (Arnold, *op. cit*.).

In many developing countries, national policies promote industrial investment by providing subsidy incentives to companies that exploit natural resources. In doing this, they assume that the country's short-term competitive advantage is worth the risk of environmental damage that the subsidy may cause by supporting short-sighted production methods (Haeruman, *op. cit*.). Policymakers should question this underlying assumption, particularly for fragile ecosystems. Rather, taxes on exports of unprocessed raw materials can encourage local processing and provide investment funds for sustainable management (FAO, 1995b). Long-term subsidies for NWFP development programmes generally can not prove sustainable in a market situation.

Implications for policy-making

In view of the above, policy-makers committed to healthy and equitable economic growth in rural areas should:

- *enact clear tenure policies* by which rural producers can secure access to the forest resource, so that they are not forced out of production as markets prosper;
- *ensure that producer groups receive information* on resource and market conditions, and environmental guidelines; this should include support for problem-focused research;
- *promote flexible credit mechanisms* for small producers and processors;
- *remove size-scale biases against small enterprises* in credit programmes, licensing arrangements and other mechanisms (many of which result from the fact that agencies find it costly to support small enterprises on an individual basis);
- *avoid subsidizing low-return enterprises* when opportunities for higher-return activities become available;
- *support formation of local producer groups*, which increase the overall competitiveness of the sector;
- *foster transparent transactions in market chains*, with better price and trade information throughout the chain and economic incentives like those used in agriculture;
- *correct gender discrimination* where it displaces women's roles in production, harvesting, processing and marketing products;
- *recognize that policy responses to actual conditions* and producers' needs are likely to be more effective than generalized approaches.

To ensure that the overall policy environment provides incentives for wise forest use, government offices should:

- ensure that tenure policies decentralize resource management and encourage people's participation in sustainable forest management;
- properly account for the contribution of NWFPs to the national economy;
- remove subsidies for wasteful enterprises, both large and small;
- fully recognize traditional rural knowledge and social and cultural practices, and secure appropriate rights for rural communities, that acknowledge and compensate this knowledge (intellectual property);

- effectively put into practice mission statements and plans that explicitly strengthen their commitment to stewardship of non-wood forest resources and partnerships with local users of the resource.

Policy reform is only as good as its implementation. To be effective, policies must provide for regular monitoring and refinement of incentives, and leaders must show commitment to the goals embodied in those policies.

Better national accounting

Improved definition and classification of NWFPs and incorporating them in the System of National Accounts mark early steps toward achieving the policy adjustments described above.

By clearly grouping the variety of non-wood products that originate from forest sources, officials and programme managers can:

- call attention to the collective importance of these items;
- highlight the need for policy coordination;
- generate the political and administrative support needed for more direct support for producers.

Definition

For international classification and accounting, FAO has recommended adoption of the definition of NWFPs given in Chapter 1: *goods of biological origin other than wood, as well as services, derived from forests and allied land uses.* For gaining recognition of these products' economic importance, it is hoped this definition can be generally followed.

Classification

A system of classification for NWFPs was proposed at the Expert Consultation on Non-Wood Forest Products held in Yogyakarta, Indonesia in January 1995, as a means to incorporate these products into the existing international systems of classification for economic activity and trade (Chandrasekharan, 1995). These systems include: the International Standard Industrial Classification of All Economic Activities (ISIC), the Standard International Trade Classification (SITC), the Harmonized Commodity Description and Coding System (HS) and the Provisional Central Product Classification (CPC) system. (The trade data in Tables 7.3 and 7.4 are based on HS classifications.) To create a clear economic identity for NWFPs, it is proposed that an annex be added to ISIC that will group together all forest products, wood and non-wood. A similar approach has helped unify coverage for the diverse components of the international tourism industry.

The classification system proposed would provide a basis for better statistical coverage of NWFPs, which in turn would improve the market and trade information available to producers and policy-makers (Padovani, 1995). Statistical coverage provides a foundation for a policy constituency that can bolster producer groups and researchers seeking support for sustainable forest management. It is to be ensured that statistical information is readily available and accessible.

National governments may choose other appropriate classification schemes that fit the specific nature of NWFP use in their country. For better international linkages, though, governments should aim to clarify how the customized national system correlates with an internationally accepted one, in order to facilitate comparisons and aggregations.

Economic classification alone cannot adequately recognize the non-economic values of non-wood products and services; complementary efforts need to better account for the "external" environmental functions (unquantifiable benefits) of forest resources.

Economic valuation of environmental functions

In many markets there is a sizable gap between a NWFP's financial value and its real economic value. Similarly, resource degradation does not appear in most governments' calculations of Gross National Product (GNP). These cause governments and the private sector to act on incorrect market signals. For example, the disastrous EXXON-Valdez oil spill in Alaska *increased* the US GNP calculation because billions were spent on clean-up but resource losses did not appear in the accounts (WRI-IUCN-UNEP, 1992).

Informed policies can reduce these distortions. Using improved methods for assigning value to resources, planners can compare benefits of conservation measures with costs suffered if no such measures are undertaken. National governments should incorporate values of biological resources and revise official cost-benefit formulas to recognize resource degradation. Economic values cannot reliably be assigned to all factors, but it is possible to estimate relative costs of species disappearance, soil loss and carbon emissions based on key ecosystem parameters (Vosti and Witcover, 1995).

For the public sector to value forests most effectively, it must first sort out the values attached to forests by the different groups with interests in the forest, and define the policy context for any proposed change in forest use (Gregersen *et al*., 1995). The relevant costs and benefits should then be assigned to different situations. The value for the case with the proposed change can then be compared with the values for the case without the change. The results should be adjusted to account for uncertainties in information on forest systems and future values; and this should form the basis for policy decisions.

Intellectual property rights

In recent years, *intellectual property rights* (IPR) have emerged as an important mechanism for securing an equitable share of benefits from forest activities to developing countries and communities. Particularly with the dramatic growth of forest-based medicines and biomedical research (see Chapter 4), securing intellectual property rights is a priority issue for some national governments.

The concept of *intellectual property* originated centuries ago in western legal systems to provide economic rewards for individual creativity. Patents reward new knowledge (inventions or discovered techniques) for a fixed period of time. There are difficulties in adapting IPR to reward long-standing traditional knowledge, but it contributes an important early step toward refining that recognition and providing rewards.

The patent protection offered by national governments varies widely. The United States grants patents on novel genetic sequences, plant parts, plant or animal varieties and biotechnological processes. On the other hand, European countries have only recently extended patent protection to plant varieties (Reid *et al*., 1993).

Another variable is that different stages of product development require different types of IPR. For example, where patenting is premature, *trade secret* protection may be applicable. In other cases, the relationship between traditional knowledge and the product may justify *trademark* protection (Grifo, 1994).

The International Convention on Biodiversity protects property rights of developing countries to native plants and other species. Signed by more than 160 countries, the Convention calls on national governments to create a framework for regulating biological resources, IPR and environmental protection. It also calls on governments to harmonize commercial laws with local goals and the equitable sharing of benefits from sustainable resource management (Sittenfeld and Lovejoy, 1994).

The 1994 Marrakesh agreement on international trade and the related TRIPs agreement are two other key conventions relating to IPR. TRIPs mandates patent or other IPR coverage for plant varieties in international trade and stipulates that the: procedures should be fair, equitable and effectively enforced. Developed countries are expected to adjust their laws and practices to conform with TRIPs within one year; developing countries and countries in transition have five years to make this adjustment; and least-developed countries have 11 years.

With this mandate, national governments can use case study experience to formulate mechanisms for ensuring IPR protection to local groups. One factor in determining appropriate compensation for traditional knowledge is the community's value system. For some traditional healers, compensation entails respect for the "sacred" or secret nature of the information provided. This spiritual value can be as crucial as financial compensation (Cox, 1995).

Intellectual property rights do not substitute for secure tenure over local resources. Developing non-wood forest resources still requires that (1) tenure policy be clear and consistently enforced, (2) communities participate in decisions governing local resource management, and (3) communities are able to weigh the trade-offs involved in economic development (Davis, 1993). Nor do IPR mechanisms replace technical or credit assistance that communities need to develop their traditional resources.

Text box 10.1: IPR, national policy and INBio's prospecting research

The INBio-Merck agreement, by which Costa Rica received several million dollars from the Merck pharmaceutical company to prospect for bioactive materials (Section 4.6), did not occur in a policy vacuum. Policy measures paved the way.

The Costa Rican government established a clearly defined National System of Conservation Areas, covering 27 percent of the country's area. It created INBio as an instrument for inventorying biological resources and encouraging wise use of the country's biodiversity. The clear definition of protected areas helped to justify the investment needed for the inventories. In 1992, a new law protected resources from over-exploitation by requiring bioprospectors in conservation areas to have a permit from the Ministry of Natural Resources.

Social policies also contributed. Costa Rica's large investment in education has created a pool of skilled technicians and the university laboratories needed for the complex process of collecting biodiversity information.

IPR and the determination of royalty rates were major business issues in negotiating INBio's contracts. A team of INBio representatives and Costa Rican environmental lawyers worked with management consultants and *pro bono* corporate lawyers from developed countries to negotiate royalty rates. Bargaining power required good knowledge of the pharmaceutical industry, the biological resource, legal precedents in other industries and conservation needs (Sittenfeld and Lovejoy, 1994).

Direct support from national-level institutions

With sound policies in place, government services can offer effective support to producers. The Joint Forest Management programme in India (see text box 4.2) illustrates one mode of government collaboration with communities to manage resources and share benefits. In other cases, governments provide technical support with less managerial involvement. At a minimum, key areas for institutional support are information, education, training, credit and promotion of local organizations.

As with policy, direct institutional support requires coordination among the agencies that deal with nonwood resources and NWFP producers, usually including: forestry departments, veterinary and livestock services, food crop services, health and medical services, and industry and commerce agencies. Coordination should emphasize clear identification of areas where support is needed and the major steps/actions for addressing these through cooperation (Sène, 1995).

Information, training and education

Producers need information from support services on:

- techniques for more efficient harvesting and post-harvest treatments;
- marketing and processing options;
- conditions throughout the market/production chain;
- policies and rules regulating NWFP utilisation, i.e. tenure, access, transport, processing and trade.

Programmes for training should be: closely linked to research and technical support (see Chapter 9), and specific training needs should be identified and courses developed for different levels of personnel involved in NWFP development: policy-makers, programme administrators and managers, local support workers and producers (FAO, 1995b).

Local knowledge is the starting point for solutions to producers' problems; therefore assessing local knowledge and presenting it in training courses is vital. Without this, training efforts can result in top-down transfer of generalized concepts that could squelch the local innovations, rather than promoting it.

Training should also provide information on networks that exist in the local and national context of the trainees. Materials should describe relevant cooperative programmes among forestry and agriculture departments, universities and the private sector. National forestry education institutions should develop and offer courses on products for which they have particular capacity and topics particularly important to the country or region.

Education and training programmes should employ a wide range of channels, including (Sène, *op*. *cit*.):

- *public awareness raising* on the vital importance of existing resources and the value of traditional skills and knowledge for managing these resources;
- *local transfer of technologies and skills* regarding utilisation of resources that may be well developed in one locality but totally ignored in another, through farmer-to-farmer exchange visits and/or seminars;

- *primary education*, including exposure to natural sciences, geography and knowledge of local resources and their contribution to local economy;

- *secondary education*, continuing the work started at primary school, dealing with the environment and the economic potential of all local resources;

- *job-oriented technical, vocational and professional training* in forms outlined in Table 9.1.

Credit

Governments possess a variety of means for improving credit availability to rural producers. For example, clear land tenure policies and secure title can provide a farm family with loan collateral for investing in production/processing equipment. Credit programmes can increase flexibility by (Clay, 1995):

- using a producer's production history as a basis for forecasting production;
- allowing physical product stock to guarantee loans for working capital;
- counting forest inventories of economically valuable species as collateral.

In the 1950s, the Kenyan government recognized black wattle trees (*Acacia mearnsii*) as a form of farm loan guarantee in view of the species' value for tannin, charcoal, building poles and other uses (Dewees, 1991).

Credit programmes could usefully distinguish between new enterprises and existing enterprises seeking to expand. New enterprises show high attrition and are often less efficient than small enterprises seeking to grow. This suggests that scarce credit funds may be more effectively used if focused on enterprises seeking incremental expansion (Arnold, *op*. *cit*.), even though they may require more customized services than new enterprises.

Support for NGOs

NGOs have played a key role in improving local forest management. NGOs vary widely in their attributes and abilities, but many have proven that they can (Sène, 1995):

- *document local knowledge* and traditional technologies;
- *promote traditional and income-generating activities* using NWFPs;
- *organize producers and marketing* channels;
- *advocate* for policy reform.

Their pivotal role in the future of sustainable forest management has been widely recognized.

National governments can further their efforts by working with NGOs as partners and by offering training that strengthens NGOs' technical and institutional abilities. Technical needs range from production, harvesting and marketing to collective organization. Institutional needs range from management and record-keeping to policy research and analysis.

Consortiums of government, private sector, and NGOs

Chapter 9 described how public-private consortiums can provide technical support for local forest-based enterprises. Such consortiums can also arrange services such as credit and managerial support (see text box 10.2).

Regional and international support

Chapter 9 described some opportunities for collaborative research at the regional level. A regional resource centre for neighbouring countries can also:

- act as an information clearinghouse;
- preserve the region's main indigenous knowledge systems;
- identify knowledge gaps best addressed through collaborative research.

A regional resource centre or centre of excellence can also act as conduit for transfer of sophisticated technologies from industrialized countries to developing countries.

Countries that share similar resources (cultural and/or biological) and problems can also collaborate through *twinning* arrangements and cosponsored activities. Twinning involves short- and long-term exchange of experience between universities or research organizations through staff visits, collaborative research and training, and exchange of publications. FAO has supported such exchanges through the Forestry Research Support for Asia-Pacific (FORSPA) and the Forestry Research and Forest Research Networking in Sub-Saharan Africa (FONESSA) (Sène, 1995).

Agencies of the United Nations, the Consultative Group for International Agricultural Research (CGIAR) and the Global Environment Facility (GEF) support programmes that relate to their mandates of alleviating poverty and improving food security for the poor. International NGOs, such as the World Conservation Union (IUCN), support efforts to promote sustainable management of the world's ecosystems.

Among UN agencies, FAO has taken the lead on NWFPs *per se* by exchanging information on sustainable production, harvesting, marketing, community organization, etc. FAO is also leading efforts to:

- harmonize the trade classification of NWFPs;
- develop methodologies for analyzing market chain interactions and resource assessments;
- compile trade statistics and assess the impact of trade regulations.

A volume of guidelines to support national biodiversity policy reform resulted from a collaboration of UN Agencies, the World Resources Institute and IUCN (WRI-IUCN-UNEP, 1992).

In the CGIAR system, the research centres that deal most with NWFPs are: the Centre for International Forestry Research (CIFOR) in Bogor, Indonesia; the International Centre for Agroforestry Research (ICRAF) based in Nairobi, Kenya; the International Institute for Tropical Agriculture (IITA) in Ibadan, Nigeria; and the International Food Policy Research Institute (IFPRI) in Washington, D.C., USA.

The Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) in Turrialba, Costa Rica, carries out research and training related to various aspects of NWFPs in Central America.

The GEF is a relatively new source of international support for local forest management initiatives, helping developing countries protect biodiversity and other resources. Jointly implemented by UNDP (technical assistance), UNEP (policy guidance) and the World Bank (trustee and investment), GEF supports projects in various countries that expand the roles of indigenous communities in environmental research and management (Poole, 1993). The Facility is committed to working with community-based NGOs on projects of up to US$ 50,000 (Braatz *et al*., 1992).

Text box 10.2: Support for local wildlife management in Zimbabwe

The Communal Areas Management Programme for Indigenous Resources (CAMPFIRE) started in 1988 to maintain wildlife resources through local management and use. The legislation that most promoted CAMPFIRE was Zimbabwe's Parks and Wildlife Act, which facilitated decentralization.

CAMPFIRE consists of the Zimbabwe Department of National Parks and Wildlife Management, the University of Zimbabwe's Centre for Applied Social Science Research and two NGOs: World Wide Fund for Nature and the Zimbabwe Trust. CAMPFIRE provides communities with managerial support and technical assistance for wildlife management.

CAMPFIRE district councils manage and effectively own the wildlife resources in their areas, employing hunting quotas, strategically located water pumps and fire management. Economic evaluations have focused on the programme's financial impact at the household level (IFPRI, in press). The programme and its interdisciplinary support system, with policy support from the relevant government department for promoting

community participation, has shown success and flexibility (Erdmann, 1993).

The international Expert Consultation on Non-Wood Forest Products held in Yogyakarta, Indonesia in January 1995 recommended that, to provide institutional support, international organizations should (FAO, 1995b):

- make NWFP activities an important component of their policies and programmes, with more support for national institutions and programmes;
- compile and disseminate industrialized-country experience with non-wood forest resource management and use;
- support interdisciplinary composition of international programme management teams;
- further examine the implications of international agreements and conventions (CITES, GATT and others) on local development of non-wood forest resources and refine them to foster wise resource use;
- disseminate existing information relevant to producers' needs more broadly (in proceedings, published research and extension materials) through national information centres and networks;
- support South-South cooperation through collaborative activities i.e.: studies, research programmes, seminars, etc.

In this way, international agencies can reduce the burden on developing countries, where the potential for sustainable utilization of NWFPs and the danger of over-exploitation of resources are the greatest.

Summary

- Use awareness campaigns to reverse negative attitudes about rural traditions in which NWFPs play a role.
- Implement policy adjustments for developing the NWFP sector. Key changes should: (1) clarify tenure and access rights, (2) review trade regulations to promote long-term investment and ensure scale-neutrality for small enterprises and (3) refine mechanisms such as intellectual property rights (IPR) to compensate communities and protect their interests.
- Maintain community control against outside commercial pressures using legal enforcement of clearly defined rights of use and strong social institutions.
- Government agencies should ensure that producers receive better information and guidance on: resources and tenure; techniques for harvesting, processing and marketing; and the effects trade regulations. Innovative government-NGO collaborations can enhance support for education and training on these topics.
- Use flexible credit mechanisms (including acceptance of physical product stock to guarantee loans, and forest inventories of economic species as collateral) to extend credit availability and improve rural productivity.
- Secure intellectual property rights for forest/rural communities in the national legal framework.
- Improve public accounting of NWFP contributions to local and national economies by using comprehensive classification systems, better information on NWFPs and improved systems for estimating environmental assets, gain and losses.
- Establish regional collaboration on technical issues and international support for sharing experience and strengthening institutions.

References

Arnold, J.E.M. 1995. Socio-economic benefits and issues in non-wood forest products use. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Braatz, S., Davis, G., Shen, S., and Rees, C. 1992. *Conserving biological diversity: a strategy for protected areas in the Asia-Pacific region.* World Bank Technical Paper No. 193. World Bank, Washington, D.C.

Chandrasekharan, C. 1995. Terminology, definition and classification of forest products other than wood. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Clay, J.W. 1995. *Generating income and conserving resources: twenty lessons from the field.* WWF,

Washington, D.C.

Cox, P.A. 1995. Conservation: indigenous peoples and medicinal plants. Paper presented at a conference on Biodiversity and Human Health, held in Washington, DC, 3-4 April. National Institutes of Health, Bethesda, MD, USA.

Davis, S.H. 1993. Hard choices: indigenous economic development and intellectual property rights. *Akwe:kon Journal* Winter 1993: 19-25.

Dewees, P.A. 1991. The impact of capital and labour availability on smallholder tree growing in Kenya. Unpublished Dphil thesis. Oxford University, Oxford, UK.

Erdmann, T.K. 1993. *An analysis of 10 African natural resource management practices.* USAID, Washington, D.C.

FAO. 1992. *A framework for analyzing institutional incentives in community forestry.* Community Forestry Note No. 10. FAO, Rome.

FAO. 1995a. Non-wood forest products in nutrition. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

FAO. 1995b. Summary of recommendations. In *Report on the expert consultation on non-wood forest products, Yogyakarta, Indonesia, I 7-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Gregersen, H.M., Arnold, J.E.M., Lundgren, A.L., and Contreras-Hermosilla, A. 1995. *Valuing forests: context, issues and guidelines.* FAO Forestry Paper No. 127. FAO, Rome.

Grifo F.T. 1994. Chemical prospecting: an overview of the International Cooperative Biodiversity Groups Program. In Feinsilver, J., ea., *Emerging connections: biodiversity, biotechnology, and sustainable development in health and agriculture.* Pan American Health Organization, Washington, D.C.

Hadi, S. 1986. Case study three: forest based handicrafts in Indonesia. In Campbell, J. ea., *Case studies in forest-based small scale enterprises in Asia.* Community Forestry Case Study 4. FAO-RAPA, Bangkok.

Haeruman, H. 1995. Environmental dimensions of non-wood forest products. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

IFPRI. In press. Proc. of a workshop on Non-Timber Tree Product (NTTP) Market Research, held December 12-14, 1994, Annapolis, Maryland, USA. International Food Policy Research Institute, Washington, D.C.

Padovani, F. 1995. Statistical information on non-wood forest products. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Poole, P.J. 1993. Indigenous peoples and biodiversity protection. In Davis, S.H., ea., *The social challenge of biodiversity conservation.* Working Paper No. 1. Global Environment Facility, Washington, D.C.

Reid, W.V. Laird, S.A. Meyer, C.A., Gamez, R., Sittenfeld, A. Janzen, D.H., Gollin, M.A. and Juma, C., eds. 1993. *Biodiversity prospecting: using genetic resources for sustainable development.* World Resources Institute, Washington, D.C.

Sène, El Hadji M. 1995. Non-wood forest products: the institutional aspects. In *Report of the expert consultation on non-wood forest products, Yogyakarta, Indonesia, 17-27 January 1995.* Non-Wood Forest Products 3. FAO, Rome.

Sittenfeld, A. and Lovejoy, A. 1994. Biodiversity prospecting frameworks: the INBio experience in Costa Rica. Paper presented at a conference on Biological Diversity: Exploring the Complexities, held in Tucson, Arizona, USA, 25-27 March, 1994.

Vosti, S., and Witcover, J. 1995. Non-timber tree product market research workshop - an overview. Draft.

IFPRI, Washington, D.C.

WRI-IUCN-UNEP. 1992. *Global biodiversity strategy: guidelines for action to save, study, and use Earth's biotic wealth sustainably and equitably.* World Resources Institute, Washington, D.C.

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FAO. 1992. *A framework for analyzing institutional incentives in community forestry.* Community Forestry Note 10. FAO, Rome.

Greaves, T., ed. 1994. *Intellectual property rights for indigenous peoples: a source book.* Society for Applied Anthropology, P.O. Box 24083, Oklahoma City, OK 73124, USA.

Panayotou, T. and Ashton, P.S. 1992. *Not by timber alone: economics and ecology for sustaining tropical forests.* Island Press, Washington, D.C.

Pearce, D. and Moran, D. 1994. *Economic value of biodiversity*. Earthscan, London.

Taylor, D.A., Lai, C.K., and Mancebo, S.T. 1993. *Developing curricula for agroforestry and community forestry in Asia-Pacific.* Report of an expert consultation held 8-12 June, 1993 in Chiang Mai, Thailand. APAN Report No. 8. FAO Asia-Pacific Agroforestry Network, Bogor, Indonesia.

United Nations Publications. 1992. *Application of environmental impact assessment principles to policies, plans and programmes.* Environmental Series No. 5. UN Publications, New York.

United Nations Publications. 1992. *Handbook of national accounting: integrated environmental and economic accounting.* UN Publications, New York.

World Wide Fund for Nature. 1993. *The vital wealth of plants.* WWF, Gland, Switzerland.

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