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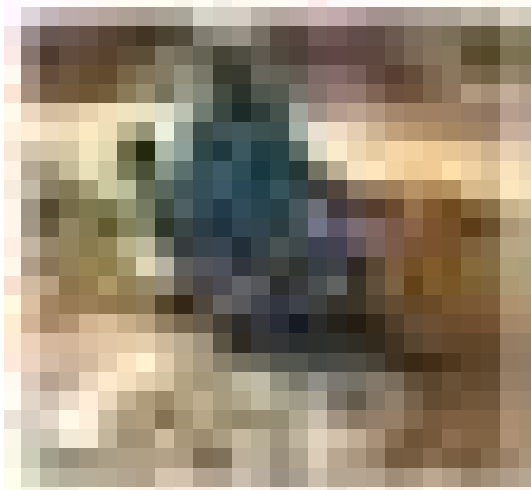
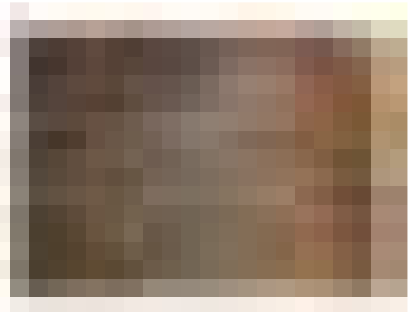


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Non-Wood Forest Products and Services for Socio-Economic Development

The AFRICAN FOREST FORUM

– a platform for
stakeholders in
African Forestry



*A Compendium for Technical and Professional
Forestry Education*

Suzana Agustino, Bennet Mataya, Kingiri Senelwa &
Enoch G. Achigan-Dako

Non-Wood Forest Products and Services for Socio-Economic Development

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Non-Wood Forest Products and Services for Socio-Economic Development

*A Compendium for Technical and Professional
Forestry Education*

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Enoch G. Achigan-Dako

The African Forest Forum (AFF)

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Acronyms and Abbreviations

AAS	African Academy of Sciences
ABS	Access and Benefit Sharing
AFF	African Forest Forum
AFORNET	African Forest Research Network
AIDS	Acquired Immune Deficiency Syndrome
CAMPFIRE	Communal Areas Management Programme For Indigenous Resources
CBD	Convention on Biological Diversity
CDM	Clean Development Mechanism
CER	Certified Emission Reductions
CES	Compensation for Ecosystem Services
CET	Carbon Emission Trading
CIFOR	Center for International Forestry Research
CITES	Convention on International Trade in Endangered Species
CO ₂	carbon dioxide
COMIFAC	Commission on Central African Forests
CPC	Provisional Central Product Classification
CPF	Collaborative Partnership on Forests
CSD	Commission on Sustainable Development
ECOSOC	United Nations Economic and Social Council
ERGS	Environmental and Recreational Goods and Services
FAO	United Nations Food and Agriculture Organization
FLO	Fairtrade Labelling Organisations
FSC	Flexible Standards Certification
FSC	Forest Stewardship Council
FUG	Forest User Groups
GARA	Gum Arabic and Resins Association in Kenya
GATT	General Agreement on Trade and Tariffs
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Green House Gases
GMP	Good Manufacturing Practices
ha	hectare
HIV	Human Immunodeficiency Virus
HS	Harmonised Commodity Description and Coding System
ICRAF	World Agroforestry Centre
IFF	Inter governmental Forum on Forests
IPCC	Inter-governmental Panel on Climate Change
IPF	Inter-governmental Panel on Forests
IPR	Intellectual Property Rights

ISO	International Standardization Organization
ISTC	International Standard Trade Classification
ITTO	International Tropical Timber Organization
IUCN	World Conservation Union
IUFRO	International Union of Forestry Research Organizations
kg	kilogramme
KSLA	Royal Swedish Academy of Agriculture and Forestry
MT	metric tonnes
NAGAPPEN	National Association of Gum Arabic Producers, Processors and Exporters of Nigeria
NGOs	Non-Governmental Organizations
NLBI	Non-Legally Binding Agreement
NPV	Net Present Value
NTFPs	Non-Timber Forest Products
NWFPs	Non-Wood Forest Products
NWFPS	Non-Wood Forest Products and Services
PEFC	Pan European Forest Certification
PES	Payment for Environmental Services
PROTA	Plant Resources of Tropical Africa
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SFM	Sustainable Forest Management in Africa
SIDA	Swedish International Development Cooperation Agency
SITC	Standard International Trade Classification
SLIMF	Small and Low Intensity Managed Forests
SNA	System of National Accounts
t	tonnes
TRIPs	Agreement on Trade-Related Intellectual Property Rights
UNCCD	United Nations Convention to Combat Desertification
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNEP-WCMC	UNEP World Conservation Monitoring Centre
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
UNIDO	United Nations Industrial Development Organization
US\$	United States Dollar
USAID	United States Agency for International Development
WCO	World Customs Organization
WHO	World Health Organization
WTO	World Trade Organization
WWF	World Wide Fund for Nature

Foreword

A pan-African initiative on “Sustainable Forest Management in Africa (SFM)” was implemented between 2003 and 2008, with funding from the Swedish International Development Cooperation Agency (Sida). The overall aim of the initiative was to learn from experiences in implementing SFM in Africa and evaluate how to upscale the positive lessons. The initiative was jointly implemented by the African Forest Research Network (AFORNET) at the African Academy of Sciences (AAS), the Royal Swedish Academy of Agriculture and Forestry (KSLA) and the Food and Agriculture Organisation (FAO) of the United Nations, in collaboration with many national and regional institutions in Africa as well as some other international institutions.

One of the key findings from this initiative is that Africa continues to have serious problems with generating new information and innovations in forestry, accessing externally available information, as well as with analysing and adopting such information and innovation into practical forest management. There are pockets of information in many institutions, networks and individuals. However, a mechanism to systematically collect, collate, synthesise (where necessary) and share the information is lacking. Such information would not only enrich educational establishments, which mould future foresters, agriculturalists, environmentalists and other stakeholders in forestry, but will also be useful for decision-makers and practitioners in forestry, environmental protection, rural development, and related areas.

In this regard the SFM initiative collected a substantial amount of information on Non-Wood Forest Products and Services (NWFPS). It was felt that this information was not available in a way that could facilitate its use by educational and training institutions for technical and professional education in forestry and related areas. A team composed of the following members examined the information and proposed ways of enriching and developing it into a teaching compendium for both technical and professional training: Prof. Daniel N. Sifuna, Dr. James B. Kung’u and Dr. Teresa Aloo (Kenyatta University, Kenya); Dr. Joel Laigong and Dr. Kingiri Senelwa (Moi University, Kenya); Ms. Jane K. Kaaria (Kenya Forestry College, Londiani, Kenya); Dr. Tsegaye Bekele (Wondo Genet College of Forestry, Ethiopia); Dr. Abdalla A. Elfeel (College of Forestry and Range Science, Khartoum, Sudan); Mr. Bennet Mataya (Mzuzu University, Malawi); Prof. John Kaboggoza (Makerere University, Uganda); Mr. Isaya Mwang’wone (Forestry Training Institute, Olmotonyi, Tanzania); Prof. August Temu (World Agroforestry Centre, Nairobi, Kenya) and; Ms Agnes Lusweti and Prof. Godwin Kowero (Sustainable Forest Management in Africa

Initiative, Nairobi, Kenya). Prof. Sifuna provided the pedagogical guidance in writing the compendium.

The initial draft of the compendium was put up by Dr. Kingiri Senelwa (Moi University, Kenya), Mr. Bennet Mataya (Mzuzu University, Malawi) and Dr. Suzana Augustino (Sokoine University of Agriculture, Tanzania). They are collectively responsible for the contents of the compendium.

The African Forest Forum (AFF), upon expiry of the SFM initiative, took up the responsibility for moving this process forward. The draft compendium was reviewed by Dr. Phosiso Sola (Southern Alliance for Indigenous Resources), Dr. Jean Lagarde Betti (University of Douala, Cameroon), Prof. Labode Popoola (University of Ibadan), Dr. Julius Chupezi (FAO-Cameroon), Dr. Abasse Tougiani (INRAN/CERRA, Maradi, Niger), Dr. Ben Chikamai (Kenya Forestry Research Institute, Kenya); Dr. Yonas Yemshaw, Dr. Mahamane Larwanou and Prof. Godwin Kowero (African Forest Forum). The final editing, graphics reproduction, layout, and production were done by Dr. Enoch Achigan-Dako (Plant Resources of Tropical Africa-PROTA-Nairobi).

This compendium is not written as a paper for scientific journal publication, but as scientific information drawn from various sources and presented in a pedagogical manner to facilitate uptake of the same by students and their instructors. Information dispersed in various writings on the subject has been collated and systematically synthesised into chapters that focus on certain topics and in a sequence that facilitates the understanding of the industry of Non-Wood Forest Products and Services. Hopefully this compendium will provide incentives for others to write books that will address the needs of teachers and students on the same and similar issues.

The compendium aims at enabling students and other interested groups including government officials, producers, exporters, non-governmental organisations (NGOs), research institutes and other stakeholders to acquire knowledge, skills, and values in the identification, development, management, utilisation and promotion of opportunities in NWFPS. It will enable the reader to:

- ▶ identify different NWFPS;
- ▶ understand concepts, values and uses of NWFPS;
- ▶ acquire knowledge and skills in sustainable production, utilisation and marketing of NWFPS;
- ▶ understand the institutional and regulatory arrangements for management and utilisation of NWFPS;
- ▶ understand the roles of NWFPS in socio-economic development;
- ▶ acquire knowledge and skills in the study and evaluation of NWFPS.

The compendium is divided into six chapters. Chapter I defines the concept and highlights the importance of NWFPS in socio-economic development. Chapter II examines issues related to the classification of NWFPS and the characterisation of actors in compensation, while Chapter III reviews aspects that are important in the sustainable management, production, processing, and utilisation of NWFPS. Chapter IV presents some aspects in marketing and commercialisation of NWFPS &Ss, including issues related to labelling and certification, value chains, and market trends. It further identifies specific challenges in the areas of competitiveness, information and marketing. Chapter V highlights the role of NWFPS in national economies, touching on employment; income generation and poverty alleviation, trade, food security, and the role of these products in health. Chapter VI addresses the concepts, roles and the different types of institutional and regulatory arrangements for management and utilisation of NWFPS.

Each chapter starts with a summary and ends with questions to refresh the memory of the reader and to highlight a number of challenging issues facing the industry of NWFPS.

Godwin Kowero
Executive Secretary
African Forest Forum

1

Concepts, Values and Uses of Non-Wood Forest Products and Services

This chapter highlights the evolution of the concept of non-wood forest products and services, and guides on appropriate definitions to be used. It also sheds light onto the roles and contributions of those resources to people's livelihoods. Benefits include: cash income, food security and nutrition, fodder and grazing for livestock, medicinal resources, as well as physical, biological, and chemical benefits arising from management of forest ecosystem. Several forest resource bases exist all over the world. In Africa they can be categorised according to the forest types and land cover. The implication of the extent, distribution and the overall forest cover decline and degradation propels reflections into the contribution of those resources to the sustainable forest management.

1.1. Background

Early man's interaction with and dependence on the forests was, for many years, almost exclusively centred on non wood forest products. For many communities, this has not changed. However, most of the forest management systems throughout the world emphasise the principle of sustained yield of timber production, and consider NWFPs as secondary or even "minor" products. Given man's dependence of forests and trees, it is therefore important to understand the broad range of products and services from the forests, trees and woodlands. Of particular importance in this compendium are Non-Wood Forest Products and Services (NWFPs) that are very important in enhancing livelihoods of many people in Africa (Tieguhong *et al.*, 2009). They are particularly important to rural communities in terms of food and nutritional requirements, medicines, fodder for livestock, fibre, fertilizers, construction materials, cosmetic and cultural products. They support village-level craft activities. NWFPs provide raw material to support processing enterprises. They include internationally important commodities used in food products and beverages, confectionary, flavourings, perfumes, medicines, paints, polishes and more.

The demand for a number of NWFPs, especially those for food and medicines, is increasing in urban centres, and as members from respective communities migrate to these urban centres they carry along their culture and habits.

About 80% of the people in the developing world depend on NWFPS for their primary health and nutritional needs and/or in terms of meeting their subsistence consumption and income needs. In many countries NWFPS form an important component of forest products exports. It is paradoxical that, in spite of their current real and potential value, most NWFPS remain grouped as minor products of the forests. These products rarely feature in national statistics and are rarely seriously studied or researched by national institutions.

There are several constraints to their development into a strong and prosperous industry. For instance most NWFPS are often associated with traditional uses that are not widely known and/or they are linked to traditional measures employed by the poor for their subsistence or to address poverty. NWFPS transactions largely take place in households and small-scale units, mostly outside the established marketing systems/channels, thus forming part of an unorganised and informal sector; their local uses go unrecorded and operations are often seasonal. For these reasons, they are often overlooked by planners. The strong timber-orientation of the forestry profession, and the bias of planners in favour of large-scale enterprises, often leaves NWFPS at a disadvantage; their productions are, at best, incidental or subsidiary. A wrong perception still exists that forests, which do not produce timber are of low or no value. In timber forests, non-timber plants are at times treated as weeds, and are often in the same category as the so called “lesser known tree species”. The latter are tree species whose timber has not been studied adequately and therefore lacks immediate markets. This distinction often gives rise to conflicts in resource use between wood and non-wood products managers, and also between the two user groups. Sustainable management of NWFPS, especially those occurring in natural forests of good biological richness and ecological diversity, is very complex. As a result their management is usually left out from management prescriptions in preference to timber management that is comparatively easier. There are also overlapping of uses of NWFPS and their sources. That is, the same product can be produced from different non-wood raw materials; and also the same non-wood raw materials can provide different products. This adds to the complexity of managing and utilising such resources. The lack of knowledge/information about the potential of NWFPS to support sustainable and remunerative enterprises also represents a serious drawback.

Baseline data to underpin their importance is scanty or lacking. There is only very limited information about the resource base. Being considered minor, there has been hardly any attention paid to these products in terms of inventory, management, conservation and related research. Similarly, the necessary skill base in the management and utilisation of these resources is poorly developed. Some of these constraints, in one way or other, are related to the characteristics of the products. NWFPS are extremely heterogeneous, requiring a mix of different skills, technology and research support in their management. The resource base for these products is often dispersed and varies considerably in concentration. This, to some extent, leads

to their localised importance and use. Knowledge on NWFPS to a significant extent is local, empirical and often linked to local culture – a feature which makes information gathering or exchange more difficult.

Recently however, the significant environmental and economic roles of NWFPS have come into focus through better understanding of their importance. The new market preferences for natural and green products and the emphasis on efficient and sustainable use of natural resources have shaped this development. It has also become apparent that with responsible use and proper husbandry, NWFPS hitherto largely confined to subsistence use, can also support sustainable and remunerative enterprises and increase the contribution of forestry to development (Tieguhong and Ndoye, 2006). This has led to an increasing interest on these products and services. For example, these NWFPS received notable attention, by being recognised as constituting an important area that merits attention as a source of environmentally-sound and sustainable development at the United Nations Conference on Environment and Development (UNCED) in 1992. In most cases, this interest has yet to be transformed into commensurate and consistent action. For this to happen the above mentioned technological and institutional inadequacies have to be overcome in order to realise the socio-economic potential of NWFPS and to bring them into the main stream of modern economies, while at the same time retaining their accessibility to traditional uses.

1.2. Definitions of Non-Wood Forest Products and Services

Most forests and woodlands produce timber for sale or for household consumption. However, there are a wide variety of other goods and services produced from forests and trees on farms, ranging from fodder for livestock to recreational, aesthetic and environmental values. According to Glück (2000), the “Pan-European Criteria and Indicators of Sustainable Forest Management” that aims at the evaluation of sustainable forest management, covers a number of forest products and services including (i) wood products; (ii) non-wood products (*e.g.* hunting and game, berries, mushrooms, cork etc.); (iii) biodiversity; (iv) soil protection; (v) water protection; and (vi) recreation. This fairly presents the range of what is covered by NWFPS, with the exception of timber. Because the range of NWFPS is very broad, they are difficult to classify (see Chapter 2).

However, to put the term NWFPS in perspective, it is important to look at some relevant and related terms used interchangeably to describe the products and services derived from the forests other than timber. These include, but are not limited to: non-wood goods and services, non-wood goods and benefits, non-timber forest products, non-timber resources and values, special forest products, minor forest products and miscellaneous forest products; other forest products; secondary forest products, naval stores, forest by-products, forest biological resources; other economic forest products; non-wood forest benefits; forest garden products; wild products; natural

products; non-timber forest and grassland products; veld products and by-products of forests (Chandrasekharan, 1992; Lund, 1998). These terms have specific definitions (Students to check the definitions and other terminologies associated with them in their further readings). It is also important to understand why all these terms emerged.

Historically, deforestation in the tropics accelerated in the early 1980s and timber exploitation practices began to be perceived as overly destructive. Gradually, more attention was given to the interests of forest-dependent people in developing countries and to the importance of forest products, other than timber. The sustainable use of a broader range of forest plant and animal species started to receive more attention, particularly from nature conservation agencies as a way of mitigating deforestation, while at the same time increasing people's income. To some degree, the terms were coined in order to facilitate a shift in emphasis towards the livelihoods of forest-dependent peoples and to more 'environmentally friendly' uses of forests, with the objective of encouraging more balanced uses of forest resources and a reduction in forest degradation and deforestation. While the emphasis on promoting NWFPs was at first placed on tropical forests in developing countries, awareness of their importance in temperate and boreal forests of the developed countries has also grown.

A product is anything obtained as a result of some operation work, as by generation, growth, labour, study, or skill (Lund, 1998). One may derive products from animals, vegetation, mineral resources, or a combination of these. The resources may be used directly or some processing has to be carried out before use. The conversion of plant or animal material into a form suitable for human use constitutes an example of production. Products have an economic implication. Service on the other hand is a contribution to the welfare of others. Forest services are usually seen as the roles or functions forests play (Lund, 1998). These may be economical, environmental, ecological, informational, recreational or cultural. Mantau *et al.* (2001) considered forest services as less tangible products supplied by the forest, which often leads to the situation where it is difficult to receive a market price for forest services without some kind of transformation or development.

According to the United Nations Food and Agricultural Organisation (FAO), Non Wood Forest Products include goods of biological origin other than wood, derived from forests, other wooded lands and trees outside forests. The products include the use of plants for food, beverages, forage, fuel and medicine, animals, birds, reptiles and fishes for food, fur and feathers, and their products such as honey, lac, silk, and services of forests for conservation and recreation. Excluded are industrial roundwood, timber and all other potential wood products, wood used for energy, horticultural and livestock products. However, there are emerging areas such as energy sources, including biofuels, which fall in the category of NWFPs and should be considered. NWFPs may be extracted from natural ecosystems, managed plantations, farms, etc., and be utilised within the household (subsistence use), be

marketed (commercial and or industrial use), or have social, cultural or religious significance. From the marketing point of view, NWFPs represent one of the most challenging product groups because of their number, versatility, end-use variation, dissimilarities of the producer base and resource richness.

NWFPs are extremely numerous and versatile. They comprise unprocessed raw materials and consumer products as well as further processed consumer or industrial goods. Many of the products are seasonal and with fairly small overall markets, which means that individual producers can seldom rely and specialize on only one product. The resource base also varies greatly, some of it being natural and even wild while other resources are plantation-based. Although researchers have characterised NWFPs as being generally small in size, consumed domestically by the collector, accessible to the poor, labour intensive and requiring little capital input, there are examples of large-scale industrial plantations that supply either primary consumer goods or raw materials for further processing using non-wood forest resources (Lund, 1998).

In the African context, it is probably more appropriate to define NWFPs by functions they play in rural households, in agro-forestry and community forestry production systems. These functions are: food production and food security, health security, house construction materials, household and agricultural tools. NWFPs are also important in income generation through harvesting, processing and trading in products such as gums, resins, oils, leaves, fruits, as well as eco-tourism activities, among many others.

1.3. Importance of non-wood forest products and services

The importance of NWFPs is related to three main groups according to Chikamai and Tchatat (2004). Firstly, NWFPs are particularly important to forest-dwellers and rural communities who use the products for livelihood support and social and cultural purposes; secondly, to the urban consumers, and thirdly to the traders/product processors. A variety of NWFPs worldwide are used either directly or as supplements of food, or as fodder, honey, mushrooms, fruits, nuts, tubers, bush meat, medicine and construction materials. There are also other uses of NWFPs such as farm tools and implements, household baskets, mats, pillows, tanning materials, sponges and brooms (FAO, 1995; Arnold 1995). In dry land areas of Africa, NWFPs are important as alternative sources of livelihood and are a source of foreign exchange earnings for some countries. Income generated from NWFPs is important in alleviating poverty. On the other hand, forest services include water regulation through catchment forests, climate improvement and carbon sequestration. For example, with respect to water regulation, in southern Africa there are major rivers such as Zambezi, Kafue and Lualaba, Okavango, Ruaha, Rufiji and Ruvuma, Save, and Congo that have their headwaters in the major forest ecosystems of the region.

1.3.1 Contributions of NWFPS to people's livelihoods

Livelihoods connote the means, activities, entitlements and assets by which people make a living through natural or biological (*e.g.* land, water, common property resources, flora, fauna), social (*e.g.* community, family, social methods, participation, empowerment) and human (*i.e.* knowledge, creation of skills) means, and are therefore key in the debate on sustainable development. The wise use of such resources and capacities in the sustenance of livelihoods could make a significant contribution in alleviating or eradicating poverty whilst protecting the environment (Dovie *et al.*, 2001). In general, forest fringe communities and upland farmers are more dependent for their livelihood on NWFPS than lowland farmers for (a) earning cash income; (b) satisfying household needs such as fodder, medicine, shelter, and other household goods; (c) sourcing traditional agricultural inputs such as leaf litter, wild plants, small tools and water; and (d) obtaining supplementary foods such as roots, tubers, vegetables, fruits and grains for the family. Due to their physical remoteness, linkage between local community and forestry is traditional and they are economically and ecologically inseparable from each other. Their dependency on the forest resources is both historic and cultural so much so that they constitute an integral component of the forest ecosystem of the area.

Sources of employment and cash income

NWFPS provide one of the good avenues for employment in many countries. For tropical countries, the importance of NWFPS is well-known. In economic terms, they contribute significantly to national economic growth and international trade (Chikamai and Tchatat, 2004). For example, the collection and sale of medicinal plants and other NWFPS alone are considered to be one of the biggest sources of seasonal employment (three to four months in a year) to the mountain communities of the North Eastern Region of Himalayas. Medicinal and aromatic plants-based industry also provides employment to a large number of trained and educated youth. Bamboo and rattan are another group of NWFPS providing large-scale employment to the artisans and village craftsmen. In order to ensure year round employment and a better income for the collectors, integration of other development activities with NWFPS conservation and use is necessary. Myers (1988) showed that a tropical forest tract of 500 square kilometres could, with effective management, "produce a self-renewing crop of wildlife with a potential value slightly more than US\$200 per ha," compared to revenue of just over US\$150 per ha from commercial logging in the same area. Peters *et al.* (1989), in an effort to illustrate the values of NWFPS, presented data on inventory, production and current market value for all commercial tree species occurring in one hectare of Amazonian Forest, including wood and NWFPS resources. They arrived at a combined Net Present Value (NPV) of US\$6,820 for a fruit and latex production and selective cutting project, with logging contributing just 7% of the total. This compares favourably with an estimated NPV of US\$3,183 obtained from a 1.0 ha plantation of *Gmelina arborea* for pulpwood in

Brazilian Amazonia and an NPV of US\$2,960 for fully stocked cattle pastures in Brazil. In India, the collection and processing of the leaves of the *tendu* tree (*Diospyros melanoxylon*), used to wrap small cheroots known as "bidi", produces an estimated US\$200 million (FAO, 1994) and provides part-time employment for up to half a million women.

Non-wood forest products contributed 14% to the Gross Domestic Product (GDP) of Senegal (Dabiré, 2003). In South Africa it was reported that 400-500 species are sold in the country and sub-region for traditional medicines. In the same sub-region it is reported that wild plant resources contribute an income ranging from US\$194 to US\$1,114 per household. At the national level, the importance of NWFPS lies in the large numbers of people engaged in gathering, hunting, processing, trading and other aspects of their production and use (Tieguhong *et al.*, 2009; Arnold, 1995).

Many of the potential suppliers of environmental services are likely to be poor. The upper watersheds that are critical sources of water services, for example, are often inhabited by poor subsistence farmers, who if paid for environmental services that they could safeguard could be an important addition to their incomes. This will not happen automatically, however. Working with many small, dispersed farmers imposes high transaction costs, and special efforts are needed to ensure that the poor have access to revenues and other opportunities created by Payment for Environmental Services (PES) programs. For example, in Costa Rica a system of collective contracting has been developed through which groups of small farmers can join the PES program collectively rather than individually.

Food security and nutrition

NWFPS contribute substantially to household food security and family nutrition by supplementing family diets. A variety of them are also used to improve health through the prevention and treatment of diseases. For vulnerable groups such as landless people, women and children who mostly come from poor households and reside in and around forest areas, forests can become the source of their livelihoods in their daily life or in periods of crisis. Tree foods comprise mainly fruits and seeds, nectars and saps, stems and tubers, leaves, twigs and mushrooms. In many villages, bamboo shoots are commonly used as fresh or preserved vegetables. Bamboo shoots are also marketed in local and national markets. For example in Namibia, Botswana and parts of South Africa, the Kalahari plant known as devil's claw (*Harpagophytum* spp.) is usually found where livelihoods options are very limited and as such its extraction by local communities is important for survival.

While at the subsistence level NWFPS are key in terms of food security they are often commercialised for cash (Tieguhong *et al.*, 2009; Shackleton and Shackleton, 2004). Foods from the forest include fruits, leaves, seeds and nuts, tubers and roots, honey, fungi, gum and sap. These foods are often significant in providing essential vitamins, minerals, carbohydrates and protein (Table 1.1).

Table 1.1 Contributions of forest foods to human nutrition.

Type of forest food	Nutritional contribution
Fruits and berries	Carbohydrates (fructose and soluble sugars), vitamins, minerals (calcium, magnesium, potassium), protein, fat or starch
Nuts	Oils and carbohydrates
Young leaves, herbaceous plants	Vitamins (beta-carotene, C), minerals (calcium, iron), fibres
Gums and saps	Proteins and minerals
Invertebrates (insects, snails)	Protein, fat, vitamins
Vertebrates (fish, birds, mammals)	Protein

Source: (FAO, 1995)

Rural households often turn to NWFPs in response to agricultural crop failures and other contingencies. For example, in northwest Tanzania, Loibooki *et al.* (2002) found that households responded to crop failure by hunting bushmeat for consumption and sale. Also, Tieguhong and Zwolinski (2009) report that wildlife is an important source of food in other countries. For example, FAO (1990) reports that more than 60 wildlife species are commonly consumed in West Africa. In other sub-regions of the continent, bushmeat provides a major source of protein to people's diets. Besides direct nutritional contribution, bushmeat also adds variety and taste to otherwise bland foods that households consume (FAO, 1995). In Ivory Coast, the importance of the annual consumption of the bushmeat was estimated at FCFA 76 billions (hunter's price) in 1996, which was about 1.4% of the GDP (N'Guessan, 2003).

In the context of recurrent epidemics, dietary supplementation with forest and tree products may play an important role in community nutrition considering the growing evidence that malnutrition (specifically that of depleted micronutrient status) is a major underlying cause for the rapid progression to Acquired Immune Deficiency Syndrome (AIDS) in people living with human immunodeficiency virus (HIV) (Enwonwu and Warren, 2001). Fruits from tree species such as *Adansonia digitata*, *Allanblackia* spp., *Parinari* spp., *Thespesia garckeana*, *Uapaca kirkiana*, *Vitex* spp., *Strychnos cocculoides* and *Tamarindus indica* are a source of food for most rural communities. Vegetables include *Zanthoxylum chalybeum*, *Adansonia digitata*, *Bidens pilosa*, *Sesamum* spp., *Vitex doniana*, *Blighia sapida* (Maundu *et al.*, 2009, Achigan-Dako *et al.*, 2010; Fig. 1.1). Mushrooms are a common form of fungi

harvested for subsistence and commercial use. Roots, tubers, bushmeat and insects are also main sources of food for many communities.

Fodder and grazing

In Africa, especially in arid and semi-arid areas, rural families keep domestic animals. Forests and woodlands provide the pasture for grazing as well as fodder for stall-feeding. While fodder is used locally, uncontrolled fodder collection and grazing often can lead to forest depletion (FAO, 1995). It may be worthwhile to mention the relationship between milk production and the availability of green leaves of trees and shrubs in the ranges in arid and semi-arid areas. During the dry season in these areas, grasses are completely dry and do not contain any carotene, the nitrogen elements represent only 1% of the dried matter; thus the only source of digestible nitrogenous matter comes from the green leaves of trees and shrubs. It is therefore easy to see the importance of trees and shrubs in the ranges for these pastoral communities where milk is one of the most important staple foods (FAO, 1993). In West Africa, various tree species are harvested by indigenous herders for foliage (Fig. 1.2). To feed their cattle and ensure constant milk production, Fulani community in Benin prune *Khaya senegalensis* during the early dry season and then later prune *Azelia africana* or *Pterocarpus erinaceus* (Gaoue and Ticktin, 2009).

Medicinal uses

Wild or domesticated plants constitute the main medicinal resources in many traditional societies all over the world and often, the use of medicines from the forest overlaps with forest food use. In order to improve taste and add health tonic properties people add certain items to foods. In most cases these uses are closely linked to cultural values and often integrate traditional and western medicine (FAO, 1995). Some 25% of the medication prescribed world-wide contains ingredients extracted directly from medicinal plants. The total economic value of medication extracted from plants was estimated at US\$43 billion a year (van Rijsoort, 2000). However, many of these plants are not harvested from natural forests but are found in cultivated form. Although to a large extent medicinal products are locally traded products with low monetary value, they play a significant role in the rural production systems by providing a significant proportion of the health care needs of the

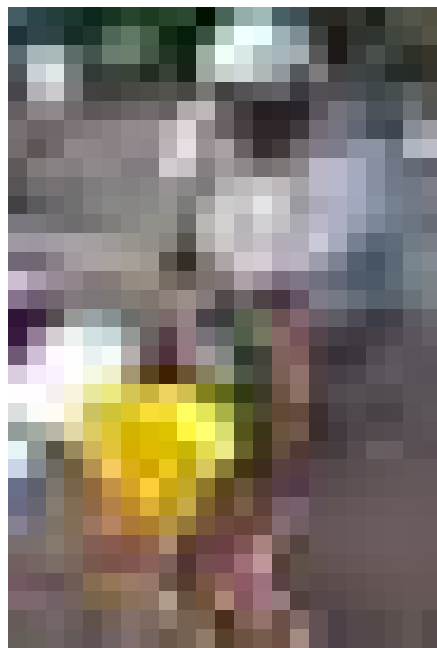


Figure 1.1 A forest dweller in Wari Maro (Benin) extracting the aril of *Blighia sapida* for a meal preparation. (Courtesy: E. Achigan-Dako)

communities. Many animal diseases are also treated with herbal medicines. By preventing and treating diseases, medicinal herbs not only improve the effective biological utilisation of food but also improve the nutritional status of the family.



Figure 1.2 A Fulani cattle keeper leading his livestock through a woodland forest in West Africa. (Courtesy: Orou Gande Gaoue)

Other uses and functions

NWFPs are used in the rural areas for social, cultural and religious functions. In Ghana and in most of the West African countries, chewing sticks from *Garcinia* spp. have provided primary healthcare for people for hundreds of years (Blay, 2004). They are made from splints of a number of stems. Among the 70 species of woody plants used for making chewing sticks three species of *Garcinia* (*Garcinia epunctata*, *Garcinia epunctata* and *Garcinia kola*) have commercial orientations. The resource base for *Garcinia* spp. is usually primary and secondary forests. Shea butter tree, *Vitellaria paradoxa*, is one of the important trees in the socio-economic livelihoods of West Africa (see also the section on food security and income generation). The species is one of the most commonly found trees in the parklands of West Africa from Senegal to the Central African Republic. In northern Benin, Schreckenberg (2004) found that of the 63 species counted per hectare, 25 were shea butter trees. Other important products from forest include essential oils, bees-wax and honey, gum, tannins, latex, dyes, fibres to list a few.

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 or socio-cultural ceremonies. Certain species play a crucial role in spiritual ceremonies, or have taboos associated with them that forbid certain harvests. There are forest foods that are commonly used in wedding rites, initiation ceremonies and other events. For example, *Ensete ventricosum* is used by local communities around Kabale National Park in Uganda for lactation purposes (Kakudidi, 2004). Although these cultural and spiritual roles of forests are losing importance in some places, they have persisted in many other communities, being renewed in the face of encroaching values from outside the community. Suffice to note that where they have persisted, the cultural values have played important roles in the conservation of such forests, with all the attendant biodiversity and other environmental benefits.

Other important services forests are rendering to humanity as a whole include the overall regulating function of life on the earth, the preservation of biodiversity and the gene store. It is a well known fact that life on earth is possible as a result of a balanced combination of certain gases in the atmosphere around the planet including carbon dioxide (CO₂). With the recent tremendous development of human activities, the release of more carbon dioxide is causing anxiety. Forests have the ability to absorb but also to release carbon dioxide, and therefore, can be used in the regulation process of the content of this gas in the atmosphere (FAO, 1993).

Forest plants are also an important source of nectar and pollen to bees and provide resin for *Trigona* bee hive construction. Forest tree species susceptible to heart-rot are important sites for wild bee nests, playing important ecological roles in the ecosystem.

1.3.2 Environmental and recreational services

In addition to traditional market commodities, forests and the related environments provide, or produce, several Environmental and Recreational Goods and Services (ERGS). These ERGS are generally perceived by our society as public goods and people cannot be excluded from enjoying them. Exclusion, when it happens, however, varies according to the property rights of each particular ERGS and is sometimes very different across countries and regions as are the local customs and the transaction costs to enforce exclusion. The degree of rivalry is equally variable according to each particular ERGS. For example, a landscape visible from a public road does not generally have a high level of rivalry, while the access to a nature reserve can create congestion and rivalry.

The issue of public goods and services provided by forestry and the related environment is not new. Watershed management, hunting and villagers' rights to the various forest products such as berries, mushrooms, firewood, among others are old debated issues, in addition to recreation and conservation, which are now considered to be the most important ERGS. The degree of rivalry and excludability has consequences for the marketability of such goods. Products with a low degree of

rivalry and a low degree of excludability are difficult to market – the marketability increases with increasing rivalry and exclusion possibilities.

Forestry-related ERGS have been linked to Recreational and Environmental Services (RES), which are an integral part of private market goods. Markets and marketing provide the link between ERGS (which basically remain in the public goods externalities) and RES products. The term NWFPS does not make the division between products or services before or after their transformation or development into marketable goods. The two concepts ERGS and RES are used here to clarify those processes. Non-marketable ERGS can be turned into marketable RES by means of two tools: transformation and development. Transformation is a modification of ERGS, mainly concerning their institutional nature including legal status, property rights, planning permissions, contractual agreements, among other aspects. Development is a modification of ERGS, mainly concerning their economic nature such as provision of complementary/additional goods and services, marketing promotion and changes of existing contracts.

Given these definitions it can be seen that save for the woody element, there is not much difference in between NWFPS and NTFPS. This teaching compendium uses the term “Non-Wood Forest Products” to capture the clarity and consistency promoted by the FAO. The goods and services described by non wood forest products and services can be grouped into environmental, social and cultural services. Environmental services can be identified by physical, biological and chemical benefits arising from management of forest ecosystems. Examples typically include, but are not limited to the following (Stefano and Gunars, 2002):

- *hydrological benefits*: controlling the timing and volume of water flows, controlling soil salinisation, protecting water quality and maintaining aquatic habitats;
- *reduced sedimentation*: avoiding damage to downstream reservoirs and waterways and so safeguarding uses such as hydroelectric power generation, irrigation, recreation, fisheries, and domestic water supplies;
- *disaster prevention*: preventing floods and landslides;
- *biodiversity conservation*: services provided by biodiversity are numerous, ranging from the maintenance of ecosystem functioning through to option and existence values (Landell-Mills and Ina, 2002). Other examples include conservation in which local people are paid for setting aside or naturally restoring areas to create a biological corridor;
- *carbon sequestration and storage*: forests-based carbon offsets; a typical benefit, for example, would be a northern electricity company paying farmers in the tropics for planting and maintaining additional trees;
- *landscape beauty*: this represents a critical ingredient into the market for eco-tourism; for example, a tourism operator could pay a local community not to hunt in a forest being used for tourists’ wildlife or landscape viewing (Fig. 1.3);

- *social and cultural services*: the social and cultural services of NWFPS are the roles and uses, the cultural and mystic values as reflected in a people's history, religion, art, and other aspects contributing to the functioning of a society as a result of their use.



Figure 1.3 Bujagali falls in Uganda attract thousands of tourists every year. (Courtesy E. Achigan Dako)

1.4. Forest resource base

The "closed forest" area of the world is estimated at 3.5 billion hectares (FAO, 2006) and is estimated to be declining at a rate of about 0.3% per year. On the other hand, forests and woodlands in Africa cover an area of about 650 million hectares, or 21.8% of Africa's land area (FAO, 2001a), representing about 17% of the world's forest area. Africa's closed forest area is estimated to be about 217 million hectares with an annual loss of 0.8%, the highest in the world. The continent is characterized by extremely diverse ecological conditions, ranging from humid forests to deserts and from montane temperate forests to coastal mangrove swamps (FAO, 2003). Superimposed on this ecological diversity are varying degrees of human interactions, shaped by political and institutional arrangements, economic conditions, and social and cultural settings. These mixes of factors result in a dynamic landscape mosaic. African forests and woodlands form an integral part of this mosaic, but are undergoing continuous changes largely due to anthropogenic factors (FAO, 2003). A

notable ecological niche worth mentioning in Africa is the Congo Basin, which is home to the second largest continuous block of tropical forest in the world.

1.4.1 Distribution of forest land by forest types

Of the 650 million ha of forests, about 98.8% is natural forests with the tropical moist forests and tropical dry forests forming the most important formations (Fig. 1.4). Africa's tropical forests represent 13% of the world's forest area and include rainforest, moist deciduous, dry and mountain forests, mainly in Central and West Africa. The subtropical forests are primarily dry forest types, plus small areas of mountain forest, mainly in northern, eastern and southern Africa. These forests are being utilised to meet a variety of objectives and are under different management. Tropical humid forests with high productivity are mainly under government ownership and management while the savannah woodlands such as the *miombo* woodlands in southern and eastern Africa with generally low productivity are increasingly coming under intense human pressure largely due to the high population densities.

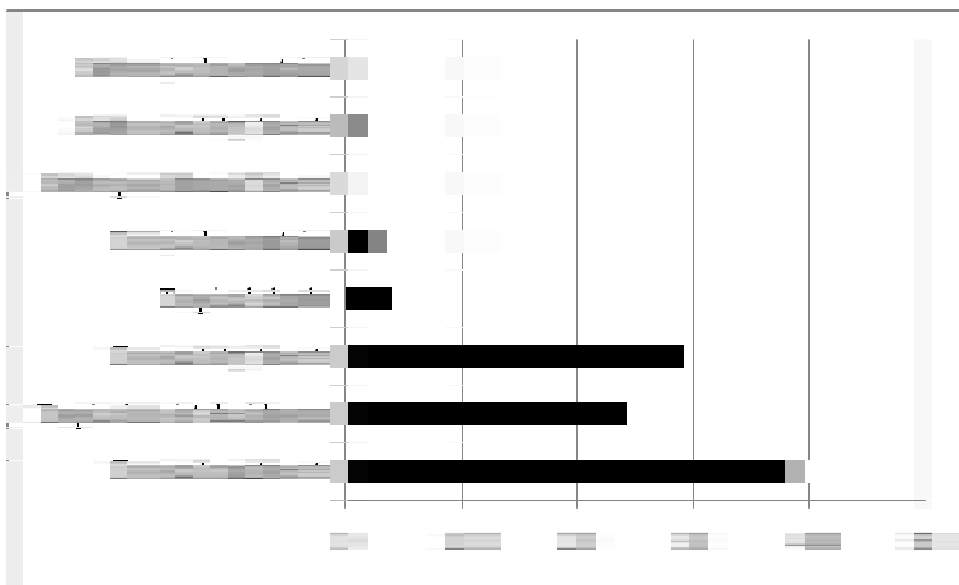


Figure 1.4 Percentage of forest land by forest types (adapted from Nair and Tieguhong, 2004)

These woodlands provide a variety of products and services that are critical to the livelihood of local communities. There have been numerous resource use conflicts because of the different demands placed on the *miombo* partly as a result of insecure tenure leading to over-exploitation of the resource. As a result, there are attempts in many countries to transfer ownership and management of these woodlands to local communities (Nair and Tieguhong, 2004).

1.4.2 Distribution of forests in Africa and threats on the resources

An important feature of African forests and woodlands is their uneven distribution between the different sub-regions and countries (Table 1.2). Most of the forests are in Central and Southern Africa, while the proportion in West and North Africa is very limited. In terms of sub-regional forest cover, North Africa is the least forested with only about 7% of its land area classified as forests. On the other hand, Central Africa with 44% of the land under forests is the most forested sub-region. Eight countries - Angola, Cameroon, Congo, Democratic Republic of Congo, Equatorial Guinea, Gabon, Guinea-Bissau and Seychelles, which comprise about 16% of Africa's land area account for 43% of the total African forests. These eight countries have more than 50% of their land area under forests.

Table 1.2 Distribution of forests in Africa

Forest land cover (%)	Countries	Total forest ('000 ha)	% of total African forests	% of African population	% of total African area
0 – 5	Algeria, Burundi, Comoros, Djibouti, Egypt, Ethiopia, Lesotho, Libya, Niger, Mauritania, Tunisia, Western Sahara	9,597	1.5	25.7	30.4
6 – 10	Chad, Togo, South Africa, Saint Helena, Mauritius, Morocco, Namibia	33,202	5.1	10.8	12.8
11 – 20	Eritrea, Nigeria, Rwanda, Sierra Leone, Somalia, Mali, Madagascar	48,892	7.5	21.0	11.9
21 – 30	Benin, Botswana, Burkina Faso, Cape Verde, Cote d'Ivoire, Ghana, Guinea, Kenya, Malawi, Reunion, Sao Tome & Principe, Sudan, Swaziland, Uganda	128,727	19.8	20.0	16.8
31 – 50	Central African Republic, Gambia, Liberia, Mozambique, Senegal, Tanzania, Zambia, Zimbabwe	152,772	23.5	11.6	12.5
> 50	Angola, Cameroon, Congo, Democratic Republic of Congo, Equatorial Guinea, Gabon, Guinea-Bissau, Seychelles	276,676	42.6	10.9	15.6
Total Africa		649,866	100.0	100.0	100.0

Source: (FAO, 2001b; Nair and Tieguhong, 2004)

On the other hand, the 12 least forested countries (Algeria, Burundi, Comoros, Djibouti, Egypt, Ethiopia, Lesotho, Libya, Niger, Mauritania, Tunisia and Western

Sahara) with less than 5% of their land area under forests account for over 30% and 1.5% of Africa's land area and forests, respectively. The population concentration and distribution patterns contrast sharply with forest distribution on the continent with the most densely populated countries being the least forested. The most forested countries account for about 11% of Africa's population while the least forested countries support about 26% of Africa's population. This uneven distribution creates significant imbalances in the demand and supply of forest goods and services and consequently the potentials and challenges related to the management of forest resources and the trade in forest products and services.

The level of effective forest management is very low in Africa; out of the total 650 million hectares of forests only 32.5 million hectares (5%) are formally protected. This is so, despite the fact that the forests sector in Africa plays an important role in the livelihoods of many communities and in the economic development of many countries; especially in Western, Central and Eastern Africa where there is still considerable forest cover. Because of the levels of protection and formal management, forests and woodlands cover has been declining largely due to increased woodfuel collection, clearing of forests for agriculture, illegal and poorly regulated timber extraction, conflicts, and increasing urbanisation. This also means that opportunities for NWFPS will also decline if efforts to implement sustainable forest management practices are not adopted (UNEP, 2006).

There is rich species diversity in the natural forests of Africa. The numbers of species of higher plants in the tropical rain forest is estimated to be 30,700; 13,000 for moist deciduous forest; 1,900 for dry and very dry zones; and 12,300 for upland formations. Many of the plants providing NWFPS are largely found among the biological richness and ecological complexity of primary forests and woodlands. This makes some NWFPS to be habitat specific and as such it is difficult to propagate them outside their natural habitats. Those species that can be grown in plantations, or as pure or mixed crops, are heavily dependent on regular infusion of germplasm from wild gene reservoirs from wild relatives. Therefore any efforts to develop disease-resisting and high-yielding varieties for the future will depend on continued existence of species variability in the wild. Thus the genetic wealth and variability are crucial for future development of NWFPS. However, deforestation and other anthropogenic influences are causing loss of species and their variability. The indicative species loss during 1981-90 in Africa was estimated by FAO to be 2.0% for tropical rain forest, 2.5% for moist deciduous forest, 1.0% for dry and very dry zone, and 2.5% for upland formations.

The Congo basin in Central Africa is home to the world's second largest continuous block of tropical rain forest. Population growth, immigration, and the need to enhance livelihoods for the people of the Congo basin will, for example, undoubtedly put increasing pressure on natural resources. At the same time, efforts to build local capacity, expand effective monitoring in the use of forest products, improve

governance and develop forest plantations will present new opportunities, allowing Africans to generate necessary solutions (CBFP, 2005, 2006; Betti, 2007). This is a critical time for conservation and development in the Congo basin.

Overall, the critical matter as far as forests and forestry in Africa are concerned is the fast disappearance of forest cover as well as the degradation of what remains. Between 2000 and 2005 the loss was about 4 million hectares per year, lower than the figure for the period 1990 to 2000. Between 1990 and 2000, Africa's forest cover loss was estimated at about 53 million hectares (Table 1.3), accounting for about 56 % of the global forest loss. This accounts for an annual reduction of 0.8%, one of the highest rates globally. The net forest cover loss varies considerably between different sub-regions and countries in Africa. A small number of countries account for most of the deforestation most probably as a result of changes in policies or lack of capacity to prevent forest encroachments. For example, during the period 1990 and 2000, three countries, namely the Sudan, Zambia and the Democratic Republic of Congo accounted for almost 44 % of Africa's forest cover reduction.

Table 1.3 Forest cover change in Africa.

Sub region	Forest cover in 1990 (million ha)	Forest cover in 2000 (million ha)	Annual change
North Africa	77.5	68.1	-0.94
East Africa	90.8	85.6	-0.52
Southern Africa	199.4	183.1	-1.62
Central Africa	250.1	240.7	-0.93
West Africa	84.7	72.2	-1.26
Total Africa	702.5	649.9	-0.80

Source: FAO, 2003; Nair and Tieguhong, 2004.

By 2005, about 28% of the land in eastern and southern Africa was covered by forests. North Africa had coverage of about 9% and western and central Africa about 44%. This is a precarious situation for Africa given the significance of forests/trees in combating desertification, providing basic human necessities, protecting biological diversity and watersheds, and moderating climate change (FAO, 2003). This loss becomes more significant especially when forests and woodlands have for long been sources of a wide range of NWFPS which are likely to be lost under continued deforestation.

One of the major causes of deforestation is the expansion of agricultural activities to feed the growing population. Between 1990 and 2000, the African population grew from 622 million to 798 million, and in 2010 stood at about 1 billion. Other factors such as logging and grazing have also contributed to forest degradation and depletion.

Forest plantations – a subset of all planted forests – are defined as forests of introduced species and in some cases native species, established through planting or seeding, with few species, even spacing and/or even-aged stands. Productive forest

plantations are defined as forest plantations predominantly intended for the provision of wood, fibre and non-wood forest products. They can also provide protective, recreational, amenity and other functions, which are not precluded by the harvesting of products. Subregions reporting the least area of productive forest plantations are the African subregions, the Caribbean, Central America and Western and Central Asia. A total area of 10,764,000 hectares productive forest plantations is found in Africa, representing a percentage of 2.5% of the total forest area (FAO, 2006).

1.5. Contribution of NWFPS to integrated and sustainable forest management

Sustainable forest management requires that management ensures utilisation that meets present demand for forest products and services and also ensures that future generations' ability to have the products and services is not compromised, and further that the forests are able to regenerate and maintain existing condition. This concept encompasses three fundamental standards: that forest management is socially acceptable and equitable; the impact is ecologically friendly and that the economic impact on local communities is positive (Chamberlain *et al.*, 1998). Just as the concept of sustainable forest management is based on three fundamental standards, sustainable management for non-wood forest products requires consideration of three types of issues related to ecological, economic and social matters. What this means is that the potential ecological impact of over-harvesting of NWFPS under certain management strategies could have devastating effects on other NWFPS. In other words the biological material, harvested for NWFPS, is important for the functioning of healthy forest ecosystems. Thus, managing forests for production and provision of NWFPS also implies maintaining biological diversity of both plant and animal species (Tewari and Campbell, 1995).

The practice of extracting economically valuable non-wood forest products while leaving forests structurally and functionally intact is an ancient one. In modern terms it is seen as a possible means of reconciling the needs of groups of people with conflicting concepts of forest resource use (Nepstad and Schwartzman, 1992). In the recent past several international initiatives have been taken in this regard as well. They include the Non-legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation, and Sustainable Development of all Types of Forests (also known as the Forest Principles") was adopted at the UNCED conference in 1992. The other main document related to forests that emerged from UNCED was Chapter 11 of Agenda 21 on Combating Deforestation. The main 'Rio Agreements', namely the Convention on Biological Diversity (CBD) and United Nations Framework Convention on Climate Change (UNFCCC), and the subsequently adopted Convention on Combating Desertification (UNCCD), do not focus on forest conservation, but still deal with many forest-related issues. The Intergovernmental Panel on Forests (IPF) was established at the third session of the

Commission on Sustainable Development (CSD) in 1995 with five programme elements: implementation of UNCED decisions related to forests; international co-operation, financial assistance and technology transfer; scientific research, forest assessment, and development of criteria and indicators for sustainable forest management; trade and environment in relation to forests; and international organisations, multilateral institutions, and instruments. Agenda 21 recognised the role of NWFPs in sustainable forest management.

Commercialisation of NWFPs can provide opportunities for (relatively) benign forest utilisation (Myers, 1988) and even create incentives for the conservation of individually valuable species and the environment in which they grow. The idea is that demand for products from a forest environment will translate effectively into demand for forests. This was fuelled by research such as that by Peters *et al.* (1989), which suggested that the value of NWFPs that could be sustainably extracted from a hectare of Peruvian Amazon forest far outweighed the value of the timber or alternative land uses. Conservation organisations have therefore been prominent among the advocates of NWFP commercialisation, seeing it as a way to encourage conservation-compatible income sources and to displace more destructive land- and resource-use options. Early examples were the support to rubber tappers and Brazil nut collectors, which aimed to increase the sustainability of Brazil's 'extractive reserves' (Schwartzman, 1992). However, such optimism was dispelled by the experience of two multi-case-study research projects, which sought to learn lessons about the impact of NWFP commercialisation on conservation and livelihoods. The first of these was implemented by the Center for International Forestry Research (CIFOR) and compared 61 case studies from Asia, Africa and Latin America (Ruiz-Pérez *et al.*, 2004). A second project, known as 'CEPFOR', was undertaken by the United Nations Environment Program (UNEP) World Conservation Monitoring Centre (UNEP-WCMC). The initial response to increased demand was more intensive harvesting leading to over-exploitation of the species (Marshall *et al.*, 2006). Almost all non-cultivated products in the CIFOR comparative study were reported to show declining resource bases (Belcher *et al.*, 2005). Arnold and Perez (2001) also questioned these views and argued that, it was a mere belief that use of NWFPs is less ecologically destructive than timber harvesting and therefore any intensive management of forests for such products could contribute to both development and conservation of forests.

By complementing wood-based management, NWFPs offer a basis for managing forests in a more sustainable way. In fragile ecosystems, NWFPs activities hold prospects for integrated forms of development that yield higher rural incomes and conserve biodiversity without competing with agriculture (Sharma, 1996). 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.

NWFPS have significant economic value. The collection and trade of these products is crucial to the economic well being of rural people and communities. Hence, the loss of access to gathering areas, or a significant decline in plant populations could have tremendous economic impact to the collectors and associated businesses. Sustainable forest management will remain elusive until knowledge concerning NWFPS is developed where it can support management decisions.

Studies of indigenous and peasant land management practices in Central and South America indicate that many traditional societies rely on the use of multiple product or portfolio approaches to land management. These strategies allow rural inhabitants to spread economic risk while biological diversity and soil fertility are maintained at much higher levels than would be possible under other kinds of management regimes. Further, since forestland could also have other competing uses, there is need to add value to forests. In an effort to increase awareness of tropical forest degradation and also the need to add value to forest resources, interest in NWFPS has grown. Thus in an attempt to manage NWFPS, efforts are required to maintain and sustain the resource and its users by conserving forests and biodiversity hence improving local economies through diversification of the economic base of the rural poor (FAO, 1995).

Given that NWFPS are socially, ecologically, and economically significant products and that the model for sustainable forest management is also based on the same three fundamental principles, the social and cultural factors needed to address sustainable forest management should also recognize the needs, rights, and traditions of NWFPS collectors. Hence the management and utilisation of NWFPS shall be regarded as a form of integrated that is, multiple-use form of forest management thereby contributing to sustainable forest management. This means that when there will be need to compile forest management plans knowledge of the complete life cycle of the species concerned and their interaction with other species will be required. Besides, a number of NWFPS have cultural and religious importance such that some forests are protected to ensure their availability. The survival of such forest areas depends on the demand by the community for such products and services (Chikamai and Tchatat, 2004). Another example is that of the production of myrrh and incense in Somalia. Strict management practices are put in place for particular ecosystems such that trees are protected from being cut down. During the gum season, harvesting is systematically carried out and a tree is tapped again only after it has fully recovered (Chikamai and Tchatat, 2004).

Some fruit trees have been used to rehabilitate degraded lands such as the marginal dry savannah and Sahel areas of Sub-Saharan Africa. For example *ber* (*Ziziphus mauritiana*) is adapted to ecologically poor and drought prone areas. Planted in an agroforestry system the tree can provide fruits for humans, nutritious leaf fodder for livestock and income opportunities. In dry areas of West Africa, communities

practice parkland agroforestry system where *karite* and *nere* fruit trees are preserved within farming landscape (Chikamai and Tchatat, 2004).

Examples from eco-tourism also demonstrate that the benefits local people can derive from a forest do promote sustainable management of that forest. The Communal Areas Management Programme For Indigenous Resources (CAMPFIRE) project in Zimbabwe is one such example where there have been improvements in the management of other resources such as water and woodlands, thereby contributing to the conservation of biodiversity. This has also promoted eco-tourism in the project areas making eco-tourism a valuable strategy in sustainable forestry in Zimbabwe. In Kenya benefits from a butterfly project called *Kipepeo* has changed the attitudes of the communities around the Arabuko Sokoke Forest Reserve such that they are contributing to the policing of the forest and are vehemently against "degazettment". Ten years ago the situation was completely different.

Honey and bees wax are products derived from beekeeping activities. Bees have provided mankind services such nectar for honey production and pollen for pollination of trees that are used by people. This act of pollination is important for sustaining bio-diversity and, when properly integrated, can contribute both to sustainable forestry. However, to be meaningful, an enabling environment is needed.

Nevertheless, a reversal could occur, where expanding commercial markets of some NWFPS can threaten the very existence of the products, the trees and associated forests from the wild. The situation is particularly constraining when the part of the plant harvested is root or bark. Examples are that of the degradation of *Prunus africana* resources in Cameroon and grapple plant (*Harpagophytum procumbens*) in South Africa. This situation is exacerbated by inadequate information on the resources and best practices for their management and harvesting.

NWFPS are more amenable for sustainable harvesting and use than wood products; they tend to have greater environmental benefits, including conservation of biodiversity, if carefully managed; they provide improved possibilities for "eco-ventures" covering small-scale NWFP-based enterprises, supply of genetic materials, buffer zone management, wildlife and wilderness-based tourism; they support upland community needs and welfare. Probably NWFPS are more vulnerable to mismanagement than wood. Sound forest management is the key for their sustainable and successful management.

The roles of NWFPS in the forest ecosystem include nutrient supply for other living organisms in the forests, regeneration of the forest itself and the maintenance of forest habitat quality. Just as sustainability of NWFPS depends on the sustainability of forests, the sustainability of forests will depend on the way that NWFPS are harvested. Non-wood forest products can be incorporated into multi-purpose systems of natural forest management where harvesting occurs for both timber and NWFPS (Tieguhong and Ndoye, 2007). Laird (1998) suggested that in managed forest areas,

timber and NWFPs can be harvested in a complimentary manner where complimentary harvests of NWFPs prior to and post logging can be planned such as the harvesting of rattans, collection of oil-producing seeds and medicinal barks, the tapping essential oils and resins which in many instances are extracted from valuable timber species.

In the forest ecosystem, biotic and abiotic factors are linked in an intricate relationship, supporting and enriching each other. Biotic components such as plants, insects, mammals, and birds, are linked in the cycles of energy, nutrients, water, and material. Many other cycles also link biotic factors with abiotic factors such as water and soil. NWFP resources play an important role in these relationships. According to van Rijsoort (2000) some species that are cut for timber may have potential value as NWFPs. In areas where there is pressure for forest land to be converted for other uses there is potential for intensification of NWFPs use in forest fringes, buffer zones of protected areas and nature reserves, inhabited forests with the necessary infrastructure, and flood plains (van Rijsoort, 2000). The additional income realised from the exploitation can therefore act as an incentive to prevent more forest being reclaimed.

Many traditional forest management systems have for some time been known to be sustainable systems. An example is the practice of establishing multi-storeyed tree gardens on the fertile slopes of Mount Kilimanjaro by the Chagga (Küchli, 1997). This practice has been known to be ecologically sustainable. Some examples of NWFPs found in the tree gardens are the bark of *Msesewe* tree (*Rauvolfia caffra*) used for beer brewing and the leaves of *Cussonia holstii* used for fodder. There are suggestions that where there is high potential for NWFPs in such kind of management systems, their use can be increased by planting extra NWFPs species by a process known as “enrichment planting” (van Rijsoort, 2000).

Where there is pressure on natural forests the cultivation of NWFPs on plantations or as part of agroforestry systems could be a strategy for reducing that pressure. This pressure often comes about as a result of increased demand due to commercialisation. It is important to note that this form of domestication of NWFPs should be done cautiously because it can result in decreased productivity of NWFPs obtained in natural forests, lower their prices and hence reduce value of the NWFPs. The consequence of this could be reduced motivation by communities to conserve their natural forests. Therefore, maintaining NWFPs in natural forests increases their value and hence the incentive to conserve them.

Points to remember

- Successful forest management can be achieved by incorporating effective sustainable strategies for exploitation of NWFPs.
- Sustainable forest management will remain elusive until knowledge concerning NWFPs is developed where it can support management decisions.
- Payment for environmental services should be directed to the right beneficiaries to ensure that they safeguard the natural resources. The payments should be continuous. Such beneficiaries should be organised in groups to facilitate the payments or access to any other benefits.

Questions

1. Briefly define non-wood forest products and services.
2. How do you perceive the difference between non-wood forest products and non-timber forest products?
3. What are the constraints that should be overcome to make non-wood forests products and services a prosperous subsector alongside the timber industry?
4. What are the research and development strategies to overcome those constraints?
5. What are the livelihoods and environmental benefits and services that forest ecosystems can provide?
6. Reflect on the implications of the ongoing forest degradation and species loss on the availability and sustainable utilisation of non-wood forest products and services.
7. Propose some conservation strategies of forest resource bases that will add value to non wood forest products and services.

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2

Classification and Characterisation of Non-Wood Forest Products and Services

To refer to Non-Wood Forests Products and Services in a comprehensive and shared nomenclature a classification system has proved necessary. Up to now there is no single and worldwide accepted classification system for these products. However, NWFPs can be broadly divided into extractive products, edible products and related materials, medicinal and pharmaceutical products, bee products, other animal based products, carvings and handicrafts, biofuels, and other products. Forests ecosystem services are many and include ecotourism, water regulation, climatic services, carbon sequestration and trade, biodiversity and soil protection, and cultural functions. These services can be marketed in many ways by actors in compensation such as ecosystem modifiers, ecosystem service beneficiaries, ecosystem service intermediaries.

2.1. Classification of non-wood forest products and services

The word *class* refers to a group of things that have the same or similar characteristics, while classification refers to the assignment to or arrangement by hierarchy. In arranging by classes, classification provides a rational system of relationships wherein distinction and coherence between elements are put into shape by a logical structure and ordering, within defined boundaries (Chandrasekharan, 1995). One of the important purposes of product definition is to facilitate product classification, by providing a framework for consistent accounting (Vantonine, 2001). Classification is thus important for data gathering and management, scientific investigations, analysis and evaluation of trends and outlook, aggregation and dissemination of information, and for forestry planning and policy making. Product classification, specifically, helps to trace the flow of goods and services through the economic systems, from the producers to the eventual users, and facilitates systematic analysis of trade to support development. It helps to assess the relative importance of the classes of products and therefore facilitates identification of development options.

Although many efforts to classify NWFPs have been made, there is no single internationally and globally accepted and commonly used classification system. Developments to date have usually used unique classification systems that vary with countries and based on existing national product classification systems to suit

particular purposes. Classification systems are useful to (i) aid reporting and (ii) provide a basis for developing an understanding of the uses and demand for products, or even help match methodologies to resources. Even though a standard classification does not yet exist, NWFPs can be grouped in many different ways. This grouping can either be based on typology for natural NWFPs (Chandrasekharan, 1995), end use (Wyatt, 1991; FAO, 2001), plant use (Prance *et al.*, 1987; Boom, 1989; Edwards, 1991; Salick *et al.*, 1995 and van Valkenberg, 1997), according to feasibility criteria for forest inventory (Kleinn, 1996), life form and plant parts used (McCormack, 1998; FAO, 2001), life form as used in multi-species resource assessments (Gadsby and Jenkins, 1992; FitzGibbon *et al.*, 1995; Wong, 1998), or provisional categorisation according to management characteristics (van Wieren, 1999).

In order to understand how an international classification for NWFPs can be developed and harmonised with the existing systems of other relevant international classifications, Chandrasekharan (1995) provided a review of other classification systems including (i) International Standard Industrial Classification of all Economic Activities (ISIC), Rev. 3, 1990; (ii) Standard International Trade Classification (SITC), Rev. 3, 1981; (iii) Harmonised Commodity Description and Coding System (HS), 1987; (iv) Provisional Central Product Classification (CPC), 1991; and (v) System of National Accounts (SNA), 1993. Out of all the systems, the Harmonised Commodity Description and Coding System, (Box 2.1) is the most widely used international product classification system that is appropriate for NWFPs accounting (Vantonine, 2001).

The Harmonised System is aligned with other existing major international and national product classification systems. It uses multi-digit coding, adequately flexible for incorporating the reporting on NWFP and therefore capable of being adjusted to the contexts within which different organisational units operate and to the specific situation of individual countries. The HS divides products into several sectors. According to this classification, activities related to NWFPs are spread over a number of different activity sectors. Because of this, any assessment of the contribution of forest products other than wood, using HS as a basis, requires a cross-sectoral approach. Improvements in the reporting on NWFP have to take place within an improved system for forestry as a whole. Treating NWFP statistics in isolation will be artificial since forest benefits, the wood and non-wood goods and services are inextricably linked. Forest influences and many intangible benefits (for example, watershed values) cannot be classified either with (or as part of) wood or non-wood products.

As a result of these different systems, statistical information on NWFPs is not properly or regularly reported, and they hardly feature in national accounts as a separate entity. Some of the products on which information is available often get reported under other sectors such as agriculture and horticulture, distorting the picture of the NWFP sector (Vantonine, 2001). For ease of discussion, this compendium will

classify NWFPs into seven major categories namely: (1) extractive products (gums, resins, oleoresins, latex, tannins, dyes, oils and fats, essential oils), (2) edible products and related materials, (3) medicinal and pharmaceutical plant products, (4) bee products (honey and wax), (5) other animal based products, (6) carvings and handicrafts, (7) biofuels, and (8) other miscellaneous forest products and services (e.g. soil improvement, watershed care, biodiversity conservation, amenity, ecotourism and cultural uses). This classification has been adopted and modified from the FAO (1992) classification system.

Box 2.1 Harmonized Commodity Description and Coding Systems

The *Harmonized Commodity Description and Coding System*, generally referred to as "Harmonized System" or simply "HS", is a multipurpose international product nomenclature developed by the Customs Cooperation Council of the World Customs Organization (WCO). It comprises about 5,000 commodity groups, each identified by a six-digit code, arranged in a legal and logical structure and is supported by well-defined rules to achieve uniform classification. The system is used by more than 177 countries as a basis for their Customs tariffs and for the collection of international trade statistics. Over 98% of the merchandise in international trade are classified in terms of the HS. The HS has 21 sections, divided into two-digit groups or chapters, 1,241 four-digit headings and 5,019 six-digit headings. All the headings relevant to NWFPs are covered in HS, and some are further subdivided at the sixth digit level. In addition, countries may add for their own national product classification, two to four more digits for further specification.

For example, in the HS classification Walnuts (*Juglans regia*) are well defined up to the species level under 08.02.2 with a further specification of "In shell" (0802.31) and "Shelled" (0802.32). Mushrooms and herbs are unfortunately not as well defined. Mushrooms (dried, whole, cut or sliced and fresh or chilled) are classified under a single item: "Mushrooms and truffles" (07.12.30). However, many countries such as Japan, have added in their own national classification, additional digits to further specify species of mushrooms of importance to them. Also for the term "herbs" (12.11) further specifications at the country level would be needed to clarify entities from either cultivated sources or from wild gathering, as the HS foresees only three groups: 1211.10: Liquorice roots; 1211.20: Ginseng roots; and 1211.90 "Others". However, several individual countries have added additional digits in their national accounts to further specify their production and trade statistics of medicinal plants.

Source: Vantonine, 2001.

More information on the HS at <http://www.foreign-trade.com/reference/hscod.htm>.

2.1.1 Extractive products

Extractive products include gums, resins, oleoresins, latex, tannins, dyes, oils, fats and essential oils. Plant gums are water soluble natural hydrocolloid compounds in form of exudates produced by plants as a protective mechanism (ooze from the tree or shrub as a result of injury) or seed gums isolated from the endosperm portion of some seeds. They are made up of polysaccharides and small quantities of protein and mineral salts. Exudate gums are the main forms produced in Africa with gum arabic and gum *karaya* being the two most important commodities (Chikamai and Tchatat, 2004). Gum arabic is a dried exudate obtained from the stems and branches of *Acacia senegal* or *Acacia karroo* (FAO, 1995a; 1998). Gum karaya is a gum exudate obtained from tapping of *Sterculia setigera*, a species found in the Sudano-Sahelian zone from Senegal to Sudan (Coppen, 1995). The gum tapped from the *Acacia senegal* tree has very important and diverse uses including use as a traditional food (FAO, 1989; Walters and Hamilton, 1993; Wang and Anderson, 1994; Soni, 1995).

Gums have diverse applications in pharmaceutical, cosmetic, food and textile industries. Though many synthetic products have replaced the uses of natural gums, their use continues for specific purposes. The bulk of world production of gums is used as an additive in a variety of food, pharmaceutical and cosmetic products (Timberlake *et al.*, 1999). Other uses of gum *arabic* are as adhesive in postage stamps, a sizing agent for fabrics and paper, and an ingredient of lithographic inks, paints and dye (Booth and Wickens, 1988). For example, gum arabic was found to be used by the majority of rural based communities in Tanzania (Makonda, 2003) for food, medicine and glue. The gum was also noted to be economically important to collectors, middlemen, final buyers and exporters and local and central governments. The move for green products will certainly give a boost to the production of natural gums. As a food additive, a wide range of toxicological evaluation is needed to satisfy the international regulatory committees concerned with the safety of food and with specifications of their identity and purity. Gums of the identity and quality permitted for use in foodstuffs command high prices, but there is a large supply of gums from many other botanical sources which subsequently only command low prices for use in non-food applications. It is important for exporters and merchants in gum-producing countries to monitor the decisions of the international regulatory committees as these greatly influence international gum trading. Generally, gum is produced in some 15 countries in Africa: Sudan, Chad, Nigeria, Senegal, Mauritania, Mali, Burkina Faso, Niger, Cameroun, Eritrea, Ethiopia, Kenya, Somalia, Tanzania and Uganda according to the Network for Natural Gums and Resins in Africa (www.ngara.org). Sudan, Chad and Nigeria supply about 90% of the world's gum requirements (FAO, 1983; 1995a; Fagg *et al.*, 1997; Timberlake *et al.*, 1999; FAO, 2001). The current world supply is about 70,000 MT though in 2005 the figure was about 92,000 MT.

Plant resins are solid or semi-solid materials, which are insoluble in water but soluble in certain organic solvents. The resins found in Africa can be classified into two categories: oleo-gum-resins and oleo-resins. The term oleo-gum-resin means that the product contains an essential oil component, a water soluble gum and alcohol soluble resin. Oleo-gum-resins are represented by myrrh and frankincense which, like gum *arabic* are ancient commodities that have remained important items of trade to the present day. Myrrh is an exudate produced from *Commiphora myrrha*, a species confined to the Horn of Africa in Ethiopia, Kenya, and Somalia. The three countries also are leading producers and exporters of myrrh and frankincense (Chikamai and Odera, 2002).

In Africa, oleo-resins of importance are pine resin obtained from some pine species upon tapping (Coppen, 1993), and used as a raw materials for turpentine and rosin. Oleo-resin or pine resin is being produced from four countries in Africa: South Africa, Kenya, Zimbabwe and Uganda. The principal producing species are *Pinus elliottii* in Zimbabwe and *Pinus elliottii* and *Pinus caribaea* in Kenya and South Africa. *Pinus radiata* is also tapped for pine resin in Kenya. In Uganda, *Pinus caribaea* is the main species. There are good prospects and potential for commercial production in Malawi from *Pinus elliottii* and *Pinus kesiya*, in Zambia from *Pinus merkusii* and *Pinus kesiya*, and Tanzania from *Pinus elliottii* and *Pinus caribaea* (Coppen, 1995).

Many forest trees possess fatty oil containing seeds which could be processed to give vegetable oils. Edible oils are used as cooking oils and in the food industry. Vegetable oils also are used in soap-making on both small and large scale. More recently, vegetable oils are increasingly being processed into components of other industrial products and biodiesel used in diesel engines.

Tannins are a group of non-crystallisable compounds widely distributed in plants, but usually localized in specific parts such as beans, nuts, fruits, barks, and stems. In addition to combining with animal skins to form a strong and flexible leather, tannins also react with salts of iron to form dark-blue or greenish-black compounds, the basis of common inks. Tanning materials are often utilised in oil drilling to reduce the viscosity of the drill without reducing the specific gravity and in the production of pharmaceuticals. The main industrial uses of tannins are leather, dyes, inks, antioxidants, lubricants, and drugs.

Colouring for food, textiles, paper and paints were originally obtained from plant and mineral resources. With the advent of synthetic dyes and pigments, the demand for natural dyes decreased so much making the use of natural dyes almost restricted to some food uses. Due to the toxic nature of synthetic dyes and pigments, particularly if used in quantities in excess of permissible limits, and the emerging demand for naturals, there is a resurgence of interest for natural dyes and pigments.

There is a wide range of essential oil sources from Africa (Chikamai and Tchatat, 2004). The major sources, on a commercial scale, are from *Eucalyptus* species.

Southern Africa is the major producing region, mostly from South Africa and Swaziland (Coppen, 1995). Most used species are *Eucalyptus smithii* and *Eucalyptus radiata* which produce medicinal oils because of the high content of *cineole*. The species *Eucalyptus globulus*, *Eucalyptus citriodora* and *Eucalyptus camaldulensis* are good sources of both medicinal and perfumery type oils that are commercialised in other parts of the world, but not optimally exploited in Africa. Like pines, the *Eucalyptus* species are grown for poles/posts, timber or pulp. The eucalyptus oil from the leaf biomass represents an added source of income.

Balsams are resinous mixtures containing large amounts of benzoic and cinnamic acids or esters of these acids. These are mainly pathogenic products obtained as exudates from trees. They are used in medicine and other consumer industries.

Natural waxes are used as components of industrial products like candles, varnishes, pharmaceuticals and cosmetics. Some of them are collected, melted and formed into cakes or pieces. Some waxes such as candellila can be obtained by solvent extraction. These too can be processed at rural level for income generation. Even with severe competition from synthetic waxes, some specific properties of natural waxes have kept them in demand. The processing and refining of the wax oils are simple but important in order to produce good quality grades.

2.1.2 Edible products and related materials

A great variety of edible products may be obtained from forest land. Forest food, where available and exploited, may offer the possibility of achieving a nearly perfect balance. Feeding people is not only a matter of having sufficient quantities of food at hand; diversity in diet is essential (Poulsen, 1982). Unfortunately, with time, forest foods availability appears to decline in many places owing to environmental destruction, or just because they are less used due to changes in eating habits.

Wild food plants play a very important role in the livelihoods of rural communities as an integral part of their subsistence in many developing countries. Locally available wild food plants serve as alternatives to staple food during periods of food deficit (Asfaw and Tadesse, 2001), are a valuable supplement for a nutritionally balanced diet (Somnasang and Moreno-Black, 2000), are also one of the primary alternative sources of income for many resource poor communities (Melnyk, 1996), and the source of species for domestication (High and Shackleton, 2000; Atangana *et al.*, 2002).

Wild fruits contain nutrients (carbohydrates, protein, and minerals) and essential vitamins which are important, especially for growing children, who are prone to malnutrition and related diseases (Chikamai and Tchatat, 2004). In areas of low and erratic rainfall conditions, fruits from trees and shrubs play an important role as emergency food. Under conditions of extreme aridity, people have access to the fruits of such hardy species as *Boscia senegalensis* and *Ziziphus* sp. The *Borassus* palm (*Borassus aethiopicum*) of the semi-arid regions for example, can be used in three

different ways: (1) the "milk" of unripe fruit is marketed as a nourishing and very popular beverage; (2) the ripe, yellow fruit is occasionally consumed as a kind of mango substitute and, (3) some fruits are left to sprout cotyledons which are eaten boiled or fried.

Chikamai and Tchatat (2004) mentioned some indigenous fruits with commercial potential in Africa including, *Tamarindus indica* (tamarind), *Ziziphus mauritiana* (ber), *Adansonia digitata* (baobab), *Vitellaria paradoxa* (karite), *Parkia biglobosa* (nere), *Sclerocarya birrea* (marula), *Uapaca kirkiana* (uapaca) and *Thespesia garckeana* (azanzia) for savannah and dryland zones and *Irvingia* spp. (andock), *Baillonella toxisperma* (Moabi), *Ricinodendron heudelotii* (Njansan), *Coula edulis* (Ewome), *Monodora myristica* (Nding), *Garcinia kola* and some *Xylopi*a species for forest zones.

Edible nuts from the wild are often used by mankind for food, edible oils, spices, condiments or beverages. They have been an important food source from prehistoric times and are among the most nutritionally concentrated human foods, high in protein, oil, energy, minerals and vitamins (FAO, 1995b). Important ones include *Monodora myristica*, *Tetrapleura tetraptera*, *Afrostryax lepidophyllus*, *Xylopi*a *aethiopica*, *Xylopi*a *longipetala*, *Aframomum citratum*, *Aframomum melegueta*, *Piper guineense*. Others, like *Garcinia kola*, *Coula edulis*, *Cola nitida*, *Dacryodes edulis*, *Dacryodes macrophylla*, *Anonidium mannii* and *Tricoscypha* spp., are directly consumed as snacks. The uniqueness of all these species is that they do not need particular transformation (except *Coula edulis* fruit).

Many trees, shrubs, and herbs are good sources of vegetables. About 70% of species used as vegetable are gathered from the wild according to an inventory study in Benin (Achigan-Dako *et al.*, 2010). Leaves of *Adansonia digitata* or *Vitex doniana*, petals of *Bombax costatum*, seeds of *Irvingia gabonensis* or *Sclerocarya birrea* are delicacies in many communities in Africa. Other vegetable species such as *Gnetum africanum* and *Gnetum buchholzianum* are part of regional and international exports from Nigeria, Cameroon, Gabon and Central Republic of Africa (Maundu *et al.*, 2009).

Some fruits are used for the extraction of oil products. For example, the oil palm, *Elaeis guineensis* is the largest source of oleaginous products. The shea butter tree, *Vitellaria paradoxa* (Fig. 2.1), of the Sudan-Guinea zone probably occupies the position of the second most important oil tree on the continent. Another forest species which seems to offer an equal or even greater potential for oil production is the *Raphia* palm, whose oil has only been commercialized on a very small scale. The *Raphia* palm occupies large areas of swampy land in high rainfall areas. In addition to being a potential source of oil of good quality, it produces a valuable fibre. Many other trees are, or may be, utilised for the production of oleaginous products, *e.g.* the baobab tree, *Adansonia digitata*, used for oil extraction in Madagascar; the tallow

tree, *Pentadesma butyracea*, of rain forest regions; and the ubiquitous (although exotic) neem tree, *Azadirachta indica*, of the arid zones.



Figure 2.1 Natural stand and fruits (upper right) of *Vitellaria paradoxa* in northern Ghana. (Courtesy: E. Achigan-Dako)

Some palm trees in Africa produce a sweet sap called “palm wine”, which is very appreciated by people. However, some, particularly adults, do not appreciate sweet palm wine, and therefore bark of some other species such as *Khaya senegalensis*, *Garcinia lucida*, *Garcinia kola*, and other trees are added to give the wine a bitter taste. The most popular species producing palm wine are *Raphia* sp. and *Elaeis guineensis* (Chikamai and Tchatat, 2004).

Forest fungi are extensively used as food in Africa due to their nutritional importance locally. However, productivity is very low almost everywhere. Mushrooms are highly valued in many societies, and sometimes considered as “meat”. Although they contain protein, carbohydrates, fats, salts, fibres and are rich in Vitamin B, they are usually considered as gourmet foods rather than subsistence foods. For instance, according to FAO (1997), the per capita consumption of mushrooms during the rainy season in Zimbabwe can be as high as 1.8 kg. Mushrooms, commonly valued as a

meat substitute, supply surprisingly large amount of protein (up to 45% of dry weight in some cases) and essential minerals. Also more than 20 tonnes of mushrooms are gathered and consumed by the 700,000 residents of the upper Shaba area of Democratic Republic of Congo every year.

Feed from forest vegetation may also benefit wildlife and livestock, which in turn may yield products satisfying human needs such as meat, milk, hides, eggs (Poulsen, 1982). In areas with a prolonged dry season, tree fodder is of immense importance to livestock and many species of wildlife. It provides the animals with food rich in proteins, vitamins, minerals - and also energy - at a time of the year when the desiccated ground-cover containing little other than pure carbohydrate cannot sustain health and vigour.

Plant based sweeteners, other than industrially produced sugar, can be good substitutes in rural areas as people do not always have access to refined sugar. Some of the resources for getting the sweeteners are the sap of palm flowers, parts of plants such as leaves of stevia (*Stevia rebaudiana*), arils of *Thaumatococcus daniellii* and bark sap of the maple tree (*Acer pseudoplatanus*). The final products are syrups, powders and solids. In addition honey obtained as a NWFP is used as a sweetening agent.

2.1.3 Medicinal and pharmaceutical plant products

There are multiple benefits of medicinal plants in developing countries. Benefits include: a) improved access to primary healthcare; 2) enhanced livelihood security; 3) potentially sustainable use of the biodiversity; and 4) improved benefit sharing with local communities. In the broader sense, medicinal plants can also address the chronic problem of global poverty and hunger.

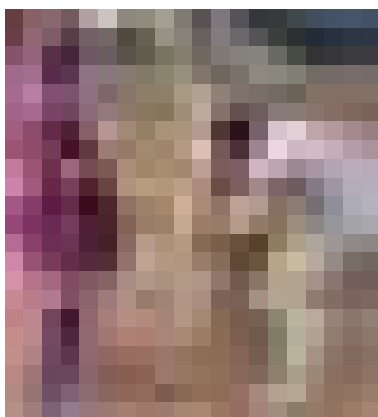


Figure 2.2 Collection of bark of *Khaya senegalensis* along a roadside in northern Mali.

(Courtesy: E. Achigan-Dako)

Medicinal plants can help meet the basic needs of the poor rural people (Fig. 2.2). Forest medicines form the base of the African traditional medicine in terms of socio-economic and socio-cultural heritage, servicing the majority of the population in Africa, coming a long way from the times of their ancestors. Traditional medicine is the first-choice healthcare treatment for more than 80% of Africans, who suffer from simple and other common ailments. The World Health Organization (WHO) has estimated that up to 80% of people in the developing world are dependent upon traditional medicines primarily because of their easy accessibility, wide affordability and cultural familiarity. In fact, considering that up to 40% of the world's poor have no access to government health services, traditional and folk medicine is the only medicine

available to them, even in semi processed form (Fig. 2.3). In the Dja biosphere reserve in Cameroon for example, the use of plant medicines plays an important role in daily healthcare. Local medicines are sometimes preferred to modern medicines. They are of course less expensive, but they are often regarded as being more “effective”. According to the Baka pygmies women the *motoko-toko* (*Picralima nitida*) is at least twice as strong as chloroquine against malaria, and *ma’a polo* (*Chenopodium ambrosioides*) has a similarly stronger potency than “vermox” against intestinal worms. In some households, “modern” health care is often applied in combination with traditional treatments (Betti, 2004).



Figure 2.3 Semi processed products of medicinal plants in a traditional healing centre in Senegal. (Courtesy E. Achigan-Dako).

Worldwide, it is estimated that there are an estimated 21,000 medicinal plants. They are more concentrated in the global biodiversity ‘hot-spots’ such as the Amazon rainforest of South America, the eastern Himalayas and Western Ghats in South Asia, and the Eastern Arc Mountains and Coastal Forests of Eastern Africa. Medicinal herbs, shrubs and trees are widely used both in the developed and developing world for preparing traditional remedies that find both domestic and commercial usage. In tropical Africa, for example, about 4,000 plant species are primarily used for medicinal purposes (PROTA, 2010), and 50,000 tons of medicinal plants are consumed annually. International trade in medicinal plants is limited to selected plant species required to produce medicines. For instance, in East Africa two important species, *Prunus africana* and *Warburgia salutaris* are sold from Kenya, Tanzania and Uganda to the World market. In West Africa, seeds of *Voacanga africana* are exported from Cote d’Ivoire, Ghana, Cameroon and DR Congo to pharmaceutical companies in France and Germany (Mayori, 2008).

The trends in drug discovery have relied on indigenous medicine for many years. Plants have formed the basis of sophisticated traditional medicine systems for thousands of years and were originally instrumental to early pharmaceutical drug discovery and industry. Therefore, the history of drug discovery and even drug chemistry is inevitably bound to the plant kingdom and the process of deriving drugs from plant sources is certainly not new (Parfitt, 1978). There are many potential drug plant candidates in Africa as indicated in Table 2.1.

Table 2.1 Promising drug plants candidates from African forests.

Plant species	Parts used	Indications	Constituents
<i>Aloe schweinfurthii</i>	Leaf	Skin infections/burns	Anthraquinones/Enzymes
<i>Azadirachta indica</i>	Leaf/bark	Fever/Malaria	Gedunin
<i>Bridelia ferruginea</i>	Bark	Diabetes	-
<i>Cajanus cajan</i>	Seed	Sickle cell anaemia	Phenylalamine
<i>Cryptolepis sanguinolenta</i>	Root	Hypertension	Cryptolepine
<i>Datura metel</i>	Aerial part	Ulcer and dysmenorrhoea	Hyocyamine
<i>Euphorbia hirta</i>	Aerial part	Asthma/dysentery	-
<i>Momordica charantia</i>	Leaf/fruit	Diabetes	Charantin
<i>Phytolacca dodecandra</i>	Leaf	Schistosomiasis	Triterpenoid saponins
<i>Senna alata</i>	Leaf/pod	Constipation/Eczema	Anthraquinones
<i>Cassia podocarpa</i>	Leaf/pod	Constipation	Anthraquinones
<i>Tetrapleura tetraptera</i>	Fruit	Schistosomiasis	Aridanin
<i>Zanthoxylum zanthoxyloides</i>	Root	Sickle cell anaemia	Phenolic acids

Source: Elujoba et al., 2005.

Some medicinal plants are already on the world market and include for instance *Ancistrocladus abbreviatus* from Cameroon and Ghana, *Rauvolfia vomitoria* from Nigeria, DR Congo, Rwanda, and Mozambique, *Senna alexandrina* from Sudan (Table 2.2).

The therapeutic function of medicinal plants is derived from a mixture of compounds ranging from primary to secondary metabolites. Secondary metabolites with potentials in drug developments include phenols, polyphenols (*i.e.* tannins and flavonoids), glycosides, terpenes, triterpenoids and saponins, essential oils and resins, fixed oils and alkaloids as well as alkaloids (Pengelly, 2004). Undoubtedly, the effectiveness of locally used medicines varies greatly. Nevertheless, trial and error and long experience have gradually resulted in the identification of suitable drugs for the treatment of a number of ailments. In fact, natural products and their derivatives represent more than 50% of all drugs in clinical use in the world (van Wyk and Wink, 2004). Higher plants contribute no less than 25% to the total. Well-known examples of plant derived medicines include quinine, morphine, codeine, colchicine, atropine, reserpine and digoxin. Recently, new anticancer drugs such as taxol and vincristine have been developed from plants. However, there are still challenges to the promotion of medicinal plants in terms of justifying their safety and efficacy as

improvers of overall health in developing countries. This is due to inadequate investigation of their chemical composition and pharmacological properties (Schmelzer *et al.*, 2010).

Table 2.2 A few African medicinal plants in the world markets.

Plant species	Major indications	Sources
<i>Albizia adianthifolia</i>	Gum	South Africa
<i>Ancistrocladus abbreviatus</i>	Anti-HIV	Cameroon and Ghana
<i>Corynanthe pachyceras</i>	Male stimulant	Ghana
<i>Physostigma venenosum</i>	Ophthalmia	Nigeria, Ghana
<i>Prunus africana</i>	Prostrate gland hypertrophy	Cameroon, Kenya, Madagascar
<i>Rauvolfia vomitoria</i>	Psychiatry/Hypertension	Nigeria, DR Congo, Rwanda, Mozambique
<i>Senna alexandrina</i>	Antimicrobial, Laxative	
<i>Strophanthus gratus</i>	Cardiotonic	West African countries
<i>Voacanga africana</i>	Antimicrobial	Cote d'Ivoire, Ghana, Cameroon, Nigeria

Source : Sofowora, 1993 ; Schmelzer *et al.*, 2010.

The extent of use of traditional medicine based on plants has prompted the development of terminologies not always well understood by users. For a shared understanding of concepts and definition, the commonly used terminologies in the context of medicinal plants and their by-products are presented in Box 2.2.

Box 2.2. Commonly used terminologies in the context of medicinal plants and their by-products

Alternative medicine: alternative medicines form a link between folk medicine and modern western medicine. The concept of alternative medicine dates back to well before the advent of modern medicine. Although alternative medicines were largely repressed with the advent and rapid and enormous progress of scientifically based modern western medicine, there has been a global resurgence of these alternative medicinal systems including homeopathy, Ayurveda, and traditional Chinese medicine.

Aromatherapy oils: these are essential oils used for therapeutic rather than solely fragrance purposes. Aromatherapy can be used in a variety of ways: massage, bath, shower, inhalation, burner, perfume, lotion, etc.

Ayurvedic drugs: Ayurveda is a South Asian, holistic therapeutic concept, based not only on medical therapy, but including all aspects of the life cycle. Medicinal plants are hardly ever used for their specific curative agents—in most cases; a number of different drugs with varying effects are administered.

Cold infusion: plant part is steeped in cold water, often over-night, and then the mixture is strained. Sometimes the plant part is crushed before or during the addition of water.

Cosmeceuticals: these topical cosmetic-pharmaceutical hybrids are intended to enhance the health and beauty of the skin.

Decoction: plant part boiled in water. Decoctions are often used for the woody parts (roots, barks) of medicinal plants.

Dietary supplements: these refer to a range of food supplements of both plant as well as animal origin embracing most non-licensed herbal remedies. Health claims are not generally allowed for such products.

Functional foods: this term can broadly be interpreted to imply any food or beverage which makes some claim to enhance one's physical or mental health and well being, and to achieve demonstrable benefits beyond adequate nutritional effects to one or more target functions in the body. Functional foods are distinguished from dietary supplements in that they are not taken in pill or capsule form but compose part of the normal diet.

Herb: herb refers to any aromatic plant of which the flowers, leaves, stems, seeds and sometimes roots are used for culinary or medicinal purposes.

Herbal remedies: herbal remedies cover a broad spectrum from basic formulae applied by traditional healers to sophisticated formulations sold alongside other over-the-counter (OTC) medicines in western pharmacies as capsules, pills or liquid tonics; they are also classified as medicines in most European countries.

Herbal Teas and Infusions: herbal teas and infusions are imbibed as hot water infusions and sold in the form of tea bags or in granulated form. Many herbal teas are sold as single item products even though combination products are becoming increasingly popular. Since herbal teas do not make therapeutic claims they are not considered medicines and are not subject to prior market approval.

Homeopathic Drugs: they are medicines derived from plant, mineral and animal sources and used in extremely dilute amounts, generally in globule form.

Medicinal and Aromatic Plants (MADPs): the dividing line between a medicinal and an aromatic plant is very blurred, and many plants are used in both, pharmaceutical as well as fragrance industries. All aromatic plants are medicinal but not all medicinal plants are aromatic.

Modern western medicine: modern western medicine seeks to fight, mitigate, or eliminate symptoms of diseases through a calculated allopathic application of agents or combinations of different substances. Unlike traditional medicine, modern western medicine does not adopt a holistic approach; rather, healing effects are achieved by applying agents opposite to the diseases they are intended to cure.

Nutraceuticals: these refer to a wide range of products using both plant and animal based medicinal extracts. Since most regulators prohibit use of the terms medicines, drugs or pharmaceuticals in the context of unlicensed herbal remedies and dietary supplements, the term nutraceutical is a cross between nutrition and pharmaceutical.

Pharmacognosy: the science that deals with the identification of medicinal plants and drugs

Phytomedicines: these are plant-based pharmaceutical products with proven medical efficacy. They are prescription drug products with formal market authorization involving

detailed toxicological and clinical trials.

Popular or folk medicine: this refers to non-institutionalized, individual, family or tribal use of medicinal plants passed down from generation to generation.

Secondary metabolites: these are active chemical compounds in medicinal plants and phytomedicines.

Syrup: plant part is boiled in water with sugar until a desired consistency is obtained.

Sources: (Phillips, 1987; Nagpal and Karki, 2004; and van Wyk and Wink, 2004). For detailed definitions on modes of preparation and administration of recipes of medicinal plants, see Adjanohoun *et al.* (1989; 1994).

2.1.4 Bee Products

Honey is the most important product of beekeeping industry (Hamza, 1997), with several derived products such as wax, pollen, royal jelly and propolis. Usually bee products are renewable resources, and with appropriate techniques they can be exploited without detrimental effect to the environment. Honey is a natural nutritious food and medicine for the rural and urban people. Honey and beeswax are commodities which support rural livelihood as alternative income from forests and woodlands, and can contribute to sustainable forest management if properly integrated.

Honey and beeswax are two NWFPs with a strong relationship with plants. Honeybees derive the nectar and pollen they need from a wide range of vegetation types. Forests, woodlands and bushlands are major sources of nectar and pollen, which have made traditional beekeepers acquire a profound knowledge of trees and other plants that bees depend on (Chikamai and Tchatat, 2004). Forest types dominated by trees of the legume family have a very great potential for honey production. Plant species highly preferred by bees for nectar gathering include *Azelaia quanzensis*, *Albizia gummifera*, *Commiphora* sp., *Ficus sycomorus*, *Grewia* spp., *Parinari excelsa*, *Rauvolfia caffra* and *Syzygium guineense* (Hamza, 1997).

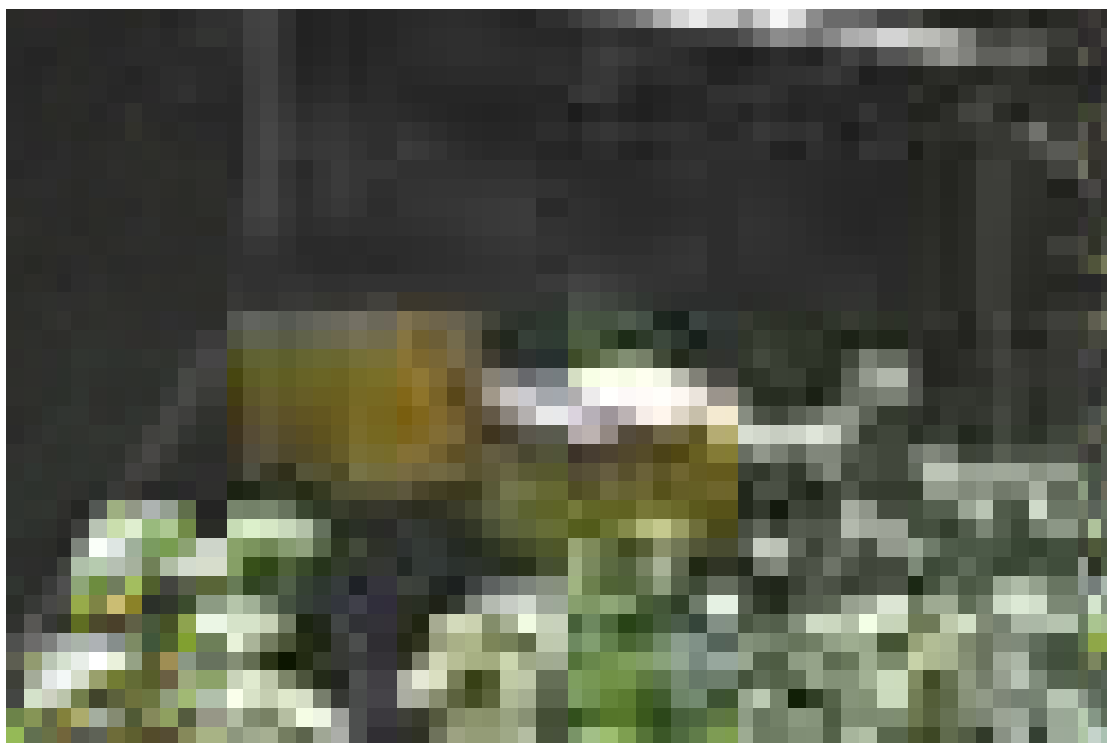


Figure 2.4 Honey production in the forest of the Stahere Girls School in Kenya. (Courtesy: E. Achigan-Dako).

Bees are also responsible for the pollination of many flowering plants and are therefore important in sustaining biodiversity (Hertz, 2002). The economic importance of pollination to agriculture and forestry cannot be over-emphasised.

2.1.5 Other animal based products

Animals include birds, insects, snails and fish, all of which are consumed as food in most African households. For communities residing in the vicinity of forests and woodland, wild animals play a significant role in local diets in terms of protein supplements. For example, animals and their products attract attention of a variety of people ranging from hunters to tourists and zoologists (Makonda, 1997).

Bush meat is not only a source of animal protein but also iron, vitamin A and B. Wild animal consumption varies greatly from one region to another in Africa. Small animals (*e.g.* buck, genets, field mice, rock rabbit, porcupines, bush pigs and hares) are the most important bush meat due to their natural abundance and unrestricted hunting. In regions which are unsuitable for conventional animal husbandry, bush meat is often of immense importance. According to Lo'pez and Shanley (2004), in Central Africa alone, bush meat harvest is believed to amount more than two million tonnes annually. Over large areas of the African continent, particularly in the humid

regions, people get most of their animal protein requirements from this source. Unfortunately, supplies are rapidly dwindling in most places, partly as a result of destruction of the natural environment, and partly because of excessive exploitation (Poulsen, 1982).

A number of different birds and their eggs are also hunted and eaten in most parts of African communities. These include the guinea fowl (*Numida meleagris*), ostrich (*Struthio camelus*), francolin (*Francolinus sephaena*), geese and ducks (Hamza, 1997).

Insects form the largest known division of animals, with about a million species estimated to date. Insects are commonly consumed by most human beings as they contain considerable nutrients including important amino-acids, some vitamins, and minerals. The consumption of caterpillars, for instance, is likened to vitamin pills while, bees larvae are good source of vitamin D (ten times more than in fish liver oil) and vitamin A (two times more than in egg yolk). Furthermore, some species of grasshopper contain up to 77% protein, with the protein content of many other insect species varying between 35 and 60% (Hamza, 1997). In Africa, particularly Tanzania, the commonly consumed insects, mostly trapped during swarming season, include ants, beetles, termites (*Macrotermes bellicosus* and *Macroterme natalensis*), grasshoppers (of the genus *Melanoplus*) and locusts. In Cameroon, Lo'pez and Shanley (2004) reported that larvae consumed at household level are mainly extracted from the trunk of *Raphia* palms from swampy lowlands.

Snails, especially the giant African land snail *Achatina achatina*, also provide a significant portion of people's animal protein supply. Beside protein, the snail shell is a good source of calcium for animal feed and crop fertilisation (Hamza, 1997).

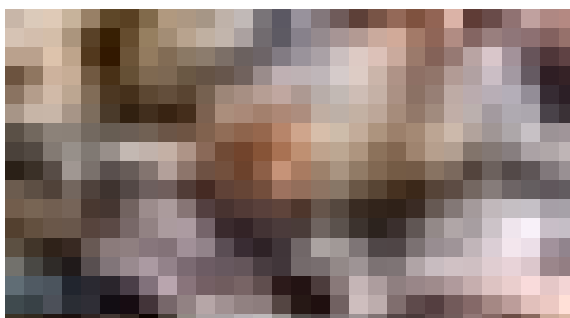


Figure 2.5 Harvested snails from the evergreen forest of Ghana and sold along roadside between Accra and Kumasi. (Courtesy: E. Achigan-Dako).

Forests provide and maintain stream habitats for many fresh water fish species. Fresh water fish species supply more than 20% of the per capita animal protein intake in most African countries. Mangrove forests also provide essential habitat for coastal fisheries notably shrimp, crabs, milkfish, shad, sea perch, mullets and catfish (Hamza, 1997).

2.1.6 Carvings and handicrafts

Although these are wood products, they have been deliberately included in this compendium. Woodcarving provides one of the most important uses of wood in most

African countries both in terms of economic returns and generation of self-employment opportunities. According to Choge (2004), wood carving is increasingly posing a major conservation problem through depletion of highly favoured tree species from their existing natural habitats. Only a narrow range of species meet the desirable carving qualities. These include hardwoods such as *Brachylaena huillensis* (*muhugu*), *Dalbergia melanoxylon* (ebony/*mpingo*), *Olea europaea* L. var. *africana* (olive/*mutamaiyu*), *Spirostachys africana* (*mutanga*) and *Combretum schumannii* (*mkongolo*).

The overexploitation of these species is further complicated by their slow growth rates and limited recruitment potential under natural conditions (Choge, 2002). The widespread depletion of traditional carving woods has led to increased utilisation of alternative species such as *Azadirachta indica* (neem), *Jacaranda mimosifolia*, *Mangifera indica* (mango), *Terminalia brownii* (Fresen), and *Grevillea robusta* (*mukima*) among others.

In Kenya for instance, Choge (2004) reported the use of *Azadirachta indica* for woodcarving as a fairly recent phenomenon. The wood was discovered accidentally as other favourable species were becoming more difficult to obtain. Commercial carving using indigenous species, like *Pterocarpus angolensis*, harvested from communal lands has been reported by Shackleton and Shackleton (2004) to be a household activity in the Bushbuckridge district of South Africa for several decades. Carvers in this district produce utility items such as bowls, spoons and walking sticks that are marketed through curio outlets and informal markets.

In countries like Uganda, wood carving industry produces mainly musical instruments such as drums, harps, tube-fiddles and xylophones. These are exported and sold to tourists as well as sold locally to schools, churches and musical groups, which keep Uganda's vibrant music tradition alive (Omeja *et al.*, 2004).

2.1.7 Biofuels

Biofuels are fuels derived from biomass or by-products. They can be either first generation biofuels (bioethanol from sugar based crops or starch and biodiesel from seeds, used cooking oil and animal tallow) or second generation biofuels (synthetic biofuels via the gasification route and the production of synthesis gas followed by catalytic conversion), bioethanol from lignocellulosics or hydrogenated oils and fats. Biofuels are considered as replacements or extenders for mineral or fossil fuels such as diesel or petrol. They can be sub-divided into a number of categories, the principal three being (i) hydrogen and developments in technology (*e.g.* thermal gasification) (ii) vegetable oils or animal fats which can be used in unprocessed form or converted to biodiesel; and (iii) bio-ethanol produced from the fermentation of organic materials such as sugar beet and cereals.

Vegetable oils include oil from purpose grown oil seed crops (*e.g.* rapeseed). They also include waste vegetable oil (or recovered vegetable oil) such as waste cooking

oil from the catering industry. Animal fats include tallow produced by the rendering industry. Other biofuels include:

- biogas (principally composed of methane), which is collected at landfill sites or from anaerobic digestion systems, could be used in vehicles in compressed form;
- bio-methanol and dimethylether (DME), which are produced from biomass derived methane, offer limited attraction compared to alternatives; and
- bio-oil produced from the pyrolysis of biomass materials continue to be the subject of extensive research, although commercial uptake is limited as yet.

Vegetable oil and bio-ethanol technologies are now well developed and have reached commercial acceptance in many countries. In Brazil for instance, bioethanol from sugarcane is favourably competing with gasoline used in the transport sector. The use of vegetable oil or its derivative, biodiesel, as a transport fuel is established in Germany and Austria where production in 2001 was 350,000 tonnes and 31,400 tonnes respectively. Bio-ethanol is also used as an oxygenate in petrol in the USA, where production levels have reached 1.4 billion gallons, or approximately 1.1% of US gasoline consumption. A derivative of bio-ethanol, ethyl tertiary butyl ether (ETBE), is similarly used in France, where 219,000 tonnes were produced in 2001.

Biofuel production in the European Union (EU) countries has been based almost entirely on crops grown on set-aside land. Since the introduction of the scheme in the early 1990s, the production of non-food crops on set-aside land has been permitted subject to conditions. This use has increased steadily each year. By 1999, out of 5 million ha of set-aside land in the EU countries, about 1.2 million hectares were devoted to biofuel crops.

Use of biofuels is argued to result in reductions of greenhouse gas emissions, given that they are considered to be carbon neutral (carbon emitted on combustion is taken up in new plant growth, resulting in no net addition to the atmosphere). It is recognised, however, that there are greenhouse gas emissions associated with the production of these fuels, resulting from the use of fossil based energy in their production. This needs to be taken into account by analysing emissions on a life cycle basis. These fuels have no sulphur, which improves exhaust emissions, and they are biodegradable, which reduces pollution risks from spillages. They are therefore deemed to be premium fuels whose use could be directed to applications that promote human health and the environment.

Currently, biofuels are produced from vegetable oils (biodiesel) and starch (ethanol). There are however other techniques for making biofuels from low cost non-oil and non-starch biomass such as crop residues, by-products, and processing wastes by converting biomass to biopolyols, processes to lower the molecular weight of the biopolyols, and a distillation fractionation process to recover the biofuels.

Throughout the tropics and warm subtropics *Jatropha curcas* is increasingly planted for biofuel purposes. The oil is either used directly in adapted engines powering local grain mills, oil presses, water pumps and small generators, or first refined by transesterification with methanol or ethanol to produce regular fuel suitable for high-performance diesel engines. In recent years, *Jatropha curcas* has become the focus of large planting programmes in several tropical countries on account of its potential as a biofuel crop with low agro-ecological demands. Most of these are still in the pilot stage of development, together probably not exceeding 100,000 ha. Countries in tropical Africa with major development projects for jatropha biofuel production include Mali, Burkina Faso, Ghana, Tanzania, Malawi, Zambia and Madagascar (Henning, 2007).

2.1.8 Fibres

Fibres obtained from forest vegetation are of great importance to African communities. They are used for making papers, cloths, baskets, mats, cordage, furniture and in house construction. Tropical Africa is home to about 500 species primarily used for fibres (PROTA, 2010). The group is very diverse, including species producing the well known fibres of international trade such as cotton (*Gossypium* spp.), jute (*Corchorus* spp.) and sisal (*Agave sisalana*), but also many lesser-known fibre plants found in forest ecosystems (Achigan-Dako and Brink, 2009). Some quality fibres find markets overseas for the manufacture of brushes and wickerwork. High-quality fibres are mainly obtained from palms, and are used for making mats. On the other hand, for wickerwork the best material is peeled from the outer bark of various climbing palms (e.g. *Calamus* sp.). The fronds of the *Raphia* palm are also widely used for the manufacture of cord and rope. One famous source of rope is the baobab tree whose bark, surprisingly, can be removed again and again without any apparent adverse effect on the vigour of the tree. Some varieties of grass are also used for making cord. Rope is not only utilised for holding beasts of burden and tying goods during transport; very large amounts are used in house construction and, regionally, for tying bed tops (Poulsen, 1982). Cordage like rope, twine, binder twine or fish lines are obtained from species such as *Triumfetta* species, *Manniophyton fulvum*, *Piliostigma reticulatum* or *Piliostigma thonningii*. Usually those plants are used without much processing. *Luffa cylindrica* and *Momordica angustisepala* furnish brushes and sponges. Filling material for stuffing is also obtained from fibre plants. One valuable species of stuffing materials is kapok (*Ceiba pentandra*). Kapok fibre, obtained from the floss of the inner fruit wall, is used for stuffing cushions, pillows and mattresses, and for insulation. Thatching materials are obtained from species such as *Trachyphrynium braunianum*.



Figure 2.6 Various fibre products on sale along Limuru Road (Nairobi, Kenya). Courtesy: E. Achigan-Dako.

2.2 Identification and characterisation of marketable forest ecosystem services

A forest ecosystem is defined as a dynamic complex of plant, animal and microorganism communities and the non-living environment acting as a functional unit within the forest environment. Environment or ecosystem services on the other hand denote the benefits people obtain from the forest ecosystems. Three categories of services are obtainable from forest ecosystems: production services, regulation services, and cultural services. Definition and examples for each category is provided in (Table 2.3).

Table 2.3 Categories of ecosystem services

Category	Definition	Example
Production services	Production services reflect goods and services produced in the ecosystem.	Food, fodder, fuel (wood and dung), timber, fibres, other raw materials, biochemical and medicinal resources, genetic resources, ornamentals.
Regulation services	Regulation services result from the capacity of ecosystems to regulate climate, hydrological and bio-chemical cycles, earth surface processes, and a variety of biological processes.	Carbon sequestration; climate regulation through regulation of albedo, temperature and rainfall patterns; regulation of the timing and volume of river and ground water flows; protection against floods by coastal or riparian systems; regulation of erosion and sedimentation; regulation of species reproduction (nursery function); breakdown of excess nutrients and pollution; pollination; regulation of pests and pathogens; protection against storms; protection against noise and dust; and biological nitrogen fixation.
Cultural services	Cultural services relate to the benefits people obtain from ecosystems through recreation, cognitive development, relaxation, and spiritual reflection.	Nature and biodiversity (provision of a habitat for wild plant and animal species); provision of cultural, historical and religious heritage (e.g., a historical landscape or a sacred forests); provision of scientific and educational information; provision of opportunities for recreation and tourism; provision of attractive landscape features enhancing housing and living conditions (amenity service); provision of other information (e.g., cultural or artistic inspiration).

Source: Hein et al. (2006)

2.2.1 Ecotourism

Ecotourism, also known as ecological tourism, is a form of tourism which appeals to the ecological and social conscious. It mainly focuses on local culture, wilderness adventures, volunteering, personal growth, and learning new ways to live on the planet, typically involving travel to destinations where flora, fauna, and cultural heritage are the primary attractions. Ecotourism is often viewed as effective for promoting the conservation of endangered species and habitats in developing countries. By creating economic incentives for impoverished villagers or their communities, ecotourism is thought to encourage local "guardship" of biological resources. Ecotourism has several assets such as flora and fauna, specially protected natural areas, beautiful landscapes and villages with traditional architecture.

Ecotourism is one of the sectors with fastest economic growth rates in the world and

one that has generally low negative impact on the environment in comparison with other productive sectors (Chikamai and Tchatat, 2004). It is a form of non-consumptive use of the forest, and therefore a well suited element for conservation of the forest and its biodiversity. In well designed ecotourism undertakings, local residents can receive substantial economic benefits, while enhancing incentives for nature conservation (Wunder, 1999).

The concept of ecotourism however, is widely misunderstood, and in practice is often used as a marketing tool to promote tourism that is related to nature. For many countries particularly in Africa, ecotourism is not simply a marginal activity to finance protection of the environment but as a major industry of the national economy. In places such as Kenya and Madagascar, ecotourism represents a significant portion of the gross domestic product and economic activity (Eadington and Smith, 1992; Isaacs, 2000). In addition to environmental and cultural factors, an integral part of ecotourism is in the promotion of recycling, energy efficiency, water conservation, and creation of economic opportunities for the local communities (Randall, 1987). Ideally, ecotourism is supposed to satisfy several criteria (Wight, 1993; Touhino and Hynonen, 2001) such as: 1) conservation of biological and cultural diversities through ecosystem protection, 2) promotion of sustainable use of biodiversity by providing jobs to local communities, 3) sharing of socio-economic benefits with local communities and indigenous people by having their informed consent and participation in the management of ecotourism enterprises, 4) increase of environmental and cultural knowledge, 5) minimisation of tourism's own environmental impact, 6) affordability.

Ecotourism has the potential to alleviate poverty in many African countries through bringing money into the economy and creating jobs if proper management and planning, both at local and regional levels, are put in place. The difference between ecotourism and sustainable tourism is that, in ecotourism the cultural heritages of the specific area are respected and conserved (Guitierrez, 2006). Many examples of forests being important sites for ecotourism have been noted by Chikamai and Tchatat (2004), including the internationally acclaimed CAMPFIRE project in Zimbabwe, the *Kipepeo* project in Kenya, Gorilla watching in Bwindi forest in Uganda, Rwanda and the Democratic Republic of Congo, and the USAID/Ghana tourism led economic growth promotion programme in Ghana. Ecotourism has been also a greater attraction at Amani Forest Nature Reserve in the East Usambara Mountains of Tanzania, where emphasis is on walking and hiking.

2.2.2 Water regulation

Globally, there is growing awareness of the many services forests provide, such as watershed protection, and also of the costs to society when these services are degraded or lost. These costs may come from the local effects of degradation, such as

floods and landslides. Of the many services that forests provide, hydrological services, such as water quality and water flow, are among the most valuable.

Water plays at least three critical but distinct roles in the ecological-economic process (Lant, 2004). First, water is a raw material, a factor of production of a number of marketable commodities, some of which are themselves factors of production for other final goods such as electricity, transportation, crops, livestock, industrial goods of various kinds and residential and commercial landscapes. Second, because of its contribution to human health, treated potable water for domestic use is enormously valuable in producing human capital, whether it is delivered as a commodity by a private-sector firm, as a public service by a government-owned utility, or by some other institutional arrangement. Third, water in oceans, estuaries, rivers, lakes, wetlands, soil, and other components of the hydrologic cycle is a, if not the, critical factor of production of ecosystem services. In fact, one could argue that without water no ecosystem services could be generated. Wetlands are the most illustrative examples of water-defined environments that produce multiple ecosystem services such as flood control, water purification, wildlife habitat, carbon sequestration, nitrogen cycle regulation, and sediment control (Mitsch and Gosselink, 1993).

There is a close biophysical relationship between forests, water and people, though these relationships vary highly from one place to another due to climate, soils and vegetation types. Basically, forest ecosystems provide people with four types of water-related benefits, namely water quality, flow regulation, water supply and aquatic productivity. For example, forests can slow the rate of runoff in a watershed through vegetation by taking up water and delaying the time to soil saturation, after which water pools into the nearest watercourse. This is due to the fact that forest soils usually have a higher water storage capacity than non-forest soils (Falkenmark *et al.*, 1999). Furthermore, the more complex structure of the forest ground surface and underlying soil allows more efficient soil infiltration compared to a deforested watershed. Thus, by slowing the rate of runoff, forests can help to minimize flooding in smaller watersheds and increase minimum stream flows during the dry season.

Forests reduce soil erosion and sedimentation of waterways through interception of rain and snowfall by forest canopies, reducing water falls on the ground compared to a deforested watershed. Understorey forest vegetation and leaf litter protect the soil from the impact of rain that does fall through the canopy. Extensive root systems help hold soil more firmly in place and resist landslides compared to clear-cut or heavily disturbed watersheds. Nevertheless, sedimentation levels in waterways of forested watersheds are generally lower than in nearby agricultural or urbanized watersheds, though the degree depends on soil types, topography, and climate (Falkenmark *et al.*, 1999).

Forest soils filter contaminants and influence water chemistry due to the fact that they are more waterlogged than other soils (except wetlands) and contain more nutrients, allowing them to filter out contaminants (Falkenmark *et al.*, 1999). Clearing and

cultivating forest soils tend to greatly accelerate decomposition and also to release large amounts of nutrients that leach into groundwater, surface water runoff, and streams.

Nevertheless, contrary to popular opinion, forests generally reduce the total annual stream-flow particularly in watershed areas (Calder, 1998). This is because trees consume water for transpiration, which is then evaporated back into the atmosphere. In general, trees consume more water than other types of vegetation, including grasses and annual crops. There is therefore need to draw caution arising from the blanket belief that trees in forests conserve water.

Forests can increase or decrease groundwater recharge through its cover which is capable of lowering groundwater recharge since considerable precipitation is intercepted by vegetation and returned to the atmosphere through evapotranspiration. In some areas, however, removal of forest cover can result into a crusting of the soil surface that then reduces or prevents water infiltration and groundwater recharge (Falkenmark *et al.*, 1999). The presence of forests and bushland, according to FAO (1992), helps to lower water tables, lessen the risks of salinisation, and help to stabilize water supplies.

Forest loss can shift aquatic productivity as its cover plays an important and complex role in sustaining aquatic productivity. Trees shade waterways and moderate water temperatures. Woody debris provide fish with habitat while leaves and decaying wood provide nutrients to a wide array of aquatic organisms.

Most ecosystem services provided by water however, are public goods and are thus subject to all the problems of market failure in which individuals' pursuit of pure self-interest leads to results that are not efficient (Randall, 1983). To contain this, it is therefore necessary to redesign relevant policies and institutions so that local water managers, who normally make short-term decisions about water allocation, water quality, and the physical condition of aquatic ecosystems, account for the costs and benefits of their actions on natural capital and ecosystem service flows.

2.2.3 Climatic services and carbon sequestration

Concern about the role of atmospheric carbon dioxide as an agent of global climate change has led to intensive efforts to find ways to reduce or offset fossil fuel emissions. Innovative technologies, policies and financial mechanisms have emerged and include the development of methods for quantifying and assessing carbon stock and flows in forests and other land use activities. The significance of forests in climate change, especially their role as carbon sinks is now widely recognised (Chikamai and Tchatat, 2004). This is despite the many scientific uncertainties associated with carbon sequestration by forests and land use changes that are in addition fuelled by lack of capacity to quantify such changes in most developing countries.

Ecosystems like those under mangroves, as well as cloud and high mountainous forests are among the most vulnerable ecosystems on the planet (Gitay *et al.*, 2002). Since “climate is the major determinant of the global distribution of biomes” (Chapin *et al.*, 2002), changes in climate are likely to severely affect forests worldwide. According to Scholes and Linder (1998), climate change is likely to have impact on several aspects including changes in the location of areas suitable for the growth of certain species, increases or decreases in the production of wood and non-wood forest products, changes in the types and incidence of pests and diseases affecting tree and plant species, altered ecosystem functions, increased or decreased nutrient retention, and changes in species’ reproductive cycles.

The Kyoto Protocol, a global facility on regulation of climate change mitigation, allows developed countries to account for removals from forestry in meeting targets of greenhouse gas emissions. Developing countries can participate in mitigation through the implementation of afforestation projects under the Clean Development Mechanism (CDM). According to FAO (2003a), the current form of the Kyoto protocol (to expire in 2012) is unlikely to stimulate sufficient carbon credit trading to attract substantial investment in reforestation and afforestation in Africa, particularly in view of the limited availability of productive land, the uncertainty of land tenure, and political instability.

It has been argued that, valuing carbon sequestration over other ecosystem services might have a negative effect on the environment and people’s livelihoods. Others, however, feel that establishing a market for carbon will create new incentives for improved environmental management and biodiversity conservation (Orlando *et al.*, 2002). All in all, many international organizations such as The World Conservation Union (IUCN) and the United Nations Environment Programme (UNEP) have highlighted the need for forestry and land-use activities administered under the Kyoto Protocol to be environmentally sound and socially equitable (Orlando *et al.*, 2002).

2.2.4 Biodiversity and soil protection

Environmental services supplied by biodiversity may be quite wide in scope, while localised in scale and particularised in effect because many of the production and regulation services are closely related to the phenomenon of ecosystem resilience. A greater degree of biodiversity may contribute to greater resilience of an ecosystem, because there are more species present at a location to respond to change and thus absorb or reduce its effects. If the resilience declines, the services can generally be expected to decline too (Myers, 1996). Resilience can be defined as the ability of ecosystems to resist stresses and shocks, to absorb disturbance, and to recover from disruptive change (many of these perturbations being due to human activity and especially economic activity). How far is ecosystem resilience dependent on biodiversity? There is some evidence that biodiversity can make an important contribution to ecosystem resilience. At the same time, there is much uncertainty

about several associated factors such as 1) the range of species composition within which ecosystems and communities function; 2) the part played by species richness in ecosystem attributes such as trophic structures and successional stages; 3) the contribution of dominant species such as keystone mutualists and critical-link species; 4) the link between biodiversity and ecosystem scale; and 5) the relationships among biodiversity, biomass, and ecosystem productivity (Myers, 1996).

In similar style, vegetation and to some extent biodiversity protects soil cover. Soil erosion is a major problem in many parts of the world since it leads to (i) significant declines in soil fertility and, thus, in the productivity of croplands and pastures and (ii) sedimentation of rivers and other water bodies affecting downstream communities (Myers, 1996).

2.2.5 Cultural services

Culture consists of ideas, beliefs and customs that are shared and accepted by people in a society. Information on cultural significance of plants and forests can be gleaned from anthropological, ethnobotanical, geographical, ethnomedicinal and linguistic studies. The cultural values and symbolic functions ascribed to forests are as diverse as the communities and cultures throughout the world. The cultural and symbolic functions range from the tree's significance as a link to culture and beliefs, location for socio-cultural and religious activities, symbolic, sacred significance of particular resources, and judicial function of trees, to the use of various parts in healing ceremonies (Falconer and Koppell, 1990).

The importance of sacred groves as a tool for *in situ* conservation of biodiversity centres on widespread distribution and the roles they play as reservoirs of local biodiversity of threatened species (Laird, 1999). They are attracting increasing interest in international and conservation organizations such as the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the World Wide Fund for Nature (WWF) and, have significant relevance for the implementation of Article 8 of the Conservation of Biological Diversity which emphasises the use of traditional wisdom and practices for conservation and sustainable use of biological diversity.

Local community participation in conservation of biodiversity takes various forms, including ownership and management of trees (Stave *et al.*, 2001), the use of hills and mountains as venerated sites (IUCN, 1997), and the protection of individual trees that are used as shrines and for spirit worship (Chandarakanth and Jeff, 1991; Msuya, 1998; Mgumia, 2001). However, the most widespread practice involves sacred groves that represent cultural landscapes (Odera, 1997; Posey, 1999; Laird, 1999). They occur in different forms such as remnants of old forests (Millar *et al.*, 1999), burial grounds (Falconer, 1992) and sites of ancestral worship (Githitho, 1998).

In Tanzania, the *miombo* woodlands are central to the spiritual needs of the local people, with specific trees and blocks of woodlands conserved for cultural and ritual reasons. Among the *Wanyamwezi* people, there are rules that govern sacred groves including prohibition to visit gravesites except with permission from the priests (Mgumia and Oba, 2003). In addition, the sacred groves are protected from exploitation, while removal of plant parts for medicinal purposes requires ritual performance. In Sierra Leone sacred groves are used to conserve plant species that are mainly used for medicinal purposes (Lebbie and Guries, 1995), while in Nigeria, they serve as preservation units against overexploitation of forest resources (Okafor and Lapido, 1995).

Traditionally, some forests or tree species have been used for ritual performances (Makonda, 1997). For example, in West Kilombero Forest Reserve in Tanzania, Lovett (1992) observed ceremonies being held annually by *Hehe* people from Iringa region. Similarly in Arusha, Hines and Eckman (1993) observed that *Ficus sycomorus* is regarded as a spiritual tree that provides means of communicating with ancestors. In Uganda, Kakudidi (2004) recorded 89 species including those with multiple uses such as *Cymbopogon nardus*, *Ficus natalensis*, *Ficus ovata*, *Hibiscus fuscus* and *Phoenix reclinata* in areas adjacent to Kabale National Park. The recorded species were used for 26 cultural and social purposes including, wedding ceremonies, witchcraft, religious ceremonies and others.

Several beliefs and taboos are also associated with tree uses. For instance, in communities adjacent to Kabale National Park, it is believed that *Kigelia africana* fruits if applied on girls' nipples, will make the breasts grow long, make the girl ugly and eventually prevent her from getting married. *Ficus exasperata* should never be used as a walking stick or a pole as it drains away riches. *Sapium ellipticum* should not be used as poles for the main house because the owner would be hated or become mad. Dogs should not eat the leaves of *Stephania abyssinica* because they would never go hunting. If the plant is touched, a hunter would not find his way back (Kakudidi, 2004). For example in India, local people have over the years developed a strong affinity towards the temple and the sacred groves as a result of their faiths, taboos and beliefs. They also believe that their livelihood, security and cultural existence are complementary to the blessings of their deity (Chandrashekara and Sankar, 1998).

2.3 Identification and characterisation of actors in compensation for ecosystem services

Three generic types of stakeholders in compensation for ecosystem services can be identified (i) ecosystem service modifiers: entities such as individuals, families, groups or communities whose actions modify the quantity or quality of the ecosystem services available to ecosystem service users; (ii) ecosystem service beneficiaries:

entities such as individuals, families, groups, corporations, towns or utility companies who benefit from the ecosystem services generated by an ecosystem; and (iii) ecosystem service intermediaries: people such as public authorities, non-governmental organisations, community or faith-based organisations, projects that directly or indirectly shape interactions among ecosystem service modifiers, ecosystem service beneficiaries and the ecosystem itself. While these are presented as three distinct groups, it is important to keep in mind that individual persons, communities or corporations may simultaneously be ecosystem service modifiers, beneficiaries and intermediaries.

Ecosystem service beneficiaries, directly or through intermediaries, might reward ecosystem service modifiers for reducing their level of pressure or threat on the ecosystem, or for making investments or changes in land use practices that enhance ecosystem services. Ecosystem service beneficiaries may also institute compensation schemes among themselves, which may or may not have feedback effects on the ecosystem or ecosystem modifiers. A range of external influences *i.e.* markets, governance, technologies also affect the behaviour of all three types of human agents.

The characterisation of actors in compensation entails decisions on a number of issues regarding inclusion/exclusion of different groups of ecosystem service modifiers, beneficiaries, and intermediaries *i.e.* who is in, who is out, what basis for inclusion or exclusion with regard to:

1. the nature of previous relations between ecosystem service modifiers, ecosystem service beneficiaries, and ecosystem service intermediaries: a multi-stranded or single stranded relationship *e.g.* whether or not the parties to a CES mechanism also have social or ethnic or market relationships, competition, conflict, trust, nature of the contract, for example individual or group contracts, enforcement agency like statutory or customary authorities;
2. transaction costs of establishing and operating the mechanism, including information, contracting and enforcement; distribution of those transaction costs;
3. type of remuneration or incentive: quid pro quo exchange of money for divisible, excludable goods, more secure property rights, public services, extension services for land uses and resource management practices that are consistent with production of the ecosystem services;
4. what market instruments are used: market instruments are tangible pieces of evidence of ecosystem services that are issued or certified by some public or private authority and backed by the reputation or legal sanction held by that authority; market instruments for ecosystem services have been created to encourage private-sector enterprises to internalise the environmental externalities of their actions; trade in market instruments is intended to increase the efficiency in the way that environmental costs are borne by the overall economy; examples of market instruments include Certified Emission Reductions (CERs) backed by the Executive Board of the Clean Development Mechanism and certified by

reputable private firms, and wetland credits backed by the United States Wetland Mitigation Banking Program;

5. temporal pattern of payment: is the payment a recurrent payment to offset the opportunity costs of lower returns or a lump sum which is assumed to facilitate environment service modifiers to make the investments necessary to surpass some type of threshold?
6. initial distribution: nature and enforcement of rights and duties;
7. scale of the mechanisms *vis-à-vis* scale of the ecosystem and scale of the administrative arrangement (Hein *et al.* 2006); and
8. extent to which the payment mechanism adds onto or replaces regulatory approaches to environmental protection.

Table 2.4 shows mechanisms of compensation for ecosystem services in common practice based on these criteria (Swallow, 2006).

Table 2.4 Prototype mechanisms of compensation for ecosystem services in common practice

<i>Environmental service</i>	Providers/sellers	Users/buyers	Main issue
1. Total water yield for hydroelectricity via storage lake	Impacts on total water yield small; reservoir sedimentation issue may dominate the debate; option for sediment traps and landscape filters.	Consumer satisfaction depends on continued functioning; high project investment costs, little subsequent management flexibility.	Intercepting sediment flows rather than avoiding them is generally easier to accomplish; sediment flows out of well-managed upper catchments may still be high because of geological and geomorphological processes.
2. Regular water supply for hydroelectricity via run-off-the-river	A change from soil quick flow (saturated forest soils) to overland flow will have some effect on buffering of river flows and hydroelectric operation time.	Consumer satisfaction depends on continued functioning; high project investment costs, little subsequent management flexibility.	Interventions influencing the speed of drainage (linked to paths, roads and drains) have the most direct effect on buffering at larger scales.
3. Drinking water provision (surface or groundwater)	Intensive agriculture and horticulture will cause rapid pollution of surface flows and slow but persistent pollution of groundwater flows with nitrogen and pesticides; people residing around streams cause pollution, <i>E. coli</i> and other diseases.	Willingness to pay for drinking water depends on quality assurance from medical perspective, as well as taste.	Slow response of groundwater flows to changes in the pollutant status make 'regulation' a more effective solution than results based markets.
4. Flood prevention	Land use effects strongest for flow buffering of small-to-medium sized events, with saturation dominating the large events.	Relevance of upland land use depends on location (floodplains) and engineering solutions (dykes, storage reservoirs).	Risk avoidance for the rare category of large events.
5. Landslide prevention	Mortality of deep-rooted trees ('anchors') causes temporary increase in landslide risk.	Relevance depends strongly on location in the flow paths.	Deep landslides are little affected by land cover.
6. General watershed rehabilitation and erosion control	Promoting tree cover and permanence of litter layer protecting the soil is a good precaution.	'Holistic' perception of watershed functions survives despite the lack of clear impacts on specifics.	Communication gap with scientists who try to enhance clarity.

<i>Environmental service</i>	Providers/sellers	Users/buyers	Main issue
7. Biodiversity buffer-zones around protected area	Use value of buffer zones depends on hunting restrictions, presence of human-life threatening species.	Flagship species still dominate the public perception of value.	Push and pull factors in human land use; livelihoods operate at larger scales than most conservation plans acknowledge.
8. Biodiversity landscape corridor	Still new concept in agriculture/forest land use mosaics in the tropics; use value of patches in the 'stepping stones' similar to the buffer zone case.	Relevance depends on dispersion properties of the species of main interest; sometimes higher connectivity not desirable; relevance increases with climate change concerns.	Ex-ante impact assessment of efficiency is still difficult.
9. C restocking degraded landscapes	Options for profitable tree restocking primarily depend on policy reform.	Demand is for Certified Emission Reduction (CER) rather than carbon.	Additionality issues in CDM; high transaction costs.
10. C protecting soil and tree stocks	Road construction (accessibility) is main determinant of 'opportunity costs' for non-conversion.	Demand is for Certified Emission Reduction (CER) rather than carbon.	Not recognized as part of CDM.
11. Guaranteeing production landscapes meet environmental standards	Where the 'ecolabel' process starts from the consumer side, there can be a substantial gap in communication and trust, leading to high transaction costs.	Consumers with high sense of personal responsibility; gradually replaced by the introduction of standards and the raising of baselines of 'acceptable' behaviour.	Relevance of global standards in the face of variation in local conditions; transparency of the standards and compliance monitoring; transaction costs.
12. Providing guided access to landscapes of beauty/ heritage/ recreational value	The local and international appreciation for landscape beauty depends on culture and time (fashion); rewards are for roles as guide and provider of accommodation, food, transport and handicrafts; gender aspects of provider roles may be prominent.	The appreciation of landscape beauty and cultural traditions does not reduce the need to provide security and comfort to potential tourists.	Global ecotourism is a highly volatile market where security and political concerns can interfere.

Source: (Swallow, 2006)

Points to remember

- There is currently no single internationally and globally accepted and commonly used classification system for NWFPS. This situation should be improved to make the marketing of these products much easier.
- Difficulties in classification of climatic services are further compounded by scientific uncertainties associated with carbon sequestration and inability to quantify the associated land use changes.

Questions

1. Indicate the classification systems that can be appropriately used for non-wood forest products and services. How can the Harmonised Commodity Description and Coding Systems be improved for appropriate integration of NWFPS and in which ways?
2. What are the major categories of NWFPS and how do they fit into the Harmonised Commodity Description and Coding Systems?
3. Propose strategies to add value to NWFPS such as medicinal plants, biofuels, bee products
4. Why is it necessary to include carvings and handicrafts into non-wood forest products despite their very nature as wood products? Suggest arguments to include firewood as NWFPS.
5. List four marketable forest ecosystem services. How could non-material benefits be sustainably valued? Propose some policy recommendations.
6. At what point of biodiversity decline do ecosystems start to lose the self-organizing capacity and, hence, the resilience that apparently enables them to provide certain environmental services?
7. Who are the actors in compensations for ecosystem services and how can you characterize them? Do you foresee any conflicting or coinciding interests among stakeholders for a sustainable management of forest ecosystems?

Further readings

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3

Sustainable Production and Processing of Non-Wood Forest Products

Sustainable production of NWFPs has several benefits. These include improved food security and better nutrition for the rural people, increased employment opportunities and income in rural areas, availability of a range of products vital for human welfare, increasing participation of people in forest management activities, and enhanced market opportunities. Additionally, processing of NWFPs adds value to the resources by making them suitable for consumption and also supports technology-based development. Importantly, norms for collection, processing and export of high value forest products should be developed. Standards and certification are valuable tools to promote quality at all levels and protect the viability of the NWFP-based business. Increased of commercial markets for NWFPs might have consequences on ecological processes and ultimately on people's livelihoods.

3.1 Availability and supply of NWFPs

Under natural conditions, NWFPs can be managed along with wood for timber and allied products in an integrated manner, thus increasing overall forest productivity and value. NWFPs can also be grown as pure or mixed crops under agro-forestry and/or community forestry systems. They can be harvested from an ecosystem in quantities and ways that do not alter the basic reproductive functions of the forest (FAO, 1993).

Many of the plants providing NWFPs are found among the biological richness and ecological complexity of primary forests and woodlands. Some of the plants can only thrive within natural habitats and do not lend themselves to domestication of any sort. Those species that can be grown in plantations, or as pure or mixed crops, are heavily dependent on regular infusion of germplasm from wild gene reservoirs (wild relatives). Only the continued existence of species variability in the wild will afford plant breeders a better chance for creating new, disease-resisting and high-yielding varieties for the future (Chandrasekharan, 1993).

The availability and supply of NWFPs depends on the quantity of the resources in the wild. It has been argued that commercialisation of wild plants intensifies the

difficulty in managing harvested populations sustainably, especially when demand is high, and harvesters lack tenure rights and/or customary rules of uses have been eroded (Godoy and Bawa, 1993; Dovie *et al.*, 2001; Luoga *et al.*, 2005).

Sustainability has four components that need to be integrated (Geldenhuis 2004). Firstly, the biophysical components and processes of the resource need to be maintained to ensure the functioning of the ecosystem. Secondly, it is essential to satisfy the cultural and livelihood needs of the people depending directly and indirectly on those resources and their products. Thirdly, it is necessary to sustain viable businesses and industries to ensure economic activities. Finally, it is important that rural development initiatives be carried out within a legal framework and an effective institutional structure. However, integrated ecological, social and economic studies of sustainable resource use in rural development are lacking to guide policy and resource management practices (Mander, 1998). Taking the case of NWFPs and services, the challenge is how to control the industry and to ensure that harvesting from natural areas is kept within sustainable levels to maintain demand and supply.

3.2 Harvesting and post harvest handling of NWFPs

Harvesting links resource management and resource utilisation and thus influences resource sustainability. Harvesting of NWFPs from both wild and cultivated sources is different from wood harvest in terms of the use of tools and equipment, technology, pre-harvest preparations, post-harvest treatment and requirement of intermediate processing. Harvesting often does not involve a whole tree or plant, but only parts thereof. It varies from collection of nuts and leaves to tapping of latex (Fig. 3.1), harvesting of palm hearts, extraction of medicinal plants and plant materials, honey hunting, extraction of wax and collection of decorative plant materials.

The cycle of harvesting also varies from a few weeks (*e.g.* for tender shoots), to longer periods, as in the case of mature fruits or rhizomes (FAO, 1995). The harvesting techniques, including pre-harvest and post-harvest treatment, for the various NWFPs (i) vary considerably for both wild and cultivated sources; (ii) range from destructive to non-destructive techniques; and (iii) are of fundamental importance in guaranteeing the sustainability of the resource. For example, for edible nuts, the process involves collecting raw nuts, cleaning, drying and grading; for fibres, cutting relevant parts of the plant (leaves, branches), removing thorns and hard coating, boiling, beating and separating fibres, dressing or treating, drying and bundling.

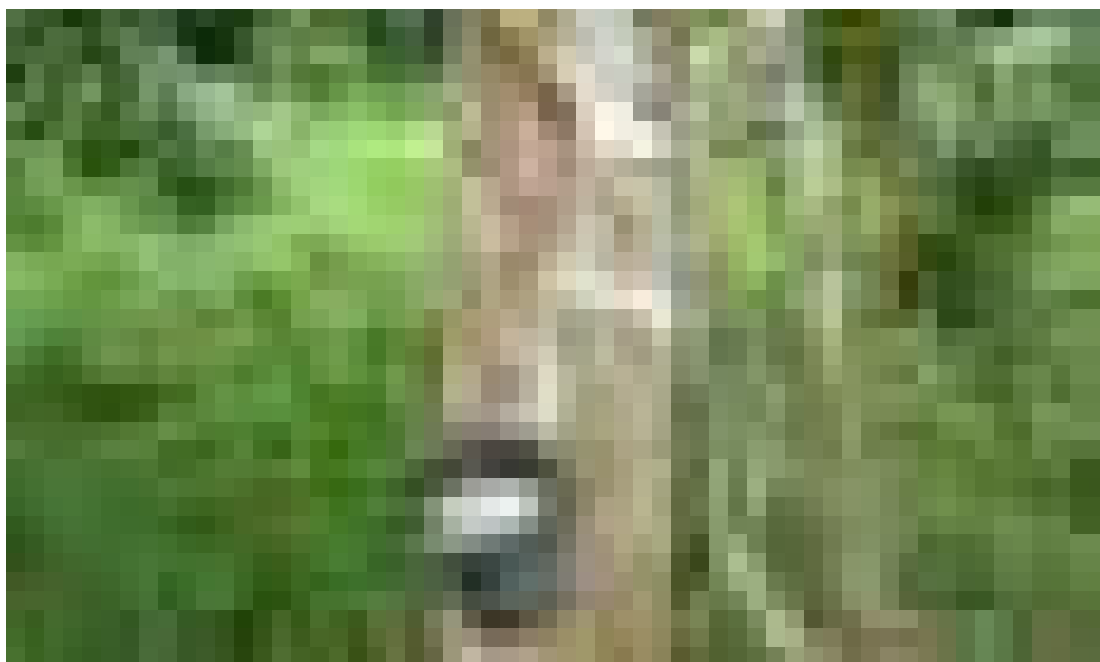


Figure 3.1 Tapping of natural rubber latex in the evergreen forest of Ghana. (Courtesy E. Achigan-Dako).

Take the example of *Prunus africana*, a multipurpose tree species (Cunningham and Mbenkun, 1993) that occurs in Afromontane forest "islands". The bark is a major source of an extract used to treat benign prostatic hyperplasia. Bark harvesting is from wild populations in Afromontane forests of Cameroon, Zaire, Kenya and Madagascar. *Prunus africana* has a remarkable ability to withstand bark removal. However, die-back and felling of trees are frequent in high-priority conservation sites.

For some latex/gum harvesting, such techniques as making incision on the tree trunk, treating as necessary with acid for enhancing exudation, collecting of crude exudates (Fig. 3.1), boiling it to pasty consistency, cooling into balls or blocks for packing and transport are often applied (Chandrasekharan, 1993). In harvesting some medicinal plants, techniques such as root digging, debarking and collection of aerial parts while ensuring that some reproductive materials are left in the ground (depending on how conscious the collector is), slicing, sun drying, grinding and packing are employed.

Harvesting procedures for many non-wood products are poor and undeveloped, thus wasteful, destructive and unsustainable. This is due to the fact that, in most cases, small volumes are harvested for individual NWFPs. This tends to decrease the attention devoted to their harvesting. The collectors are mostly unskilled and untrained in proper methods (Chandrasekharan, 1993). Appropriate harvesting technology is therefore needed in order to prevent post-harvest losses. This is

particularly important for perishable products. Also many NWFPs (*e.g.* juicy fruits) are characterised by seasonal gluts, fruit rot and price declines. The lack of appropriate processing, preservation and storage techniques also limit their potential contribution to the household diet since some species may not be edible in their harvested state, and many forest foods, being perishable, can only be consumed for a limited period in the year (FAO, 1995).

To overcome all these, there is a need for good planning and control of harvesting operations for NWFPs, by for example introducing more efficient harvesting methods and systems, reducing harvesting waste and keeping overall costs of operations at the lowest possible level could ensure utilisation of these resources on a sustainable basis.

The quality of primary NWFPs is also influenced by post-harvest handling, processing and storage conditions, where most producers lack skills and knowledge in this regard (Chandrasekharan, 1993). Post harvest care is poor in most cases, and wastages are high during collection, transport and storage. Therefore, consideration of physical infrastructure is more important when harvested products are delicate or perishable compared to those which can stand rough handling and long storage. Everything considered, there is a need to rationalise and improve harvesting systems and practices, for example through improved tools and techniques, training and skill improvement, incentive and institutional arrangements, promoting local facilities for processing, and value addition that links harvesting to processing.

3.3 Processing and value addition of NWFPs

Processing of NWFPs adds value to the product, provides local employment and helps to increase the retention value in the country of origin. Processing and trade of NWFPs are often seasonal due in part to the seasonal availability of raw material (such as fruit or mushrooms) and an acute need for cash and/or the availability of labour during slack agricultural work (FAO, 1995). In developing countries, particularly in Africa, harvested products reach the local or foreign market, either after some intermediate processing in the form of cleaning and grading or after primary processing. According to Chandrasekharan (1993), market oriented downstream processing, for export markets, is highly specific on quality and stresses on reliability of supply. But due to the lack of technology, skilled manpower, management expertise, capital for investment and marketing arrangements, coupled with inadequate information on resource and resource development, sophisticated or refined downstream processing is rarely done in most developing countries.

There is a range of variation in the level of processing of NWFPs. In most cases processing of non-wood products for local use is done in very small family units, employing persons without any training, often working on part-time basis. They are low-return activities and survivability is low, as they tend to be abandoned as wages rise and alternative opportunities grow. Those products of comparatively bigger

establishments carrying out primary processing for export, such as the case of gum *arabic*, undergo further processing in developed countries (Chandrasekharan, 1993). This however, has adverse impacts on local enterprise survival rates.

Processing and preservation should be considered at different levels: household, cottage industry, and food industry. However, first-stage processing should be organised within or in the immediate vicinity of forest areas in order to ensure local employment generation and value addition. Cheap and efficient post-harvest techniques for depulping fruits or seed, quick drying of harvested plant material and prophylactic treatment preventing insects (*e.g.* biopesticides) and microbiological contamination should be introduced together with standards for dry storage. The common NWFPs processing taking place in most African countries uses a range of technologies and equipment. These range from semi-mechanical or mechanical processes with equipment mostly locally fabricated to those with improved processing technology and equipment. For example, crude extraction of palm oil from fruits of *Elaeis guineensis* is done using wooden presses; simple distillation for essential oil involves passing of steam through a charge of fresh or partially withered grass or leaves and condensing the vapours; and fairly sophisticated processing of wattle bark for producing tannin. Nevertheless, there are facilities established in some African countries for producing medicinal preparations/pharmaceuticals from phytochemicals and for manufacturing fragrances and toiletries using essential oils. These productions essentially meet local and national demands (Chandrasekharan, 1993).

A national industrialisation strategy to add value to the NWFPs materials of the forests does not exist in most African countries. However, subject to feasibility based on stable supply of suitable non-wood forest products and analysis of economic and market factors, development through value-addition on NWFPs calls for appropriate process technology capable of producing marketable goods. Process technology for medicinal plants, for example, helps to isolate pure active compounds for formulation into drugs, to isolate intermediates for production of semi-synthetic drugs and to prepare standard extracts, powders, or tinctures (Chandrasekharan, 1993). Provided that appropriate management capability, skills and technology are available, several developing countries have the potential to install improved facilities for processing of NWFPs for domestic consumption and for export. However, it is necessary to know the specific market needs, as well as the product specifications and standards required, before deciding to venture into export-oriented production. There is also need to link production to a reliable and captive source of raw material supply. It should also be born in mind that more efficient modern technology can cause more economic harm if tied to inconsistent supply.

An appropriate processing technology can improve the socio-economic status of local people, generate employment and ensure better value for the material collected, thus helping to alleviate poverty. Particular attention should, however, be paid to gender

issues when dealing with NWFPs. For instance, where some foods may be traditionally reserved for men (*e.g.* palm wine), women and children will likely receive little benefit from the promotion of such foods. The participation of forest users, and in particular women, in the decision-making process of village-level activities is essential.

The development of appropriate technology to process raw products into ready-to-consume food for urban consumers for instance should also be encouraged since this is an essential condition to their effective promotion. Norms for collection, processing and export of high-value forest foods need to be developed. The application of these norms should be included in training on product quality control at different levels.

3.4 Standards and certification

Certification is defined by the International Organization for Standardization (ISO/IEC, 1996) as a procedure by which written assurance is given that a product, process or service is in conformity with certain standards. Forest certification is a market-based instrument that aims to encourage sustainable forest management for the multiple values of the forest, beyond timber to include non-timber forest products and services, social and cultural values and future options. Certification schemes relevant for the use of and trade in NWFP not only focus on forest management certification, but also include certification schemes mainly used in the agricultural sector such as social (fair and ethical trade) and organic certification. A certification system can also focus on product quality. There are about forty-six commercial non-timber forest products for which certification standards have been approved, plus ongoing evaluations of other original products in new countries and forest types (Shanley *et al.*, 2005).

Certification programmes related to natural resource use have mainly been developed for timber and agricultural products. Four main categories of certification schemes have been identified to be of major relevance for the use of NWFPs. These include forest management, social, organic and product quality certification (Walter, 2002a,b). Depending on their basic concepts, these certification schemes focus on different areas such as production, processing, manufacturing as well as trade and marketing. Thus, traded NWFPs can be certified according to these different areas, even though many schemes do not focus on only one area but include, to different degrees, several areas. This results in considerable overlaps, and potential synergies between the different certification schemes (Vantomme and Walter, 2003).

Forest management certification programmes are market-based initiatives aimed at improving the quality of forest management and promoting higher prices or better market access for products derived from sustainably managed forests (Siry *et al.*, 2005). Certification programmes mainly assess environmental and ecological aspects

of resource management, both at the forest and at the species or product level, including chain-of-custody certification. These schemes guarantee that the products are obtained from sustainably managed forests. Good examples include the Forest Stewardship Council (FSC) and the Pan European Forest Certification (PEFC). Despite initial concerns with sustainable forest management, it has been observed that “owners of forest operations being certified today appear to be motivated more by improving their marketing image (*e.g.* to gain an advantage over other suppliers in some ecologically sensitive markets) than by improving forest management” (Wittmeyer, 2003). Unfortunately, only a fraction of global forests are certified and of those that are, 93% are in the North (Siry *et al.*, 2005, Rametsteiner and Simula, 2003; Taylor, 2005; and Wittmeyer, 2003). Estimates suggest that 5,509,000 ha of African forests have management plans (1% of the total); and 1,107,000 ha are certified (0.2 %) (Siry *et al.*, 2005).

Social certification systems, such as fair and ethical trade, assure that labour conditions are acceptable and benefits are equally shared among those involved in production and trade. These kind of trade initiatives foster business partnerships and management supply chains, which include secure and fair commercial deals and support the provision of market information (Kruedener, 2000). Important criteria focusing on social issues include: i) tenure and customary rights; ii) fair returns and adequate benefits; iii) safe and healthy working environment; iv) impact on local or indigenous communities; v) economic viability; vi) absence of child labour; and vii) ethical marketing (Mallet, 2000). A good example for improvement in social equity scheme is the Fair Trade Labelling (see Section 4.3.10).

Organic agriculture is a holistic production management system which promotes and enhances agroecosystem health, including biodiversity, biological cycles, and soil biological activity (FAO/WHO, 1999a). The aim of organic certification is to optimise and maximise the economic potential of certain marketable species, without negatively impacting the resource base of these species. Organic certification does not create imbalances in existing traditional management systems, many of which are based on complex histories of bio-fertilizer use and belief in natural systems. Rather, organic certification attempts to minimise any potentially negative impacts of market forces on traditional local use and management of resources by building organic practices on local people’s strength and developing necessary technical and managerial capacity, required infrastructure such as indigenous and affordable system of certification and quality monitoring. Some of the criteria and approaches suggested to develop organic certification include promotion and development of production methods using natural and certified inputs, improving agronomic and ecological conditions based on norms which meet the national and international norms of organic agriculture that involve improving local growing and ecological conditions beneficial to the soils, companion crops and farmers; and gradual switching from chemical-based cultivation system to ecological agriculture, especially in small and marginal farms.

Wild crafted and semi-domesticated NWFPs can be considered as organic and many NWFPs such as pine nuts, mushrooms and herbs are increasingly commercialized as organic food products. Product quality certification aims at ensuring that defined production standards have been taken into consideration. These standards can focus on the product itself as well as on the way it is processed and manufactured. Product quality parameters include product identity, purity, efficiency and safety. These parameters are relevant for a wide range of internationally traded NWFPs mainly used in the food and pharmaceutical industry (FAO/WHO, 1999b).

Product quality certification is particularly for food products, and for which trade is governed by national, regional and international food control agencies. At the international level, trade in food products occurs guided by international standards and specifications provided by agencies like the International Organization for Standardization (ISO), Codex Alimentarius, FAO, World Health Organization (WHO), and Good Manufacturing Practices (GMP). For medicinal plants, Good Harvesting Practices for medicinal plants of WHO is an example.

Certificate of Origin schemes is widely used to certify that a product originates from a given region that may have high prestige among consumers. Examples are wine, honey, mushrooms and berries.

Regulations for grading and standards exist in many countries for trade products including the ones from NWFPs like medicinal plants. General quality standards for internationally-traded products are established by the International Organisation for Standards. Quality and safety/sanitary regulations, including packaging standards, established by food and drug administrations and consumer protection groups of importing countries are often rigid in respect of items such as medicinal extracts, phytochemicals, food colorants and additives. Inability to meet the standards would normally lead to loss of market.

The basic requirements by consumer markets of NWFPs include sustainable and continuous product availability; reliable and predictable supply; and stable quality of products. Recognizing these and distinguishing the differences among geographic aspects of markets, whether local or international, are key to successful marketing of NWFPs. The NWFPs producers however, could benefit from trade certification schemes if well organized and implemented (Box 3.1).

Box 3.1 How trade certification schemes can help NWFP producers

In developing countries, ‘fair trade’ or forest certification and organic labelling schemes are becoming options to help protect the commercial viability of NWFP-based businesses against competition from similar products obtained through farming or synthetic substitutes. ‘Proper’ forest management certification schemes, along with schemes that certify ‘appropriate’ behaviours and procedures in agriculture (*e.g.*, ‘proper’ labour practices, organic farming, and fair trade), offer promising frameworks for successful commercialisation of certified NWFPs. Such schemes can help guarantee better prices to gatherers, social equity within the processing and marketing chains, and ensure that attention is given to the environmental sustainability of the resources providing NWFPs. Fair trade markets and organic products offer major advantages to NWFP producers because of the smaller quantities needed to supply international trade (when compared to agriculture-based production), and because premium prices can be offered to producers.

In addition, fair trade food markets and foods labelled as organic are among the fastest growing market sectors in the food distribution sector. Several NWFPs ideally fit such niches, particularly those that have a high per unit value, a long shelf life, and are easy to process, store and handle. Good examples include essential oils, honey, bamboo, medicinal products/herbs and nuts. Several types of certification schemes already exist, and cover a range of products in agriculture, fishing and forestry, but NWFPs are only marginally involved in these schemes. Some major challenges to increasing certification of NWFPs include:

- ▶ **Dispersed nature of production.** Monitoring the NWFPs production of many small-scale producers dispersed over large areas is a problem. Difficulties arise in ensuring that products come from certified sites. All these can lead to higher monitoring costs that could be prohibitive to small-scale producers of NWFPs.
- ▶ **Definition of sustainable harvest levels.** Appropriate methodologies and standards to define or verify sustainable harvest levels and practices for many NWFPs are still under development.
- ▶ **Resource user conflicts.** Restricting access to certified harvest sites for NWFPs can create conflicts within and among forest-user groups.
- ▶ **Unclear market potential.** Actual market demand for certified NWFPs is the driving force behind many certification initiatives and is key to ensuring the economic viability of NWFP production schemes. However, for many NWFPs it is not yet clear that customers will pay premium prices for products certified as fair trade or organic.
- ▶ **Insufficient product definition and classification.** Most NWFPs are not yet included in international classification or standardization systems (*e.g.*, the Harmonized System, Standard International Trade Classification, Codex Alimentarius), and this slows their marketability in international trade.
- ▶ **Insufficient collaboration/compatibility among existing certification schemes.** The proliferation of certified products is creating confusion among consumers.
- ▶ **The limited potential for mainstream benefits of certification schemes to cover all**

producers in the sector. For example, the present market share of certified Brazil nuts is only a fraction of the total world production, so the number of Brazil nut gatherers that may benefit from a certification scheme is limited by the market share of the certified product.

- ▶ **‘Non-tariff’ trade barriers.** In the areas of food and herbal/medicinal products, trade barriers can generate obstacles for certification efforts. For example, in 2003 the European Union declared a full ban on the import of Brazil nuts from Brazil because of high levels of aflatoxins. Although production from certified places of origin may have acceptable levels of aflatoxins, the certified products are equally affected by the ban.

Source: Vantomme and Walter (2003).

There are some key issues that need to be addressed in the development of certification programmes for NWFPs as pointed out by Viana *et al.* (1996). These are:

- **Intensity of management.** The intensification of management systems of NWFPs to increase competitiveness with alternative land uses can result in conflict between economic returns and environmental quality. Increasing the density of desirable species often results in a lower biodiversity, and also conflicts with other forest uses and values, such as wildlife habitat protection.
- **Natural forest NWFP production systems versus plantation systems.** Several authors have questioned the productive potential of NWFPs in natural forests based on claims that domestication would eventually drive them out of business. There are many examples of products that are more competitive in wild or semi-wild conditions than in domesticated plantations. One example is ginseng (*Panax* spp.) production, which is much more valued from natural stands than from plantations. Other examples include some ornamental plants that are difficult to cultivate. Also, in many instances, traditional people have developed forest management techniques that resulted in semi-wild populations of trees and animals that have greater productivity, broader environmental benefits, and greater appropriateness to low capital availability.
- **Poor scientific basis for NWFP management.** For many NWFP species, knowledge of the basic aspects of their population biology remains unknown or incomplete, even for widely marketed NWFPs. This type of information is critical, not only for certification but also for developing alternatives to increase the productivity of NWFPs. The low productivity of NWFPs can be related, to a significant extent, to the scanty research on the biology and management of those species.
- **Sustainability analysis of NWFPs.** Certifying NWFP management systems requires different approaches to the sustainability analyses used for timber production systems.

- **Other NWFP labelling initiatives.** Certification of NWFPs must be differentiated from certification of organic products. In fact, consumers need to be able to distinguish NWFPs that are purely organic from those that are also environmentally and socially sound.
- **Public education and marketing of NWFPs.** The public perception that one can harvest NWFPs and still "keep the forest" should facilitate the development of certified NWFP markets. However, public reaction to the need for certification is mixed. In 1994 for example, the Rainforest Alliance conducted interviews with major producers, importers, and retailers of rattan products for the US market. The results from these interviews suggested that the market for certified rattan products would be minimal, unless a major public education effort took place to inform consumers of the negative impacts of many unsustainable rattan sources. This scenario can be true for other NWFPs.
- **Equity issues.** As commercialisation of NWFP has increased, it is not always clear if the economic benefits have been equitably shared with harvesters, or that adequate resources have been invested in improving the ecological aspects of NWFP management. Some companies, like Cultural Survival Enterprises, the Body Shop, and Ben and Jerry's have made commitments to equitable and ecologically sound commercial NWFP development. However, even for these well-meaning companies, mechanisms are not always in place for ensuring that local people are adequately compensated, and that environmental control on production is in place.
- **Subsistence communities and cultural integrity.** Profit motivation is often foreign to subsistence communities, and the introduction of such a concept via NWFP marketing may prove perilous to traditional social structures. Protection of these social structures, and protection of the products relied upon by these cultures from exploitation by outside forces, pose major challenges for certification.
- **Chain of custody for NWFPs.** NWFPs create special problems for certification from a chain-of-custody perspective. NWFPs are often collected from a widely dispersed resource base, and many opportunities exist, in theory, to mix products from a certified production area with products from non-certified operations. This contamination can occur at any step in the processing of NWFPs. Certifiers, therefore, must give greater attention to the chain-of-custody.

Despite advances in timber certification, significant obstacles remain for NTFP certification, as demonstrated by the case of wood carving in Kenya (Box 3.2). Management plans, monitoring, unfamiliarity with national laws, uncertain knowledge of market opportunities and other factors can combine to make certification inaccessible to small producers.

Box 3.2 Flexible Standards Needed: The Case of Kenyan Woodcarvers

Although we considered developing a simple eco-label (2nd party certification) for carved “Good Woods”, we decided to aim for a Flexible Standards Certification (FSC) label for Kenyan “Good Wood” carvings for three reasons. First, we were reluctant to contribute to the proliferation of labels that has posed a problem in “certification” of wood products. Second, we hoped to contribute to changes within the FSC that would result in greater sensitivity for small producers. Third, aiming high for the FSC label would offer a label with widespread brand recognition and ultimately more benefit for carvers in Kenya – and in the longer term, further afield.

The delays, complexities and constraints to achieving an FSC label for carvings meant that no clear ethical choice for woodcarving buyers existed; carvers still had insufficient incentive to switch to ‘Good Woods’ and continued to carve indigenous hardwoods from globally threatened forests. Inadequate enforcement of the ban on cutting hardwoods and illegal trade from Tanzania contributed to the fact that hardwoods were still available cheaply. Nearly 10 years after work on ‘Good Wood’ carvings began, FSC certification (under the new Small and Low Intensity Managed Forests system) was achieved in January 2005. Conservation and certification expertise, however, was not enough. It was crucial to work in partnership with organizations such as Oxfam and their partner Kwetu and the Kenya Gatsby Trust (KGT) who brought crucial expertise in farmers’ organization and training and business skill and quality assurance training, respectively. With their help a stakeholder-owned company, Coastal Tree Products, has been set up to market and trade certified carvings and to manage the certification scheme and pay for the certification, marketing and design costs. It will remain to be seen if FSC certification will be sustained and the farmers growing neem and the wood carvers remain committed.

Despite the relaxation of certain requirements under Small and Low Intensity Managed Forests (SLIMF), the reporting and monitoring system required under FSC may still prove impractical for local farmers and wood carvers to maintain. On a positive note, trying to achieve wood carving certification has had some non-monetary benefits. First, the neem management plan was acceptable to the Forest Department without excessive bureaucratic requirements. Second, the wood carving certification experience has led to the formation of an FSC National Steering Committee in Kenya. Third, the certification attempt has highlighted the lack of business skills and quality assurance systems of co-operatives, leading to the partnership with KGT. Fourth, it has stimulated engagement at forestry policy level, such as proper enforcement of logging ban and recognition that wood carving adds higher value and more jobs per cubic meter of wood than any other wood use in Kenya. Finally, it has encouraged wood carving certification efforts in other woodcarving countries, such as India.

Source: Cunningham et al. (2005).

3.5 Implications of NWFPs production, processing, commercialisation and utilisation

It is important to understand and appreciate what happens when commercial markets for NWFPs develop and demand increases. There are some clear lessons from theory and from experience regarding the risks that are associated with NWFP commercialisation from both the conservation and livelihoods perspectives. Suffice to mention that NWFPs have been harvested by human populations for subsistence use and trade for thousands of years, and their harvest from the wild represents an important source of income to millions of people particularly in Africa. It is commonly assumed that harvesting of most NWFPs has relatively low environmental impact compared to extracting timber. However, the level of environmental impact is dependent on the characteristics of the species, and the nature and intensity of harvesting. It is therefore difficult to assess whether or not they are harvested sustainably (Boot and Gullison, 1995). It has been observed by Ticktin (2004) that, harvesting these products can affect ecological processes at many levels, from individual and population to community and ecosystem.

NWFPs obtained from plant resources, including seeds, flowers, fruits, leaves, roots, bark, latex, resins and other non-wood plant parts, have gained much attention in conservation circles. The growing commercial trade of natural products, in particular plant medicines and crafts, has resulted in the harvest of increasing volumes from wild plant populations (Kuipers, 1997; Lange, 1998), and has therefore generated concern about over-exploitation (Clay, 1997; Rawat, 1997; Tiwari, 2000). The most direct ecological consequence of NWFPs' extraction is alteration of the rates of survival, growth and reproduction of harvested individuals. Changes in these vital rates can, in turn, affect the structure and dynamics of populations (Ticktin, 2004). Harvest of some NWFPs can also exacerbate soil erosion processes. For instance, *Aloe vera* and *Asparagus racemosus* act as good soil binders in the Indian forests in which they are found, and heavy harvest of their underground portions has led to large-scale soil erosion (Ramakrishnappa, 2002).

Almost any type of resource exploitation conducted in tropical forests will have an ecological impact. The initial impact of resource extraction is determined largely by the specific type of resource or plant tissue harvested. For example, harvesting the bark *Pausinystalia johimbe*, a valuable medicinal tree native to the Gulf of Guinea, typically involves the felling of mature trees and completely stripping the stem. The current destructive bark harvesting practice is seriously reducing seed production and eroding the natural populations of this medicinal plant species (Tchoundjeu *et al.*, 2004).

The harvest of vegetative structures produces one of two different impacts. The plant species will either be killed in the process, or, in a limited number of cases, it will survive and later regenerate the vegetative structure removed. Rattan is a well-known

example of the former scenario, and uncontrolled harvesting is rapidly depleting it in Southeast Asia. Leaves and buds are examples of vegetative structures that regenerate after harvesting. Although unnecessary, many fruits and seeds are currently harvested by felling the tree. This practice has led to the serious depletion of several important fruit and oil seed-producing species. Even in the absence of destructive harvesting, the collection of commercial quantities of fruits and seeds can cause notable changes in the structure and dynamics of a tree population. These changes are typically precipitated by a reduction in seedling establishment due to over-harvesting. If uncontrolled, this process can result in the gradual extinction of the population under exploitation (Peter, 1994).

3.5.1 Ecological implications

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

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

Where the land/resource base is not limiting, opportunities may exist for extensive management. For example, in conservation areas or in buffer zones around protected areas, some NWFPs can be managed to provide income for local people, with relatively low impact. The harvest of cardamom fruits (*Amomum villosum*) from the

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

In situations where the land/resource base is limiting and the competition among harvesters is too high, intensification through management or cultivation is the only option for increasing the quantity of production. Intensified management can also give better quality products and more control over the timing of production. So, as demand/prices increase, so do the rewards for intensified management. If the NWFP is collected from land under communal tenure, there is potential for more intensive production in the forest, while cultivation is more likely where producers have access to individually held land and the species concerned is cultivatable. Intensively managed NWFP production systems may completely displace the natural vegetation within the management unit, as is frequently the case with bamboo (Fu and Yang, 2004). However, the impacts at the landscape or plot level are less clear for some of the less intensively managed cases. In most cases ecological and biodiversity impacts have not been measured or even estimated. Moreover, assessing impacts of this kind needs a clear understanding of the baseline situation.

Should the current management system be compared with a natural undisturbed forest? Or should it be compared with a degraded forest or even an agricultural field? In the case of the West African parklands, for example, diversity is certainly lower than in the original savannah vegetation. Nevertheless, the range of useful trees retained by farmers clearing their fields represents a much higher level of structural and biological diversity than the monocultures such as those of cotton which typically replace them when markets for the tree products decline (Boffa, 1999). The main constraints on successfully intensifying management of the wild resource are a good understanding of the biology and ecology of the NWFP species combined with secure tenure and good organisation. Mushroom collectors in Oaxaca, Mexico, for example, have zoned their communally owned land to prevent timber extraction or other land uses from damaging mushroom collecting areas. They have also trained harvesters to avoid litter removal, which has a negative impact on production, and to recognise different quality grades (Edouard *et al.*, 2006). Homma (1992) has argued that as intensified production increases, wild resources will be harvested to economic extinction, as the market will increasingly be supplied with cultivated material. This is illustrated by several cases, including woodcarving in Bali (Rohadi *et al.*, 2004), rattans in Kalimantan (Pambudhi *et al.*, 2004) and Vietnam (Quang, 2004), paper mulberry in Lao PDR (Aubertin, 2004) and mushrooms in Korea (Youn, 2004). Although industrial-scale NWFP cultivation may displace natural vegetation, as in the case of oil palm or rubber plantations, both originally collected only from the

forest, NWFP production can also be incorporated with other agricultural or horticultural production.

More recently developed multi-strata systems incorporating NWFPs are found in the humid lowlands of West and Central Africa. In Cameroon, *safou* (*Dacryodes edulis*) and other fruit trees are planted in high densities in cocoa and coffee plantations to provide shade for the commodity crop, as well as food for the family and an income at a time when no other income sources are available (Schreckenber *et al.*, 2002). Through selection of preferred traits, farmers in the region have improved the fruit and kernel size of *Dacryodes edulis* and *Irvingia gabonensis* trees respectively, apparently without jeopardising intra-specific diversity (Leakey *et al.*, 2004). In Oaxaca, Mexico, farmers say that enrichment planting of pita (*Aechmea magdalenae*) gives them a reason to retain the forest rather than convert it to other land uses (Edouard and Marshall, 2006).

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

3.5.2 Livelihood implications

The rationale for supporting NWFP commercialisation is often to improve the livelihoods of poor people, especially NWFP producers (Tieguhong *et al.*, 2009a,b).

By creating and capturing more value, it is expected that poor people will gain from improved income and employment opportunities. NWFPs are often the only source of cash income for people in remote areas, as is the case for incense harvesters in Bolivia (Enriquez *et al.*, 2006), and can be particularly important for women, for whom few alternative income-generating options may exist (Marshall *et al.*, 2006; Shackleton, 2006). Even where the absolute value of NWFP-derived income is not high, its timing may complement that of other activities, providing an income at critical times of the year and/or in years when other activities fail (Schreckenberg *et al.*, 2002; Shackleton, 2006). Despite these benefits, there is a real risk that the gains of increased commercialisation will not be captured by the intended beneficiaries.

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

Potentially more serious, many NWFPs represent important sources of ‘safety-net’ *i.e.* a resource that households can turn to in times of need, subsistence (*i.e.* for households’ own consumption) or cash (Tieguhong *et al.*, 2009a). Increased commercial trade can quickly lead to reduced access through over-exploitation and/or changing property rights, such that poor local people are left worse-off and more vulnerable. In the case of marula in north-central Namibia, for example, although the tree is widespread, one quarter of households do not have direct access to marula fruits and related products and rely on the goodwill of their friends and neighbours to share the resource. There is a risk, therefore, that commercialisation will lead to increased ‘privatisation’ of the resource and the exclusion of certain groups from the benefits (Wynberg *et al.*, 2003). This situation is well described by May (1986) with reference to the *babassu* palm kernel trade in Brazil. And where commercialised products have important local ritual or medicinal uses, increased exploitation to supply the market may lead to an erosion of cultural values and health. This may be particularly problematic for women, who frequently bear the brunt of the greater labour investments required by increased commercialisation.

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

Points to remember

- There is need for appropriate harvesting technologies to prevent post harvest losses associated with undeveloped, unsustainable and wasteful harvesting methods.
- National industrialisation strategies are necessary to add value to NWFPs based on good feasibility information, stable supply, and economic analysis. Exploitation processing and value addition should be guided by specific market needs, product specifications and standards.
- Trade certification by recognised bodies is important especially for exports to protect products from unfair competition. It also offers good framework for commercialisation.
- Commercialisation should be planned in a manner that does not lead to privatisation which excludes vulnerable groups (*e.g.* women) from benefits.

Questions

1. Do you believe that non wood forest products will always be available and harvested at any time to satisfy the needs of the communities?
2. Elaborate on how commercialisation of non-wood forest products in the wild can jeopardise the sustainability of the forest ecosystem. Propose alternatives to sustain the business.
3. Using specific examples, describe how NWFPs are harvested. In which ways do you think harvesting can be improved? For the specific examples chosen propose post-harvest technologies (handling, processing, storage) that would add value to the product.
4. Give examples, if any, of processing of medicinal plants in developing countries (*e.g.* in Africa) and describe product isolated and for what purpose.

5. Why are standardization and certification necessary for the proper commercialisation of NWFPs?
6. How much do you know about the regulations for commercialisation of NWFPs in your country? Give examples of products under certification.
7. What are the key issues to be addressed in the development of certification programs for NWFPs?
8. According to you what could be the implications of the commercialisation and utilisation of NWFPs on the forest ecosystem and people's livelihoods?

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4

Marketing and Commercialisation of Non-Wood Forest Products and Services

The development of the NWFPS business requires a thorough knowledge of the marketing and commercialisation system, and how local people value forest ecosystem's resources. The value of NWFPS is determined through ethnobotanical approaches which reveal how local people conceptualise and use resources available to them. Commercialisation of non wood forest products is then seen as a way to generate or diversify income for the communities. Commercialisation of non-wood forest products happens at three levels (locally, nationally, and internationally) and targets various niche products such as fruits, natural honey, mushrooms, aroma chemicals, and phytomedicines. Most of these products are exported to Europe, United States of America, and Japan which represent the three main markets of NWFPS in the world. Although important products are traded in Africa, statistics are usually rare to appreciate quantities and types of products traded. This can be overcome through the improvement of NWFPS' value chain. Similarly, there is enormous potential in developing a market for environmental services such as biodiversity conservation, carbon sequestration, watershed protection, and landscaping whereby actors using or receiving the services should pay for doing so. In this regard, an effective compensation/payment system should be developed.

4.1 Introduction and definitions

Marketing provides a set of tools with which people can create, more efficiently, economic value for the resource and products made out of it. In the socio-economic context of forestry, marketing is one of the means, in combination with processing and resource management, to cater for the needs of people. Unfortunately, poor recognition of the role of marketing is clear in most NWFPS activities. Planners and operators in this sector are more involved with issues of the resource, processing and community development than with those related to identification of potential markets and developing appropriate marketing approaches to take full advantage of them. To better guarantee success, all economic activities related to NWFPS should start from the markets, their needs and wants. Proper marketing also assists in a more equal distribution of the economic value created among the marketing actors. It is therefore vital to medium and large-scale industrial enterprises, as well as to small farming and forestry communities to move from a subsistence economy to one in which they can

start and sustain profitable enterprises on their own. In sustainable forest utilisation, marketing provides a means for maximising the values and distributing them among the different actors in forestry activities. It is closely linked to processing which converts the resource into marketable products. In this chapter marketing is discussed with specific reference to NWFPS, but also recognizing that other elements that are equally important for sustainable utilisation.

Lintu (1995) define marketing as “an information-based technology which is at the disposal of producers to (i) identify market opportunities in the form of market needs and wants; (ii) analyze competition; (iii) develop appropriate approaches to reach the markets; and (iv) to make a profitable income”. It uses a mixture of basic factors comprising product, channels of distribution, promotion and price by which it satisfies the needs and wants of the customers in the markets. Marketing operates in an environment which is created by economic, social, cultural, technological, political, regulatory, legal, institutional and infrastructural factors, all of which are beyond the control of the individual actors in marketing.

NWFPS comprise such a varied group of products and services that meet the needs and wants of many end-users. Some of the products are marketed and consumed without any major processing (*e.g.* fruits, berries, mushrooms, etc.); others are marketed as raw materials for industrial processing; others as materials for furniture and crafts (*e.g.* rattan furniture).

In discussing NWFPS marketing one needs to be cautious in defining the context in which the discussion takes place. Does it concern marketing of products gathered from the forest to the first processing stage, or marketing of primary processed products to the secondary processing stage, or marketing of secondary processed products to further processing stages or final consumers? These are basic questions which have to be asked in order to identify the kind of marketing approach. 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 resources managers, processors, and end users. To understand marketing, it is crucial to understand the basic cycles of "processing-product-marketing" chain which follow each other in taking the forest products from forest to final consumer. The discussion in this chapter will concentrate on two levels of the "processing-product-marketing" cycles, *i.e.* from the forest to primary processing / consumers and from primary processing to secondary processing / consumers. The chapter considers 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. Before we further develop the commercialisation system of NWFPS, it is essential to highlight some Ethnobotanical aspects of the same.

4.2. Ethnobiological aspects of NWFPs.

Considering that most NWFPs are often associated with traditional uses that are not widely known, the discipline of ethnobiology (*e.g.* ethnobotany, ethnozoology) becomes very relevant to students. Ethnobiology is the study of how people of a particular culture and region make use of indigenous plants or animals. Ethnobiologists explore how plants/animals are used for such things as food, shelter, medicine, clothing, hunting, and religious ceremonies.

The aim of ethnobotany is to study how and why people use and conceptualize plants in their local environments. The two questions mostly asked are (1) how and in what ways people use nature; and (2) how and in what ways people view nature. Ethnobotanists gather data mainly from living people in the hope of gathering information of the past existence and use of these plants, as well as an understanding of present uses of plants for food, medicine, construction materials, and tools. Ethnobotanical research can be a door into cultural realities, as well as a way to understand the future of human relationships with this land we call Turtle Island, Bear's Back, and the Earth. Specific guidelines exist for conducting ethnobotanical research (Alexiades, 1996; Adjanohoun *et al.*, 1989; 1994) and analysing ethnobotanical data (Höft *et al.*, 1999). Ethnobotanical methods are important for studying NWFPs since they are less expensive and more efficient in the discovery of new active compounds from plants (Balick, 1990; King *et al.*, 1994; Cotton, 1996). Also, ethnobotanical methods facilitate the establishment of a suitable framework of collaboration between the managers (foresters) and local communities (Sow *et al.*, 1996; Cotton, 1996; Betti 2001).

When conducting research on traditional use of medicinal plants with view to discover potential active compounds, it is important to start by asking the single question: is the plant indicated by the informant the real one that he uses in his/her practice of traditional medicine? For that Betti (2001) proposed several ways of gathering and analysing data as to get meaningful results. The inquiry sheet proposed by Betti (2001) for gathering first hand information on the traditional use of medicinal plants is composed of five groups of elements including: (1) the identification of the informant (names, age, gender, locality, ethnic group), (2) ailments (diseases or symptoms, physiological effects), (3) characteristics of the plant material (vernacular names of the plant, morphological type of the plant used, plant part used, state of development of the plant part used including young leaves, old or dried leaves, locality / biotope of harvesting, mode of harvesting, etc.), (4) the mode of preparation and administration of recipes with precision on the solvent and the role of the associated plants, and (5) remarks. It is important to conduct inquiries among many informants and in different periods as to examine the similarities of uses in space and time. Ethnobotany has shifted from mere listing of plant uses to more quantitative analyses of information gathered through surveys (Box 4.1).

Box 4.1 Essential of Quantitative Ethnobotany

For millennia, humans have been using plant products in their daily needs such as food, shelter, medicine. The study of this use of botanical products by communities started some decades ago with the assessment of the diversity of plants used. For a long time these studies had focused on list making and lacked methodological rigor (Reyes-García *et al.*, 2006). Thus, the growing interest in applying quantitative tools to the field is to fill in this gap and make the results statistically robust.

Definition of terms

The term **ethnobotany** was used for the first time by Harshberger in 1896, and was limited to “the study of plant use by indigenous or traditional peoples”, omitting the interaction between people and plants (Bennett, 2005). Etymologically, the term comprises two words, **ethno-** (referring to people, culture) and **botany** (study of plants). Its use in this chapter refers to the study of the traditional use of plants by humans, and their associated knowledge and interactions, be it ecological, social or cultural. This knowledge could be related to the diversity of plants used and local classification systems, the range of products extracted by the community of a village, a country, or a region, and/or the ways people use the products, the changes occurred and the information sharing systems from one generation to another. Ethnobotany is the second branch of **ethnobiology**, the other branch being **ethnozoology** (study of the use of animal resources by communities).

Ethnobotanical research and quantitative methods

The scope of ethnobotany is generally broad and tools and methods to test hypotheses are usually borrowed from a range of disciplines such as ethnography, anthropology, sociology, geography, economics, and natural sciences (Bawa and Godoy, 1993). The types of goods extracted from the natural habitats by human have been classified into timber and the non-timber (or non-wood) forest products (NTFPs/NWFPs). Ethnobotanical research covers all plant resources used by people, be they NWFPs or not. At the centre of ethnobotanical studies are plants and human beings. This justifies the application of several disciplines to better understand the history of plant use by humankind, how resources are used, and the interactions between human and nature. However, there have been few systematic attempts to measure the value of natural resources to rural households and many questions have remained unsolved: who depends on plant resources? What are the gender implications? How much are the resources depleted? What might happen if the resources disappear? (Cavendish, 2002).

To answer these questions and analyse the sustainability of the resource extraction, ethnobotanists have moved from the classic ethnobotanical inventory (simple listing), severely criticised to be lacking methodological rigor (Phillips and Gentry 1993a; Bennett 2005, Reyes-García *et al.*, 2006), to quantitative ethnobotany with statistical hypotheses testing. Since Prance *et al.* (1987) there has been an important development of quantitative methods and the progress in the field is described by Phillips and Gentry (1993b). Thereafter, different approaches have been developed by researchers to quantitatively describe and analyze patterns of use and valuation. Mainly methods have been applied to evaluate the importance of taxa, families, vegetations, landscapes, partial or entire flora to one or more ethnic groups, communities, people; to compare the uses and valuation of the same by

different ethnic groups, in the same or different regions. More robust methods are progressively being developed to provide policy makers with high quality information to impact on conservation and development. Quantitative ethnobotany can be defined as "the application of quantitative techniques to the direct analysis of contemporary plant use data" (Phillips and Gentry 1993a). Herein the use of the term **quantitative ethnobotanical methods** refers to numerical approaches used to assess the use of plants by communities. This addresses, for instance, the diversity of plants used, value assessment, resource mapping and quantification.

Quantitative ethnobotanical methods in NWFP studies

As depicted above, the main field of application of ethnobotany has been in the study of plant resource use by communities. More prominently, the use of quantitative methods helped to reveal the importance of NWFPs which were overlooked over decades by both scientists and policy makers. With quantitative ethnobotany the economic value of tropical forests was revealed (*e.g.* Schreckenber 1999; Shackleton and Shackleton 2004; Lawrence *et al.*, 2005) and new insights demonstrated that conservation through use is possible for tropical forests (Altieri and Merrick 1987, Appasamy 1993, Ganesan 1993). More importantly, concerns have increased for the inclusion of non-market values in the estimation of the total value of forests and other important vegetation types where NWFPs are sourced (Campbell *et al.*, 1997; Brehm *et al.*, 2010). In some regions of the tropics, researchers found the necessity for the combination of quantitative ethnobotany with pure ecological tools to produce data that enabled the comparison of the net productivity of the ecosystems to the annual amounts extracted (Ganesan, 1993).

The use of quantitative ethnobotanical methods offers two advantages: 1) it allows the replication of studies and 2) permits statistical tests. Areas of investigation include for instance: market and economic studies (Cavendish, 2002; Avocèvou-Ayisso *et al.*, 2009); valuation studies to estimate local importance of species, plant families or landscapes (Wong *et al.* 2002a,b; Lawrence *et al.*, 2005, Shackleton and Shackleton, 2004, Vodouhê *et al.*, 2009) ; identification of conservation priority species to the local dwellers (Kristensen and Lykke, 2003; N'Danikou, 2009), community perception studies on forest resources conservation and utilisation (Gaoue and Ticktin, 2009; Vodouhê *et al.*, 2010); comparison of the diversity and use patterns across socio-linguistic groups or ecological zones (Achigan-Dako *et al.*, 2011). The different methods developed have been inspired from those applied in economics, social and natural sciences. The main tools borrowed from the economics and social sciences are the ranking and scoring of resource units (*e.g.* commodity groups, species, families, vegetations, landscapes), by socio-cultural groups or geographical entities to generate quantitative data suitable for statistical analysis (Wong *et al.*, 2002a,b; Kristensen and Lykke 2003; Maraseni, 2008). Quantified data and analysis with ranking and comparison procedures (simple preference ranking, direct matrix ranking, pair wise comparisons, use value analysis and resource evaluation, relative importance and cultural significance values) provide in-depth and useful information for planning conservation and promotion of NWFPs. Economic approaches have been used to gather quantitative data on marketable NWFPs, the revenues generated, their contribution to household income and the profitability analysis within the value chains (Maraseni *et al.*, 2006, Avocèvou-Ayisso *et al.* 2009). Also forest inventory and economic tools are combined to quantify resources available in the natural

ecosystems and determine the sustainability of exploitation.

Quantitative ethnobotany methods are still in development and the main criticism on the robustness of results remains. The data produced through the different quantitative ethnobotanical methods are hardly suitable for parametric statistical tests. Mostly, just a number of non-parametric tests can be applied. There is also a lack of theoretical basis (Bennett, 2005).

4.3 Valuation of NWFPs

Natural resource valuation comprises a suite of techniques aimed at putting monetary values on natural resources as a means of demonstrating their worth. There is a range of applications of natural resource valuation, but the ultimate aim of many is to promote sustainable use of the resources and prevent degradation. Natural resource valuation however enables assessment of alternatives by using a common currency and assisting decision-making regarding policy frameworks and in the allocation of scarce resources. Few studies have however focused on tropical savannahs, in recent times. There have been several case studies that placed monetary values on secondary resources from woodlands and forests (Peters *et al.*, 1989; Butler, 1992; Chopra, 1993; Campbell *et al.*, 1997; Shackleton and Shackleton, 2000). Thus the monetary valuation of secondary woodland and forest products could be an effective incentive for conservation, and reducing land-use and land-cover transformation.

The value of NWFP harvesting, like that of wood harvesting, is an indicator of the contribution of forests and woodlands to national economies. It also indicates the contribution of the sector to poverty alleviation, since these products are mostly collected by relatively poor people living in rural areas. Unlike the case of wood products, the bulk of production and consumption of NWFP is for subsistence; thus the transactions of NWFP take place outside the formal and organised markets. In such cases, national accounts and other statistical systems can accept estimates based on other valuation methods. The number of people benefited, or the imputed value of unreported consumption of NWFPs such as fodder/forest grazing, traditional and herbal medicines, non-wood construction materials, food and edible products from wild sources, are acceptable as a basis for estimation. There have been increasing number of attempts to improve and make use of economic techniques to value the externalities; and different techniques are being tried in different situations.

Although availability of information on the value of NWFP exploitation appears to be problematic, it should be noted that values are likely to be zero (or close to zero) for many of the products in many countries. People's opinion on NWFPs, the importance they subscribe to them and their attention for them, and so on, is the value people give them. Steinhoff (1980) made a useful distinction in presenting two meanings: "(a) a value is an attitude which results in the value of a thing; (b) the value of a thing is its worth in relation to other things."

Three kinds of values can be identified: held, assigned and intrinsic value of objects (Brown and Manfredi, 1987). Held values can be viewed as precepts and ideas held by an individual about something, whereas assigned values can be viewed as the relative importance or worth of something. Held values are concepts about objects, and assigned values focus on and indicate the worth of the same objects. The intrinsic value of objects on the other hand is defined as values 'not being assigned by humans but rather are inherent in the object or its relationships to other objects'.

The most used approach is to value them by their function. Economic values, held and especially assigned, are the values generally associated with production, consumption, and exchange of goods and services. Held values can be distinguished into (i) cultural values: those held values that build up a culture, sometimes referring to ethics and other unwritten rules; (ii) societal values: focus on those held values relating to social relationships among people such as family, social cohesion, and community use values and (iii) psychological values: related to the benefits that one perceives from the object value. Objects might be valued because they enhance personal well-being. (iv) physiological values: associated with objects if they lead to the improvement of health and functioning of the human body *e.g.* walking in nature provides exercise and reduces stress.

Considering NWFPs, people feel a need to classify them based on their value or function. The total value a forest generates, comprises of timber products and non-timber products and services. Economic value associated with forests can be classified into four categories: i) direct use values (including consumptive and non-consumptive use values); ii) indirect use values; iii) option values; and iv) the existence and bequest values. The 'total economic value' of the forests, is an aggregate of i) total use value; and ii) total non-use values (Fig. 4.1). Products are tangible outputs that broadly constitute the consumptive use of forests. Services are broadly intangible and constitute the indirect, option and existence values.

Direct use values are distinguished into wood forest products and the NWFPs. Indirect, option and existence use values constitute the forest services defined by their non-consumptive nature (Fig. 4.1). People may value the option to use a forest in the future. Although such values are difficult to measure in economic terms, they should be recognized in valuing the contributions of forests to human welfare - a concern that promotes the conservation and preservation of forests. On the other hand, people may value a forest purely for its existence, without any intention of using it directly in the future. People may also value a forest as a bequest to their children. This teaching compendium is concerned with the non wood forest products and services.

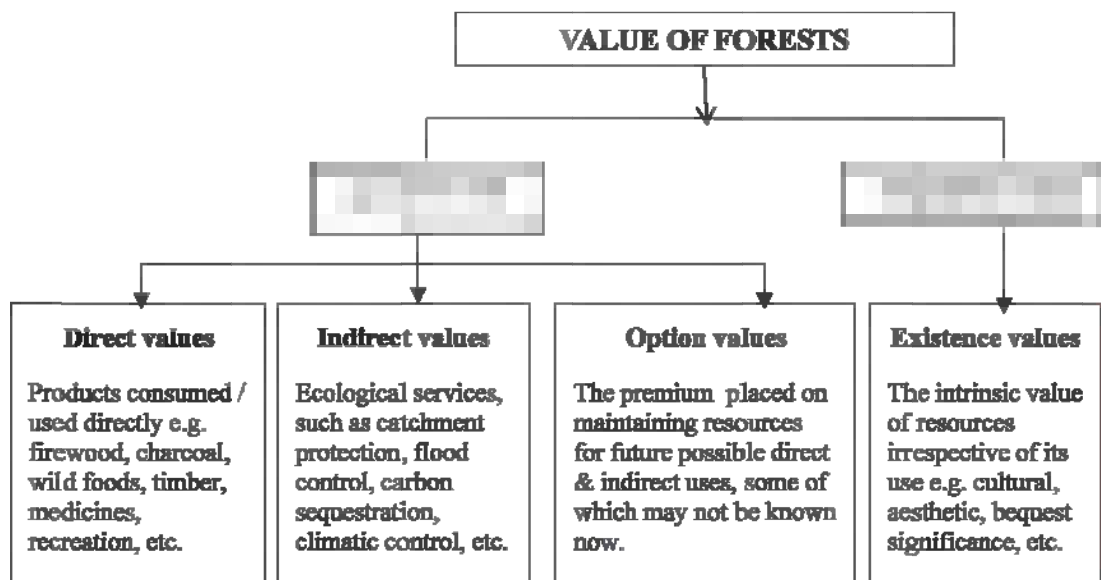


Figure 4.1 Total Economic Value of Forests (FAO, 1995a)

In line with Figure 4.1, Saastamoinen (1998) further described the different categories of forest values including: (i) market values (these are the values of marketed goods and services); (ii) value of household consumption (these are the values of marketed goods and services directly used in households); (iii) recreational values (these are the values linked to recreational activities); (iv) indirect use values (which are the ecological effects of forests such as protection against erosion or carbon sequestration); (v) option values (which define the option for future use of environmental benefits and reflecting uncertainties on factors influencing demand and supply of environmental benefits); (vi) existence values (which refer to an environmental asset, unrelated to either current or optional use); and (vii) value of damage (which define the internal damage (damage caused to one forest use by other forest uses) as well as external damage (adverse impacts to other human activities and uses outside the forest system)).

The total economic value of forest is the sum of all these values. However, only a couple of them can be expressed directly by a common unit, the market price; and they are the market value, the value of household consumption and some portions of the damage value of forest products. The non-market values are more difficult to quantify. There are methods to do so, e.g. willingness to pay/accept and travel cost method (Glück, 2000).

Mantau *et al.* (2001) use the terms ERGS (environmental and recreational goods and services) and RES (recreational and environmental services) when describing forest products and services other than timber. These products and services are divided into three categories (i) Environmental products, e.g. clean air and drinking water, climate protection, but also biodiversity; (ii) Recreational products, e.g. recreationally

attractive nature areas with an entrance fee, mountain biking tracks and (nature) campsites; and (iii) Traditional products, *e.g.* harvestable goods like berries, mushrooms, Christmas decorations and natural products like organic meat from nature areas.

An example of practical valuation of such products and services is given by a complete survey of the economic value of land-based livelihoods, *i.e.* harvesting of NWFP and agro-pastoralism directly, used by the people of Thorndale in 1999, through which important principles and relationships were established (Fig. 4.2).



Figure 4.2 The monetary value of some NWFP per household per annum (Dovie *et al.*, 2001)

Every household in the village was involved in the harvesting of some NWFPs. With the aim of determining the precise contribution of all livelihood sectors to rural households, the relative value of land-based livelihoods was 57.5% as against 42.5% by cash income streams. This represented US\$1,665 and US\$1,228 per household, respectively across all households. The direct-use value of NWFPs to households was estimated at US\$559 per household per annum, representing 19.4% of total contribution by all livelihood sectors. The five resources that exhibited the highest direct-use values were fuelwood US\$311, wild edible herbs US\$183, thatch grass US\$75, weaving reeds and mats US\$60, and medicinal plants at US\$41 per user household. Other studies have reported similar important values (*e.g.* Ayuk *et al.*, 1999; Dzerefos *et al.*, 1999; Shackleton *et al.*, 2000a, 2000b).

4.3.1 Local importance of non-wood forest products

Although the importance of NWFPs is location-specific and dynamic, it is important to remember that the key to good forest management is to identify trends in use, not merely static facts. Suffice to emphasise that rural people apply NWFPs to multiple uses - 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). In such cases, harvests are restricted to meet the needs for religious or 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 (Uraivan, 1993).

Certain species may play a crucial role in spiritual ceremonies, or have taboos associated with them that forbid certain harvests. For example, in parts of 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 part in wedding rites, initiation ceremonies and other events. In many places, these cultural and spiritual roles are now losing their importance, but in other places they persist and are even renewed in the face of encroaching values from outside the community. For example, Table 4.1 demonstrates that in southern Ghana, people value intangible cultural and spiritual benefits from the forest as highly as physical products and services (Falconer, 1992). The figures in Table 4.1 illustrate the wide variation of local values within the same society, such that 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. Note that some people named more than one benefit as most important. Similar tables can be made and have been made for other countries.

Table 4.1 Valuation and ranking of forest benefits in eight villages in Southern Ghana

Benefit from forest	Villages								Total Ranking*
	Banso	Betinasi	Essamang	Nkwanta	Essuowin	Koniyao	Kwapanin	Nanhini	
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
No. of people interviewed	25	11	15	21	38	39	47	30	226

*No. of people ranking product first - all villages

Source: Falconer, 1992

4.3.2 The value of NWFP harvested

In 2005, the total reported value of NWFPs amounted to about US\$4.7 billion. Plant products accounted for about three-quarters or just under US\$3 billion. Among these, food had the highest value reported at US\$1.3 billion, followed by other plant products valued at US\$0.5 billion. Fruit, berries and nuts were identified as the main food products in most countries. Three specific products and countries accounted for the relatively high value of other plant product removals: *bidi* leaves in India, cork in Spain and manure in the Republic of Korea. Of the animal products, the reported value of bushmeat removals was by far the most important, with a value of US\$0.6 billion. At the regional level, Asia and Europe accounted for almost 90% of the total reported value of exploitation, with values of US\$1.7 billion and US\$1.8 billion respectively. In Asia, food was by far the most significant product, with a reported value of US\$0.8 billion, followed by exudates and other plant products (US\$0.3 billion each). In Europe, the reported value of bushmeat was US\$0.6 billion, followed by food valued at US\$0.4 billion and ornamental plants at US\$0.3 billion. The other regions reported minimal values for NWFP removals in 2005, owing to very limited availability of information. For example, the reported value of bushmeat outside Europe was only US\$5 million, which is likely to be an underestimate of the true value of exploitation in these other regions. Much of the bushmeat produced in

other regions is unregulated and/or illegal, so there are no official statistics and the product is not reported by countries. The reported global value of NWFPs removals in 2005 valued at US\$4.7 billion compares with a total value of global international trade in NWFPs of US\$11.0 billion in 2004. Although the latter figure includes some trade in processed NWFPs, international trade probably accounts for only a tiny proportion of NWFPs. Thus a comparison of these two figures suggests that the values reported here are an underestimate of the total value of NWFP.

There is lack of reported trends at the country level because very few countries provided statistics for all three years. Globally, it appears that the total value of removals increased from 1990 to 2000, then declined from 2000 to 2005. At the regional level, the reported value of NWFPs increased significantly in Asia from US\$2.0 billion in 1990 to US\$3.4 billion in 2000 and increased very slightly in Europe from US\$1.5 billion in 1990 to US\$1.6 billion in 2000. However, these trends may not be very reliable, given the small proportion of total NWFPs covered by the information. For the same reason, reliable trends for the other regions cannot be derived from the small number of reported values.

The availability of information is very low for both the amount and the value of NWFPs. However, given that NWFPs can have an impact on large numbers of poor people, there is great interest in this type of information; for example the current interest in the contribution of forests to poverty alleviation and achievement of the Millennium Development Goals in many developing countries. In view of this, it is recommended that countries continue developing ways to collect, estimate, and analyse this information with appropriate support from international partners.

4.4 Commercialisation of NWFPs

Developing the commercial extraction of NWFPs is often seen as a way to generate income for local communities while conserving biodiversity; consequently these form the two reasons or objectives for promoting NWFPs commercialisation (Belcher and Schreckenber, 2007). From the livelihoods perspective, NWFPs commercialisation, defined as increasing the value of a NWFP in trade, is expected to increase income and employment opportunities, especially for poor and otherwise disadvantaged people. This expectation is based on the well documented importance of many NWFPs in rural livelihoods (Tieguhong *et al.*, 2009; de Beer and McDermott, 1989; Falconer, 1990; Scoones *et al.*, 1992; FAO, 1995a); the emergence of new markets for natural products; and the development of new marketing mechanisms (green marketing, fair trade). From the conservation side, there has been much speculation that NWFPs commercialisation can provide opportunities for (relatively) benign forest utilisation and even create incentives for the conservation of individually valuable species and the environment in which they grow. The idea is that demand for products from a forest environment will translate effectively into demand for a forest.

4.4.1 What is involved in NWFP commercialisation?

To understand the implications of promoting NWFP commercialisation, the 'production-to-consumption system', in the context of what and who is involved or 'value chain', must be understood (Belcher, 1998). NWFPs are essential for the livelihood of forest dependent people and they have social, cultural and spiritual importance. The commercial issues related to NWFPs and discussed here focus primarily on markets and their role in the process of exchange and in assembling and distributing forest products in space, time, and form that is desirable to consumers. Commercialisation of NWFPs is important for several reasons:

- ▶ it enables rural dwellers and poor urban households to diversify their source of incomes, which in turn contributes to their food security and reduce their level of poverty;
- ▶ it increases the economic value of NWFPs thereby increasing the awareness and incentives for local communities to conserve many forests;
- ▶ at the local level, it increases rural employment, especially for women and minorities;
- ▶ it increases the awareness of decision makers and donors of the value of forest products other than timber, and therefore may encourage them to reorient their policies and approaches in a way that integrates both timber and NWFPs and;
- ▶ it provides more opportunities for regional trade within Africa and between Africa, Europe and North America.

Marketing is essentially a 'soft-ware-based' function where knowledge and information are important ingredients along with attitudes and skills of those who are involved in market development. Production and product marketing involve several loops forming a chain from commodity production to marketing of consumer products. Although primary producers are influenced by all the repetitive loops, they usually manage only the first loop. It is essential to know well enough the whole chain of these loops and one's own position in the full chain, as well as the particular role and importance of the NWFP concerned in the final product, to claim, and justify getting, a "fair" share of the total wealth created between the extraction of the NWFP and the sale of the final consumer good. The need for an appropriate marketing information system for NWFP is crucial.

4.4.2 Marketing practices

Descriptions of marketing practices are too often limited to portraying it as a physical activity of haulage, sorting, grading, packaging, storage, display, etc. Despite the fact that ultimately the buyer is directed by the values which are provided through the physical activities, value-based descriptions of marketing practices are really rare.

The marketing of NWFPs used as raw materials in industries normally takes place in two main stages:

- ▶ the marketing of raw material, *i.e.* from the gathering stage until it reaches the industrial user as a raw product; and
- ▶ the marketing of the semi-finished or finished industrial or finished consumer product either to other processing industries or to final consumers.

The first stage is mainly carried out in the producing, developing countries with less-developed marketing organisations, while the latter is carried out in the consuming, industrialised countries with modern marketing organisations.

4.4.3 Marketing information

Marketing is a largely information-based (or "soft") technology operated on the basis of information about markets, means for accessing the markets, competition and business environment. Efficient marketing relies on a well-functioning marketing information service that provides necessary quantitative and qualitative information regularly, reliably, timely and at a lowest possible cost. This is more so for those at the production end of the marketing chain who often do not have access to information (FAO, 1995b).

Information needed on the markets include: demand, end-uses, supply; marketing factors such as products, distribution channels, promotion and prices; competition, marketing environment comprising social, economic, political, technological, regulatory, legal, cultural, infrastructural factors; and institutions related to marketing. In the case of NWFPs, systematically collected, analyzed and disseminated information is seldom available except for a few selected products and markets.

For an efficient collection of data and information, a well-defined classification of products is essential. Equally important is the need to identify and classify the end-uses in different markets to which the individual products can be sold. Unfortunately, the demand for many NWFPs is derived, *i.e.* the final consumption takes place after a great number of successive loops in the production-product-marketing chain. Better understanding of the actual needs and wants of the customers in the market requires learning about the specific values that customers associate with the products offered.

An important means to collect market and marketing information is through market and marketing research. Detailed information of end-uses of individual NWFPs and

means for accessing the markets have to be obtained through specific marketing studies which are needed to analyze the flow of raw materials from the gatherers of NWFPs to the primary processing industries. Further, information is needed on market opportunities and means for accessing the markets for products from the primary processing industries. Information from such studies can be used for planning and operation of marketing activities, including components of marketing, such as product development, pricing, promotional policies, and marketing and delivery channel development. In developing information systems, especially for small-scale enterprises and community forestry systems, two critical questions should be asked: How sophisticated do the information systems have to be? Can the truly small enterprises afford the information systems?

4.4.4 Markets of non-wood forest products

Because of the variety of non-wood forest products, ranging from fruits and food to aroma chemicals and phyto-pharmaceuticals, the markets for them show corresponding variation: bartering in subsistence economy, local village markets, large city (national) markets and international markets. Markets for NWFPs range from simple local village level consumer markets to urban, national through to the most sophisticated international industrial niche markets in numerous end-use sectors both in developed and developing countries. Some of the products meet bulk demands *e.g.* edible nuts, resin and others need specific niches such as special types of honey, aroma chemicals. Some non-wood products are not traded but only collected and consumed.

From the marketing point of view, markets are comprised of their geographic location, end-uses, and customer needs and wants in the end-uses, and the buyers. Geographically, markets for most of the internationally traded NWFPs are in industrialised countries in Europe, Japan, Oceania and North America. There are also large domestic markets in the producing countries themselves, both in the developing and industrialised regions. Information on the geographic markets is mostly in the form of trade statistics which are, however, incomplete and only seldom allow worldwide assessment of the size and importance of markets.

In terms of end-use, the markets for non-wood raw materials and primary processed products are extremely varied, even for the same products. The end-uses for primary processed products are extremely numerous. The main end-use sectors served by non-wood forest raw materials and primary processed products include: cattle and other animal raising, food industry, pharmaceutical industry, fragrance and flavour industries, dye and colorant industries, insecticide industries, industrial chemical industries, furniture industries, building and construction industries, religious ceremonies, among others. Market information is very seldom available by end-uses.

From the gatherers' point of view, the markets are the middlemen and the government-operated buying organisations. The markets for gatherers are also the

village or town markets where they sell or barter their products directly to the consumers. In terms of marketing, the basic questions the gatherer/producer needs to analyse when starting any NWFP-based marketing activity include: (i) what are the potentially marketable products available? (ii) what and where are the markets for those products? (iii) who are the competitors in supplying the markets? (iv) what are the specific strengths of the producer/gatherer in supplying the markets in relation to the competitors? (v) what are the means to get to the markets in competition with other suppliers?

In marketing, it must be appreciated that once a market is lost, it is often difficult to regain it fully. This is illustrated by the case of gum *arabic*. Gum *arabic* sales had increased throughout the 1960s, reaching a peak around 1970 at approximately 70,000 tonnes. But the severe Sahelian droughts of 1973-74 led to a world shortage and high prices. This resulted in an impetus for some major users to shift to the newly developed modified starches. Consequently, annual sales of gum *arabic* never exceeded 40,000 tonnes again. A further disruption in supplies forced many more companies to shift irreversibly to reformulations of their products based on synthetic products. Sales could not exceed 20,000 to 24,000 tonnes per year, even after adequate gum *arabic* stocks became available in 1986. Nonetheless, despite steadily decreasing demand over the past 15-20 years, gum *arabic* still remains a major natural exudate of commerce (Anderson, 1989). The above situation is different now. Increasing health consciousness and aggressive market promotion campaigns since the mid 1990s to early this decade has increased demand to around 100,000 MT and current supply is slightly over the 70,000 MT per year.

4.4.5 Evaluating NWFP markets

Good marketing involves getting information about which values a particular market seeks, and making one's product more desirable than competing products based on that information. Each market place involves different influencing factors relating to the product, promotion, and price. For example, selling herbal medicine in a local market may not require packaging and classification into broad quality categories, and usually transport costs are low. 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 recognise from the start that it is not financially or ecologically feasible for them to expand their market. However, marketing the same product in a city can require precise identification of quality standards, more sophisticated packaging and advertising, and incorporating significant transport costs into the product's price.

In many countries, urban markets for traditional rural products are growing as people move to the city while at the same time retaining rural customs. A case in point is

that markets for traditional forest-based medicines in Indonesia have grown; with the number of companies producing these items having 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. 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. 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 4.2 presents several methods for evaluating markets. Producers should also talk to private firms and NGOs that have experience in marketing related products, development agencies, universities and other information clearing houses.

Once an enterprise has learned about a prospective market and its requirements, it should further narrow the scope to a target market (ATI, 1995). 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, would be willing to pay a higher price for morels that have been cleaned (Iqbal, 1993).

4.4.6 Key factors in marketing non-wood forest products

There are four essential factors that producers need to understand in selling their products. These are designated by the "Four P's" – the product, place, promotion and price. Producers should determine these factors at the beginning of developing 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, 1995).

Table 4.2 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.

Source: ATI, 1995

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. These values vary depending on how the product is marketed (Lintu, 1995). In the case of NWFPs, the first question that a producer would ask is: is the product already established in the market or not? In general, established products involve less risk than new products and more marketing information normally exists 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 include: 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

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.

Promotion

Promotion involves advertising or other ways of raising purchasers' awareness of the product. In rural markets, word-of-mouth recommendation is often the most effective promotion. Urban and national marketing will most likely require more formal campaigns. New products, or established products in new niches, require more resources for their 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. 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, like the local availability and cost of raw materials, including packaging; cost of equipment and operations such as maintenance and repair needed to produce the item; labour costs; infrastructural costs of energy, workshops and storage; costs associated with maintaining market specifications of quality for example, inspectors, testing equipment; distance to target markets and the attendant transportation cost; costs of product marketing, promotion, distribution; costs and benefits of using intermediaries; financing costs such as loan repayment, and the volume demand (ATI, 1995). 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.

4.4.7 Marketing structures and their limitations

There are three main types of producer channels. Producers can operate individually, or with the assistance of middlemen or through cooperatives. Generally it has been observed that commercial NWFP producers sometimes sell their products themselves at local markets or sell to merchants and even may exchange them for manufactured consumer goods. In most cases the goods are sold at small markets or to middlemen. However intricate chains of intermediaries, village traders, wholesalers and exporters do exist (Neumann and Hirsch, 2000).

Marketing individually

A producer marketing individually represents a small competitor individually controlling meagre resources. This limits producers' bargaining power in the market, which is further weakened by a poor financial position and inability to keep up with rapid changes in market conditions. The small size of surplus marketed by producers makes it difficult for them to sell to companies interested in bulk purchases. Producers are generally unaware of markets for their produce, and in some instances even when they are aware, they do not know how to market their products. This ignorance is perpetuated by a lack of information on markets and prices. Producers sell to whoever wants the products at prices usually set by the buyer. Each producer makes non-systematic independent decisions which are not planned. They thus lose out to unscrupulous traders.

Marketing through a middleman

Intermediaries or middlemen play important roles in marketing of forest products. In many places, they (i) provide producers market information on prices; (ii) can supply quick credit, quick and non-bureaucratic payment for products and good organization (Pswarayi-Riddihough and Jones, 1995); (iii) are essential for centralizing supply among dispersed producers; (iv) help absorb risk in markets that require product volumes too large for individual producers to provide *e.g.* industries for gums, resins and essential oils; and (v) provide essential services for commodities that require time, storage, space and energy inputs, for example products that must be dried, stored, transported, processed and packaged before distribution. In many cases these commodities are sold and bought several times, adding value at each step, before reaching the consumer. The technology and finance to perform these functions are usually beyond the reach of low-income producers and are left to middlemen who have the resources. Often, producers sell through middlemen for want of a better marketing system.

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. It has been observed that there are high levels of exploitation of poor and politically powerless extractors of NWFPs (Neumann and

Hirsch, 2000). This is attributed to often-complex set of social relations that structure marketing chains in tropical forest settings. As a result the marketing networks created there are often more inequitable in the distribution of income. However it has been observed that relationships between producers and middlemen though often exploitative, they are not always so. On other hand, elimination of middlemen would not necessarily be economically beneficial to producers in all cases, or in any case the benefits may not be as large as they appear before taking costs into account. Many intermediaries perform critical tasks, bear significant costs and expose themselves to great financial risks (Neumann and Hirsch, 2000). It is important to note that traditionally, the supply of NWFPs has thus involved networks of local collectors and intermediaries bound by long-term, often debt-based, relationships. It is a trader-dominated system, and is often exploitative and not supportive of sustainable development and the birth and growth of enterprises (FAO, 1995c).

Producers can avoid unfair exploitation by middlemen by: (i) educating themselves about market conditions; (ii) organising themselves into groups for greater collective strength; and (iii) pressing for market channels that are transparent, that is, traceable in terms of transactions and profit margins.

Marketing through cooperative movements

Although cooperatives are in operation in many countries, there are four major deficiencies about them. Most of them lack (i) strong leadership (ii) group homogeneity to ensure a common view on problems and rapid identification of correction measures; (iii) planning on long-term goals of the cooperative; and (iv) government support needed at the initial stages of a cooperative. However, if producers' cooperatives or associations are promoted, small-scale producers can be helped to gain access to information, greater negotiating strength and economies of scale to be competitive with larger enterprises. In addition this will also call for strong policy support and regulatory instruments to correct market imbalances and distortions (FAO, 1995c).

4.5 Trade in Non-Wood Forest Products

Trade in NWFPs occurs at three levels: local, national and international. In Costa Rica for example, products from the bitterwood tree (*Quassia amara*) are marketed in local markets as a medicinal substance, national markets as processed 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. For instance, consumers in an industrialised 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 on the other hand may

purchase the same basket for its functional value, or if cheaper than plastic baskets, for its economic value.

The Brazilian Amazon region provides an example of the importance of NWFPs in regional trade. The total value of these recorded products obtained by gathering and traded in the Brazilian Amazon amounted to US\$110 million in 1987. The trade was composed of a number of different products. By order of importance they were: *acai* (US\$42 million), *babassu* (US\$22 million), rubber (US\$20.7 million), palm-hearts (US\$11.8 million), Brazil nuts (US\$9 million) and *sorva* (US\$1.2 million). They are followed by several other products with values less than US\$1 million each, comprising: gums and waxes (*balata*, *licuri*); fibres (*buriti*, *piacava*, *tucum*); oils (*andiroba*, *virola*, *licuri*) and medicinal plants (*jaborandi*, *ipecauanha*, *timbo*) (Vantomme, 1990). Similar examples from Africa are on gum *arabic* from Sudan (Fig. 4.3).



Figure 4.3 Volume and value of exports of gum arabic from Sudan, 1980 to 1990 (FAO, 1993a)

Also similar examples from Asia are on rattan from Indonesia, Malaysia and the Philippines (Fig. 4.4).

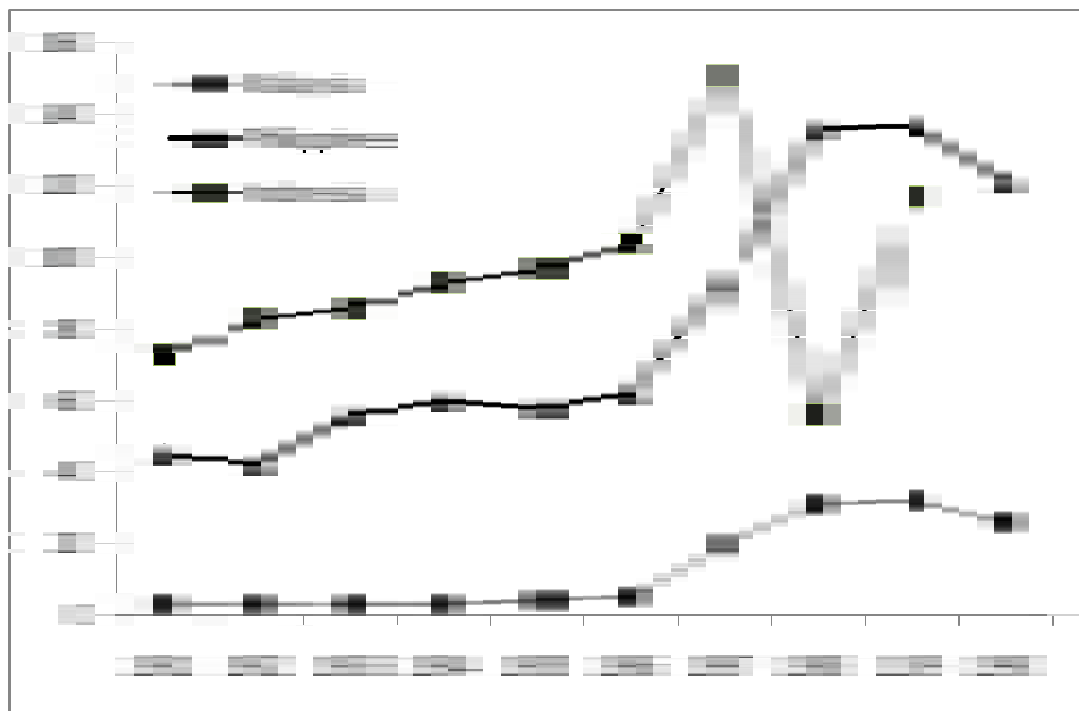


Figure 4.4 Value of exports of rattan from Indonesia, Malaysia and the Philippines (million US\$; FAO, 1993a)

4.5.1 Local and national trade

Local trade, although relatively small in quantities and values in case of individual products and producers, is often of vital importance to local communities by allowing increased efficiency in resource utilisation, opening up outlets for producers/gatherers with excess production and thus providing cash income to them and others involved in selling and distributing the products. Unfortunately, quantification of the local trade is extremely difficult due to its sporadic nature and because only a part of it is monetised and recorded. Some efforts on a case-by-case basis have been made to measure local trade using sample surveys. Some local markets can, however, be described as industrial markets. For instance, strong demand for fruits in local markets is often propelled by fruit processors, such as syrup and concentrate manufacturers, ice-cream makers, fruit juice makers, and jams and preservatives manufacturers (Raintree and Francisco, 1994). The aggregate of a large number of NWFPs and their individual producers makes local and national trade in many cases more important than their international trade. In order to assess the volume and

reliability of potential supply, an analysis of what determines the marketable surplus is important.

With the increase in economic well-being and shift to monetary economies, factory-made products increasingly erode the local markets for NWFPs in their traditional uses. Under these circumstances, the contribution of trade of these products to local economies start, depending on national and international markets which can change the product range demanded and the marketing approaches applied. The process of exchange takes place in village markets between the gatherers/producers and final consumers. The barter and customary sharing of products which still exists at the local-level trade will gradually be replaced by money-based exchange systems. In India, for example, local-level trade is important particularly to forest dwellers, some of whom still depend entirely on the forests. About 60% of production of NWFPs in India is consumed by about 50 million tribal people where NWFPs are estimated to constitute about 10 to 40% of tribal household earnings, even though collection of a single NWFP from existing resources is not able to provide enough income to sustain people. Thus, different NWFPs in different seasons are collected and marketed to ensure sustained income.

According to a study from the Philippines, no less than 46% of the total multipurpose tree products production, which includes many NWFPs, went for home consumption while 10% was given away to neighbours and relatives. Only the remaining 44% was sold. This implies that small producers catered more for family consumption on a subsistence level than to markets (Raintree and Francisco, 1994). A significant part of local trade in NWFPs takes place through bartering. Trading activities are often conducted seasonally, when demand for agricultural or other labour is low. The rural poor especially rely on income from NWFPs in these periods when returns from other sources decrease. Considerations to improve local markets for NWFPs include for instance the fact that: (i) many NWFPs are not marketable; some are not marketed at all and some are only used locally; these non-marketable products are the link to socio-economic benefits/issues; (ii) if a market is created or a value is put on a product, it changes the local use of the product drastically, for example from subsistence to specialization; and (iii) more attention should be given to improving local markets (*e.g* by raising the level of awareness of policy-makers). This is so because local markets and related trade involve less risk than either national or international markets and that local NWFP markets, although often "invisible" in accounting records, are vitally important to local communities (FAO, 1995b). However, it is important to remember that the conditions by which many NWFPs traditionally benefit local economies, which are often household-based with diverse range of products and are seasonal and labour-intensive, tend to be disadvantages in efforts to gain wider markets and increased rural income. This requires creative management solutions.

There are national markets that support trade of NWFPs in specific countries, largely propelled by the increasing number and income levels of city dwellers, especially those who make these markets expand and require particular marketing approaches. People who have move to urban centres often maintain their cultural habits. Significant opportunities could be identified through appropriate market and marketing studies in these markets. More often, national trade of many NWFPs exists parallel to international trade of the same products. For example, the internal trade in medicinal plant material is, in many countries, often considerably more important than international trade. In the United States, for example, imports represent only a small percentage of the value of internal trade in medicinal plants.

4.5.2. International trade

International trade of NWFPs is composed of imports and exports of many products at different stages of processing. Exports of NWFPs are a significant source of foreign exchange earnings for several developing countries¹. Some 150 NWFPs are traded internationally in significant quantities, including cork, essential oils, forest nuts, gum *arabic*, rattan and plant and animal components of pharmaceutical products. An FAO study (FAO, 1995c) identified 116 items of NWFPs as commercially important in international trade. The study also found that about 500 to 600 different medicinal plants were entering the international trade then. The general direction of trade is from developing countries to developed countries. However statistical data on the production and trade of NWFPs is mostly indicative only. Most production and consumption takes place in the informal sector and is therefore not reported. Figure 4.5 gives some illustrative statistics on trade in several important categories of NWFPs.

Country trade data generally do not differentiate between wild-gathered or domesticated resources. Bearing these caveats in mind, it has been estimated that world trade in NWFPs could be roughly US\$11 billion. Suffice to emphasise that international markets for NWFPs are sophisticated and involve more risk, particularly since NWFPs that gain international demand quickly are subject to competition from synthetic substitutes or cultivated materials, and are sensitive to consumer preferences and quality considerations (FAO, 1995c). Some of these are unprocessed goods from the forest while others have undergone processing to lesser or larger degree. Many of the products are often traded in rather small quantities compared to other commodities. For example, the quantity of cinnamon bark oil amounts to some 2.8 tonnes/year in the world trade, cinnamon leaf oil to 120-150 tonnes/year, and rosewood oil to 100 tonnes/year. On the other hand there are NWFPs which are produced and traded in considerably larger quantities like Brazil nuts (14,000 tons/year), orange oil, gum turpentine, rosin, rattan, and gum *arabic*.



Figure 4.5 Value of trade of selected NWFPs (Vantomme, 2001)

Essential oils, comprising a number of individual products, are traditionally used as basic raw materials in fragrances and flavouring, and provide an example of international trade in NWFPs. In 1990, the value of total world imports of essential oils amounted to over US\$ 1 billion. Principal import markets are the European Union, the United States and Japan, which together account for over 70% of the total trade. Asian countries including, Hong Kong, Republic of Korea and India, with their share of some 12% of the world imports, demonstrate the importance of the Asian region in this trade. Consumer demand for natural flavourings and fragrances continues to grow despite the increasing market share of synthetic substitutes (ITC, 1993).

Brazil nuts provide another example of international trade in NWFPs. Almost all Brazil nuts are destined for international markets. About US\$50 million annually, or less than 2% of the US\$2 billion international edible nut market, is made up of Brazil nuts. Brazil represents 80% of the production while the rest is produced in Bolivia and Peru. Main markets for Brazil nuts are the United States of America, Canada, United Kingdom, Germany and Australia (LaFleur, 1992).

International trade means knowing the markets outside the country of production. Very often the trade is controlled by local and foreign brokers, agents, traders and other middlemen. They all have vested interest in the business. Therefore, relying solely on the information provided by them, does not guarantee that, the gatherers and producers get all the information that they need. Products which enter the

international trade are often raw materials for further processing in countries of destination. There are also a number of value-added goods based on NWFPs which are internationally traded. The market size, growth and its specific requirements are determined by factors far away from the supplying countries. The reliable availability of marketing information is a key factor for successful marketing in export markets.

With only a few exceptions, international markets for NWFPs are niche markets. This, however, also matches the character of most NWFPs, as hardly any of them have the potential to feed into large markets without threatening sustainable resource management. For successful international marketing of NWFPs, it is essential to provide substantial general information on the products, production processes and in some cases also on producers, because contrary to most other traded goods, little tends to be known about NWFPs above a regional level. Particularly, the fair trade market sector also requires general transparency concerning production and marketing for the whole chain from the forest to the consumer. In order to access international markets, it is also essential for the producers to have a high level of organization and clear access rights. Only when these conditions are met, long-term co-operation at an international level is possible, ensuring also the sustained availability of the relevant NWFPs. In addition, producers benefit greatly when NWFPs are locally processed for added value, as this brings a whole range of advantages to the producer community, *e.g.* higher earnings, concomitant local capacity building in processing techniques, diversification of occupations which then might bring about a genuine development incentive from within the community and based on the resources available to the community, which supposedly leads to higher value addition. Such genuine local development can then help to support regional identity building, and eventually also reduces pressure on the forest.

4.5.3 Trends in international NWFP trade

Many NWFPs are economically important in world trade (Table 4.3). They totalled about US\$11 billion in 1995. This trend has changed since then. However, the important observations from this table are that 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. Other major suppliers to world markets include India, Indonesia, Malaysia, Thailand and Brazil.

Table 4.3 NWFPs most prominent in world trade in three main markets (US\$ million)

Item	EEC	USA	Japan	Total Imports
Ambergris, castoreum, civet, musk	44.48	3.02	42.92	134.08
Balata, gutta-percha	5.25	4.87	6.71	26.72
Bamboos	12.57	3.13	7.58	37.56
Beeswax, other insect wax	8.65	2.38	2.77	19.14
Brazil nuts, fresh or chilled	22.11	16.78	0.20	44.34
Chestnuts	2.01	10.46	64.14	109.95
Cinnamon and cinnamon-tree flowers	10.05	28.91	2.58	95.62
Colouring matter of veg. and animal origin	32.21	31.80	12.94	152.08
Concentrates of essential oils in fats	9.23	7.30	3.71	39.95
Corks and stoppers of natural cork	17.45	59.26	6.18	157.16
Edible products of animal origin	6.75	4.02	1.46	80.38
Essential oils, resins	95.53	108.54	22.43	312.52
Flour and meal of sago	0.77	0.92	0.33	18.06
Ginseng roots	11.90	11.10	39.89	389.34
Gum Arabic	53.74	18.89	6.18	101.31
Gum, wood or sulphate turpentine oils	12.16	2.12	7.84	31.23
Joboba oil and its fractions	7.61	2.29	0.42	11.59
Kapok	1.45	0.73	5.23	11.92
Lac	4.67	9.37	2.38	25.28
Liquorice roots	5.74	9.39	7.54	33.45
Liquorice sap	22.79	15.48	5.38	57.27
Locust beans	18.30	0.45	0.18	22.39
Maple sugar and maple syrup	9.64	28.09	1.30	43.63
Mats, mattings and screens of vegetable materials	22.03	17.13	135.12	215.95
Mucilages, thickeners derived from locust beans	34.02	45.35	25.95	141.33
Natural honey	143.39	53.92	35.12	268.18
Natural rubber latex in primary forms	109.24	84.08	37.09	519.92
Nutmeg	12.56	2.51	2.58	24.16
Other articles of natural cork	2.81	3.05	1.30	13.71
Other fixed vegetable fats and fractions	33.73	8.67	10.06	98.90
Other fresh fruits	263.22	51.30	127.91	685.22
Other live animals	61.67	43.48	8.05	183.92
Other natural gums, resins, balsams	29.95	11.00	2.14	92.75
Other nuts	21.01	91.68	24.39	222.91
Other plants used in pharmacy	171.23	88.59	91.96	689.92
Other spices	5.65	20.85	2.22	48.34
Other vegetable materials for plaiting	20.90	4.73	8.33	39.67
Other vegetable products (doum palm flour, Panama bark)	18.43	11.49	20.29	63.85
Quebracho extract	20.66	6.36	0.98	51.93
Rattans	13.75	5.44	6.53	118.98
Raw vegetable materials (for dyeing, tanning)	9.40	2.03	2.48	31.06
Resinoids	7.92	34.88	3.01	61.35
Tanning extracts of vegetable origin	1.54	7.59	0.66	20.51
Tung oil and its fractions	4.53	9.36	11.86	49.59
Vegetable materials esp. for brooms, brushes	10.20	8.59	3.96	28.11
Vegetable waxes	13.49	13.08	6.13	44.02
Walnuts in shell	91.11	0.03	1.26	115.33
Walnuts without shells	37.68	0.27	13.03	100.56
Wattle extract	15.41	8.07	5.49	63.87

Source: Iqbal, 1995

A second observation from the table is the striking pattern in international trade of NWFPs: that developing countries are the major producers and exporters of raw or semi-processed products; and developed, industrialised countries are the major importers (Iqbal, 1995). Just three markets, the European Union, the United States

and Japan comprise about 60% of the world trade. Table 4.4 shows the direction of trade for some of the most-traded products.

Table 4.4 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, EU
Walnuts	China, India, Afghanistan, Pakistan	EU, 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, EU
Nutmeg and mace	Indonesia, Grenada	USA, EU, Japan
Cinnamon and cassia	Sri Lanka, Seychelles, Madagascar	USA, EU, Japan
Gum arabic	Sudan, Nigeria	USA, EU especially UK and Germany, Switzerland, some Scandinavia countries not in EU, Japan
Gum tragacanth	Iran, Turkey	EU, USA, Japan, CIS ²
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, EU, 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	EU 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	EU countries
Mulberry and non-mulberry silk	China, India, Brazil	EU countries, Japan, Korea, Hong Kong
Liquorice roots	China, Western Asian countries, Russia	USA, Japan, EU
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	EU, USA, Japan
Cochineal	Peru, Canary Islands	EU, USA, Japan
Truffles	France, Italy	USA
Birds' nests	Malaysia	Hong Kong, Singapore, Japan, Taiwan
Bidi leaves	India	Pakistan, Sri Lanka

Source: Iqbal, 1995.

4.5.4 NWFPs market examples from Africa

Although Africa's share in the international trade is low compared to other regions, market value of NWFPs is very important. In Cameroon for instance, the commercial value of *Ricinodendron heudelotii* in a single market, New-Bell, Douala, was

estimated at US\$248,700 in 1998 and US\$464,235 in 1999 (Ngono and Ndoye, 2004); the annual value of the African plum (*Dacryodes edulis*) market was estimated at over US\$7 million; exports to the expatriate African community in Europe and the U.S.A. were valued at over US\$2.2 million (Awono *et al.*, 2002b); and the total commercial value of *Irvingia* spp. trade in the year 2000 in ten major markets in the Cameroonian forest zone stood at over US\$825,000. Besides the international trade, regional trade remains an important aspect of the NWFP economy in Cameroon. For example, the value of *Irvingia* spp. trade to Gabon, Equatorial Guinea, Nigeria and Central African Republic was estimated at US\$260,000 in 1997 (Ndoye *et al.*, 1999). These high market values are repeated in Rio Muni, in Equatorial Guinea, where Sunderland *et al.* (1999) reports that *Irvingia* spp. kernels are sold more widely than any other NWFPs. Sales of processed *Irvingia* spp. kernels to the United Kingdom, America, and Europe are reported, with about 100,000 potential consumers in these markets (Lesley and Brown, 2001).

European and American pharmaceutical companies are increasingly importing NWFPs from Africa for their chemical properties useful for the production of organic medicines. Examples include *Prunus africana*, *Pausinystalia johimbe*, *Voacanga africana*, *Strophanthus gratus* and *Physostigma venenosum* (Walter, 2001). In 1999, the commercial values of *Prunus africana* and *Pausinystalia johimbe* bark to the economy of Cameroon were US\$700,000 and US\$600,000 respectively (CARPE, 2001). For example, *Prunus africana* extract, used for the treatment of benign prostate hyperplasia in Europe and America, was worth US\$200 million to pharmaceutical companies in 1999 (CARPE, 2001).

Based on a purely illustrative per unit weight comparison *i.e.* not production, the prices of some lesser known NWFPs for local income generation are currently higher than for cocoa in Cameroon (Ndoye and Tieguhong, 2004). The average price of a kilogram of *Irvingia* spp. and *Ricinodendron heudelotii* were more than 200% higher than the average price of the same quantity of cocoa beans between 1996 and 2003. However, to go beyond such price observations, *i.e.* to assess and compare cocoa's economic potential with that of NWFPs for the same site, one would need to take into account other variables such as unit area production and their yearly fluctuations, returns on labour input, average product price and their fluctuations.

Production and exports

NWFPs play a significant role in local economies. They provide the much needed income and local employment. Although local processing and trade of NWFPs is often seasonal, semi-industrial processing could be done all year round, with some NWFPs preserved for future processing (Walter, 2001). Activities involved in processing and trade often offer a cushion of extra income in times of hardship. Below are tables showing quantities and value of different NWFPs from selected countries in Africa by region³. They demonstrate the importance of NWFPs at local

and national level. Table 4.5 presents the quantities and values of NWFPs as an example from North Africa.

Table 4.5 Quantities and values of NWFPs in North Africa.

Country	Main NWFP	Selected statistical data available
Algeria	Cork (<i>Quercus suber</i>)	Annual production of 6,000 t exploited from 460,000 hectares of cork forests
Egypt	Essential oils, medicinal plants, honey, fruits	Annual exportation of 11,250 t of medicinal plants worth US\$12.35 million in 1992-1995
Libya	No information available	No information available
Mauritania	Fruits, fodder, gums, medicinal plants	No information available
Morocco	Cork, medicinal plants, aromatic plants	Exportation of 6,850 t of medicinal plants worth US\$12.85 million in 1992-1995
Tunisia	Fodder, aromatic plants, cork, alfa grass (<i>Macrochloa tenacissima</i>)	Annual production of 10,000 t of <i>Pinus halepensis</i> seeds

Source: Walter, 2001.

Significant revenues were generated in Egypt and Morocco and to a lesser extent in Tunisia. These revenues are likely to be higher if all NWFPs produced were valued. In addition NWFPs provided by forests and trees are often more important than timber production in North Africa. Since sylvopastoralism is the main land use in most of the countries in North Africa, forest grazing and forest fodder represent a major contribution to the livelihood of the local populations and to the national economies. Other important activities are collection, grading and processing of aromatic and medicinal plants. The processing and trade in these products generates income at household and national level.

Exudates (gum *arabic*, olibanum, myrrh, opopanax), medicinal plants and bee products are among the most important NWFPs in East Africa (Table 4.6). Gums and resins are mainly exploited in the "gum belt" in Sudan, Ethiopia and Eritrea. Gum *arabic* was introduced to medieval Europe by the Arabs, hence its name, gum *arabic*. Gum *arabic* is obtained from *Acacia senegal* and *A. karroo*, and is widely used in the food industry. Formal trade in gum *arabic* commenced in Sudan in the 1820s (FAO, 1993b). Since then Sudan has dominated the world gum *arabic* production making up about 70 to 80% of total production comprising around 30,000 to 40,000 tonnes per annum. Sudan is the main producer of gum *arabic* in the world and is claimed to produce the best foodstuff grades. Chad and Nigeria are the second and third largest producers of gum *arabic*.

Table 4.6 Quantities and values of NWFPs in East Africa.

Country	Main NWFP	Selected statistical data available
Djibouti	Fodder plants	No information available
Eritrea	Exudates (gum arabic from <i>Acacia senegal</i> , olibanum from <i>Boswellia papyrifera</i>), utensils (leaves from the doum palm <i>Hyphaene thebaica</i>)	In 1997, Eritrea exported 49 t of gum arabic, 543 t of olibanum and 2,064 t of doum palm leaves
Ethiopia	Exudates (olibanum, gum arabic, myrrh from <i>Commiphora myrrha</i>), medicinal plants, honey and beeswax	Ethiopia is one of the world's largest producers of olibanum with an annual production of 1,500 t Annual production of gum arabic reached 350-400 t in 1988-94 In 1976-1983, annual honey production ranged from 19,400 to 21,000 t, representing 24 % of the total African honey production
Kenya	Fodder plants, medicinal plants, exudates (<i>e.g. Boswellia</i> spp.) and tannins (<i>Acacia meurnsii</i>)	Annual production of tannins is estimated at 9,700 t/year, with exports up to 7,800 t/year
Somalia	Exudates (myrrh, opopanax from <i>Commiphora</i> sp., olibanum)	Annual production of myrrh is estimated at some 4,000 t, worth US\$16 million. Exports of olibanum reached 200 t in 1987 (<i>Boswellia carterii</i>) and 800 t in 1988 (<i>Boswellia frereana</i>).
Sudan	Exudates (gum arabic, gum karaya from <i>Sterculia</i> sp., olibanum), fodder, fruits, shea butter (<i>Vitellaria paradoxa</i>), medicines, dyes (henna from <i>Lawsonia inermis</i>), honey and beeswax, bushmeat	Sudan is the main producer of gum arabic (from <i>Acacia senegal</i> and <i>A. seyal</i>), widely used in the food, pharmaceutical and technical industry. In the 1996/97 season, the total exports of gum arabic, mainly derived from <i>A. senegal</i> , was 17,759 t.
Tanzania	Fodder plants, medicinal plants, honey and beeswax, birds	Important exported medicinal plants include <i>Cinchona</i> sp. (exploitation of plantations of this exotic species yielded 756 t of bark in 1991 worth US\$258,000) and <i>Prunus africana</i> (annual exploitation of 120 t worth between US\$240,000 – 1,200,000).
Uganda	Honey, bushmeat	The only statistical data available indicates the exportation of 50 kg of shea butter (<i>Vitellaria paradoxa</i>) in 1996.

Source: Walter, 2001.

Medicinal plants are also important NWFPs in the region, and are both used for personal and commercial purposes. Use of medicinal plants is an important component of the national health care system in the region. For example, in Ethiopia more than 600 plant species are used directly as medicinal plants by traditional healers as well as by general population. In total, more than 80% of Ethiopians and Tanzanians use medicinal plants and a similar proportion could be expected in the other East African countries.

The most important medicinal plants used in the traditional medicine are to be found in the local and national markets. International trade in medicinal plants is limited to selected plant species required to produce medicines. Important East African medicinal plants, which are gathered from wild sources and commercialised on the world market, include *Prunus africana* in Kenya, Tanzania, Uganda and *Warburgia salutaris* in Uganda and Tanzania. Bee products also have a significant importance in Ethiopia, Tanzania and Uganda. Ethiopia is one of the five biggest wax-producing countries in the world.

As in other regions, rural communities in East Africa also depend on NWFPs for food, medicines and fodder. During periods of famine and food shortage wild fruits are often used as buffer food. A significant portion of honey produced is not traded as most of it is consumed locally. In general most of the products are not only used for subsistence purposes but also sold in local, regional and national markets. These become important sources of income for most rural people. In the region the industry involved in NWFPs collection, process and trade also provides some form of employment to seasonal workers drawn from the community.

In Insular East Africa the NWFPs in use include edible plants, ornamental plants, forage, aromatics, bamboo, Christmas trees, tools and construction material, living animals, bee products and bushmeat (Table 4.7). However the most important NWFPs of Insular East Africa are the edible, ornamental and medicinal plants, as well as living animals. As in other sub-regions, a wide range of edible plants providing food and income are found.

Table 4.7 Quantities and values of NWFPs in Insular East Africa.

Country	Main NWFP	Selected statistical data available
Comoros	Edible plants (e.g. fruits of <i>Cycas</i> sp.), ornamental plants (e.g. orchids, fern tree), living animals, honey, forage	Exportation of 100 t of fibres derived from the coconut palm in 1936
Madagascar	Medicinal plants (e.g. <i>Prunus africana</i> , <i>Catharanthus roseus</i>), ornamental plants (e.g. orchids), aromatics (e.g. <i>Syzygium aromaticum</i>), living animals (e.g. birds, reptiles)	Exportation of 300 t of <i>Prunus africana</i> bark worth US\$1,400,000 in 1993 Annual exportation of 1,000 t of <i>Catharanthus roseus</i> roots and aerial parts
Mauritius	Edible plants (e.g. <i>Coffea vaughanii</i>), forage (e.g. <i>Setaria sphacelata</i>), Christmas trees, bamboo, medicinal plants, bushmeat, honey	No information available

Source: Walter, 2001.

In Southern Africa, like in the other regions, NWFPs are also used as food and include wild fruits, edible fungi, insects and bushmeat (Table 4.8). Other NWFPs are used as fodder, medicines, bee products, utensils and construction materials, dying and tanning materials, ornamentals, exudates and aromatics and animal-based

medicines. However, the most important NWFPs specific to the sub-region are fodder, edible plants, medicinal plants and bee products.

Fodder is one of the most important NWFPs in the region. In Lesotho, Namibia, Swaziland, Zambia, Zimbabwe and South Africa major species providing fodder include *Adenium obesum* in the case of Swaziland, *Hardwickia mopane* for Namibia and *Acacia tortilis*, *Azelia quanzensis*, and *Piliostigma thonningii* in Zimbabwe. Also edible plants, fruits, roots, tubers and mushrooms are important as these contribute significantly to the diet of the people. In Angola, Botswana, and Zambia, edible roots and tubers are used as food and drinks. Roots have become important in Zambia especially during the times of heavy rains or droughts when food shortages set in. In this way they have become important in food security. In Mozambique, roots and tubers are consumed only occasionally. In some of the countries of the region, the *miombo* woodlands are a major source of mushrooms mostly collected during the rainy season. They are marketed in Malawi, Zimbabwe, Mozambique and Zambia, while in Namibia they are collected for local consumption. Southern Africa also has a variety of medicinal plants. The most traded are species such as *Warburgia salutaris* in Mozambique, Swaziland, Zimbabwe, South Africa; *Harpagophytum procumbens* in Botswana and Namibia, and *Harpagophytum zeyheri* in Namibia. Just like in the other regions NWFPs in southern Africa are not only used for subsistence but they also contribute to household food security, health as well as generating income and employment.

In Central Africa many NWFPs are collected for consumption, utilisation and trade. Animal based products include bushmeat, trophies and whole live animals. In addition honey and beeswax, caterpillars, ornamentals and medicinal plants are collected. Vegetables include edible plants such as tubers, legumes, leaves, bark, fruits, mushrooms, juice, seeds and oils. Other products are forage for livestock, rattan for furniture making, aromatics and cosmetics, colorants, tools especially the wrapping leaves, construction materials and gums. However, the most important NWFPs in Central Africa are bushmeat, edible plants, medicinal plants, and rattan. Bushmeat is an important source of protein for the population of the Central African sub-region.

Table 4.8 Quantities of NWFPs in Southern Africa.

Country	Main NWFP	Selected statistical data available
Angola	Edible plants (fruits, leaves, tubers, roots, nuts), mushrooms, medicinal plants	No information available
Botswana	Edible plants (tubers from <i>Raphionacme velutina</i> and <i>Coccinia rehmannii</i>), medicinal plants (<i>Harpagophytum procumbens</i>), bushmeat	No information available
Lesotho	Bushmeat, insects, fodder, medicinal plants, edible plants (fruits)	Honey production of 448.4 kg in 1997
Malawi	Honey, caterpillars, termites, bushmeat, mushrooms, edible plants (fruits of <i>Uapaca kirkiana</i> , <i>Tamarindus indica</i> and <i>Strychnos spinosa</i>)	Annual honey production of 1,000 t and annual beeswax production of 150 t
Mozambique	Bushmeat, honey and beeswax, medicinal plants (<i>Warburgia salutaris</i> , <i>Securidaca longepedunculata</i>), mushrooms, edible plants (fruits of <i>Strychnos madagascariensis</i> , <i>S. spinosa</i> , <i>Sclerocarya birrea</i> , <i>Hyphaene coriacea</i>)	Annual honey production of 380,000 kg and annual beeswax production of 68,000 kg
Namibia	Fodder, medicinal plants (<i>Harpagophytum procumbens</i> , <i>Harpagophytum zeyheri</i>), edible plants (nuts, fruits of <i>Sclerocarya birrea</i> , <i>subsp. caffra</i> , <i>Berchemia discolor</i> , <i>Diospyros mespiliformis</i> , <i>Hyphaene petersiana</i>), bushmeat, honey	Annual exportation of 600,000kg of <i>Harpagophytum</i> spp. worth between US\$1.5 -2 million in 1998 Annual economic value of medicinal plants is supposed to be US\$5.8 million
South Africa	Medicinal plants (<i>Glycyrrhiza</i> sp., <i>Origanum</i> sp., <i>Salvia</i> sp., <i>Euphorbia resinifera</i> , <i>Aloe ferox</i>), ornamentals (<i>Rumohra adiantiformis</i>), fodder, edible plants (fruits of <i>Sclerocarya birrea</i> , nuts, beverages), bushmeat	The annual trade of medicinal plants at the national level is worth US\$60 million Honey production reached 3,200 t and honey exportation 30 t, worth US\$96,000 in 1996. 4 t of beeswax, worth US\$16 000 were exported in 1996
Swaziland	Fodder (<i>Adenium obesum</i>), medicinal plants (<i>Warburgia salutaris</i>), edible plants (fruits of <i>Sclerocarya birrea</i>), bee forage (<i>Burchellia bubalani</i>), insects, honey and beeswax	No information available
Zambia	Honey, beeswax, mushrooms, bamboo (<i>Oxytenanthera abyssinica</i>), caterpillars, edible plants (roots of <i>Rhynchosia</i> spp., <i>Satyria siva</i> , fruits of <i>Uapaca kirkiana</i> , <i>Parinari curatellifolia</i> , <i>Strychnos</i> sp.), medicinal plants (<i>Pterocarpus angolensis</i> , <i>Eulophia petersii</i> , <i>Selaginella</i> sp.), fodder	Trade in medicinal plants is worth US\$4.4 million per year In 1992, 90,000 kg of honey was produced, worth US\$171,850. In the same year, beeswax production reached 28,515 kg, worth US\$74,140
Zimbabwe	Bushmeat, insects, fodder, medicinal plants (<i>Warburgia salutaris</i> , <i>Spirostachys africana</i> , <i>Erythrophleum suaveolens</i> , <i>Phyllanthus engleri</i>), fruits (<i>Diospyros mespiliformis</i> , <i>Strychnos cocculoides</i> , <i>Thespesia garckeana</i>)	In 1988-94, 30 t of gum arabic were produced per year Annual production of resins reached 1,000 t

Source: Walter, 2001

For edible plants, there is a variety of products ranging from fruits, nuts, bark, leaves, seeds, roots and oils (Table 4.9). Although a significant quantity is used for subsistence, some selected species are traded at national and international level. Traded edible plants include the fruit of *Irvingia gabonensis* (Bush mango) mostly

used for the extraction of edible oils, *Dacryodes edulis* (Safou), *Cola acuminata* (Kola seeds), *Coula edulis*, *Elaeis guineensis* (Oil palm, edible oil), *Piper guineense*, *Xylopiya aethiopica*, *Aframomum* spp. and *Chrysophyllum africanum*, the leaves of *Gnetum africanum* and *Gnetum buchholzianum*, the tubers of *Dioscorea* sp., the bark of *Garcinia* sp. and different species of mushrooms. *Vitellaria paradoxa* (shea butter) and *Parkia biglobosa* (nééré) are important species providing edible fruits and oils in the semi-arid parts of the sub-region.

Table 4.9 Quantities and values of NWFPs in Central Africa.

Country	Main NWFP	Selected statistical data available
Burundi	Bushmeat, living animals, medicinal plants	Export of 13,780 examples of reptiles in 1992 Export of 1,000 kg of mushrooms (<i>Cantharellus</i> spp..) to Germany in 1995
Cameroon	Edible plants (e.g. fruits, nuts, leaves), medicinal plants, rattan, bushmeat	Annual export of 600 t of <i>Gnetum</i> spp. leaves (food) worth US\$2.9 million Annual exportation of 413 t of gum arabic (<i>Acacia senegal</i>) between 1988 and 1993
Central African Republic	Bushmeat, edible plants, medicinal plants	Export of 273 kg of rattan in 1994, worth US\$1 800
Equatorial Guinea	Medicinal plants, edible plants, rattan, bushmeat	Exportation of 200 t of <i>Prunus africana</i> bark in 1994
Gabon	Edible plants, rattan, bushmeat	No information available
Republic of Congo	Edible plants (fruits, mushrooms, legumes), medicinal plants, honey, bushmeat, Ornamental plants and construction material	No information available
Democratic Republic of Congo	Edible plants, bushmeat	No information available
Rwanda	Edible plants (fruits), medicinal plants, honey, living animals	Production of 23,000 t of honey in 1998
Sao Tomé and Príncipe	Medicinal plants	No information available

Source: Walter, 2001

Like in other regions, traditional medicine is an essential part of the health care system in Central Africa. A wide range of species is used as medicinal plants. For example, in Cameroon more than 500 medicinal plants are used by the population and by specialists, mostly traditional healers. Some species such as *Prunus africana* are exported to pharmaceutical companies from Guinea Equatorial and Cameroon. Other species such as *Pausinystalia johimbe*, *Voacanga africana*, *Strophanthus gratus* and *Physostigma venenosum* from Cameroon are also exported.

In Central Africa, NWFPs are an important additional source of income, supplementing that from agricultural activities. For example, in Cameroon men in villages close to the Korup National Park use bushmeat and women use *Irvingia gabonensis* fruits as their main source of income. Export of NWFPs is reported for medicinal plant, live animals, edible plants such as mushrooms, *Gnetum africanum*, *Garcinia* sp., *Irvingia gabonensis*, *Dacryodes edulis*, *Piper guineense*, and *Rauvolfia vomitoria*, rattan, bee products, gums and ornamental plants. The export markets are in Europe, the United States and neighbouring African countries.

In West Africa, NWFPs include edible plants, medicinal plants, resins, honey and beeswax, bushmeat, rattan, bamboo, ornamentals, forage, gums, tannins, colorants, live animals, insecticides, wrapping leaves, construction materials such as thatching grass, hides and skin (Table 4.10). However, edible plants, bushmeat, medicinal plants and forage seem to be the most important NWFPs.

Fruits, seeds, nuts and kernels are sources of food. Most of the edible plants are also important as an additional source of nutrition. Some of these products are also found on local, national and international markets. Important edible plants in the sub-region are *Vitellaria paradoxa*, (shea butter), *Parkia biglobosa* (nééré), and the oil palm *Elaeis guineensis*. Shea butter and nééré are mainly found in the semi-arid parts of the sub-region. *Vitellaria paradoxa* is used for local consumption as shea butter, making soap for sanitation and for making candles for household lighting. In addition, the kernels as well as the shea butter are traded. Other important species that provide food in the dryer parts of the sub-region are *Adansonia digitata*, *Tamarindus indica*, *Bombax costatum*, *Borassus aethiopicum*, *Balanites aegyptiaca* (savonnier), *Detarium microcarpum*, *Ziziphus mauritiana* (jujube), *Sclerocarya birrea*, *Diospyros mespiliformis* (ebenier), *Hyphaene thebaica*, *Faidherbia albida*, *Detarium senegalense* and *Boscia senegalensis*.

Elaeis guineensis is an important plant in West Africa, especially in the southern humid parts of the sub-region especially in Ghana, Côte d'Ivoire, and Nigeria. The fruits and kernels are used for the production of edible oils and palm wine, contributing to about 10% of the total energy consumed in the region. Palm oil based products are also an important source of vitamin A. For example, in South-eastern Nigeria, about 90% of the population consumes palm oil on a regular basis. Other important edible plants from the humid parts of the sub-region are cola nuts (*Cola nitida*, *Cola acuminata*) and bush mango (*Irvingia gabonensis*). In Nigeria, the consumption of bush mango reaches 3 to 14 kg per year per household, while the total national demand is estimated at 78,800 tonnes. Cola nuts are also collected from the humid south in Nigeria and traded in the arid north of the country.

Table 4.10 Quantities and values of NWFPs in West Africa.

Country	Main NWFP	Selected statistical data available
Benin	Edible plants, medicinal plants, honey, bushmeat, rattan	No information available
Burkina Faso	Edible plants (<i>Vitellaria paradoxa</i> , <i>Parkia biglobosa</i>), bushmeat	Annual mean export of 14,200 t of Karité worth US\$2.4 million between 1984-90 National bushmeat trade is worth US\$880,000 - 2.4 million
Chad	Gum, edible plants, forage	Export of 5 800 t of gum arabic in 1996/97
Côte d'Ivoire	Edible plants, construction material, rattan	No information available
Gambia	Edible plants	Production of 60 t of honey in 1998.
Ghana	Bushmeat, edible plants (cola, shea butter, oil palm), medicinal plants, rattan, construction material	Export of 19 654 t of shea nuts (35% of national production) in 1996 worth US\$5 846 000 Export of living animals worth US\$344,000 in 1985
Guinea	Edible plants, bushmeat, tools, construction material, medicinal plants	Annual use of more than 100 million chewing sticks of <i>Lophira lanceolata</i> ; Annual production of Cola nuts (<i>Cola nitida</i>) reaches 350 - 400 million, used for exportation (200 million) and consumption (150 - 200 million)
Guinea-Bissau	Edible plants, forage	The export value of cashew nuts (<i>Anacardium occidentale</i>) corresponds to 50% of exportations of the entire forestry sector in 1988
Liberia	Edible plants, bushmeat	Some 100,000 t of bushmeat are used for subsistence purposes annually
Mali	Edible plants, forage, gum, honey	Production of 293 t of gum arabic (<i>Acacia senegal</i>) in 1989
Niger	Forage, edible plants, medicinal plants, gums	No information available
Nigeria	Edible plants, bushmeat	Annual production of 4,000 – 10,000 t of gum arabic Export of hides and skin worth US\$4.4 million in 1965 Annual national demand of bush mango (<i>Irvingia gabonensis</i>) of 78,800 t
Senegal	Edible plants, forage, gum, living animals	Annual exportation of gum arabic varies between 500 and 800 t Production of 1,423 t of gum mbep (<i>Sterculia setigera</i>) in 1993
Sierra Leone	No information available	No information available
Togo	Edible plants, forage, medicinal plants, tannins	No information available

Source: Walter, 2001

For most of the West African population bush meat is treasured food. Animals that are hunted for their meat include warthogs, bush pigs, antelopes especially duikers,

lizards, grass-cutters, rats, porcupines, birds, bushbucks and monkeys. Consumption of bushmeat is also important for nutrition, especially as sources of proteins. In the rural areas of Ghana, approximately 75% of the population consume wild animals on a regular basis. In Southern Nigeria, about 80% of the population consume bush meat, which also provides about 20% of the required animal protein.

The traditional application of medicinal plants is of high socio-economic importance in most West African countries. In Burkina Faso, Niger, and Ghana, more than 80% of the population uses medicinal plants. In Nigeria, over 90% of the rural and over 40% of the urban population depend on traditional medicine. Medicinal plants are used by the population itself and by traditional healers. In the humid parts of West Africa, chewsticks derived from *Garcinia afzelii* and *Garcinia epunctata* in Ghana and Nigeria and *Lophira lanceolata* or *Lophira alata* (Fig. 4.6) in Guinea, where national consumption is estimated at 100 million pieces per year, contribute to the health welfare of the communities.

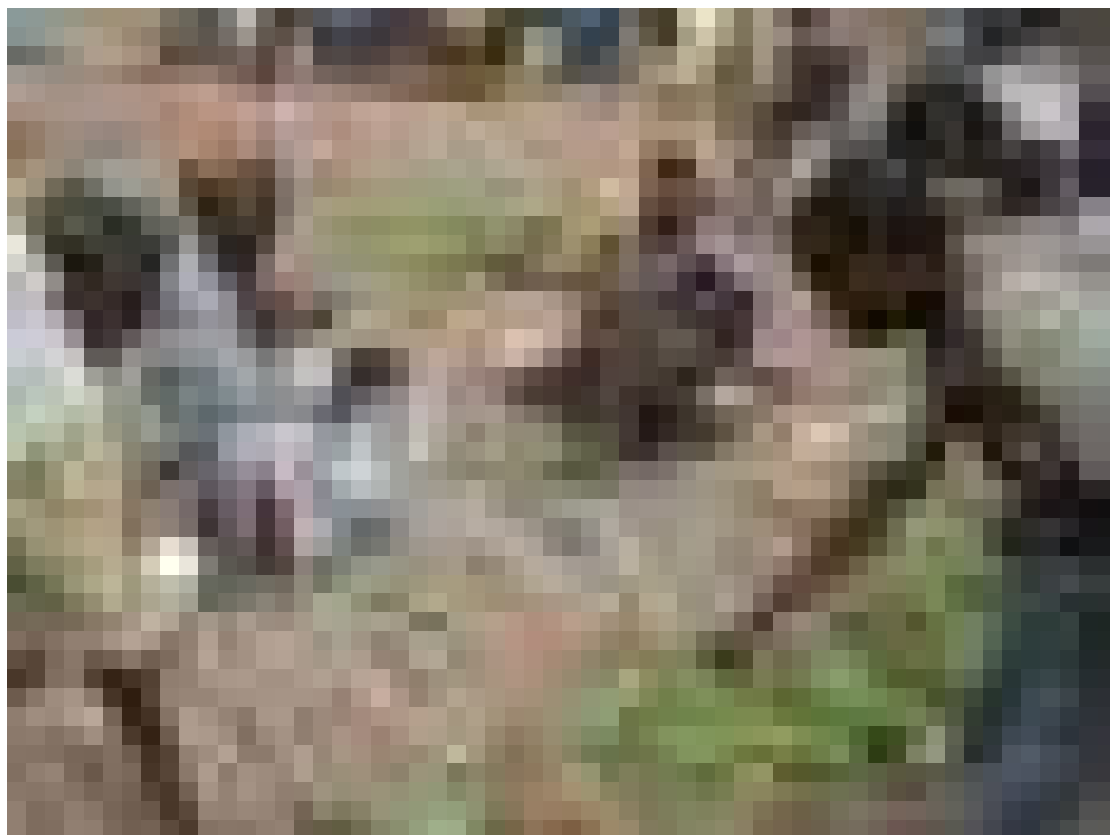


Figure 4.6 Sale of toothbrush sticks (*Lophira alata* & *Prosopis africana*) in a local market in Nzerekore, Guinea. (Courtesy E. Achigan-Dako)

The use of fodder plants is of particular importance in the semi-arid and arid parts of the sub-region, where production of cattle, sheep, goats, donkeys, and camels is a

major activity. Main fodder plants include *Acacia* spp., *Prosopis juliflora*, *Khaya senegalensis*, *Faidherbia albida*, *Balanites aegyptiaca*, *Commiphora africana*, *Pterocarpus erinaceus* and *Azelia africana*. During the dry season, forage provides an important additional source of fodder. Tree forage contributes to 25% of fodder supply for ruminants in Niger. In the Nigerian savannah areas, which host more than 90% of Nigerian livestock, forage contributes to 10 to 15% to livestock feed.

Generally NWFPs contribute significantly to subsistence and income generation in the region. In rural and remote areas, the NWFPs contribute considerably to the livelihoods of the people. The NWFPs that are exported also generate foreign exchange which can be used to improve social welfare services. Products that are exported include shea butter, gum arabic, cashew and cola nuts, mushrooms, medicinal plants, live animals and bush meat.

Trading constraints

It has been observed that for various reasons there has been an erosion of international market share of NWFPs over the years. There has been a reduction in prices and for some commodities their markets have almost collapsed. This could have risen possibly due to the problem of product grouping considered in statistical reports. In addition the aggregation of products in International Standard Trade Classification (ISTC) makes it difficult to distinguish NWFPs by specific products and by sources for by forest vs. non-forest and country. For many NWFPs they fall under "vegetable materials and vegetable products". For example, edible nuts from forest are included under the group of all edible nuts, along with groundnut, cashew, almond and others.

It has also been difficult to analyse all the factors causing price changes and to determine whether the prices and the costs reflect the true values and hence whether production controls can improve the situation. As indicated earlier on relationship between local collectors, intermediaries and exporters, the big disparities between prices paid to the collectors and traders could be improved through control of costs and improving efficiencies without involving sophisticated downstream processing and refinements. In fact it has been reported that for a numbers of NWFPs, the local producer receives only 2 to 3% of the price fetched in developed country markets. Such is the nature of markets controlled by intermediaries and exporters.

4.5.5 International trade agreements

International agreements have a great effect on the international market prospects for certain products. Key conventions with direct relevance to NWFPs include the General Agreement on Trade and Tariffs (GATT), the Convention on International Trade in Endangered Species (CITES), the Agreement on Trade-Related Intellectual Property Rights (TRIPs) and the Convention on the Conservation of Migratory Species of Wild Animals. GATT 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 (*e.g.* patents, trade secrets, trademarks) and measures for enforcing these rights.

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 internalises 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.

CITES, which has been ratified by more than 111 nations, 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 Convention on the Conservation of Migratory Species of Wild Animals obligates countries to protect endangered migratory species and precludes commercial trading of some 51 listed species, including antelopes, 24 bird species and six marine turtles. The convention encourages species conservation and international action. TRIPs on the other hand, like WTO, provide more enforceable protection for trade-related intellectual property rights. In this, it encourages developing countries to conduct more research and innovation, and helps them to have better access to new technology, including environmental technology. An important provision permits a country to exclude an invention from patent protection if the commercialisation of that invention seriously endangers the environment.

In Cameroon for example, *Prunus africana* has been recognised as a "special product with particular interest". Article no. 2 of Decision no. 0336/D/MINFOF of the 06th July 2006 provides a list of "special products with a particular interest", and states that these are products that are relatively less abundant in the forest or for which

some additional measures are indispensable, due to the threats caused by non sustainable harvesting methods used by harvesters. The quotas for “special products with particular interest” are granted by an inter-ministerial commission comprising of representatives from the forest administration, environment, research, finance, and other administrations.

In addition, the Cameroon’s forest administration has identified *Prunus africana* as one of the six most important NTFPs in Cameroon that needs to be promoted for socio-economic development. Although, sometimes, even with good regulations, they are unfortunately poorly implemented or not at all. Most often, stringent measures were prescribed only in the face of a tragedy, such as the recent destruction of *Prunus* in Mount Cameroon and North West, when the tendency was to consider only the immediate causes, forgetting the root cause of the problem. For example, despite the official ban in 1991, a greater quantity (3900 tonnes) of *Prunus africana* was harvested and exported between 1991 and 1992 than in any preceding year, indicating the lack of law enforcement and a high level of corruption in the production zone (Cunningham, 1997 cit. Tieguhong and Ndoye 2004).

Concerns on the future of *Prunus africana* led to its listing in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1994, becoming effective in 1995 (Sunderland and Tako, 1999 cit. Tieguhong and Ndoye, 2004). The impact of listing *Prunus africana* by CITES has been partially effective in reducing threats because it has helped to raise awareness about the problems posed by its international trade.

A key requirement of CITES is certifying that export is not detrimental to the survival of the species. This requires information on the location, stocking, growth and condition of the species and on its ecology, regeneration and subsequent protection. Such information is often lacking, incomplete or imprecise making a proper evaluation of the sustainable levels of utilisation and other conditions difficult. The scientific authorities required to make such certification also face obstacles due to inadequately trained and resourced staff (ITTO-CITES, 2006).

Another key requirement is that the designated management authority must certify that exports have been obtained legally. However, such authorities often lack adequately trained staff and resources to implement tracking and compliance systems.

4.5.6 Value chain

Value chain is defined as a complex web of companies and other actors that affect the production-to-consumption process (Blowfield, 2001). The term ‘value chain’ highlights the value that is realised in the process and how it is communicated (Schreckenber *et al.*, 2006). A market chain includes all the actors that contribute value added to a given primary product. It is synonymous with terms such as ‘supply chain’, or ‘market chain’ used by Neumann and Hirsch (2000) in their review of NWFP commercialisation.

The value or commodity chain approach emphasises the importance of horizontal coordination among the operators at a given level of the chain as well as of vertical coordination mechanisms between successive levels *i.e.* cash market, future market, contracts, forward contracts, etc. It also highlights the importance of a conducive environment as a critical condition for the value chain to grow and be competitive, *i.e.* favourable natural conditions for producing diverse products; the presence of other inputs such as research and extension support and other factors of production which are critical for technology adoption; a stable political and macroeconomic policy environment as well as sectorial policies that provide adequate incentives for the commodity chain operators to invest and allocate their scarce resources in conservation/cultivation and derived products and the willingness of the government and the private sector to practice liberalisation and fair trade practices.

Value chain analysis

A value chain describes the full range of activities required to bring a product from the producer to the consumer, emphasising the value that is realized and how it is communicated. In this section, the actors in the NWFP commercialisation chain, what activities they carry out, what their profitability levels and opportunities are, and what constraints they face in terms of regulations, investment in human capital and infrastructure are examined. This type of analysis has been called value chain analysis, which covers a wide range of topics from local level incentives to work in a NWFP commercialisation chain to government regulations that affect how any person involved in this chain may work. Value chain analysis brings together the data and information generated by the community-level research, enterprise budgeting, and market analyses. It is a flexible tool that can be useful in identifying key constraints and opportunities within a NWFP commercialisation chain.

The objectives of value chain analysis are to: (i) identify the main actors or organizations in the commercialisation chain from the input provider to the collector and through to the final consumer; (ii) identify their specific activities; (iii) identify the different routes to commercialise the NWFP, which could be what currently exists and what potentially is available or could be developed; and (iv) assess how well the marketing chain is working.

Functions within the NWFP value chain

An NWFP value chain can be broken down into several sub-sets of activities: production, collection, processing, storage, transport, marketing and sale. The relative importance of each of these differs from product to product, they may not occur sequentially and some may even be repeated or omitted for particular products (Marshall *et al.*, 2003). Some chains, particularly for locally traded products, are very short and simple, with harvesters selling their products direct to consumers. Value chains that extend beyond the local level tend to be more complex. Although some NWFPs such as shea butter from the Sahel, gum Arabic from Sudan, natural rubber

and vegetable ivory from the Amazon have been exported for centuries, the recent trend towards increased globalisation has transformed the way business works, making value chains more complex and difficult to manage.

A key difference between most NWFPs and agricultural products is the importance of wild harvesting in the production process, often from locations that are distant from the home and over which the collector has no secure tenure. Storage, processing and transport may be more or less complex, depending on where the product is produced, the nature of the product, the degree of processing and the requirements of the consumer. NWFPs include many fresh fruits for which “perishability” is a serious concern. These require careful storage and handling and rapid transport to markets or some level of primary processing close to the point of origin. The predominantly wild and therefore low-density production of NWFPs means that ‘bulking-up’, the collection of sufficient volumes of the raw or partially processed material to make any subsequent processing step economical, is a key function of the value chain.

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

Actors in the NWFP value chain

At the local level, a family may gather fruit and sell it directly to local consumers. For nationally or internationally traded products the whole production-to-consumption system is rarely encompassed within a single enterprise. Often there is a chain or network of different types of organisations, from individuals to loose associations to shareholder companies, involved in getting the product from the forest or field to the retail shelf. Thus, some types of organisation may be more appropriate for performing different functions along the value chain. Where the NWFP is collected from communal land, community organisations may be best placed to ensure that over-exploitation does not occur, while collection from individual plots is more likely to lead to the development of co-operatives with individual members (Marshall *et al.*, 2006). Both types of organisation allow for pooling of produce to meet the minimum order requirements, sharing the costs and benefits of collective investments in storage, processing or transportation and improved bargaining power through collective negotiation.

The importance of individual entrepreneurs in helping to establish international NWFP value chains cannot be overemphasized. Intermediaries can play a critical role in communicating information from consumers to producers, providing market acumen, organising transport and quality control, advancing credit, consolidating volumes for export or national processing and shouldering risk, all contributions that are often intangible and hard to value. As trade develops beyond local and regional markets it becomes ever more sophisticated and relationships between actors are likely to shift from informal agreements to formalised arrangements supported by contracts and memoranda of understanding. Access to such markets can be intimidating or impossible for poor rural people. However, there is increasing global interest in ensuring that trade is fair to all concerned. This usually means introducing conditions or practices to safeguard the interests of the less powerful partners in any relationship, typically the producers, or increasing their ability to exert their power by promoting producer associations and networks.

4.5.7 Challenges and opportunities in marketing and trade in NWFPs

A number of challenging characteristics of NWFPs markets must be understood if promotion of national-level and export-oriented NWFP enterprises is to succeed. Many NWFPs are produced in small volumes, dispersed over wide areas, and with market sectors as diverse as pharmaceuticals, botanical medicines, cosmetics, abrasives, food and beverage. Wild harvested products in particular can be very unreliable in the quantities, qualities, and even on locations of production due to the biology of the organism and the vagaries of the weather. In southern Mexico, for example, the yields of shitake mushrooms, harvested for sale to Japan, correlate with levels of rainfall (Edouard *et al.*, 2006). Quantities may also be affected by the existence of competing opportunities for producers, for whom NWFP production typically contributes just a small part of their income. Moreover, products that come from forests, almost by definition, come from remote areas, characterised with poorly developed communications and transportation infrastructure, thus making it difficult and costly to move products to markets.

NWFP markets are very vulnerable to substitution, as demonstrated by the ‘boom and bust’ experience of natural chicle, which fuelled the modern chewing gum industry. Chicle extraction was the main industry in the Yucatan Peninsula of Mexico in the mid twentieth century but, by 1960, the development of much cheaper petroleum-based gum had almost eradicated demand (Laird and Guillén, 2002). In addition to substitution by synthetic products, NWFP producers may have to compete with large-scale cultivation in other countries, as in the case of the Brazilian natural rubber harvesters, whose livelihoods were turned upside down by the massive production of plantation rubber from South-East Asia.

Many NWFP markets are small in scope and value, and therefore attract limited attention or investment (Shanley *et al.*, 2002). When they do become successful,

sustaining supply may be a serious problem. On the other hand, niche and fair trade type markets may be small relative to potential production, as in the case of marula oil, the supply of which is far greater than can be absorbed by its current main international market, the Body Shop (Schreckenberg, 2003).

There is frequent misunderstanding about the level of technology required to get NWFPs to market even though many NWFPs are today being used as ingredients in very sophisticated industries. A high degree of technological innovation may be necessary to achieve value-added in the country of origin, while at the same time meeting the quality standards demanded by international clients. Examples include the need to develop new extraction and refining technology to produce international-standard oil from the hard seeds of the Kalahari melon in Namibia, where the available technology was not adequate to achieve a profitable rate of extraction (Schreckenberg, 2003). Similarly, the isolation of active ingredients for new drugs can only be carried out in fairly sophisticated laboratories.

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

Fair trade products

The concept of fair trade emerged some 40 years ago through alternative trade organisations offering to consumers in developed countries products purchased directly from small producers in developing countries. Initially, these products were sold mainly through world shops and catalogues. The number of world shops increased rapidly since the first opening in 1969.

Fair trade is an alternative approach to conventional international trade that aims at sustainable development for excluded and disadvantaged producers. It seeks to do this by improving market access, strengthening producer organisations, paying better prices and providing continuity in the trading relationship. It promotes development opportunities for disadvantaged producers, especially women and indigenous people,

and seeks to protect human rights and the environment. It also raises awareness among consumers so that they can exercise their purchasing power positively and campaigns for changes in the rules and practice of conventional international trade⁴. There are five main actors in fair trade:

1. **Producer organizations** that produce a range of handicraft and food products.
2. **Fair trade importing organizations** that buy products at a fair price directly from producers and give them various forms of advice, support and training. They sell the products either directly to consumers through mail-order catalogues or to retailers. They also engage in awareness-raising campaigns.
3. **Retailers**, such as world shops, supermarkets and some fair trade importing organizations that sell fair trade products to end consumers. They may also engage in awareness raising activities.
4. **Consumers** who buy fair trade products.
5. **Fair trade labelling initiatives** that seek to enlarge the market for fair trade products by bringing them into mainstream sales outlets like supermarkets, while at the same time offering consumers an independent guarantee of fair trade standards.

Fair Trade labelling

Fair trade is an eco-label which guarantees consumers that certain criteria are met. Fairtrade Labelling Organisations (FLO) International was founded in 1997 to coordinate efforts and to ensure the audit of all fair trade labelled products from the producer to the supermarket shelf. It also aims at the introduction of a single international fair trade label. But unlike other certification systems, producers do not pay for their certification by FLO. The FLO has developed criteria for coffee, cocoa, tea, honey, sugar, bananas and orange juice. Criteria for each product are developed in consultation with the producers to reflect differing conditions.

The fair trade label guarantees fair trading relations, including (i) a price that covers the cost of sustainable production; (ii) social premium for development purposes⁵; (iii) partial payment in advance to avoid small producer organisations falling into debt; (iv) contracts that allow long term production planning; and (v) long term trade relations that allow proper planning and sustainable production practices. Fair trade also guarantees fair production conditions, including for small farmers' co-operatives a democratic, participative structure; for plantations/factories the workers should have decent wages *i.e.* at least the legal minimum, good housing, where appropriate, minimum health and safety standards, the right to join trade unions, no child or forced labour and minimum environmental requirements. The FLO monitoring programme ensures that all the trading partners continue to comply with fair trade criteria, and that the individual producers really do benefit. FLO lists producers who

meet these criteria in a register, which is distributed to fair trade importers. Figure 4.6 shows how the fair trade labelling system operates.

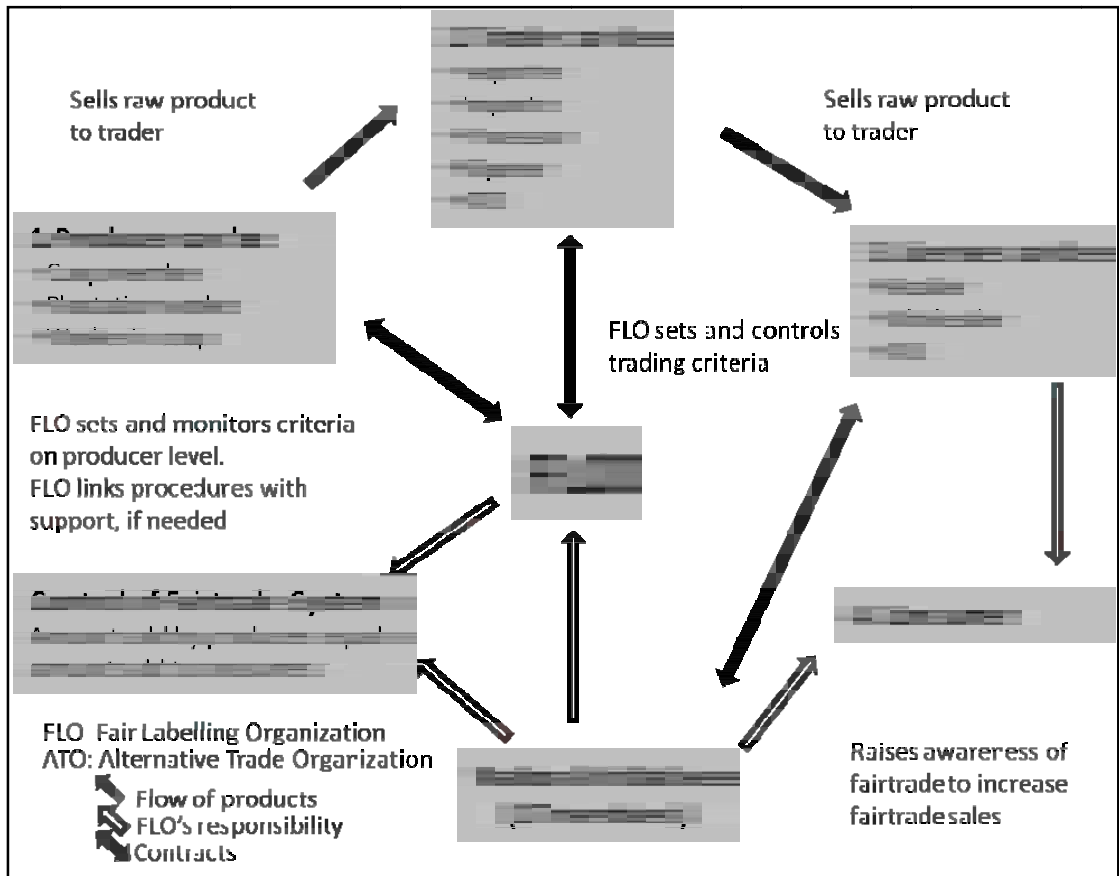


Figure 4.7 Fairtrade Labelling System (Adopted from <http://www.fairtrade.net.>)

4.6 Initiatives and case studies in commercialisation of NWFPs

Building on their local importance, there is increasing interest in the possibility of NWFP commercialisation acting as an engine for rural growth, as in the case of wood carving in Bali (Rohadi *et al.*, 2004), and contributing to improved national incomes. In Burkina Faso, for example, shea (kernels and butter) is the third most important national export (Schreckenberg, 2004). In Mexico, the potential importance of non-traditional products has been highlighted by the establishment of a national logo 'From Mexico to the World' (Ramírez Farías, 2001). Similarly, the establishment of a national indigenous fruits task-team in Namibia signals high-level support for a co-ordinated approach to the development of new natural product-based enterprises (Schreckenberg, 2003). Even in a country with a timber resource as valuable as that

of Indonesia, the Forestry Department declared that this value may be surpassed by that of NWFPs. And in India there is a great deal of optimism among NGOs and government that NWFPs can offer a means to alleviate rural poverty.

Harvesting, processing and marketing NWFPs can be important for local employment and often provide the basis for local craft production and small-scale industries (Box 4.2). However, external entrepreneurs often appropriate a large part of the revenues of NWFPs⁶. Efforts must be made to enhance the value-added accruing to the local communities, for example by promoting local and regional processing. Moreover, adequate control mechanisms must be put in place to ensure that the harvesting of NWFPs does not lead to depletion of the resource.

Box 4.2 Characterisation of the trade in *Pentadesma butyracea* products in Benin

Trade in *P. butyracea* products in Benin contribute to substantial incomes for actors involved in the value chain. A case study conducted in Penessoulou district (Benin) revealed that *P. butyracea* almonds were traded through four channels:

- ▶ collector – transformer (almonds end user);
- ▶ collector – village wholesaler – transformer;
- ▶ collector – district collector – wholesale collector – local product exporter;
- ▶ collector – village wholesaler – district collector – wholesale collector – local products exporter – transformer.

The first model, *i.e.* collector – transformer channel, was the most important as most of the harvesters sold their almonds to transformers. Most collectors sold their almonds locally or at home just after harvesting. Collector – wholesaler – transformer channel only functions during the period of almonds scarcity (*i.e.* between November and March) and it coincides with the period wholesalers try to reduce their almonds stocks. The commercial channels *Pentadesma butyracea* products (*e.g.* butter) varied most locally between:

- ▶ transformer – consumer;
- ▶ transformer – village retailer – village consumer; and
- ▶ transformer – village retailer – village wholesale collector – urban centre retailer – urban centre consumer.

International commercialisation includes exports to countries such as Gabon by exporters of shea (*Vitellera paradoxa*) butter.

Collectors received the highest share of the price paid by the consumer whereas wholesalers received the lowest. The same trend was found for the marketing margins of operators of *P. butyracea* butter trade. Actors involved in almond processing received the highest share of the price paid by the consumer, followed by retailers and wholesalers. Net Present Value of fruit harvesting and almond processing activities showed both activities were financially profitable. However, fruit harvesting was significantly more profitable than almond processing (NPV equal to US\$0.36 versus US\$0.12). Net present values of fruit harvesting and almond processing activities are positive, with the highest value for fruit harvesting activity. The high NPV of *P. butyracea* almond collection compared with almond processing is explained by the low input costs related to the activity (US\$0.03/kg of almonds versus

US\$0.21/kg of butter). In fact, harvesting does not need an investment base, and input costs for acquisition of fruits are also low. Harvesters collect fruits without monetary compensation whereas more than 95% of transformers have to pay for almonds. Furthermore, fruit harvesting requires few rudimentary utensils in contrast with almond transformation that uses a number of utensils such as bowls, mortar, millstone, etc. *P. butyracea* almond harvesting and butter processing appear to be profitable commercial activities for both fruit harvesters and almond transformers. Indeed, they receive between 47 and 80% of the end price paid by the consumer, depending on product and specific marketing channels.

Source: Avocèvou-Ayisso et al. (2011).

4.7 Commercialisation and marketing of forest services

Healthy ecosystems have long been understood to produce services that are valuable to society. Fibres, food and fresh water are some of the many essential services that people obtain from ecosystems. In recent years, attention has also been drawn to the regulating, supporting and cultural services generated by such ecosystems. Water filtration, climate regulation, nutrient cycling, pollination, pest control and disease regulation are just some of the many life-support services that ecosystems like wetlands, forests, grasslands and oceans, among others, provide to people around the world. While most of nature's provisioning services have a market value within the prevailing economic paradigm, nature's regulating, supporting and cultural services generally do not. In the 20th Century, this approach to valuing nature was reflected in decision-making processes that favoured the management of ecosystems for the production of goods over the maintenance of services. As communities in both the developed and developing worlds begin to realise that ecosystems are on the verge of collapse, increased attention is being paid to the economic importance of the regulating, supporting and cultural services.

The first decade of the 21st Century, has seen an explosion of interest in the science and economics of ecosystem services. Conservation biologists, ecologists and economists seek to weave ecosystem services into the global economy in ways that will shift the self-interest of individuals toward the stewardship of land and sea. Governments have begun to experiment with 'cap-and-trade' mechanisms and other market-based incentives for ecosystem services, in an effort to mobilise private sector efforts to advance public goals. Economists have realised that they might use new funding for ecosystem services to supplement international aid for sustainable development as well as to reduce poverty. And indigenous and local communities hope to steward their ecosystem services as a means of attracting income to, and increasing yields from, the fields and forests in which they live.

An environmental service market is defined as a creation of an incentive system that provides the link between providers and beneficiaries of environmental services (Landell-Mills and Porras, 2002). In developing countries, and especially in Africa,

the environmental service markets are still nascent, although it is recognised that rural communities (often poor) that provide environmental services to outside beneficiaries, are not equitably sharing the benefits such services provide. The services provided include clean and abundant water supplies, biodiversity protection, and stocks of carbon that may contribute to the alleviation of global warming.

Rewarding the poor providers could add to their livelihood options; reduce poverty, while contributing to the maintenance of environmental services. There is a new paradigm in environmental policy to recognize and to reward for the provision of environmental services. A popular example is the 1996 forest policy reform in Costa Rica. This policy introduced the concept of payment for environmental services, based on the principle that the providers of the environmental service will receive payment to compensate them for the benefits that accrue to the Costa Rican society (de Camino *et al.*, 2002). The intent of this policy was to increase income from forest activities to make them competitive with alternative land uses. China also has made progress in establishing the rules and framework for setting up mechanisms for environmental services payment. The Forest Law of 1998 introduced the Forest Ecological Benefit Compensation Fund as a responsible institution that channels the money from beneficiaries to providers. At a smaller scale, the small village of Sukhomajri in northern India has provided a model for development of watershed services payments. Here the village's inhabitants share the costs and benefits of environmental restoration to ensure that everyone gains from the process (Kerr, 2002). The initiative was to share water rights among all residents, including the landless. This can be seen as a type of environmental service payment as an agreement to share the benefits that would accrue from providing the service. The outcome of this mechanism was a major transformation in the village, with success in regenerating vegetation on the hillsides, increasing agricultural production and raising incomes throughout the villages.

While there is, indeed, enormous potential in these new market-like approaches to managing ecosystem services, there is no guarantee that this potential will be fully realized. Structuring incentive schemes around ecosystem services is a complex process and pilot schemes have shown that agencies must not only get the science, economics and institutional frameworks right for ecosystem service payment schemes to work, but they must also be able to tailor them to the prevailing social, political and cultural realities.

4.7.1 Marketing of environmental services

Merlo *et al.* (2001) used the terms Environmental and Recreational Goods and Services (ERGS) and Recreational and Environmental Services (RES) in analysing the possibilities and difficulties with regards to the marketing of forest environmental services, and found in their analysis of policy options based on market approaches that transformation/development of non-market ERGS into market RES is mainly

given by two approaches. The first relies on institutional transformation from public to private goods, often through the modification of property rights, and resulting in changes in excludability/rivalry. This transformation is not always easy to realise as social pressure, customs, and other factors can prevent changes of excludability. Parties concerned must accept that the change and the transaction cost of enforcement must not exceed the net revenue from the marketing of the forest services. The second is based on market development techniques exploiting the relationship between the ERGS and what are actually sold in the market, the RES products. For example, this relationship can be demonstrated by consumption of appropriate equipment such as walking boots, mountain bikes and infrastructure such as footpaths and restaurants. Quite clearly the consumption of ERGS is linked, and complementary, to that of infrastructure and equipment, making up the RES products. This complementarity can also be seen in terms of added value with the activity producing and providing the infrastructure, *e.g.* maintaining footpaths and restaurants, and with the RES products being complementary and additional to the pure ERGS. This relationship of complementarities and additional value represents a final step in deriving a market value.

Markets for biodiversity conservation

The process of commercialising the diversity of nature is difficult. Services provided by biodiversity are many, ranging from the maintenance of ecosystem functioning through option and existence values. However, most are intangible and that makes them difficult to package for sale. In addition it is difficult to clearly identify customers that consume the services and the threshold effects in the supply of biodiversity. This implies that for a given size of a forest area below which a certain size fails to deliver the demanded biodiversity, it will be difficult to portion out the services to individual buyers (Landell-Mills and Porras, 2002). Despite this, governments, international non-governmental organisations (NGOs) and private companies are paying for forest biodiversity conservation, with the growing public awareness of biodiversity benefits and threats of loss serving as the main drivers. As growth and diversification takes place in the market place, significant innovations in the design of commodities and payment mechanisms have occurred. Costly and complex project-based deals are paving way to intermediary-based transactions (especially trust funds), pooled investment funds, transactions that piggy-back on retail sales (*e.g.* shade coffee) and even over-the-counter sales of standardised products. This way each mechanism seeks to cut market risks, overcome threshold effects, and minimise transaction costs. As risks and costs come down, market participation is likely to continue to rise. Although there is this significant progress as registered in recent years, for the most part payments for biodiversity services remain nascent and, to a large degree, experimental. Major constraints to market development remain, not least the significant transaction costs associated with setting up and implementing trades. For the most part, constraints are greatest in poor

communities of developing countries (Landell-Mills and Porras, 2002). Particular attention needs to be given to the distribution of benefits and costs, and the repercussions for social equity. It has been reported that while there might be gains from increased income, a more diversified asset base, and the development of new skills, the livelihoods of poor communities may be threatened by the market through increased exclusion, lower incomes, and a weaker asset base.

Markets for carbon sequestration

Trees play an important role in the global carbon cycle as reservoirs and so-called 'sinks' of carbon dioxide, the most important greenhouse gas. Therefore, the protection and restoration of forests can help to mitigate it. In the United Nations Framework Convention on Climate Change (UNFCCC) sinks are taken into account in the achievement of the goal of reducing emissions to 1990 levels. Article 4.1 (d) of the Convention is particularly relevant, stating that Parties must "promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including forests" (UNFCCC, 1992). Under Article 3.3 of the Kyoto Protocol, greenhouse gas removals and emissions through afforestation and reforestation since 1990 are accounted for in meeting the set emission targets (UNFCCC, 1997). Article 6 of the Protocol provides for the possibility of forest-related projects in the Joint Implementation Projects among Annex I Parties.

The signing in 1997 and the activation on 16 February 2005 of the Kyoto Protocol marked the emergence of a market in carbon offsets, especially through the forest-related strategies which have been proposed as a means to influence CO₂ emissions. These include (i) Maintaining existing carbon stocks through forest management and conservation; (ii) Increasing storage of carbon in forests by increasing forest area or biomass per unit area, and in forest products; and (iii) Substituting fossil fuels with fuelwood from sustainably managed forests, and substituting energy-expensive products (*e.g.*, steel, aluminium or concrete) with industrial wood products. Although there are three market-based mechanisms to assist developed and developing countries reduce green house gases (GHG) that cause climate change under the Kyoto Protocol, *i.e.* (i) Joint Implementation (JI); (ii) Carbon Emission Trading (CET); and (iii) the Clean Development Mechanism (CDM). Until recently the CDM provided the most hope for Africa, given that it involves participation of both Annex I and non Annex I parties (Senelwa, 2004).

The carbon-offset market has been evolving quickly. It has been observed that while national governments are passing laws to ensure that emission targets are met, greenhouse gas emitters, brokers, consultants, NGOs, communities, and potential suppliers are responding directly to international policy processes. As with other markets for environmental services, the process of market development for carbon offsets has not been an easy one. Neither has there been a single unified trading

platform (Landell-Mills and Porras, 2002). What has happened is that transactions have taken place at a number of levels (*i.e.* local, national, regional and international), through a variety of payment mechanisms (from bilateral to exchange-based) and with varying degrees of government participation. There is more progress in the industrialised countries where sophisticated trading systems are being established mostly as a result of concerted government efforts to introduce emission ceilings and develop clear rules and regulations to guide market development. In these situations, voluntary *ad hoc* transactions aimed at gaining experience and generating favourable publicity are being replaced with more systematic trading of a defined carbon commodity – normally 1 tonne of carbon dioxide equivalent – aimed at minimising the costs of compliance (Landell-Mills and Porras, 2002). International trade in Joint Implementation and Clean Development Mechanism carbon offsets have been primarily generated through complex and individually negotiated projects.

These mechanisms offer potential new business and market opportunities based on the forestry sector, particularly in the carbon sequestration through “Kyoto forests”. These instruments will promote sustainable development along with cost-effective greenhouse gas mitigation through reforestation, afforestation and better forest management (Senelwa, 2004). It is expected that as the market matures, it will offer expanding opportunities for learning even though it remains unclear whether the carbon market will act as a force in favour of, or against, poverty alleviation. The concern arises as there has been evidence coming out that poor smallholders in developing countries face serious constraints in accessing market opportunities and that while allowing space for learning-by-doing is important, governments have an essential role in acting early to head off emerging problems (Landell-Mills and Porras, 2002).

Current and proposed mechanisms (CDM and REDD+) will fare differently under different forest types and conditions. REDD+ (Reducing Emissions from Deforestation and forest Degradation) is aimed at conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries. For example, high deforestation rates are likely to be associated with forests close to densely populated communities; forest re-growth from abandoned farmland will likely exhibit higher carbon dioxide sequestration rates than old forests in protected areas, while agroforestry can readily facilitate the adoption of intensification as an adaptation measure. The forest type and conditions will have to be ascertained for each situation to provide the appropriate fit to either CDM or REDD+ arrangements. But climate change is currently not sufficiently addressed in national forest policies and plans.

From an African perspective, CDM has until recently been seen as a potential source for financing environmentally sustainable development in developing countries. However, an examination of the circumstances of the continent reveals the unattractiveness of Africa (Sokona and Nanasta, 2000). At present, it is difficult for

Africa to adequately participate in CDM because of the conditionalities and complexities involved in the process. Political and tenurial uncertainties, together with unstable investment environment, have also contributed to diminished interest on the part of CDM investors in the African forest sector. By March 2009, only two afforestation and reforestation projects, globally, were approved for funding. CDM is restricted to afforestation and reforestation as defined under the Kyoto protocol, and this does not suit many African forestry conditions. The only places where afforestation for CDM is accepted are where there has not been a forest in the last 50 years (that is before almost most African countries became independent). Further, reforestation can only be done where there was no forest on December 31, 1989. These conditions therefore seriously limit African participation in CDM.

REDD+ is now seen as potentially a very good source of financing forestry. This follows from pledges made at the 15th Conference of Parties to Kyoto Protocol (COP15) in 2009 of the UNFCCC to *operationalise* the Copenhagen Accord. REDD+ was also an outcome of COP15.

Markets for watershed protection

Forests, either alone or as part of broader multiple-use landscapes, produce a number of watershed services valued by society. While services vary between sites, forests are credited with, among other things, protecting water quality, regulating water flows, preventing floods, controlling soil salinisation and maintaining aquatic habitats. Historically, the protection of critical watersheds has been the preserve of governments. However there is a growing role by private companies, individual landholders, NGOs and communities in delivering and financing for watershed services.

It has been observed that significant competition in supply or demand has not arisen as the market for watershed services has emerged (Landell-Mills and Porras, 2002). The reason is that since watershed services benefit groups of individuals and are characterised by threshold effects, cooperation in demand and supply has been the key. To develop markets, cooperative and hierarchical arrangements have to be strengthened to enable beneficiaries and providers to come together to formulate group payment strategies and to tackle free riding. At the same time where there are cooperative or hierarchical arrangements, but have come under strain due to inequitable benefit-sharing and high costs, markets are being introduced to ease tensions and facilitate financial and in-kind transfers. Payments tend to be channelled through intermediaries where a large number of stakeholders are involved in watershed protection. This allows buyers and sellers to negotiate and conclude deals, oversee implementation and enforce contracts. In addition intermediaries are an important link in pooling funds from a group of beneficiaries and/or collecting user fees. In industrialised countries over-the-counter trading using pre-packaged

commodities is being promoted (Landell-Mills and Porras, 2002). In some cases this is done alongside clearing-house systems.

Overall, markets have emerged as a result of a growing willingness to pay amongst beneficiaries. This is because of improved understanding of the benefits provided by watersheds and growing threats they are facing. In more developed countries, new government regulations for improved water quality have been the major force behind investment. Where it has been difficult to exclude non-payers from watershed services, suppliers have generally faced difficulties in demanding payments for those services. Yet, as commodities and payment mechanisms become increasingly sophisticated, the emergence of supply-driven markets is inevitable. However, there are concerns that where the gains from trade may be significant, the high transaction costs involved may introduce serious barriers to entry for anyone lacking financial resources, managerial and coordination skills, technical knowledge and political connections. In addition, as the costs of participating in emerging markets rise, and as the number of individuals living in a watershed increases, governments' regulatory capacities will become weaker. This will result in less reliable hydrological data and less secure property rights. It has also been observed that while developing countries could have difficulties in establishing markets for watershed protection, the poorest groups in these countries that risk marginalisation. Therefore governments have a critical role to play in ensuring markets work for the benefit of all sections of society, not just the most powerful (Landell-Mills and Porras, 2002).

Markets for landscape beauty

For some time it has been known that landscape beauty represents a critical component of the market for ecotourism. However, payments for this component have largely been ignored. Tour operators take landscape beauty as a free input and protected area managers have not done much to capture the consumers' willingness to pay. As a result the situation is becoming unsustainable and in many locations supplies are threatened. This means that concerted efforts to establish markets for landscape beauty are needed as a matter of urgency (Landell-Mills and Porras, 2002). However it is important to observe that the evolution of this market is not a simple process. Where payment mechanisms have not existed before, the introduction of this payment mechanism will involve the creation of new institutional arrangements and the involvement of new stakeholders. Unlike the markets for the other services, little progress has been made in developing sophisticated payment mechanisms such as auctions or clearing-house mechanisms for landscape beauty. In many cases payments are based on site-specific negotiations or reformed entrance fees. More recently, the establishment of community-based ecotourism operations and joint ventures has allowed land stewards to tap tourists' demand directly (Landell-Mills and Porras, 2002). However, far from creating a more transparent and efficient market for landscape beauty, vertical integration internalises the market for landscape beauty within a new enterprise. Thus, despite its claim to being the oldest market

among the other forest environmental services, the market for landscape beauty remains relatively young and undeveloped. Constraints to market development are well established and shifts in power balances are difficult to make. As long as tour agencies resist paying for landscape beauty, land stewards' opportunities for being rewarded for the services they provide lie in establishing themselves as marketing enterprises. It must be noted that in all this, poor people may have difficulties especially where skills are needed to administer and manage complex international businesses. However, some more forward-looking agencies and communities believe that ecotourism must ultimately involve a joint effort and the pooling of skills and resources. Whatever the model that may be used for landscape beauty to be protected into the future, the providers must receive fair compensation for their inputs (Landell-Mills and Porras, 2002).

Markets for bundled services

There is not much that has been written about bundling environmental services. However, practical experience is expanding as those demanding and supplying services seek to capitalise on complementarities between services (Landell-Mills and Porras, 2002). Two approaches to developing markets for a suite of services are emerging: (1) merged bundles and (2) shopping basket bundles. Where control of transaction costs is crucial, no sub-division of merged bundles should be done to sell services individually. Where sellers can sub-divide the services, then the shopping basket approach, though more sophisticated, is more appropriate. This enables sellers to subdivide packages of services for sale to different purchasers. It is expected that through this approach, there will be a more efficient allocation of resources and higher returns to sellers. However, given the technical, informational and institutional requirements for successfully marketing a suite of services to separate buyers, most forest managers would find it difficult to market bundled services through the shopping basket model.

4.7.2 Payment for Environmental Services

Payment for Environmental Service (PES) is a voluntary transaction where a well-defined Environmental Service (ES) (or a land-use likely to secure that service) is being 'bought' by an ES buyer from an ES provider if and only if the ES provider secures ES provision (conditionality) (Wunder, 2005). The central principles of PES are that those who provide environmental services should be compensated for doing so and that those who receive the services should pay for their provision (Pagiola and Platais, 2002). According to Wunder (2005), four ES types currently stand out: (i) carbon sequestration and storage (*e.g.* a northern electricity company paying farmers in the tropics for planting and maintaining additional trees); (ii) biodiversity protection (*e.g.* conservation donors paying local people for setting aside or naturally restoring areas to create a biological corridor); (iii) watershed protection (*e.g.* downstream water users paying upstream farmers for adopting land uses that limit

deforestation, soil erosion, flooding risks, and so on); and (iv) landscape beauty (*e.g.* a tourism operator paying a local community not to hunt in a forest being used for tourists' wildlife viewing). While some services (for instance social, cultural, sacred grooves, historical and spiritual) may be 'bundled' for specific consumers, only the four identified above have so far exhibited significant commercial scale.

The core idea of PES is that external ES beneficiaries make direct, contractual and conditional payments to local landholders and users in return for adopting practices that secure ecosystem conservation and restoration (Wunder, 2005). There are different perspectives to the issues and subject of payment for environmental services (PES) or Compensation for Ecosystem Services (CES):

- ▶ from a *wildlife conservation perspective*, CES is mostly viewed as a source of conservation finance that may or may not complement or replace public funding and entry fees;
- ▶ from an *environmental management perspective*, CES may be mostly viewed as a way to provide positive incentives for good environmental stewardship to go along with the standard set of environmental regulations;
- ▶ from a *poverty reduction perspective*, CES may be mostly viewed as a possible alternative income stream for poor people, that is, a new way to "put money in farmers' pockets";
- ▶ from an *economic planners' perspective*, CES may be mostly viewed as a flexible and efficient way of correcting market failures and collective action problems;
- ▶ from a *rural empowerment and social equity perspective*, CES may be mostly viewed as a way to redress historical imbalances in the power, rights and responsibilities of resource-dependent people *vis-à-vis* ecosystem service beneficiaries who enjoy greater influence over the political and economic processes;
- ▶ from a *peace and justice perspective*, CES may be viewed as a mechanism for managing conflicts over resource use or benefit sharing.

Compensation for ecosystem services may look quite different to those who are actually involved in the mechanisms. Thus, there appear to be multiple business perspectives: a) redressing environmental damage caused by business operations; b) a component of a corporate social responsibility strategy designed to maintain or enhance the reputation of the business; c) complying with current or likely future environmental regulations; or d) sustaining or improving crucial ecosystem services that are inputs into business operations. Farmers and others who live within key ecosystems may also see compensation for ecosystem services from several perspectives: a) official recognition of their rights to reside in, use and modify a protected ecosystem; b) a new government program that provides public services in exchange for formation of groups and/or planting trees; or c) a new source of revenue for performing a defined service. People seeking redress for environmental damage caused by others may see compensation for ecosystem services as one of several

ways to redress past grievances. These different perspectives have influenced the way that CES schemes are evaluated.

PES programs will have the desired effect only if they reach the land users in ways that influence their decisions on how to use the land. To achieve the desires, several general principles to guide the development of PES systems have been identified (Pagiola and Platais, 2002). These include: (i) making payments continuous and open-ended to make the benefits continuous providing that appropriate land uses are maintained; (ii) targeting payments since an undifferentiated payment system that pays everyone the same could be more expensive and make it difficult to tailor interventions to the particular requirements of given situations; and (iii) avoid perverse incentives. For example, payments for reforestation can encourage land users to cut down standing trees so as to qualify.

PES programs require a supporting institutional infrastructure. A portion of the benefits received by environmental service beneficiaries must be captured and channelled to land users to provide incentives to protect ecosystems. These systems depend on several prerequisites. Market participants must have access to information on the value and volume of the services being exchanged. Participants must have opportunities to negotiate payments. Property rights to service commodities need to be clearly defined, and ownership has to be assigned. Monitoring and enforcement mechanisms are required. A network of supporting regulatory and institutional arrangements may be necessary if markets are to function effectively. Establishing such market infrastructure is not easy and is rarely cheap.

Notes

1. In India, for example, non-wood products account for around 60 per cent of forestry exports. Indonesia, Malaysia and Thailand have also witnessed rapid growth of export revenues from NWFPS.
2. Commonwealth of Independent States (part of States of the former USSR). Most states such as Ukraine, Khazakstan and Belarus have since become independent.
3. Source of all the material: Walter (2001).
4. This is a shortened version of the definition of Fair Trade adopted in April 1999 by FINE, an umbrella organization of the four main international Fair Trade Networks. See http://www.traidcraft.co.uk/fs_fine.html
5. For example, for coffee the guaranteed minimum price is US\$126/100 lbs FOB, inclusive of a US\$5 social premium. When the market price is above this minimum, the surcharge for coffee is US\$5 per 100 pound. For details on other products, please consult the FLO website at <http://www.fairtrade.net>.

6. Developing countries seek to obtain a fair and equitable share of the economic benefits derived from the commercial use of certain NWFPs by foreign companies (*e.g.* medicinal plants, essential oils, pesticides, biochemicals).

Points to remember

- Availability of accurate information on consumption is key to economic exploitation or planning for NWFPs. However, the illegal nature of harvesting in some instances prevents capturing of accurate information consumption of NWFPs.
- Local communities valued intangible forest products as highly as the physical products. Cultural values of forests need to be promoted for effective conservation. Ethnobotanical information should be collected to facilitate the establishment of suitable frameworks for collaboration between the forest managers and the local communities.
- Improvement on market information is a good foundation for marketing (planning and operation) of NWFPs. Producers of NWFPs can avoid unfair exploitation by middlemen by increasing their awareness on market conditions, and organising themselves into groups for greater collective strengths.
- Proper regulations should be put in place and implemented effectively to ensure that the threatened species are protected from depletion through trade. Trade certification requires good information on the NWFPs resource base to enable proper evaluation to facilitate international trade.

Questions

1. How do you define marketing in the context of NWFPs?
2. Develop a sound methodological approach to assess the value of a specific type of NWFPs in an area you know.
3. How do you characterize (products, actors, *modus operandi*) the domestic and international markets of NWFPs?
4. Propose a method to evaluate NWFPs markets other than the one by Appropriate Technology International.
5. What are the challenges facing the marketing and commercialisation of NWFPs? How would you approach these challenges for an effective promotion and sustainable use of NWFPs?
6. Propose strategies to improve trade in NWFPs from Africa. What are the prospects for medicinal plants in the international markets?
7. List the international conventions or legal instruments with relevance to NWFPs? What are their goals?

8. Select a NWFP of your choice and propose a value chain analysis: (i) identify the main actors from the input provider to the collector and through to the final consumer; (ii) identify their specific activities; (iii) identify the different routes to commercialise the NWFP; and (iv) assess how well the marketing chain is working.
9. How do you envisage the marketing of environmental services such as biodiversity conservation, carbon sequestration, watershed protection or landscape beauty?
10. What compensation systems are more effective if we want to sustainably enjoy the benefits of forest ecosystems?

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5

Non-Wood Forest Products and Services in Socio-Economic Development

Although the accepted concepts of the use and value of forestry have changed greatly over the years (Nilsson, 1996), it is a commonly held view that the benefits from forests are important only if they affect people. For many years forests were seen as vital for production and industrialisation (Westoby, 1962) and were a strong link to general economic development (Hirschman, 1958). Today, the global forestry agenda is complex and to a large extent dominated by issues and values outside the market. While most of the attention from economists used to be on the market value of (certain) forest products, non-market values of forests are now increasingly being appreciated and measured. Unfortunately, statistics on NWFPs are not properly or regularly reported, and they hardly feature in national accounts as a separate entity. Furthermore, some of the products on which information is available often get reported under other sectors such as agriculture and horticulture, distorting the picture of the NWFPs sector. As a result, the actual role and impacts of forests, including forest influences and many intangible benefits (for example, watershed values) have often not been captured adequately in Systems of National Accounts (SNA). Further, because of these, it has often been difficult to trace the flow of NWFPs through the economic systems from the producers to the eventual users to facilitate systematic analysis of trade to support development. These shortcomings notwithstanding, the objective of this chapter is to enable students understand the role of NWFPs in socio-economic development. The chapter highlights the role of non-wood forest products and forest services (including the indirect, option and existence use values) in national economies, with emphasis on employment; income generation and poverty alleviation; trade; food security; and the role of these products in health. It also describes the cultural aspects in NWFPs with economic potentials.

5.1. Non wood forest products and services in national economies

5.1.1 Employment, income generation, and poverty alleviation

Employment and income from non-farm activities are of increasing importance in the rural economy of developing countries. Small forest-based enterprise activities constitute one of the largest sources of such income. They also account for a large part of the total harvest from forests in many areas. Many farmers supplement their incomes through gathering and trading products such as forest foods, medicinal plants, and fuel wood. Small-scale manufacturing of items such as furniture, baskets, mats, and craft goods constitute substantial informal sector industries. Income from these activities tends to be particularly important during seasonal shortfalls in food and cash crop income and in periods of drought or other emergencies (FAO, 1996).

As an example, 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 (FAO, 1996). Dealing in NWFPs can provide employment during slack periods of the agricultural cycle, and provide a buffer against risk and household emergencies. In China cross-sectional studies in Anji County (Zhejiang) have shown that bamboo farming is an important activity for farmers (Pérez *et al.* 2004). In Ghana and most of West Africa, harvesting of *Garcinia* spp. for chewing sticks is a major income generating activity (Blay, 2004). The activity also provides employment to men who are usually engaged by traders to harvest the stems for making chewing sticks. Ndam and Marcelin (2004) observed that the activities related to harvesting of *Prunus africana* in Cameroon have improved incomes in some villages such that villagers are able to construct houses. The improved incomes have also led to an increase in formal marriages and a good number of children are able to go to school.

In South Africa, women in the peri-urban areas around King William's Town and Grahamstown rely on the trade of harvested bark material, used for medicinal purposes from a tree called *Cassipourea flanaganii* for their income (Wynberg, 2004). On average they earn about \$2,000 per year. In other parts of Africa, indigenous fruit trees have been domesticated opening up opportunities for income generation both at the local as well as in international markets. In the forest zones many poor farmers may opt to domesticate indigenous fruit trees as a means of alleviating poverty (Schreckenber *et al.*, 2006). For example, in the humid lowlands of Cameroon it has been estimated that the gross annual value of *Dacryodes edulis* production per household (on farms averaging 1.7 ha in the Haut Nyong, Mvila and Lekié divisions) ranges from US\$ 9 to US\$80 using peak season prices, and up to US\$160 for much higher early season prices (Schreckenber *et al.*, 2006). Some 30–40% of this production is sold, with the rest being used for household consumption. In the same area, farm level production of *Ricinodendron heudelotii* has been estimated at US\$20

per annum while *Irvingia gabonensis* fruits and kernels are estimated to be worth US\$90 and US\$80 per annum respectively. A combination of these and other species can therefore make a substantial contribution to a household's income. Most importantly, the income obtained from indigenous fruit trees can be continuous throughout the year (*e.g.* for processed *Irvingia* spp. kernels or palm oil) or can be concentrated at one time of the year (*e.g.* fresh *Dacryodes* fruits). Women in Benin use their small regular incomes to purchase their daily needs (Schreckenber, 2004).

Although this daily survival mechanism may not alleviate poverty, it has been observed that lump sum incomes have been used as start-up capital for new activities. For example, in Benin women have used those lump sum money incomes, from a one-off sale of stored shea kernels to buy a goat or build storage sheds (Schreckenber, 2004). They also use it to invest in social capital by buying presents for family and friends and covering the costs of family celebrations. Byron and Arnold (1997) observed that some communities do generate income from forest products in order to purchase seeds, hire labour for cultivation or generate working capital for trading activities. Where forest products have provided substantial income this has helped communities to clear their debts or accumulate some capital. This is one form of generating income, creating employment and alleviating poverty by creating wealth through capital accumulation.

Other studies have shown that income from forest foods and other products are often important for poorer groups. Although the income may account for a relatively small part of a household's total income, it often helps to fill the seasonal or other cash flow gaps and also helps in coping with particular expenses or to respond to unusual opportunities. For example, in southern Ghana, 72% of the households surveyed identified income generated from forest products activities as being important either in absolute terms, or in meeting particular needs, or because of its timing (FAO, 1996). However, 10% of the respondents identified this as their sole source of income, and for only a minority was it the main source. For 66% of these households, half or more of their income came from agriculture. Nevertheless these activities were still a source of income for the households. The role of forest-based activities as a source of income that people can fall back on in times of crop failure or shortfall, or to cope with some other form of emergency is important.

In Southern Africa, communal areas provide a diversity of wild resource products. Among the NWFPs are foods and medicines which are used by a majority of the households. Though they may not be gathered for everyday needs, sometimes they are harvested in order to generate income (Shackleton *et al.*, 2000). By using some of the collected products, communities avoid cash expenditures. This is crucial especially for the livelihoods of poorer households. More importantly research has shown growing trade in many of the resources utilised. For example, in South Africa it was shown that up to 25% of households' trade in at least one resource with

women playing a particularly strong role (Box 5.1). This is evidence of opportunities for self-employment and income generation from NWFPs.

Box 5.1. Evidence on the use of wild resources.

Over 100 goods derived from woodland resources have been recorded for Shindi Communal Area, Zimbabwe. In South Africa, communities in three villages were regularly using between 18 and 27 wild products and 100 - 300 species (excluding medicinal plants). Across all studies reviewed the most commonly used products and main contributors to value are fuelwood, construction wood, wild fruits and herbs, and fodder. In Caprivi, Namibia, wild foods provide up to 50% of household sustenance during the non-agricultural season. In Zimbabwe, wild products contribute as much as 35% of average household income, increasing to 40% for poorer households. Wild resources may provide up to 20% of cash income to poor households against 5% for better-off households. Direct use-values of wild resources can be high: gross values of US\$194 – US\$1,114 per household per year were estimated across seven studies in South Africa. Cost-benefit analysis revealed that, even for a highly degraded area, the benefits of wild resource harvesting outweighed the costs. In all cases, values of wild resource harvesting have been shown to be within the same range or higher than those contributed by other land based livelihood activities and state welfare grants. Cash income from the sale of products is highly variable. Earnings can range from a few dollars for ad hoc activities to as much as US\$146 per year for skilled carvers in Namibia. Incomes tend to be higher where there is an external market for products. Returns to labour are usually higher than for agricultural production.

Source: Shackleton *et al.* (2000).

5.1.2 Trade

The trading of non-wood forest products and services has been around for centuries. Although other wood products have become major international commodities in recent times, there are examples of trading in gum arabic in ancient Egypt imported from Sudan and used in cultural practices. In Europe, and France in particular, it was taxed in as early as 14th century. Different types of non-wood forest products available range from fruits and food to aromatics and phyto-pharmaceuticals. This has also led to some form of market segmentation with the barter system in subsistence economy, local village markets, large urban markets and international markets (FAO, 1993). Some of the products such as edible nuts and resin are supplied in bulk to the markets, while others such as speciality products (including honey and some aromatics) have niche markets. Not all non-wood products are traded. Many are collected solely for local consumption. It has been seen that in a number of African countries, many people are involved in the trading of NWFPs. This is solely for the purpose of generating extra income and is done in supply chains involving a network of merchants and different types of buyers and sellers.

5.1.3 Food security

Food security is defined as physical and economic access to food, for all people (FAO, 1991a). The concept of food security used in its most general form essentially means a state of affairs where all people at all times have access to safe and nutritious food so as to maintain a healthy and active life (FAO, 1991a). FAO has *operationalised* the concept within its mandate by stressing those aspects of the phenomenon that are related to the availability and stability of food supplies at the national level through both time and space and access to food supplies at the household and individual, as well as national level.

Hoskins (1990) and Ogden (1990) have stressed the important role of forests for the security of food. They report that trees and forests contribute to food security in many regions of the world by (i) providing a direct source of food, often in significantly greater quantity and variety than is generally recognized; (ii) providing essential nutrients and medicines that increase the nutritional impact of other foods; and (iii) filling food gaps by supplying food during seasonal shortages and acting as emergency foods. Unfortunately, very few studies have been undertaken to quantify either the potential supply of, or demand for food from trees and forests.

The lack of specific or regional studies notwithstanding, these products still play an important biological and social role in local food systems. Forest foods are widely consumed in most rural communities and even in many urban areas in the developing world. In some cases, they provide a regular supplement to the diet; in others they represent a primary source of food. They contribute substantially to nutrition, either as part of the family diet or as a means to achieve household food security. Although household food security may not appear within the realm of forestry practice, it does not necessarily affect agricultural output, but other factors that affect a household's access to an adequate year round supply of food (FAO, 1991b). Deforestation, seasonal changes in food supplies, availability of fodder and other forest foods, among other factors, affect the food security of households. In many rural areas forests and farm trees play an important role in household food security. Forests and trees provide critical support to agricultural production, they provide food and fuel, and they provide cash income particularly for the poor, and insurance against drought and crop failure. Thus, both directly and indirectly, many forestry activities have an impact on rural people's food situation.

Forests and trees contribute to many household needs, in addition to food security. It is therefore difficult to separate the contribution forests and trees make to food security from the other socio-economic benefits they provide. Both forests and farm trees supply food and other products which may be consumed, sold directly, or processed and then sold. The contributions forest foods make to food security can be described in three main ways: providing a supplementary source of food, as seasonal foods in the diet, and as emergency food supplies during periods when others are unavailable. For example, leaves and wild animals as foods supplement the quantities

of agricultural foods available to houses; and also add to the taste in the culinary activities of communities. In north-eastern Brazil palm groves are important hunting grounds for several popular large rodents (notably *Agouti paca* and *Dasyprocta punctata* (FAO, 1991b). Where bush meat may not be available, NWFPs as fodder can help maintain regular livestock milk and meat supplies. In many regions of Africa and the world, forests are important sources of dry season fodder for livestock. Likewise, when consumed as snacks NWFPs also contribute to energy and nutrient requirements. In Kenya for example, some fruit trees such as *Ximenia americana* and *Sclerocarya birrea* have been reported as increasingly finding their way on farms to supplement food supplies to households (FAO, 1991b). Income from NWFPs can help poorer households supplement their meagre income to meet their basic food needs. In some cases, income from NWFPs can also be invested in agricultural assets such as livestock, land, or agricultural equipment thereby improving a household's food security.

NWFPs as food contribute to the essential nutrients thus contributing to the overall nutritional quality of the diet. In south-eastern Nigeria, for example, the leaves of the forest trees *Pterocarpus* sp., *Myrianthus arboreus* and *Ceiba pentandra* are highly valued because they flush at the end of the dry season, providing a vegetable during this "hungry period". Similarly, the fruits of *Sterculia africana*, *Chrysophyllum albidum*, and *Dacryodes edulis* are popular because they mature with the early rains during the crop-planting season (Okigbo, 1975). In one study in Swaziland, it was found that more than 200 species of wild plants were commonly consumed (Ogle and Grivetti, 1985). Leaves of *Grewia* spp. are consumed mostly in the spring and summer. Mushrooms, caterpillars and termite larvae are other types of forest foods consumed seasonally. In Upper Shaba, Democratic Republic of Congo, women were reported to spend several hours a day collecting mushrooms during the early rainy season (FAO, 1991b). In the Machakos district of Kenya wild vegetables are a delicacy during the rainy season. It has been reported that these foods contributed 35% by weight to the diet (FAO, 1991b). Fruits, which are mostly seasonal, are in most cases eaten by children.

Many communities, especially those practising subsistence agriculture, have been known to go by what is known as a "hungry season". In this case, when cultivated food varieties are in low supply, NWFPs act as a bridge to provide food. In Zimbabwe a study showed that when cultivated food supplies became low, collection and consumption of wild fruits reached its peak. Fruits were not consumed when they were plentiful but sought at the time when they were needed most (FAO, 1991b). A study in Zambia's Luangwa valley reported that wild foods are important components of the diet, especially during the hunger period. Wild vegetable foods provided ingredients in 42% of the meals served in Mukupu village in September when compared with cultivated vegetables which were used in only 10% of the meals at this time of year. However, during June wild vegetables were used in only 7% of the

dishes compared to cultivated varieties which at this time feature in more than half the meals.

During planting season where there may be little time for cooking, NWFPs provide snack foods for energy and nutrition. For instance, *Diospyros mespiliformis*, *Strychnos cocculoides* and *Thespesia garckeana* are popular foods in some regions of Africa, especially in South Africa (FAO, 1991b). In many regions hunting is also a seasonal activity, undertaken during the off-peak agricultural season. In the rain forests of the Democratic Republic of Congo, hunting for bushmeat is at its peak in July and August when agricultural activities are at a minimum and lowest level during the planting season (FAO, 1991b). The seasonal availability of forest foods becomes critical in arid regions where seasonal food supplies can be erratic. For example, in the Ferlo region of Senegal, where as many as 150 wild plant foods have been recorded, the leaves and fruit of baobab (*Adansonia digitata*), leaves, fruit and seeds of *Balanites aegyptiaca* and the fruit of *Ziziphus mauritiana* which is principally gathered by the Moors, are widely consumed. These are products that are mostly available during seasonal "hunger" periods. During the hunger period in the same region, it is the fruit of *Boscia senegalensis* that is processed and consumed as a staple as it is one of the few species that produce fruit at end of the dry season. Similarly, the availability throughout the wet season of the leaves of *Senna obtusifolia* contributes to their popularity. Other forest foods are only relied upon during food emergencies (Becker, 1983). For example, in Ethiopia, *Pterocarpus* sp. and *Myrianthus* sp. are highly valued for their dry season flushes, which provide leaves when few other vegetables are available (Getahun, 1974). *Balanites aegyptiaca* known locally as *tuyunwo* in the semi-arid Pokot region of Kenya, is cherished by local communities because even in drought years when other forest foods are in low supply it is still able to produce (FAO, 1991b).

Although forests provide food resources for most of the seasons, it is when there are shortfalls of the cultivated food varieties such as during droughts and emergency periods, where forests may be the only source of food and most appreciated. For example, in Kenya in the Kathama area, wild fruits have long been valued as buffer food resources in famines and in times of food shortages. Gathering and processing of forest products provide an emergency means of cash earning during emergencies which can be used to purchase food. Sometimes during the emergency periods, forest foods are not gathered for the sake of cash but for food for survival. For example, in the Sine Saloum region of Senegal, the Wolof and the Soce have been known to turn to the forests in food emergencies (FAO, 1991b). Communities would normally gather wild yam (*Dioscorea* sp.) which acts a staple food when the cultivated grains fail. They also consume raw the forest tuber (*Raphionacme bingeri*) as a staple and is also treated as a snack especially by the children. When other products are unavailable, the leaves of *Portulaca oleracea* and *Ficus thonningii* are used in sauces.

In West Africa, shea butter, *Vitellaria paradoxa* is a staple component for most of the local diets. In the southern Sahel and Sudan zones of Africa, it is the most affordable and extensively used edible fat (Schreckenber, 2004). Its fruit flesh is an important snack during early agricultural and low periods when stocks of food from previous season are low and yet energy needs are high. It is important to note that during emergencies such as famine, famine foods differ from those forest foods consumed at other times. Famine foods are highly energy-rich, but they are not often consumed regularly as they can be unpalatable. For example, throughout Sahelian Africa, baobab (*Adansonia digitata*) roots are consumed during famines; during less trying times, only the fruit is eaten (FAO, 1991b). In northern Senegal, Becker (1983) found that fibres extracted from *Grewia bicolor* and the seeds of *Combretum aculeatum* were used only in emergencies. In Mauritania, gum arabic from *Acacia senegal* is fried to make *n'dadzalla*, a dish eaten by Mauritanian nomads, or is sometimes mixed with sugared water to produce a milk substitute (FAO, 1991b). In Botswana the tubers of *Raphionacme velutina* and *Coccinia rehmannii* are used by the San Bushmen as sources of drinking-water.

In Natal, South Africa, there are 33 species valued as famine foods, including the fruit of *Carissa macrocarpa* and Natal plum (*Englerophyton natalense*), and the roots of many species including *Boscia albitrunca* and *Maerua cafra* (FAO, 1991b). FAO (1984) estimated that almost 150 species of wild plants collected in India, Malaysia and Thailand were consumed as emergency foods. In certain cases the kernels of *Shorea robusta*, the bark of *Acacia* sp., *Bombax ceiba*, and *Premna mucronata* are ground into a fine flour to make chapattis. Chapattis would normally be made from wheat or rice flour. The grains of several species of grasses, especially bamboo, are also used the times of scarcity.

Kola nuts are chewed (masticated) fresh in their regions of origin. Commercial kola consists of the dried cotyledons of the seeds. These are usually picked before they reach maturity. Kola nuts are used in the preparation of non-alcoholic beverages, in particular Coca-Cola. *Cola acuminata* and *Cola verticillata* are also used. Kola leaves were removed from the original formulation of Coca-Cola in 1904 (Hostettmann *et al.*, 2000). The most common Kola species that grow in the equatorial West Africa Region ranging from Mali, Sierra Leone to Nigeria and Gabon is *Cola nitida* (Sterculiaceae).

NWFPS can also play an indirect role in food security like enriching the nutrient content of the soil and retention of moisture. They also provide shade and windbreaks to food crops and help control soil erosion. NWFPS provide fodder for both domesticated and wild animals especially during the dry season when the herbaceous groundcover dries out. They also provide medicine for livestock and are used as plant-based insecticides, such as the *Azadirachta indica* (neem) tree. They are used for staking climbing plants such as tomatoes, preparation of hunting and fishing equipment, and construction of storage facilities and fences. For example, in Africa,

Strophanthus spp. (Apocynaceae), whose seeds have a long history of use as arrow poisons in East and West Africa, are also important in food security. *Strophanthus kombe* (known to the local population of southern Malawi as “kombi”) grows in the lake region of East Africa. In Malawi it is used to kill fish (Hostettmann *et al.*, 2000).

In conclusion the NWFPS have been historically an integral part of rural food systems and local cultures. Dependency on NWFPS by poor households will continue to remain high. Those households that are in or near forested areas may combine different uses of local NWFPS (as food sources, in-kind or cash contribution to household food security) in their economy. This combination will vary according to the knowledge about and availability of these products, the opportunities perceived by the household, and its present needs; which in turn will be determined by ecological, cultural and economic factors. The contribution of NWFPS to household food security and nutrition will therefore change with evolving lifestyles as well as development of robust market economies away from subsistence economies.

5.1.4 Health

Most developing countries are endowed with vast resources of medicinal and aromatic plants. Where modern medical facilities are limited, or where these are costly, local people depend on plants and/or fauna as sources of medicines for treating human and animal diseases. Parts used for their medicinal properties are tree bark, roots, leaves and animal skins and other organs.

One of the problems of low levels of Vitamin A intake is it can result into blindness. In Southeast Asia almost 250,000 children go blind every year because of lack of vitamin A (FAO, 1984). However many forest fruit species, as well as leaves, are good sources of this vitamin. For example, one good source of vitamin A is palm oil which is widely consumed throughout West Africa. Mushrooms are highly valued in many societies, and sometimes considered as "meat". Although they contain protein, carbohydrates, fats, salts, fibres and are rich in Vitamin B, they are usually considered as gourmet foods rather than subsistence foods. It should be noted that other factors influence the body's ability to use vitamin A. Vitamin A requires fats in order to be digested and synthesized and therefore a low fat diet may contribute to problems of vitamin A deficiency. In order to reduce this problem consumption of nuts and oil seeds as well as fruits can be helpful.

Another common nutrient-related health problem is riboflavin deficiency responsible for several eye and skin disorders. The onset of these problems would usually indicate a deficiency of all the B vitamins. However many forest foods, especially leaves are good sources of this vitamin. Wild leaf vegetables tend to have significantly higher riboflavin contents compared to cultivated varieties.

Iron is essential for the manufacture of blood haemoglobin. In Africa, it has been found that low levels of iron intake are associated with some major health problems. This situation often leads to anaemia. Of particular importance is that pregnant and

lactating women require iron in order to avoid anaemic conditions. Many forest foods, especially the leaves, have sufficient iron to meet dietary requirements.

Diseases can increase the morbidity of the productive members of the community. They can debilitate or can reduce labour efficiency in periods that are crucial to agricultural production, such as during the planting period. In this kind of situation forests often provide the only medicines available to the vast majority of the world's population and about 75-90% of the developing world. A few important points need to be made: some plants contain high concentrations of different chemicals which are the base for modern drug equivalents; many plants chosen for their medicinal qualities are high in particular vitamins and minerals which can counteract illnesses caused by vitamin shortages or meet a need for additional quantities of a particular vitamin or mineral.

The quality of water can directly influence disease prevalence. Forests and forest products can indirectly and directly affect the quality of this supply. Forests act as water supply regulators, ensuring higher levels of year-round water. They also protect against high sedimentation by acting as filters. A few forest tree species have interesting properties which can affect the quality of water supplies. *Moringa* sp. is used by women in Egypt and the Sudan to clear turbid water. The seeds of the tree contain natural coagulants which can clear water to tap water quality in 1 to 2 hours. The elimination of turbidity is accompanied by a 98-99% elimination of indicator bacteria. Thus the use of moringa seeds can provide a low cost water treatment technology, thereby improving the health of rural communities.

The fruits of *Balanites aegyptiaca* and *Swartzia madagascariensis* contain saponins, which are lethal to the snails which act as the intermediary host of bilharzias, as well as to the water flea, which harbors the guinea worm. Other species with important molluscicidal properties include the bark and fruit of *Balanites aegyptiaca*, the shell of *Anacardium occidentale*, and the seeds of *Phytolacca dodecandra* and *Swartzia madagascariensis*.

Traditionally, villagers inhabiting the edge of the Sinharanja rain forest in Sri Lanka have a variety of plant species for both food and medicine. Seeds of wild cardamom, for example, are harvested by large groups of villagers and used as medicine to treat internal diseases of the liver and the uterus as a diuretic and to prevent excessive vomiting in children. For most rural communities many foods are considered to have properties that improve health. Woody stems of the liana, *Coscinium fenestratum*, comprise one of the commonest indigenous medicinal ingredients found in both rural and urban households, and is usually taken in combination with other medicinal plant products to treat a variety of ailments from fever to tetanus. In addition, a variety of indigenous food preparations, cooked into curries or as steamed salted or sweet dishes, is made with flour made from the fruits of the *Shorea* tree. These are strongly recommended by local physicians for gastritis and other bowel ailments. Work done by CIFOR in the Amazon found that it is a tradition for communities to use oil from a

tree called *andiroba* (*Carapa guianensis*), meaning 'bitter oil', against insects such as mosquitoes and to relieve skin problems, fever and sprains. Internationally, the market for *andiroba* oil is growing. It is sold in Europe and the US as medicinal oil for a host of different complaints - from worms to arthritis.

Women play a key role in this field since they are usually the first to diagnose and treat the problems of children. Wild plants constitute the main medicinal source in most traditional societies. They are used in the prevention and treatment of diseases and therefore contribute to the effective biological utilisation of food by the individual. Besides this direct contribution, medicinal plants can be bartered or sold and generate income in kind or cash. Table 5.1 summarises the relation between nutrient related problems and type of forest foods needed to combat various deficiencies.

Africa has a long and impressive list of medicinal plants. One classic example is a tropical plant found almost everywhere in Africa called *Securidaca longepedunculata*. In Tanzania the dried bark and root are used as a purgative for nervous system disorders. Throughout most of East Africa, the plant's dried leaves are used for wounds and sores, coughs, venereal diseases, and snakebites. The leaves are used for wounds, coughs, bilharzias, venereal diseases, and snakebites in Malawi while the dried leaves are used to cure headaches. The dried leaves are also used against skin diseases in Nigeria. The roots of the plant have been known in Botswana and Zimbabwe to treat malaria, and to treat impotence in Tanzania. In Angola, the dried root is used as both a fish poison and as well as an aphrodisiac. The same dried roots have religious significance in Guinea-Bissau and are understood to have a psychotropic effect. In Ghana the root bark is used for epilepsy.

One of the major plants used for medicinal purposes is *Prunus africana*. *Prunus africana* (Rosaceae; African Cherry, Red Stinkwood) is an evergreen hardwood tree that grows in the mountain forests of West Africa, East Africa, Southern Africa and Madagascar. It is commonly found in the afro-montane forests of Cameroon, Democratic Republic of Congo, Kenya and Madagascar. It is a multiple-use tree species with local and international economic and medicinal value (Cunningham and Mbenkum, 1993). Traditionally it has been used to treat malaria, stomach pains, fever, urinary problems, sexually transmitted diseases, wounds, chest pains and heartburn. The bark, leaves and fruits have been used in witchcraft and as arrow poisons.

Table 5.1 Nutrient deficiency related problems and forest foods remedies.

Nutrient-related problems	Forest food with potential for combating the deficiencies
Protein-energy malnutrition: due to inadequate food consumption causing reduced growth, susceptibility to infection, changes in skin hair and mental facility.	Energy rich food which is available during seasonal or emergency food shortages, especially, nuts, seeds, oil-rich fruit and tubers; e.g. the seeds of <i>Geoffroea decorticans</i> , <i>Schinziophyton rautanenii</i> , and <i>Parkia</i> sp.; oil of <i>Elaeis guineensis</i> , <i>babassu</i> , palmyra and coconut palms; protein-rich leaves such as baobab (<i>Adansonia digitata</i>) as well as wild animals e.g. snails including insects and larvae.
Vitamin A deficiency: in extreme cases causes blindness and death; responsible for blindness of 250,000 children/year in southeast Asia.	Forest leaves and fruit are often good source of Vitamin A; e.g. leaves of <i>Pterocarpus</i> sp., <i>Moringa oleifera</i> , <i>Adansonia digitata</i> , the gum of <i>Sterculia</i> sp. palm oil of <i>Elaeis guineensis</i> , bee larvae and other animal food; in addition fats and oils are needed for the synthesis of Vitamin A.
Iron deficiency: in severe cases causes anaemia, weakness and susceptibility to disease, especially in women and children.	Wild animals including insects such as tree ants, mushrooms, often consumed as meat substitutes, as well as forest leaves such as <i>Leptadenia hastata</i> , <i>Adansonia digitata</i> .
Niacin deficiency: common in areas with maize staple diet; can cause dementia, diarrhoea, and dermatitis.	Forest fruit and leaves rich in niacin such as <i>Adansonia digitata</i> , fruit of <i>Boscia senegalensis</i> and <i>Momordica balsamina</i> , seeds of <i>Parkia</i> sp., <i>Irvingia gabonensis</i> and <i>Faidherbia albida</i> .
Riboflavin deficiency: common throughout southeast Asia; among those with rice diets causing skin problems.	Forest leaves are especially high in riboflavin, notably <i>Anacardium</i> sp., <i>Sesbania grandiflora</i> , and <i>Senna obtusifolia</i> , as well as wild animals, especially insects.
Vitamin C deficiency: common to those consuming monotonous diets; increases susceptibility to disease, weakness.	Forest fruit and leaves often supply the bulk of Vitamin C consumed; good sources include fruit of <i>Ziziphus mauritiana</i> , <i>Adansonia digitata</i> and <i>Sclerocarya caffra</i> ; leaves such as <i>Senna obtusifolia</i> , and the gum of <i>Sterculia</i> sp., are also good sources of this vitamin.

Source: FAO, 1991b

Tribes on the slopes of Mount Cameroun revealed to colonists that they had used the bark to treat diseases in old people for centuries. Bark extracts have stimulated considerable interest in Europe since 1969 for the symptomatic treatment of mild and moderate Benign Prostatic Hyperplasia (BPH), an increasingly common health problem in older men worldwide (Ndam and Marcelin, 2004; Hostettmann *et al*, 2000). For now, the bark of *Prunus africana* is only harvested from the wild in the four countries mentioned above and to some extent from some eastern and southern

African countries such as Ethiopia, Tanzania, Malawi, Mozambique, and South Africa. The bark or the processed extracts are then exported to Europe, primarily to France or Italy, for preparation of the drugs, which are sold under trade names as “Tadenan” in France or “Pygenil” in Italy.

In Ghana, and in most West Africa countries, chewing sticks from *Garcinia* spp. have provided primary healthcare for people for hundreds of years (Blay, 2004). In fact the good condition of most of the people in the region has been attributed to chewing sticks. In most of West Africa stretching from Senegal to Central African Republic, products from shea butter trees are in traditional medicinal applications and some of them are reputed for their skin healing properties (Schreckenber, 2004). In Namibia, Botswana and South Africa devil’s claw (*Harpagophytum* spp.) is used by local communities to treat fever, blood diseases, muscular aches and pains, digestive disorders and syphilis. It is also used as a painkiller for pregnant women. At international level the plant is used to produce medicines for treating rheumatism and arthritis. In South Africa, the bark of *Cassipourea flanaganii* is sold locally and nationally for production of skin lightening cosmetics.

Acokanthera schimperi is used in the treatment of heart problems and its action is rapid and brief (Hostettmann *et al.*, 2000). The baobab tree, *Adansonia digitata* (Bombacaceae) contains tartaric acid in the fruits and seeds; they are used as a remedy for dysentery in Central Africa. In Nigeria and Senegal, the fruits are reputed to be effective against microbial diseases. These observations have been confirmed in tests against both bacteria and fungi (Hostettmann *et al.*, 2000). The rhizomes of *Hypoxis hemerocallidea* (Hypoxidaceae) are used in African traditional medicine for the treatment of urinary infections, prostate hypertrophy and internal cancer. *Hypoxis hemerocallidea* (formerly *H. rooperi*) from southern Africa contains compounds which inhibit the growth of certain cancer cells. Patients suffering from AIDS are also reported as being treated with the methanol extract of *Hypoxis* species (Hostettmann *et al.*, 2000).

Yohimbe, *Pausinystalia johimbe* (Rubiaceae), which grows in the forests of Cameroun, Gabon and Congo is another important medicinal tree. The bark contains important medicinal compounds and can be processed into health products. As a medicine the compounds are used to treat hypertensive activity at low doses (Hostettmann *et al.*, 2000). As a health product, the extracts contain a compound known as yohimbine and known for its aphrodisiac effects. It is also used to increase libido and has been used with success in the treatment of erectile dysfunction. With the introduction of Viagra for the treatment of erectile dysfunction, there has been increase in the use of natural alternatives. One of these preparations known as “*Vukavuka*”, originates from Zimbabwe, where people have used it for many years. Traditional healers originally distributed this product but the product is now sold as a dietary supplement by firms originating in Zimbabwe, South Africa and the USA. An investigation of preparations prescribed by traditional healers and sold in markets in

Zimbabwe has shown the frequent presence of the following: root bark of *Mondia whitei* (Asclepiadaceae), roots of *Albizia antunesiana* (Leguminosae) and stem bark of *Ozoroa insignis* (Anacardiaceae). Other constituents may include: *Pouzolzia mixta* (Urticaceae) stem bark or root, *Elephantorrhiza goetzei* (Leguminosae) roots and *Senna singueana* (Leguminosae) stem bark. Although studies are still being carried out, it is known in some cases the preparations have included powdered blister beetles and/or yohimbine both of which are known to be efficient provokers of erections (Hostettmann *et al.*, 2000).

5.1.5 Forage and pasture

Forage is defined as "all browse and herbaceous food that is available to livestock or game animals" (Ibrahim, 1975). Thus forage includes NWFPs that sustain such animal populations. Forests provide many pastures for both domestic and wild animals alike. Pastures are present in natural forests and/or woodlands, around homesteads in agricultural fields and other individually and/or communally owned forest areas. Grazing is offered in terms of grass biomass production and browse. There are also numerous grasslands, some of which were previously forests, but due to continued pressure from deforestation and late fires have slowly been converted to grasslands. The dominant grasses belong to the genera *Acroceras*, *Leersia*, *Oryza*, *Panicum* (Fig. 5.1), *Paspalum*, *Sacciolepis* and *Vossia* (Mulombwa, 1998). In southern Africa grasslands are found around *dambos*, flood plains, margins of pans, swamps and lakes.

Fodder, which is sometimes incorrectly attributed as forage, refers to dried, cured plant material of crops such as maize and sorghum, including the grain. Browse refers to the tender twigs and leafy shoots of woody plants (Ibrahim, 1975). In arid and semi-arid environments of the Sahel, browse becomes important to all herbivores, as grasses alone are not able to supply maintenance requirements for more than a few months of the year. Fodder trees have been used in the past mostly as browse by livestock in open forest areas, that is, communally owned land, and in pastures on farmland. Fruits, leaves, and at times bark, have been browsed by most domestic and wild animals as fodder since time immemorial. Livestock such as goats have had a wider base for fodder because they are able to browse from all manners of trees except the poisonous ones. Indigenous trees have ably performed this task up until recently when unprecedented deforestation started to create local shortages. Ibrahim (1975) emphasised the importance of trees and shrubs as sources of browse; that probably more animals fed on shrubs and trees, or on associations in which trees and shrubs played an important role, than on true grass-legume pastures.



Figure 5.1 Harvest of *Panicum* sp. for animal feeding in Buwuni, Uganda (Courtesy E. Achigan-Dako).

However, it is important to note that the amount of browse utilised by herbivores depends on species. In sub-Saharan Africa where droughts are a frequent occurrence the use of browse of any given species also depends on the circumstances and overall availability of usable biomass. Cattle, sheep, equines, wildebeest, most antelopes, gazelles, white rhino and hippo are mainly grazers, but during the dry season they balance their diet by browsing. Other species, such as goats, camels, eland, impala, kudu, elephant, giraffe, black rhino and a number of antelopes are mainly browsers and can thrive satisfactorily on a purely browse diet (Ibrahim, 1975). In any case the potential availability of indigenous vegetation as a source of food for wildlife and domestic animals is great, such that it is essential that its preservation, regeneration and productivity needs to be assured for the future survival of livestock and wild herbivores.

5.2 Cultural aspects in NWFPS

It is important to understand the cultural and spiritual values of forests because this often determines the extent to which communities are dependent on them. If NWFPS are only considered from an economic point of view, their cultural values could be lost. Most households exist in an environment within which their activities are influenced by an array of interrelated objectives, constraints, and other factors. While non-wood forest products may be considered for livelihood security for most of the households, they also have local social, cultural and spiritual significance. For example, in northern Benin, harvest of *Khaya senegalensis* foliage in Fulani community is strongly related to cultural beliefs (Box 5.2)

Box 5.1 Fulani ecological knowledge of foliage harvesting impacts on *Khaya senegalensis* in Benin

A study conducted in Benin on the Fulani people (a cattle raiser community) demonstrated that their knowledge of the effects of pruning on *Khaya senegalensis* foliage quality and quantity was not influenced by the ecological region where they operated, their age, lifestyle or herd size. According to 95% of the Fulani interviewed, at the tree level, pruning improves both the quality and quantity of leaves produced. They explained that pruning rejuvenates trees, removes old leaves and allows trees to produce new light-green and shiny leaves that are more preferred by cattle to the old dark-green leaves. They said that a lack of pruning over many seasons may attract parasites; therefore the more one prunes a tree, the better leaves it produces the following year. However, Fulani did mention that repeated pruning at high levels weakens the tree, preventing it from renewing branches, or causing it to produce smaller leaves in the long-term.

According to most Fulani interviewed, pruning does not affect whether a *K. senegalensis* tree will fruit or not. Twenty percent of participants responded that only heavy pruning (100% crown removal) affects fruiting probability. Pruning intensity (percent branches pruned) matters less than pruning frequency (number of times a tree was pruned) as the most important factor in determining the probability of fruiting. They maintained that even trees pruned at 100% are likely to produce flowers and fruit in the future, if given enough time to recover. Fulani reported that *K. senegalensis*' reproductive response to harvest varies not only with the frequency and intensity of harvest, but also with trees age. Older trees tend to take more time to recover from harvest than younger trees.

There is a traditional practice pertaining to limit pruning intensity and locally referred to in the Fulani language as *sopoodu* or *oloodu* which means "head" or "top". The *sopoodu* practice consists of leaving a few branches at the tops of trees after pruning. This practice is specific to *K. senegalensis*. Participants provided three main reasons to explain why someone would resist pruning all the branches and leaving a *sopoodu*. Leaving a *sopoodu* shows courage and skill. *K. senegalensis*, unlike other fodder tree, is tall (up to 30 m height) and difficult to climb. Pruning *K. senegalensis* is therefore a dangerous activity that provides opportunities for young Fulani to demonstrate their talents, and to earn respect and prestige from their peers. The *sopoodu* is also spared to "protect the tree and promote vertical growth and reproduction". The majority of participants who suggested this explanation of the role of the *sopoodu* indicated that removing the *sopoodu* would inhibit tree growth. They also compared the *sopoodu* to the square of hair that is commonly left on Fulani children head, which is also referred to by the same name. Some participants said that the *sopoodu* carries spirits known in Fulfulde as "*djin*". Traditionally, harvesters leave the *sopoodu* to avoid disturbing those spirits, which would hunt them down if angered. Others suggested that the *sopoodu* is spared to avoid leaving the tree "naked". We also found that most trees had small *sopoodu* and in some cases the *sopoodu* is absent, indicating the loss of this traditional management practice. According to Fulani participants, "the size of the *sopoodu* tells a lot about the personality of the harvester". They associated the small-sized or no-*sopoodu* with young and inexperienced harvesters, and with immigrant Fulani harvesters who do not care about the regeneration of the species.

Source: Gaoue & Ticktin 2009.

Some forest sites and/or species may also have a sacred value. For example, sacred forests, that is, forests with spiritual, cultural and religious values, are also often the

source of most NWFPs. They therefore need to be managed to preserve the needs and spiritual life of the communities. They constitute an integral part of the habitat and of the social and cultural structure of those living within that environment. The cultural and religious significance of these NWFPs are not only important in playing a role in forest management but also require that forests be managed sustainably (van Rijsoort, 2000). These values vary from one village to another. However, traditions and culture are continuously changing according to new perceived opportunities. This evolution is accelerated by changes in attitude in the younger generations and immigration of people with different values.

It has also been observed that the success of a NWFP extraction system is to a great extent determined by the extent of participation by women. Women have an extensive knowledge of the use, management and processing of NWFPs and could play a greater role in the production, diversification and development of economically important NWFPs. This also includes knowledge of NWFPs among children (van Rijsoort, 2000). Care should be taken to ensure that as NWFPs are being developed, the traditional culture, often associated with most of the NWFPs, is also strengthened and supported.

Gender and age aspects have been found to be critical in the way NWFPs are perceived. For example, men and women have different roles in collecting, processing, and marketing NWFPs. Women in particular are to a considerable extent dependent on NWFPs for self-support and income. For many women, collecting, processing and marketing NWFPs becomes the only way to earn an independent income. In Central Africa, most of the traders are women (van Rijsoort, 2000). However the way NWFPs are used also differs between men and women. Women often describe more uses for each species of trees than men, especially for medicinal uses; and men are much more concerned with agricultural uses. Given the extensive knowledge women have of the use, management and processing of NWFPs, they should be closely involved in the production, diversification and development of economically important products (van Rijsoort, 2000).

5.2.1 Cultural aspects in the consumption of forest foods

Culture has a lot of influence on what plant or animal species in a given area may or may not be eaten. It goes both ways that in as much as consumption of foods is a social issue, it is also a biological one. Food is an essential part of most social interactions and rites. Thus the selection of foods is based on the social, political and economic processes that underlie them. These decisions are generally guided by local cultural perceptions, attitudes and beliefs. Wild foods often have a cultural value and some are consumed during special feasts. Local perceptions of the value of a given food are generally independent of its nutritional content. Thus in some societies' bushmeat is considered "real meat" while in others the preferred choice to meat is from domesticated animals. Local populations often consider their taste superior.

5.2.2. Changing consumption patterns and cultural value of forest foods in some regions

On some islands of the South Pacific such as Tonga and Vanuatu, consumption of some traditional foods, such as insects, was found to be declining and elders complained that young people did not like that type of food any more (FAO, 1991b). Foods, which once provided security against famine following hurricanes and droughts, had now been replaced by more recently introduced cassava and sweet potato. However, the traditional foods still retain a high cultural value and continue to be used in ritual feasting. In some societies mushrooms are so highly valued that they even referred to as "meat". For these societies mushrooms are gourmet foods and not merely subsistence foods.

Again in most societies, use of foods is sometimes governed by a series of unwritten rules and codes. Taboos and ritually marketed foods may, for example, determine the selection of foods for specific social groups. For example there would be food for women, food for children and food for adult males and so on. These taboos are often linked to local health beliefs. Many foods, like spices, are considered to have properties that improve health and are therefore used as self-administered medication. For example, in some regions it is a cultural requirement that lactating women consume bush foods in order to acquire additional vitamins. This is the case because in most rural communities many forest foods are considered to have properties that improve health. However, in certain regions religious regulations or ethnic values may lead to some systematic food avoidances (taboos), which discourage the eating of particular animals and plants. For example, the *Achuaras Jivaro*, a population of tropical-forest-dwelling Amerindians in the Amazon, have a number of general taboos. Categorized as "not eaten" are the largest land mammals, such as tapir, deer, and capybara, as well as the largest intermediate-sized species, such as sloths and anteaters. Among the Achuaras these animals are excluded from the diet for a variety of reasons; religious and mundane. On the one hand, deer, tapir, and sloths are considered to be reincarnated spirits (*wakanz*) of the human dead, while tapir is also believed to cause a skin rash if consumed.

The role and use, of individual NWFPs can be subject to these cultural and mystic values that reflect a people's history, religion, art, and other aspects of its functioning as a society. Sacred groves or forests in particular areas are for example often maintained whereby harvesting of produce is banned or closely controlled. In such cases, individual species, both animal and plant, have spiritual or other cultural significance and therefore cannot be used or are reserved for particular uses. In some cases, control of the use of particular trees is exercised because they provide products of special value locally. Certain foods are reserved for celebration of harvests and weddings. For example, some forest foods also feature in many cultural ceremonies in West Africa such as in marriages, funerals, initiations, installation of chiefs, and birth celebrations. In Nigeria palm wine is of paramount importance at most social

functions (Okafor, 1979). It is used in pouring libations, offering prayers, and heralding events. Cola nuts are regarded as important symbols of welcome and hospitality. For Muslims of the region, cola nuts are sacred. The belief is that the prophet gives them the cola nuts. They are a symbol of friendship and feature in all festive occasions. Among the Igbo of Southern Nigeria, all discussions, prayers, and ceremonies begin with the breaking of cola nuts. The seeds of *Pentaclethra macrophylla* are another example of symbolically important forest foods. In south-western Nigeria, they feature in child-naming and girl initiation ceremonies thus heralding maturity. Breadfruit, *Treculia africana*, is served at women's burial ceremonies. It is also served during a festival staged to indicate a girl's impending departure to her husband's home (Okafor, 1979). The seed shells of *Chrysophyllum albidum* and *Mammea africana* are worn by dancers as rattles in Igboland, Nigeria. Ceremonial clothing and costumes are also often made from specific forest products. Among the *Ashante* in Ghana, traditional cloth is still important at festive and ceremonial occasions. For example, the bark and stem of *Lannea barteri* are used for dyeing the funeral cloth *kuntunkun*. The bark of *Bridelia ferruginea* is used for dyeing *Adinkra* cloth which is important at other ceremonial occasions. The *gara* cloth is a traditionally valued indigo cloth. The indigo dye of *gara* is derived from the leaves of the woody climber *Philenoptera cyanescens*.

5.2.3 Cultural values of specialty forest foods

Sometimes gathering of certain forest foods is not necessarily an activity of economic desperation. Some forest foods are considered a specialty and have important cultural values. Specialty forest foods with cultural values include traditional foodstuffs and craft materials. For example, for some ethnic groups in some of the regions of the world, the gathering is an enduring way of marking the passage of the seasons and acquiring culturally important goods (Emery, 1998). It is also observed that sometimes NWFPs have ceremonial uses for which substitutes may not be available on the market and therefore the very process of gathering these products according to cultural norms may be an important part of their ceremonial value.

Emery (1998) noted that where some NWFPs are not required to meet urgent material needs, they are sometimes critical in building and maintaining social networks that may be called upon in times of need. The exchange of gifts is one way of ensuring this. They are also ways of redistributing livelihood resources to individuals such as the very young and old, who cannot provide for themselves. Because gathering of NWFPs is most frequently done in intergenerational groups, it creates opportunities for older family members to pass on information that is vital to the continued observation of practices and the maintenance of cultural identity. This knowledge transfer is also a way of ensuring that NWFPs livelihood values will be available to future generations.

5.2.4 Emerging products, services and issues

The most significant emerging products and services derive from environmental concerns emphasising climate change and global warming. These have emerged from Agenda 21, the Inter-governmental Panel on Climate Change (IPCC), and the Kyoto Protocol and REDD+ of the United Nation Framework Convention on Climate Change (UNFCCC) both of which have been dealt with earlier.

Another important issue worth noting is the emergence of catastrophic diseases related to HIV/AIDS and the attendant effects on forestry and the national economies as well as the gender perspective.

HIV & AIDS

HIV & AIDS limit the social capacity of communities. These limits provide the objectives for strategies and policies that facilitate household capacities to move from a situation of survival towards a rehabilitation process. In the case of NWFPs, interventions relevant to HIV & AIDS have to reinforce existing strategies to contain the scourge. Some NWFPs strategies will target (i) health - to engage in traditional medicine; (ii) business - to develop micro-enterprises and lending schemes; and (iii) agriculture - to increase access to land and credit. In *operationalising* these strategies specific activities might include support for (i) smallholder-trader networks; (ii) ecologically sustainable products that minimize the need for resource management; (iii) access to credit and resources particularly for women and orphans; and (iv) the transfer of, and rights to local knowledge.

However, there remains little response from the natural resource management sector, a result of inadequate understanding of its role in household responses. Recommended interventions to support income generating activities involving NWFPs fall under the current emphases of the international multisectorial response. Considering this, implementation of the recommended interventions does not require a new framework. Given the limited funds, and the magnitude of the epidemic, efficiency is a primary concern of responses. Another concern is effectiveness. An effective and sustainable HIV & AIDS mitigation effort will require support for bottom-up processes. In the case of NWFPs, there remains a need for better understanding of the bottom-up responses.

The gender perspective

The resources and knowledge available in a community may differ between men and women. When considering issues of NWFPS, a number of factors related to gender should be considered, such as: whether men or women are cultivating crops and the cultural aspects related to utilisation of certain resources; what potential obstacles they may encounter with regard to access to financial assistance, long-term rural credits, information and access to competitive technologies. These factors may be decisive to a successful outcome. The scale factor is also important. Women are

usually cultivating their crops on small plots of land whereas men tend to use larger areas of land for their production, and this must also be considered. Women may benefit to a larger extent than men from producer co-operatives, in their efforts to reach economies of scale and reduction of transport, storage and marketing cost per producer. It is also important that both women and men benefit from the dissemination of information through education and training programmes for producers.

Points to remember

- NWFP provide income and employment during low periods in the agricultural cycle. In fact, it has potential to employ many times more than the conventional forest timber industries.
- The contribution of NWFPs to household food security and nutrition will change with evolving lifestyles and development of robust market economies. There is a need for studies to quantify the demand and potential of supply of food and other products from the forests with the changing times.

Questions

1. Propose a business plan based on a NWFP of your choice. How does your plan contribute to alleviate poverty?
2. How can NWFPs help contribute to food security? Give examples of sources of food from forest ecosystems. Expand on the nutritional importance and give specific examples.
3. How can NWFPs contribute to solve the nutrient deficiency observed in developing countries?
4. Many NWFPs are medicinal plants whose importance in improved livelihoods has usually been highlighted. However, their integration into primary healthcare system in many countries has been limited. What are the bottlenecks hindering their proper utilisation and how can they be overcome?
5. In which way can traditional knowledge be used to promote sustainable management of forest ecosystems and NWFPs?

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6

Institutional and Regulatory Arrangements for Management and Utilisation of Non-Wood Forest Products and Services

Most NWFPs are often associated with traditional uses that are not widely known if not linked to poverty and subsistence. Most countries, in Africa especially, lack policies or institutions to specifically govern the management, harvesting, processing and marketing of NWFPs. This results in lack of adequate and appropriate provisions for: community participation, including tenurial rights and incentives, usufruct rights; investment and involvement of private sector; credit facilities; regulations relating to processing and trade; evaluation of social and environmental values; and establishment of relevant standards. Any transactions related to NWFPs largely take place in households and small-scale units, mostly outside the established marketing systems/channels, thus forming part of an unorganised, informal sector that is largely under reported. This chapter analyses and explains how the institutional background, which shapes local enterprises, can promote improved management of forest based resources and the attendant NWFPs. 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. The chapter will further describe actions that governments can take to promote better use of NWFPs. It will examine (i) patterns in the growth of NWFP sector and their implications for policy interventions, (ii) areas for direct institutional support; and (iii) areas for international support.

6.1 Overview of institutional issues

In this compendium an ‘institution’ is defined as “an organised or established procedure”. Institutions set the ground rules for resource use and establish the incentives, information, and compulsions that guide economic outcomes. Institutions can be either formal or informal and guided by a set of rules. Formal rules include the written laws, regulations and procedures while the informally established procedures, norms, mores, myths, practices and patterns of behaviours define the institutional frameworks (Kajembe *et al.*, 2000). Institutional frameworks related to the management of natural resources can be considered in three broad categories: policies, laws, and administration (Saleth and Dinar, 1999). Thus, the institutional

framework combines (a) policies and objectives; (b) laws, rules and regulations; (c) organizational by-laws and core values; (d) operational plans and procedures; (e) incentive mechanisms, accountability mechanisms; and (e) norms, traditions, practices and customs.

The sustainable production and conservation of forest resources and products, especially non-wood forest products and services (NWFPS), are influenced by a number of factors that are largely of socio-economic, policy and institutional nature. The policy and institutional environment are often the most influential forces shaping the potential for sustainable resource management. Unsustainable harvesting of the plant materials from the wild by collectors mostly for selling in the outside markets, and lack of awareness of the people about the real value of the resources are two important causes for over-harvesting.

6.2 Governance and non-wood forest products and services

One of the major ills afflicting the NWFPS sector is the institutional neglect relating to policy, strategy and plans, legal rights and arrangements, incentives, development of skills, health and safety considerations, access to information, and streamlined support from public administration.

In most forest policies, non-wood forest products are often mentioned in passing, and without clear objectives, targets, and strategies for their development. Harvesting, storage, processing, standardisation and marketing of many non-wood products are neglected areas of development, often because they are seen (wrongly) as suitable for local consumption only. This inadequacy of seriousness or understanding leads to the lack of appropriate plans, programmes and projects related to NWFPS, and inadequacy of investment. Because of this, there is hardly any emphasis on developing and maintaining a database on NWFPS in many African countries. There have been initiatives to improve the situation in some countries, but a lot more needs to be done, and urgently.

Participation of the local communities in the production and management of NWFPS calls for appropriate provision regarding legal rights to encourage long term investments and improvements. The issue of the rights and involvement of local communities in harvesting and managing NWFPS have social, economic and ecological implications. When values of products accrue to the intermediaries in marketing/trade, the people engaged in their collection remain poor, regardless of the value of the products involved. Consistent and equitable income from harvesting of NWFPS gives the people involved an incentive to conserve and sustainably or better manage the forest. This is necessary also for facilitating availability of loans/funds for developing NWFPS.

Apart from tenure, security and autonomy, other economic incentives are also needed. Rational policy interventions are necessary to ensure access to credit and

markets and remunerative prices for the product. Financial institutions at present provide credit to the processors and exporters of NWFPs and these funds get used primarily for buying and marketing and not for sustainably managing and harvesting the resource.

Broad-based and organised participation encompassing local groups, women, indigenous communities and private sector is an essential means of strengthening the institutional structure for developing non-wood products for their economic and ecological benefits. Appropriate gender considerations can help improve the effectiveness and benefits of NWFPs programmes at the local level. Provision of facilities for training and skill development, capacity building, delivery of technological packages and extension support, a system of providing market information, credit facilities, support for establishing necessary infrastructure, and a streamlined public forest administration with development orientation, are other components of a rational institutional structure. Such a structure is required to promote healthy relationship between producer and user industry, and integrated operations wherever feasible.

In linking the NWFPs resources with national and international markets to support sustainable development, each country has to design arrangements appropriate to its own situation and addressing access, control, management and ownership of the resource; as well as involving local people and groups, management agencies, industry and trade. International support and assistance can considerably facilitate and help to accelerate the process.

6.3 Institutional support in development of non-wood forest products and services industry

Important institutional services in the development of non-wood forest products and services industries include capacity building (development of skills and capabilities) through education and training, research, and extension. Efficiency of these services in relation to NWFPs will be reflected in how far these products support socio-economic development and how far it succeeds in the market place, without jeopardizing their role in supporting local communities.

Institutional support to marketing is provided basically on two levels. At the highest level it comes in the form of government policy measures and regulations governing their implementation. In the case of NWFPs marketing, the implementation of trade policies and forest policies in particular, has the greatest impact. At the operational level, institutional support consists of the various cooperative arrangements among producers, standardization organisations, product and quality monitoring and control institutions, research institutes, extension and other human resource development services, banking and credit services, marketing information services, transport and communication networks, among others. Most institutional support is provided by

governmental or other public organisations and is therefore to a large extent beyond the control of individual operators in a single sector. There are, however, forms of institutional support for which operators in the sector can organise themselves, such as getting organised as groups, initiating training and forming joint marketing information systems.

NWFPS activities fall under several ministries, such as national planning, agriculture and forestry, trade and industries, health and education. Coordination of work at the national level is a pre-condition for successful development of NWFPS activities, including their marketing. However, adequate recognition of these products and their importance by the various policy making bodies is the primary condition for initiating such cooperation.

Many NWFPS are export commodities and therefore governed by foreign trade policy, which is a combination of (i) foreign exchange policies which determine, among others, exchange rates and payment regulations; (ii) import policies which deal with, among other things, tariff and non-tariff barriers; (iii) export policies which deal with regulations and procedures, incentive schemes, export promotion policies and practices, and export credit and insurance; and (iv) international relations through which trade negotiations are conducted, countertrade and similar arrangements made and international transport and warehousing regulations formulated.

At the national level, trade is further influenced by monetary, fiscal, production and price control and investment policies. Many institutions are responsible for various foreign trade activities. Unfortunately, NWFPS are only one of many product categories over which forest and trade policies have an influence; in most instances no specific attention can be paid to them unless they turn out to be particularly important in that country. In India for instance, the Ministry of Environment and Forests initiated the concept of Tree Growers' Cooperatives in collaboration with National Dairy Development Board. The cooperative undertakes marketing of the produce of the farmers by entering the market for certain non-wood and other forest products to purchase the commodities at the current market price and selling them at the market price. The entry of the cooperative as a large buyer pushes up the market prices and thus helps the farmers to get better return for their efforts (Raintree and Francisco, 1994).

National forest services are also involved in inventorying NWFPS resources, regulating their harvesting and collecting royalties from the gatherers. Cameroon is one of the Congo basin countries where efforts have been made in the sustainable exploitation of NWFPS of plant origins. But in spite of those efforts, many problems still exist. At the central administration (ministry of Forestry and Wildlife), the quotas attributed to different permit holders are not based on scientific data. The interministerial commission in charge of the attribution of quotas of NWFPS to different trade companies does not consider reports from field forest officers. The forest database in the forest sector does not collect data on NWFPS. Statistical data

published every year by the national institute for statistics does not gather suitable statistical data on NWFPs. In the field, and mostly at the level of checked points, the control of NWFPs is not well conducted. Problems that limit the monitoring and control of NWFPs in Cameroon include poor documentation of the permits (licences) for the harvesting sites, the lack of harvesting standards, and the absence of qualified and motivated personnel. It is estimated that more than 50% of Cameroon's NWFPs are being exported without the control of forest officers (Betti, 2007a).

On the other hand, universities, other training institutions and extension services provide institutional support through training of personnel for the marketing function. Government agencies and private industry organisations collect analyze and disseminate information to support marketing efforts. These commendable national efforts should be brought together at the regional and international levels to make the information more readily available to other interested users.

Industries, private-sector research institutes and individual scientists have data and information which is useful for NWFPs marketing. For example, health and safety information needed by manufacturers probably already exists but is not readily available. Similarly, industries know the standard chemical properties of each product they are dealing with. Identification of such sources of information and establishment of appropriate alliances to access the information are therefore important.

At the operational level of marketing, banking and credit systems provide financing to support production and trade of NWFPs. Transportation and communication authorities provide services vital to efficient marketing. They all are important to a successful operation of the NWFPs sector, especially if the sector and its significance are sufficiently known to them. Cooperatives are vital in organising gatherers and small-processing industries, and in developing marketing structures jointly. In the agricultural sector there are already well-functioning cooperatives which may be interested in expanding their activities to NWFPs.

6.3.1 Policy support

In many countries, policies governing NWFPs are scattered over many sectors, for example in agriculture, forestry, health and industry. Further, for most developing countries, there is little to no formal organisation in the NWFPs sector. Stakeholders in the sector often operate individually with little communication between them or information available to them. In contrast, the current structures involved in rural development are formal and are geared towards the service of mainstream agricultural activities such as agricultural extension services. Given the challenge that many of those involved in the NWFPs sector are landless and semi-skilled, they tend to fall outside the ambit of the formal rural administrative arrangements. Therefore, stakeholders need to have a context or space created for them by administrative institutions to articulate the challenges they experience in sustaining their livelihoods through NWFPs. Such space could facilitate the identification of challenges in

NWFPs, as well as provide an opportunity to mobilise stakeholders to seek possible solutions through collaboration.

Because most policies are often not formulated to address non-wood forest enterprises or rural livelihood, they fail to provide adequate incentives. In the Congo basin for example (Betti, 2007a), policies are well defined for what concerns timber, wildlife and recently community forestry. But questions related to NWFPs of plant origin remain problematic. The system of management of revenues gathered from both timber and NWFPs used in all central African countries is that of shared quotas. Those revenues are mainly shared between the public budget and the forest administration. And inside the forest administration the revenues are shared between a forest fund and other forest administration's services. The Fund is mainly destined to sustain the exploitation of forest products. All central African countries tax commercialised NWFPs. These taxes include harvesting and exporting taxes. The current fiscal scheme of NWFPs of plant origin does not include processing taxes, in any country in the Congo basin. Also, all taxes perceived in the harvesting stage are related to the quantity of the product, and not to the surface area exploited. This explains the low contribution of the NWFPs of plant origin sector to the forest revenues.

In Cameroon, the creation of a Forest Revenues Enhancement Program (FREP) in 1999 allowed the Government to better administer a regeneration tax on NWFPs. Since 2007, the Cameroonian forest administration has been implementing two main tools namely: the note book for way bills, and the note book for monitoring the stock of special products. The introduction of these tools is expected to ensure the control of the NWFPs exploitation. In spite of those innovations and progress, there are still some problems that negatively impact the sustainable exploitation of NWFPs in Cameroon. The glaring development challenge here is the total involvement of the forest administration in the knowledge of the resource, the revision of the regeneration tax, the fixation of permits in given areas, the attribution of permits through a competitive basis, the organization of the sector of NTFP as to allow enough usage rights to local communities, to allow those communities to sell their products at the council level to small companies, and to dissuade big companies to stay at the processing and export levels. If these improvements are made (Betti, 2007b), the Cameroon system can be evaluated for up-scaling in the other member countries of the Commission on Central African Forests (COMIFAC).

If policies are harmonised and redefined with an aim of stabilising rural economies and promoting rural enterprise, communities could become more self-reliant and generate surplus for export. Unfortunately, rural markets for non-wood products are linked to the rate of agricultural change. Institutions involved in rural community development need to recognize the special requirements of those who are involved in the NWFPs sector and foster the development or create the necessary support networks. The role of the public institutions needs to be perceived as one of

providing guidance for resource management through establishing a suitable framework that would facilitate a participatory role for communities in management of the NWFPs resource. Governments on the other hand need to recognize the constraints of land ownership and the demand for resources faced by stakeholders in the sector. Collateral management arrangements that provide NWFPs producers with access to forest resources and/or land for the explicit purpose of NWFPs production and management can serve to give stakeholders a vested interest in effective management and an incentive to protect scarce resources.

6.3.2 Patterns of economic change and implications for policy

Unmanaged commercialisation 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, 1995). Likewise, men tend to take over trade from women as it becomes more commercialised. Small enterprises find themselves unable to obtain credit and other services, which often favour larger operations. Thus, growth in forest-products 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. Under such circumstances, there is need to institute measures to ensure that community groups maintain control. According to Arnold (1995), conditions that help community groups maintain collective control against mounting pressures include (i) a legal system which is able to help the group enforce its rights; (ii) strong social institutions; (iii) well-defined rights of use; (iv) small homogeneous groups of users; and (v) rapid returns to investment in collective management.

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 and similar factory-made items begin to replace forest-based products in rural markets. Commercialisation 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, 1995).

When harvest rates outstrip natural regeneration/replenishment rates to satisfy growing market demand, the supply in the natural forests 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 fallows and domesticated sources (Arnold, 1995).

6.3.3 Implications for policy-making

To ensure that the overall policy environment provides incentives for wise forest use, government offices should (i) ensure that tenure policies decentralize resource management and encourage people's participation in sustainable forest management; (ii) properly account for the contribution of NWFPs to the national economy; (iii) remove subsidies for wasteful enterprises, both large and small; (iv) fully recognise traditional rural knowledge and social and cultural practices, and secure appropriate rights for rural communities, that acknowledge and compensate this knowledge (intellectual property); (v) 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. As they have often been considered as minor products, access regulations to NWFPs are generally more clearly embedded in the customary rights than in specific modern and often highly regulated external management and control mechanisms, except for some of the most important NWFPs. In forest-rich countries, where logging is of central importance, NWFPs are neglected except if concession holders can easily market them. In forest-poorer countries, competition for different land uses can also lead to a poor consideration of NWFPs' production potential. Despite the safety net role of NWFPs, forests are often perceived as a land reserve or available resource, even or especially for poor farmers.

Ultimately, access and management regulations must reconcile the often top-down land development planning with local and sometimes sophisticated customary rules. The latter naturally take into account the multifunctionality of forests whereas land use planning can have the tendency to consider one priority function for one space unit. Several examples demonstrate however that most traditional local forest managers normally try to domesticate the wild production of some NWFPs either in conjunction with other forest activities or with other farming activities (agroforestry). In the case of intensive domestication processes, for example, the cultivation of a forest species in agricultural fields or agroforestry systems, many technical, economic and social aspects should be known and considered before embarking on this option. First of all, the effect on product quality of growing the NWFPs in a different ecological environment must be assessed. Secondly there may be product quality variability which is determined by inherent genetic variability in the NWFP wild populations. In such cases, it is crucial to ensure that the appropriate selection of planting material is made and for some NWFP products, such as those for medicinal purposes, this would require substantial research, although again some traditional knowledge exists even on this aspect. Further, the transition from wild harvested to cultivated products may radically alter the balance of advantages or disadvantages

between different beneficiaries of the markets. While landless people may have taken advantage of the growing commercialisation of a NWFP, they may become the first victims of an intensive domestication process usually led by powerful outside investors. For instance, interestingly, German drug traders know that the percentage of their imported products originating from cultivation and from the wild varied from 80% to 90% respectively. However, they do not know the provenance of the purchased drug largely because certificates of origin are not normally required. It has been estimated that on average 70% of Germany's traded medicinal drugs are collected from the wild and 30% are from cultivation.

Based on basic, concrete and effective recognition of the rights of local populations, modern regulations will have to consider forests and forest products in a landscape perspective, *i.e.* considering the farming system as a whole and the multiple functions of forested ecosystems; and within an approach ensuring the livelihoods of each social group. In the process of developing such policies, NWFPs can be used to highlight the diversity and the importance of forest product uses and marketing for poor people and to ensure that customary uses/rights can be incorporated in the new regulations (Paudel *et al.*, 2002), or alternatively that equitable compensation could be provided for lost access and rights.

6.3.4 Considerations for institutional framework

NWFPs have a number of objective characteristics that make them difficult to support with suitable institutional governance which should always be kept in mind when dealing with the institutional options and set-up for them. These include:

- ▶ in most cases, they have remained in the informal economy; ignored by national economic and statistic services and neglected by natural resource management; their economic recognisance is hampered by a general lack of documented facts;
- ▶ the resource base is in most cases scattered and hardly known; the forest resources themselves are not well known, let alone the part that produces NWFPs;
- ▶ the command of the resources is largely based on collective management and its sustainability is very fragile and rarely survives when a product achieves national and international demand;
- ▶ like all natural products, they are intrinsically variable and location dependent; the degree in which this variation occurs very strongly affects the possibility to evolve common approaches in their collection, handling, processing and valuation;
- ▶ the accessibility of the resource is often difficult, as producing areas are often remote and products are submitted to a number of transfers that may affect their quality and freshness (especially edible products such as wild fruits or tubers,

mushrooms or honey); collecting areas may also be economically disadvantaged, which may not be favourable for fast establishment of feeder roads;

- ▶ many climatic and human factors affect the products themselves or the yield; in sub-humid, semi-arid and dry regions, where NWFPs are relatively more important to local subsistence and economy, drought and forest/bush fires often affect the non-wood production of forests and trees;
- ▶ the traditional technologies that in most of the cases are used to process NWFPs vary from location to location, making standardization difficult if not impossible;
- ▶ the demand for NWFPs is very variable and susceptible to changes in mode and fashion; the chemical industry is always on the look-out to replace with synthetic products any NWFP when supplies dwindle or become erratic; and
- ▶ a major weakness in promotion of NWFPs is that the markets of those with international significance are dominated by international trade forces, which establish prices beyond the influence of national institutions, producer groups and their organisations.

6.3.5 Institutional arrangements

Institutional issues are important in the sustainable management of NWFPs but often tend to be left out in part due to (i) the informal nature in which most of these commodities are handled in producing countries; (ii) their not being well captured in national statistics; and (iii) the fact that the traditional technologies of their production makes standardisation difficult. This notwithstanding, there are a number of institutional aspects that can be taken into account to ensure sustainable resource management. Amongst these are:

- ▶ Clear identification of producers and their organisation into producer groups whose capacity can be improved through training in sound methods of harvesting and post harvest handling. Training can cover good management of resources including aspects of marketing. Good examples are the Gum Arabic and Resins Association (GARA) in Kenya and the National Association of Gum Arabic Producers, Processors and Exporters of Nigeria (NAGAPPEN). These associations of producers and merchants have led to improvements in the quality of gum Arabic and are playing a crucial role in conflict resolution with respect to removing suspicion between producers and merchants on prices.
- ▶ Setting up specific policies and legislative framework that promote and regulate management of NWFPs. This will entail review and harmonisation of policies that support development of the sector, and reinforced by relevant legislation. This will also reduce corruption or bribery that occurs when some important NWFPs such as Gnetum (Awono *et al.*, 2002) are transported from forest to the market.

- ▶ Establishment of relevant institutions within the government that will provide supportive roles, such as extension to producers and/or merchants and research that will address specific issues of resource development, management and use.
- ▶ Promoting trade initiatives to strengthen local communities by focusing on a fair return, adequate benefits, tenure and customary rights and healthy work environments. For example, in India, various benefit-sharing arrangements have been negotiated, such as those in Chattisgarh, between pharmaceutical companies and certain governments to cover the search for trade opportunities in commercially valuable natural biochemical and genetic resources (bio-prospecting) (FAO, 2003). Other arrangements cover the increasing trade in environmental services, such as credits for carbon sinks, and in wildlife products, including photo safaris and trophy hunting. These approaches have good potential for strengthening economies of local communities and contributing to the socially equitable, environmentally friendly and economically viable use of forest products and services.

6.4 Binding international and regional instruments

Several international instruments with direct implications on the management, production and commercialisation of NWFPs exist. These include the following:

1. The Kyoto Protocol: Under the Kyoto Protocol, forests play an important role in carbon sequestration;
2. The Convention on the International Trade in Endangered Species of Fauna and Flora (CITES) which lists many species of plants and forest-dwelling animals identified as endangered. Suffice to note that the Convention applies only to international trade in endangered species and parts thereof such as ivory. Domestic use or misuse of endangered species, ranging from consumption to wastage, in the case of destruction of endangered plant or tree species to clear forest, is not addressed. Further, the Convention is very much on species identified individually, rather than on ecosystems or habitats. Nevertheless, CITES is potentially important in respect of endangered forest products that end up in international markets.
3. The World Heritage Convention aims to conserve sites of cultural or natural heritage importance, effectively becoming protected areas. There are 160 natural sites recognized under the Convention, 31 of which are in Africa. At least 16 of the sites are forest sites or contain forests. Unfortunately, several of these sites are on the List of World Heritage in Danger, for example, all of the sites from the DR Congo, which are all rainforest areas.
4. The Ramsar Convention is aimed at conserving wetlands, many of which are in forests or are closely related to forests, such as mangroves. Several of the Ramsar

sites are also World Heritage Convention sites. Although the Ramsar Convention is thus not directly concerned with forest conservation, this may be achieved if designated Ramsar wetlands are within or linked with forests.

5. The Forest Principles - one of the outcomes of the 1992 Rio Earth Summit officially called the Non-legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of all types of Forests. Another well-known instrument is Chapter 11 on Combating Deforestation in Agenda 21. The guiding objective of the forest principles is to 'contribute to the management, conservation and sustainable development of forests and to provide for their multiple and complementary functions and uses'. The United Nations established the Intergovernmental Panel on Forests (IPF), which was succeeded by the Intergovernmental Forum on Forests (IFF), to implement the Forest Principles and Chapter 11 of Agenda 21. From 1995 to 2000, the IPF/IFF processes dealt with such issues as the 'underlying causes of deforestation, traditional forest-related knowledge, international cooperation in financial assistance and technology transfer, the development of criteria and indicators for sustainable forest management, and trade and environment'. The IPF/IFF processes resulted in a comprehensive set of 270 proposals for action for the promotion of the management, conservation and sustainable development of all types of forests. In addition, in 2000, the United Nations Economic and Social Council (ECOSOC) established the United Nations Forum on Forests (UNFF), which had as its main objective to promote '... the management, conservation and sustainable development of all types of forests and to strengthen long-term political commitment to this end...'. When UNFF was established, the Collaborative Partnership on Forests (CPF) was also formed to cooperate on forest issues and support the work of the UNFF. The Partnership is currently composed of 14 international organizations including the Centre for International Forestry Research (CIFOR); Food and Agriculture Organization of the United Nations (FAO); International Tropical Timber Organization (ITTO); International Union of Forestry Research Organizations (IUFRO); Secretariat of the Convention on Biological Diversity (CBD); Secretariat of the Global Environmental Facility (GEF); Secretariat of the United Nations Convention to Combat Desertification (UNCCD); Secretariat of the United Nations Forum on Forests (UNFFS); Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC); United Nations Development Programme (UNDP); United Nations Environment Programme (UNEP); World Agroforestry Centre (ICRAF); World Bank; World Conservation Union (IUCN). The collaboration between the UNFF and CPF was known as the international arrangement on forests (IAF). In 2007 the UNFF came out with the Non-Legally Binding Agreement (NLBI) on all types of forests, which is yet another global agreement on how forests should be managed sustainably and in line with the Forest Principles.

6. The Forest Stewardship Council (FSC) is an international market-based initiative/network which aims to promote responsible management of the world's forests, and promoting higher prices or better market access for wood products derived from sustainably managed forests (Siry *et al.*, 2005). Unfortunately, only a fraction of global forests are certified and of those that are, 93% are in the North. Estimates suggest that 5,509,000 ha of African forests have management plans (1% of the total); and 1,107,000 ha are certified (0.2%) (Siry *et al.*, 2005).

6.5 The role of institutions in quality standards control and marketing

There are international and national organisations active especially in the areas of product classification, standardization and quality control. For example, the International Standardization Organization (ISO) and many national standardization organisations have established standard specifications and testing conditions for various NWFPs. WHO has been charged to develop international standards and specifications of identity, purity and strength for the most widely used medicinal plants and their galenical preparations. WHO has also produced *Guidelines for the assessment of herbal medicine*.

CITES provides an international instrument for listing species of plants and animals whose numbers are considered to be endangered to the extent that commercial trade must either be monitored and controlled or prohibited. Only very few medicinal plants are included in CITES lists. The International Union of Nature Conservation (IUCN) and World Wide Fund for Nature (WWF) are working in the area of resource conservation and sustainable utilisation.

FAO, UNIDO (United Nations Industrial Development Organization) and ISTC have NWFPs as part of their programmes on the resource, processing and marketing aspects. FAO also provides specifications for food, flavouring and colouring agents and other food additives, through its various statutory bodies, international conferences, Codex Alimentarius and related guidelines and manuals which are disseminated as FAO Food and Nutrition Papers.

The work of various public and private organisations and institutions undoubtedly contributes to the common goal of increasing the awareness of the opportunities offered by NWFPs in sustainable utilisation of forest resources and improving the related policy environment, information base, and technologies for resource management, processing and marketing. Many of the activities are still, however, overlapping and parallel. Appropriate mechanisms to increase cooperation and coordination would be helpful in increasing efficiency in the subject matter area.

6.6 Property rights and institutionalisation of management system

Rights can be classified as 1) claim rights and 2) privileges (Rekola, 1998). The claim right implies an ability to receive benefits. The fact that a group or a person has a right also goes hand in hand with the understanding that other groups or persons do not have that right, and they have a duty not to encroach on it. For example, forest owners have the right to cut the trees but other people may not. Also individuals are free to pick berries from private forests; no one has the obligation to refrain from doing it. Berries are not owned by anyone, unlike timber. Thus, privileges are not as strong as claim rights. It is worth noting that some privileges are set forth by law but many others are not. The right to recreate in private forests, for instance, is not a strictly defined legal right or privilege. It is merely a common practice.

Rights and privileges that are of concern to natural resources have been said to function within four property regimes, namely 1) private, 2) common, 3) state, and 4) non-property regime (Bromley, 1991). These regimes define the rules under which natural resources are managed.

Private property is the simplest case. Most typical market goods, such as timber, are in this category, which consist of non-attenuated rights, *i.e.* rights that are transferable (Randall, 1987). To establish private property rights to NWFPS it should be possible to exclude other users. On the other hand real common property is a private estate managed by a group of people, like a neighbourhood or a tribe. The group as a whole decides how to use a resource, *e.g.* a communal park. The community may grant use rights to its members. These so-called usufruct rights do not permit transfer of ownership (Bromley, 1991).

According to the state property regime, individuals have a duty to observe rules concerning the use of resource (Bromley, 1991). These rules are set by agencies. For example, forest services in all countries decide how visitors may use national parks and which recreational activities are allowed. An individual who may obtain benefit from rules has a usufruct right. As in the case of common property he or she is allowed to use the resource, but does not have full rights to the resource.

The fourth property regime is the open-access. Individuals have both privilege and no claim right with respect to the use of the resource (Bromley, 1991). Many NWFPS are under open access in most African countries, and there is user right for local communities for subsistence use only, while commercial rights are subject to a permit system. Non-landowners' rights to NWFPS, the so-called Everyman's Right, are only to some extent written in law. For example, all berries and mushrooms may be collected from private forests. There are only minor restrictions.

6.6.1 Proper allocation of property rights

Most of the NWFPs in most countries come from collections in the wild. Sometimes they are overharvested because of an uncontrolled system of harvesting from the government owned and controlled forests, which often have limited enforcement mechanism to control overharvesting. There are discrepancies between the formal stated rules and observed behaviours regarding the rights, responsibilities, and sanctions pertinent to NWFPs. This is not to say which property rights arrangement is better over another but there needs to be clearly defined property rights. NWFPs can be properly managed in any of the following three types of property right arrangements: (i) extractive reserves/national forests, (ii) community forests/pasture land, and (iii) private land.

Many types of NWFPs are found within national forests and protected areas. For many people these protected areas contain resources once used for subsistence and trade. Although governments have tried to control harvesting through permits and prohibitions, these have not been effective solutions to conserve the resources, and the collection of many species of plants is going on irrespective of governments regulations. Because of the impractical and sometimes unclear property rights, there is little incentive to collectors for conservation.

Several studies report that certain NWFP species or groups of species are being overused and degraded (Edwards and Maharjan, 1994; Edwards, 1996a,b; Hertog, 1995; Karki, 1996; Sharma, 1996). The reasons for this overuse and degradation are complex; but include the lack of local control over these resources, rural poverty, and social and cultural traditions; even though many forest users desire to gain formal control of their resources and initiate activities to gain financially from harvesting and processing the NWFPs (Maharjan, 1994; Hertog, 1995; Edward and Maharjan 1994; Edward 1996a; Karki 1996). Therefore, it is important to help forest users' gain or retain, in a formalized manner, control of the forests and pasture lands they use. A strong case can be made for supporting Forest User Groups (FUG) as they work to organize and develop operational plans for their forests and pasture lands, so that these resources can eventually be handed over to the FUG by governments.

6.6.2 Intellectual property rights issues

The commercial development of many NWFPs builds on indigenous knowledge of natural products and their use. There is growing concern about how to compensate the holders of that indigenous knowledge. Furthermore, given that product development often occurs far from where the plant originates, there is equal concern about how to avoid so-called 'biopiracy' and ensure proper compensation for the nation where the plant has been collected. The 1992 Convention on Biological Diversity provides a broad legal framework to structure access and benefit-sharing (ABS) agreements resulting from the use of biological and genetic resources (Alexiades, 2002). The implementation of clear national biodiversity legislation may

be critical in establishing favourable conditions to attract companies looking for countries in which to buy natural products.

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, securing intellectual property rights is a priority issue for some national governments. The International Convention on Biodiversity signed by more than 160 countries for instance, protects property rights of developing countries to native plants and other species and calls on national governments to create a framework for regulating biological resources, IPR and environmental protection (Sittenfeld and Lovejoy, 1994). 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.

In poor developing countries, and especially in Africa, multinationals could come and take any plant from the wild once thought of as the “common heritage of mankind”, slightly alter its composition, and patent it. In some cases even traditional farmers, from whom it was “discovered”, could be prevented from using it. There is an example of a traditionally used plant, *Plao-noi* (*Croton sublyratus*), in Thailand, which a Japanese pharmaceutical company patented as an ulcers medicine. At the same time western governments have generally increased the pressure on the developing countries to sign international agreements such as the Intellectual Property Provisions of the GATT, which still allow companies to basically patent their plants.

However, many developing countries having realized that adopting certain international western property conventions is not in their economic and cultural interest, and have refused to sign such international conventions and are writing their own legislation which aims to (1) adequately protect the property interests of the source country from which material is taken; (2) recognise property rights of first nations in traditional knowledge of the uses of fauna and flora; (3) through the use of a stringent system of contracts and licensing for bioprospecting, ensure that first nations receive fair and adequate recompense for products based on traditional knowledge.

But there is a major difference between these developing countries that are full of little known flora and fauna and most developed countries, whose medicinal plants have been extensively named and scrutinized by academics, and whose knowledge has often passed into the public domain, and is therefore not patentable, through book and paper publications. These publications now form the main body of knowledge

from which several pharmaceuticals, nutraceuticals, and other emerging natural products can be found. This body of knowledge which has passed into the public domain includes: the names of many plant, animal and soil species used medicinally and their associated illnesses: preparation; processing and storage of species; knowledge of the composition of formulations; and planting, care, and selection criteria. The problem thus becomes one of fiscal compensation for knowledge appropriated long ago. No authority is prepared to assume liability for this, since it could potentially involve hundreds of millions of dollars.

6.6.3 Trade-related aspects of intellectual property rights

NWFPS management is affected simultaneously by local, national and international regulations. Observations show that these regulations are often contradictory, or incompatible, and that this accumulation of regulations is totally counterproductive. For more benefits to be obtained by local forest-dependent communities, it is urgent to re-examine the relevance of each type of regulation, and the compatibility between the different policies, laws and regulations at different levels. Appropriate policies, planning, legislation, human resource development at all levels, and administrative support are fundamental for development of NWFPS activities. These are achieved basically through good institutions and guidance. Combining local value addition, rational resource use, and initiatives for conservation is extremely complex. It requires the cooperation among governments, intermediary institutions, communities, private enterprise, and academia, as well as incorporation of various sectors of society from both developing and industrialised countries. Key issues include:

- ▶ Institutions for developing and promoting NWFPs are generally weak, including forestry administrations, educational entities, and research centres.
- ▶ Lack of explicit usufruct and tenure rights makes harvesting from certain areas risky, since conflicts can arise as to who has authority to grant access to NWFP resources, and under what conditions.
- ▶ In contrast to many governments, non-governmental organisations have been very active in promoting NWFPs.
- ▶ There is a lack of inter-institutional and interdisciplinary approaches for developing NWFPs. Sometimes policy and legislation are inconsistent.
- ▶ Only a few countries in a region could have initiated systematic prospecting and analysis of forest plants, insects and micro-organisms in protected areas for biologically active compounds.
- ▶ Existing legislation on NWFPs is normally regulatory and usually only refers to harvesting. Important aspects like land tenure, access to the resource and ownership rights to biodiversity are not considered.

- ▶ Concerted efforts in all research fields necessary for promoting NWFPs generally do not exist.
- ▶ There are no appropriate regional mechanisms for disseminating research results in many African countries.
- ▶ NWFPs have not received recognition at the higher and intermediate levels of forestry education and other disciplines.
- ▶ Extension services for promoting NWFPs are, in many African countries, incipient due to the lack of coherent policies.

Proposed initiatives include:

- ▶ To attract strong and continued political commitment at all national and local levels, it is important to raise awareness of the importance of NWFPs among policy-makers, development planners, government authorities and community leaders, as well as among foresters, ecologists and biologists. This can be achieved through national and local workshops, among other means.
- ▶ Organise broad-based participation, encompassing for example, local groups, women, indigenous communities and NGOs.
- ▶ Forest policies should pay attention to integrated forest use, re-evaluating their socio-economic and environmental potential. In this context, NWFPs should receive special emphasis.
- ▶ Through National Biodiversity Commissions, national institutions should promote inventories and conservation strategies for NWFPs. Inter-institutional coordination and harmonisation of existing laws should be promoted.
- ▶ There should be a shift in philosophy, from custodial to sustainable utilisation, according to different types and intensities of protection required; also from centralized to decentralised management, with community participation and empowerment.
- ▶ Intellectual property rights regimes should be reviewed to protect valuable knowledge developed by communities and scientists. Contract negotiation for bioprospecting should consider three basic sets of issues: (1) science; (2) business; (3) legal issues and frameworks.
- ▶ Central governments should normalise and promote rational harvesting, conservation and management of NWFPs, with a view toward substituting imports with these products where possible.
- ▶ Research on NWFPs should be strengthened and undertaken in a general framework that fosters translation of findings into policies and programmes.
- ▶ Research should be oriented towards better assessment of forest resources and their products. Particular emphasis should be given to management systems,

harvesting technologies, regeneration techniques, domestication, improved processing technologies, and market studies.

- ▶ Perspective of the forestry profession at the vocational, technical and professional levels should be rationalised, to foster appropriate awareness and knowledge about non-wood forest resources and products.
- ▶ Extension capabilities should be strengthened at the local level in order to promote improved harvesting, processing and management of NWFPs.

6.7. Rituals, beliefs and user rights

Like any other land use, the gathering and utilisation of NWFPs can give rise to conflict. There may be competition among interested industries or groups of consumers for the utilisation of the same NWFP raw material, causing demand conflicts. Conflicts are likely to arise in situations where rights are separately assigned to wood and NWFPs resources. There may be competition with foresters who wish to harvest timber or between conservation and utilisation interests for the plant and wildlife resources. The absence of well-defined boundaries of government-decreed reserve, community forest land, and private concessions also invites land disputes and conflicts in the gathering and utilisation of NWFPs resources. At the community level, conflicts may also arise between indigenous and migrant users or between groups seeking to use the resource in different ways.

These conflicts are important because the long-term sustainability of the forest resources and their residents depends upon the development of successful strategies to harmonise the interests of all stakeholders so that the economic needs of people can be met while maintaining biodiversity. These conflicts in resource use have to be considered because they can be the major causes of resource destruction. For example in Nigeria, in order to avoid conflicts related to the conversion of areas with highest potential for sustainable forest and wildlife management to other land uses, the Government in May 1990, decided to give village communities usufruct and management rights over local forest as long as management plans were drawn up and agreed upon.

6.8 Public awareness and training

A first obstacle to 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. Consumers tend to regard NWFP materials as acquired free of cost from public lands (*i.e.* common property) and thereby justify a reduction in the price of the products.

Typically the bargaining process works to the disadvantage of the NWFP producer. The collective impact is negative on the livelihoods of all involved in the sector as individuals undervalue and undercut each other. The informal marketing approach and the socio-economic strata of those that tend to be involved has led to a negative stigma associated with the sector, and an effort by young people to disassociate themselves from their family involvement in NWFPs sector. This has in turn impacted negatively on the transfer of skills and knowledge about NWFPs through generations.

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. 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, 1995).

Those involved in the NWFPs sector have acquired their knowledge through traditionally informal systems. The skills base and market knowledge have been preserved mainly through apprenticing of primarily family members or community members who indicate interest. However, given the lack of institutional support for the sector, many young people are seeking alternative livelihoods and tend to migrate towards job opportunities in urban environs, therefore forgoing the opportunity to learn the crafts from those involved in the NWFPs sector. Some training has been provided by voluntary efforts of artisans to fellow community members, and in a few cases by government supported community craft training initiatives; but these initiatives are not sustained and are not set within the broader context of developing business management skills or marketing for local communities.

The process of training in the NWFPs sector requires a holistic approach. It should empower artisans by equipping them with information and skills on marketing, application of suitable technology and business management. Such skills could enhance the capacities of not only the rural stakeholders, particularly rural women stakeholders, but also those of the disabled community who are active in NWFPs production. In many cases where training has been provided with government support, artisans are contracted to teach basketry, weaving or similar skills and relevant aspects of craft production. For many stakeholders, such support by government indicates a start in provision of support for the sector that they wish to have continued and developed.

6.9 Research, development and extension

Inadequate research has been identified as one important constraint contributing to inadequate development of NWFP resources (Mok, 1991). Know-how on cultivation, management, processing and utilisation of a large number of products is poor due to a weak research base (Saulei and Aruga, 1994). Further, within the broad group of NWFPs, the allocation of resources for research and development is extremely skewed. Some of the products have been traded for centuries and their production, harvesting and processing have been systematized, whereas there are large number of products yet to be properly identified and whose uses are highly localised (FAO, 1991). It is a complex and fast-evolving scene, with new products and uses emerging, while some of the products which were important earlier have faded out or are declining in importance due to changes in demand and competition from better and cheaper products. The research scenario in such a situation is as complex as the diversity of products. Substantial research inputs have gone into some of the highly commercialised items, while there remains a large number of items whose botanical identity remains unknown, not to mention their production and processing.

Current research on NWFPs can be broadly grouped as: (1) status surveys aimed to provide a general understanding of their uses and importance at different levels (household, local, national and international); (2) development of technologies to improve production, utilisation and processing; and (3) socio-economic studies, including marketing.

There are gaps in knowledge on various aspects of the NWFPs sector which indicate a need for research and at various levels. Thus, the need for strengthening research for solving problems and improving technology cannot be over-emphasised. Transfer of technology and adaptive research also need to get adequate emphasis in the overall scheme of NWFP development. Cooperation in research among countries, for example through collaborative programmes, can help avoid/minimise duplication and speed the process of NWFPs development. Specifically, regional cooperation should link up with international research in forestry and agroforestry. A regional information network on NWFPs can also be used to exchange research information (Chandrasekharan and Frisk, 1994). Research-extension linkage and dissemination of research information also deserve special consideration.

The institutions involved in NWFPs research can be grouped as public sector and private sector. Universities and specialised research institutions form the most important public sector agencies involved in NWFP research. Research priorities of these institutions vary and can encompass (a) all important NWFPs, (b) selected crops of high economic importance or (c) specific groups of products (*e.g.* medicinal and aromatic plants). The focus shifts depending on resource availability and the changing perceptions of the management. Researches on highly commercialised crops are undertaken by specialised institutions, which are designed to deal with all

the problems related to a specific crop. Between those dealing with the broad category of NWFPs and those targeting only selected crops, are institutions undertaking research on a broad group of related plants. Medicinal and aromatic plants form an important group that has received considerable attention.

There is need for some institutions in Africa to deal with specific products, as is the case in other regions of the world, such as the Institute of Medicinal Plant Development under the Chinese Academy of Medical Sciences, the Central Institute of Medicinal and Aromatic Plants in India, the Research Institute of Spices and Medicinal Crops in Indonesia, Herbs Production and Processing Company in Nepal and the Bandaranaike Memorial Ayurvedic Research Institute in Sri Lanka. Research efforts in such specialist institutions could generally be focused on selected species of commercial importance, with attention being given to ethnobotanical studies, maintenance of germplasm, cultivation and identification and isolation of active ingredients.

It is commendable that some research institutions in African countries such as Kenya, Nigeria, Tanzania and Côte d'Ivoire have been doing research on different aspects of NWFPs. Some amount of information is also available on distribution, ecology, phenology, active ingredients, cultivation methods, collection methods, yields and use of selected plant species. There is need, however, to strengthen the research institutions and to promote collaborative research to avoid duplication of efforts. Another aspect to be stressed here is the importance of research-extension linkage and provision of appropriate information materials and technical handbooks.

Although private sector involvement in NWFP research, especially at the processing end, is substantial, reliable documentation on this is virtually non-existent for a number of reasons. First, it is spread over a variety of products and activities and the traditional sectorial surveys and studies are unable to capture the totality of the situation. Second, in-house research is often an integral part of production and no separate information is available. Finally, the private sector is reluctant to provide information on the nature of research undertaken which are mostly treated as trade secrets. In countries like China, India, Indonesia and Sri Lanka, with strong traditions of indigenous herbal medicines, there have been significant private sector efforts to develop processing of medicinal plants, including allopathic formulations.

Dependence of NWFPs using industries on government forests and other common lands for raw material supply has continued and often rules and regulations relating to land use have discouraged private or community investment in production. Declining supply could however encourage investment in cultivation, as in the case of medicinal plants. Some of the major private sector institutions dealing with traditional medicines maintain research units, undertake studies on the efficacy of different species of medicinal plants and their propagation. Production of cut flowers (especially orchids), honey, wax, mushroom, bamboo shoots, and sericulture are other important areas of private sector production oriented research.

In addition to public and private sector activities, there has been increasing interest among developmental type organizations such as UNDP, FAO, UNEP; and regional government and non-governmental organizations in the development of NWFPs. Their efforts are mostly directed at supporting local communities with regard to cultivation, processing and marketing, and largely rely on available research information. These organisations provide resources for research through regional institutions, universities, and capacity building for community based initiatives such as GEF-Small Grants Programme. The support of these institutions is key to the task of mainstreaming the NWFPs sector in national economies, if the objective of reducing poverty and enhancing rural development is to be achieved. There is a need to establish NWFPs as an active economic sector and collaborate on assessing the current and potential role of the sector in reducing poverty, particularly rural poverty.

Research should be pursued on both the socio-economic and biodiversity related aspects of the sector. This research must establish a baseline that can inform policy development and decision making on the sector. For most African countries there is need to assess the socio-economic aspects relating to levels of income generated, level of subsistence support obtained through NWFPs, gender and intergenerational related roles or influences in the NWFPs sector.

The research needs to clearly extend beyond the reach of public institutions directly involved in NWFPs management (such as Forestry Departments). A more valid approach requires the support of a range of institutions, and would be one of cross sectorial involvement, which would also include national NGOs involved in forest management, small business enterprise, rural development and poverty alleviation.

Broadly, research and development needs of NWFPs resources for improving technology are tremendous, touching upon all aspects of their management and development. Some specific areas include:

- ▶ Enhance knowledge about NWFPs resources, for example, the biology of plant and animal products growth, reproduction and mortality rates and inter-relationships among products;
- ▶ Prospect, screen, evaluate and classify NWFPs-yielding plant species by pharmacological and toxicological studies on forest-derived medicinal plants, and identify candidate species for development of new drugs and products, including aspects related to their potential supply from wild sources;
- ▶ Develop inventory and yield models for different NWFPs resources. This deserves special research effort due to its importance as discussed earlier. A typical example would include the identification of natural fluctuations in populations or yields of NTFP and their causes;
- ▶ Promote the domestication and cultivation of commercially viable NWFPs-yielding plant species to be grown under multi-species environments, such as enrichment planting of natural forests and agroforestry and as mixed crops or

under monoculture. This would include for instance, the viability of natural forest management for NTFP, including artificial regeneration and enrichment planting;

- ▶ Develop on-farm research including species-introduction trials, plant breeding and genetic improvement, as well as the use of germplasm resources in the wild for improving yield and resistance of established crops to pests and diseases;
- ▶ Improve agronomic-practices of plants yielding NWFPs;
- ▶ Develop agroforestry systems for utilizing NWFP species;
- ▶ Improve harvesting methods and systems, including pre-harvest preparations and post-harvest treatments, for various NWFP resources, to reduce product wastage, resource damage and improve yield; research is also needed to harmonise harvest of wood and non-wood resources. Examples could include optimal rates of resource use in both ecological and economic terms;
- ▶ Develop proper scientific and situation-specific management systems. This is an important point to be stressed in promoting integrated management of wood and non-wood resources. An example could be the relationship between NTFP development and maintenance of forest resources, particularly with low-cost technologies for collection of NTFP (stage, timing and method of harvesting);
- ▶ Develop silvicultural systems for enhancing the growth of non-wood resources in forests, such as wild fruits, edible nuts, gums, mushrooms and latex which can be harvested non-destructively and in combination with timber. In this regard, research is needed on ecology to understand the dynamics of regeneration of most NWFP species;
- ▶ Conserve natural forests and their species richness *e.g. in situ* and *ex situ* conservation of genetic resources and biodiversity. Develop scientific management systems for NWFPs resources including wildlife in parks, conservation areas and buffer zones also require research efforts. A good example would be the development and adaptation of systems for controlling access to NTFP and managing extraction rates under various environmental and socio-cultural settings;
- ▶ Improve processing, storage and distribution of NWFPs *e.g.* perishable products such as forest fruits and vegetable; Examples here include (i) Low-cost technologies for small-scale pre-processing and processing , (ii) Techniques for conserving semi-processed and processed products and transport and storage under remote conditions, and (iii) Existence and magnitude of economies and diseconomies of scale and agglomeration in production and processing of specific NTFP;
- ▶ Diversifying of products, including improvement of quality;

- ▶ Examine economic potentials of NWFPS including (i) the relationship of NWFPS to household livelihood strategies; and (ii) the potential for NTFP to make a significant contribution to poverty alleviation (especially for women and indigenous groups) and equity issues in production, processing and marketing;
- ▶ Develop new products and markets, incorporating market assessment and marketing strategies development for various NWFPS and the likelihood that extracts will be replaced by cultivation or synthetics over various time horizons; and that niche markets or patches of extracts can co-exist with domestication or substitution;
- ▶ Organisational aspects, including assessment of the potential for development of co-operative production, processing and marketing, and the applicability of the concept of intellectual property rights for NWFPS; and
- ▶ Other research topics - including market research on NWFPS; evaluation of NWFPS markets - what works and what does not work; historical patterns and trends in use of NWFPS; valuation of non-marketed products and services; and examination of changes in the productivity and efficiency of production, processing and marketing of particular NWFPS.

Points to remember

- In marketing of NWFPS, implementation of trade policies and forest policies are the key drivers of impact with institutional support from cooperative arrangement, transport and communication, research and development.
- There is a need to consolidate policies governing NWFPS into one single framework and also to organise the NWFPS sector so that it fits into the formal administrative arrangements.
- There are gaps in knowledge on various aspects related to NWFPS which indicate a need for research at various levels. Cooperation in research among countries through collaborative programmes is needed to minimise duplication and speed up the process of NWFPS development.
- There is need for institutional support to create public awareness and training to improve on the uptake of knowledge and skills related to NWFPS, which have previously been passed on through traditional informal systems.

Questions

1. Describe the institutional framework for the management of NWFPS in your country.

2. Do you think that the current institutional framework is conducive for a sustainable management of NWFPS in your country or your region? Justify.
3. What roles can policy makers play to maintain a healthy NWFP business? Please elaborate.
4. In a number of countries policies governing NWFPSs are scattered over many sectors. What is the situation in your country? How efficient is the system? Is there any need to formulate specific policies on NWFPS?
5. List international and regional regulatory instrument you are aware of and describe their objectives and mandate
6. Intellectual Property Rights in relation with NWFPs and traditional knowledge have been subject of lengthy and hot debates for many years. Concerns are often raised about equitable access and benefits sharing. How do legal and institutional instruments in your country address the issue?

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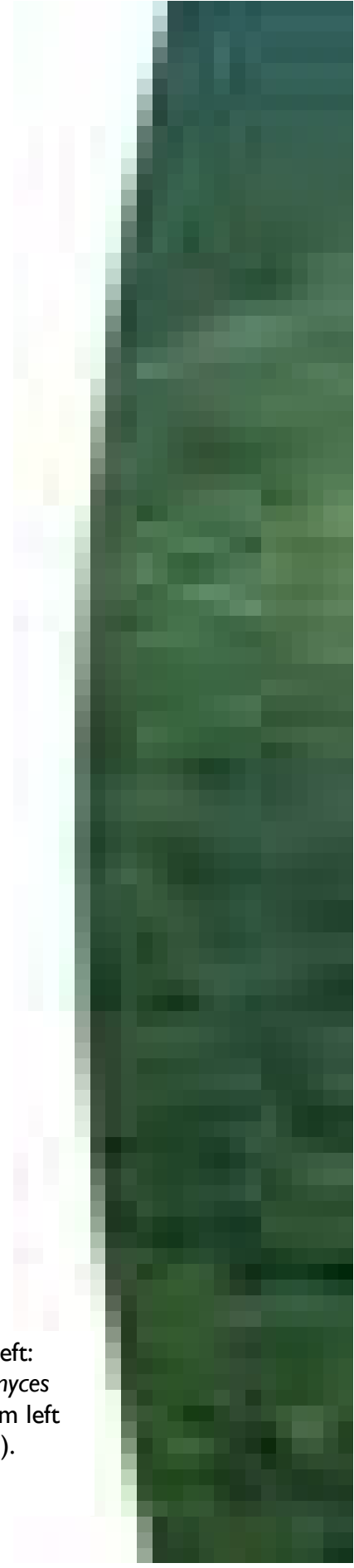
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Cover photographs top right: *Uvaria chamae*, (South Benin), top left: beeswax (Burkina Faso): middle: a woman happily selling *Termitomyces fuliginosus* in local market in Bassila, Benin (by S.N. Yorou). Bottom left *Rauvolfia vomitoria*, bottom right: *Sterculia setigera* in (North Benin). Pictures by E. Achigan-Dako.