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## NON-WOOD FOREST PRODUCTS IN ZAMBIA

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*This paper has been minimally edited for clarity and style*

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## **1. OVERVIEW**

Zambia is endowed with a lot of Non-wood Forest Products which are classified variously, namely fibres, vegetal, fauna, medicines, cosmetics, extractives and services.

The dependence on these NWFP by the Zambian population, especially the rural poorer, is ever increasing with the rise in the production costs and offer prices for the modern products and services since the NWFP have the greatest potential to offer a cheaper and more accessible alternatives.

However, despite having this potential, there is urgent need for carrying out the commodity and value specific research of the NWFP in Zambia.

This paper gives a review of the Non-wood Forest Products in Zambia (NWFP). The review is based on the terms of reference outlined in the EC- FAO Partnership Programme (1998-2000).

The information in this paper will be used along the lines of the Data Collection and Analysis for Sustainable Forest Management in ACP Countries - Linking National and International Efforts.

The terms of reference used in reviewing the NWFP in Zambia are as follows:

- To collect the available current data on NWFP in Zambia and report on its present status.
- To verify and complete data mentioned in the FAO working paper on NWFP Statistics submitted on the occasion of the Mutare workshop in Zimbabwe.
- To compile especially the available in-country information on honey, wax, eco-tourism and bushmeat, including insects.
- To analyse the past, present and possible future trends of the NWFP for local consumption, trade and exports.

## **2. STATE OF NWFP IN ZAMBIA**

There are numerous non-wood forest products in Zambia which are classified variously, but according to Chidumayo and Marjokorpi (1997), the classes include fibres (bamboo, bark, grass, leaves, rattan, stem, vines and papyrus), vegetal products (fruits, fungi, leaves, nuts, roots, seeds, shoots, stems, tubers, spices and flowers), fauna (food and other animal products), medicines and cosmetics and extractives (dyes, oils, fats, gums, latex, oil seeds, resins and tannins).

Non-wood forest products are further classified to cover forest services related to non-wood forest products e.g. hunting, eco-tourism, watershed management and conservation of biodiversity and water resources.

There is very little quantitative data on the use of extractives and fibres at the moment, but empirical observations show that grass and papyrus are used extensively for thatching in rural areas throughout Zambia. In the Copperbelt Province there was a flourishing handicraft

industry based on the indigenous *Oxytenanthera abyssinica* (bamboo) before its massive die-off during 1989/90 flowering season (Chidumayo and Marjokorpi, 1997). This may have been a result of the bamboo undergoing a full life cycle in its flowering pattern.

### 1.1 Vegetal Products

These are used as food (mostly proteins, vitamins and starch) and as earlier stated include fruits, nuts, roots, tubers, leaves and mushrooms (Chishimba, 1996; Nkomenshya, 1996, 1997). Vegetal products are used at both the subsistence and commercial levels. About one-third (1/3) of rural households harvest wild food resources in form of fruits, mushrooms and root tubers with a gross output of 31kg per household (Chishimba, 1996).

Men, women and children do harvesting of most vegetal products. The impact of harvesting on the environment depends on the species; for example, fruit harvesting which may involve cutting down trees and/or extracting roots and tubers, may have an adverse impact on the species population size and structure. The harvesting of mushrooms has little impact on the resource base. Deforestation on the other hand negatively affects mushroom productivity of species that live symbiotically with trees.

### 1.2 Fauna

Wildlife in form of fauna is an important source of food (proteins) and non-wood products. Fauna also offers aesthetic satisfaction for tourists and natural lovers. Food from fauna is in the form of bushmeat, reptile and/or bird eggs, fish, insects (such as caterpillars termites and grasshoppers) and honey. Non-food products include hides and skins, bones, horns and tusks, feathers, furs and live animals.

Consumptive utilisation of fauna involves hunting for subsistence, safari and sport needs. Traditional hunters are mostly men who hunt for both subsistence and cash needs. The levels of and, dependence on game in areas covered by a recent survey (Chidumayo and Marjokorpi, 1997) are not well documented. But given that seven out of ten Game Management Areas in the survey area are depleted of game populations suggests that over-exploitation has occurred in these areas. Areas covered by survey included Central, Copperbelt and Luapula Provinces.

Fishing and fish trading is a predominant livelihood system in the valley and swamps of Luapula (Nkomenshya, 1996), Western Province, Kafue flats and along major rivers and lakes (Mpakatani 1994). Honey is also gathered from natural and artificial barkhives for food or beer brewing and sale. Edible caterpillars (especially of *emperor moth*, *elephrodes lactea*), are important sources of protein nutrition and cash for both rural and urban households. Large quantities of caterpillars are collected from miombo woodlands (Chidumayo and Marjokorpi, 1997)

Non-consumptive utilisation in form of photographic and game viewing options is offered in national parks. South Luangwa and Kafue National Parks are well stocked and attract a lot of international tourists. The Blue lagoon and Kasaka have the potential to earn the nation foreign currency.

Through the various forms of hunting licences, the Government raises a lot of money, some of which is pumped back into the management of national parks. Licence fees for various animals range from US \$0.5 to US \$391 for a Baboon and Sable/Roan antelopes respectively.

Statistics from two (2) GMAs showed that a total of US \$152,470 was raised from licence fees during the period 01/01/96 to 23/09/96 (Kapungwe, 1996).

### 1.3 Medicines

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. There is no gender and age bias in collection, processing and dispensing of herbal medicines even though some culture beliefs may impose temporary restrictions e.g. for menstruating women or persons that are mourning (Nswana, 1996). In a recent survey statistics indicated that 70% of respondents had used traditional medicines and that trade in traditional medicine is worth over US \$43m per year (Nswana, 1996). Nswana (1996) has listed 78 species of plants with medicinal value. However, excessive removal of roots and/or bark from medicinal trees and shrubs may cause mortality either directly or through subsequent pathogenic infections. And as a consequence of deforestation and population growth, valuable medicinal species are now often collected from very far places because they have become scarce in the immediate vicinity (Nswana, 1996).

## 3. AVAILABILITY AND SUSTAINABILITY OF NWFP

The sustainability and continued availability of fruits such as *Uapaca* and *Anisophyllea* depends on their careful harvesting. *Anisophyllea* trees are reported to be victims of irresponsible harvesting by cutting the whole tree (Chishimba, 1996). The reason being that the fruit does not usually drop until it is very ripe in which case the fruit may be rotten. People must therefore be sensitised on the need for proper harvesting methods such as climbing and shaking of the tree to let the fruits drop off. There is also need to educate communities on the dangers of eminent extinction of fruit trees if they continue using unconventional harvesting methods. In the long run, extinction will entail rural dwellers being in a position where they can not afford domesticated fruits that are very expensive at the moment. *Uapaca Kirkiana* is not so much threatened with extinction as *Anisophyllea* species are, because the fruit is picked from the ground whenever it ripens. However, there are isolated cases of *Uapaca* trees being cut down for fruits.

Sustainable utilisation of mushrooms depends on careful management of forests. Disturbed forests lead to reduced recurrence of mushrooms. As the forests further away from where people are, so do the mushroom. Education is also important in this case in order to show people the difference between a normal and a disturbed forest ecosystem.

Similarly *Rhynchosia* species and *Satyria Siva*, are under serious threat of extinction because of over extraction, a result of a Lucrative market in the urban areas (Chishimba, 1996). Since the productions of interest are the roots and tubers those who do not know how to harvest properly, uproot even the most critical roots and tubes which are crucial for subsequent regenerations. Education and research would be better methods of trying to address such problems.

Research on regeneration for propagation can help to attain the desired ultimate goal of establishing artificial fields of *Rhynchosia* species and the wild orchid (*Satyria siva*). Failure to act now will lead to risk of losing these important genetic resources. Although alternatives may be found for *Rhynchosia* species, they may not be as popular as *Rhynchosia* itself. As for

*Satyria siva*, it is so unique to find an identical product which is so useful and relatively cheap (Chishimba, 1996).

#### **4. TRADE IN VEGETAL NWFP.**

From all the NWFP reported as being valuable for food, six were classified as being important for trade in three Provinces covered by a survey conducted by Chishimba in 1996. The trading levels differed from community to community depending on the ethnic background and the product. The level of trade was determined by availability of the product, distance from the market and accessibility to a reliable means of transport. Estimates of quantities sold from Kunda Mfumu (Luapula Province) a village on a high way, was as high as 193.6kg for *Rhynchosia* spp. 155.6kg for *Satyria Siva*, with a corresponding monetary value of US\$102 and US\$115 respectively (Chishimba, 1996). On the whole the main products that are traded in include *Uapaca Kirkiana* fruit, *Anisophyllea Pomifera* fruits, mushrooms, roots of *Rhynchosia* species and tubers of *Satyria Siva*. *Parinan Curatellifolia* fruit does not command much trade even though it is such an important food security product. However, there are isolated cases where you find people selling the fruit along some roads.

Mushrooms, particularly the Chanterelles are the only vegetal NWFP offered for sale on the international market. The other vegetal NWFP are mostly sold at the community and district markets. There is very little inter-provincial trade in vegetal NWFP. Imports between Provinces were only recorded in mushrooms, *Rhynchosia* species and *Satyria siva*, but all at a small scale. These commodities are mainly moved from rural to urban Provinces along the line of rail where they fetch a good market price (Chishimba, 1996).

The trade in products such as *Satyria Siva* and *Rhynchosia* roots can be very lucrative. On the Copperbelt, about 150-200g of *Satyria siva* can fetch as much as US \$0.1 (Chishimba, 1996). In Luapula Province, 300g of *Satyria siva* can cost US \$0.22. A small bundle of *Rhynchosia* roots weighing 200g, costs US \$0.1 on the Copperbelt.

Trade in honey is the most advanced together with mushrooms sold by Amanita Zambiana and the Miombo Project. According to Chishimba (1996), and Chidumayo/Marjokorpi (1997), honey and mushrooms fetch millions of US Dollars on both the national and international markets. At the moment the Mpongwe Beekeeping Project and the Kabompo Bee Products Company of North Western Province are exporting honey and beeswax. Actual Production and total earnings could not be accessed.

#### **5. MANAGEMENT SYSTEMS**

##### **1.4 Traditional Management practices for NWFP**

There are no documented traditional management practices for the management of non-wood forest products on a national scale. However, there are isolated cases within the country where flora has been preserved for cultural, medicinal and/or food value. For example, it is a common practice to preserve isolated trees for their medicinal value and/or edible fruits when clearing land for agriculture (Chidumayo and Majorkorpi, 1997)

## 1.5 Other strategies for the Management of NWFP

Fruit trees of national importance have been reserved under the Forest Law and these include *Strychnos cocculoides*, *Strychnos spinosa*, *Uapaca kirkiana*, *Anisophyllea* species and *Vangueriopsis lancifolia*. These can only be cut under licence although in practice this has proved to be very difficult to enforce due to inadequate resources for the implementing Government agency (Forestry Department).

On the preservation of fauna, the Government of the Republic of Zambia has put in place a law to safeguard endangered fauna species from possible extinction. Twenty-eight (28) fauna species are therefore considered to be endangered or vulnerable according to the World Conservation Monitoring Centre (Chidumayo and Marjokorpi, 1997). Some of these endangered species live in very specialised habitats. For example, the checkered elephant shrew (*Rhynchocyon cirnei*) is confined in the north of Luapula Province. Preservation of such a habitat is therefore very necessary to the preservation of the shrew species.

Under the National Parks and Wildlife law, 25 mammal, 36 bird and 4 reptile species are protected and can only be hunted under licence. However, this list excludes African Wild dogs, all rodents, bats, shrews and invertebrates, some of which are classified as endangered. There is therefore need to constantly review this list in order to take into account the current status of the different species (Chidumayo and Marjokorpi, 1997).

The criteria used for the conservation and management of NWFP include diversity and rarity of habitats and/or species, area, threat of human interference, representativeness and scientific value.

## 6. MAJOR THREATS TO NWFP

Most threats that have been detected concern ecosystems, especially forests and to some extent wetlands. The degradation of ecosystems also affects species and genetic diversity. Current trends in deforestation particularly threaten diversity of forest dependent flora and fauna. Activities such as conversion of forest to agricultural land lead to permanent losses or changes in availability of non-wood forest products. NWFP encounters other threats; these are essentially caused by poaching, introduced species and pollution (Chidumayo and Marjokorpi, 1997).

### 1.6 Deforestation

Deforestation is caused by excessive cuttings in illegal coupes and commercial harvesting as well as conversion of forests into agricultural land by encroachment of forest reserves and other land categories. Depletion of certain treespecies due to selective cutting in commercial harvesting leads to local extinction of species. This in turn results in loss of all NWFP that are associated with such tree species. The opening up of the tree canopy also leads to increased grass growth which increases the risk for severe late forest fires.

There is therefore, need to have sufficient information on the growing stock, quality and regeneration status of forests in order to make planning of sustainable harvesting of NWFP possible.

## 1.7 Fires

The timing and frequency of fires determine the effect of fire on the ecosystem. Frequent late fires prevent regeneration of fire tender species and thus change the species composition resulting in an open type of chipya vegetation. Late forest fires also destroy millions of other fauna species, affecting the resource base permanently

## 1.8 Poaching

Poaching is one of the causes of game population's depletion in Game Management Areas (GMA) and National Parks. Some wildlife estates have been decimated by poaching activities as a result of poor funding for the sustainable management and protection of wildlife resources. For example, Mansa GMA, Lusenga National Park, Mweru-wa-ntipa National Park, have been decimated and wildlife populations are depleted (Kapungwe, 1996)

## 1.9 Introduced Species and pollution

Some introduced species have become invasive and pose a threat to ecosystems and indigenous flora. Such are known as obnoxious weeds under the Obnoxious Weeds Act, e.g. *Lantana camara* and the aquatic fern, Kariba weed (*Salvina molesta*). These introduced species thrive vigorously and usually suppress regeneration of certain natural species. *Salvinia molesta* has led to the death and depletion of certain forms of aquatic life including edible fish and reptiles.

There is, however, little documentation on the effects of mining and industrial air, soil and water pollution on NWFP. Nevertheless there are a few areas on the Copperbelt where plants have died due to air and/or soil pollution from copper mines. Other sources of pollution are chemical contamination from waste disposal sites and from use of agro-chemicals. Deterioration in water quality has been detected in the Kafue river whose origin is in the heavily industrialised Copperbelt area (Chidumayo and Marjokorpi, 1997).

## 7. PROPERTY RIGHTS

For many decades now, the management of natural resources in Zambia has been exclusively a responsibility of government. There has been little or no consideration for the active participation of local communities and/or other stakeholders. Laws suggested that, and some still suggest all resources were vested in the President and were therefore to be so administered and managed by government on behalf of the people. This meant that all land became property of the state and traditional systems and other private landholders had no rights on the utilisation and management of land and its resources.

But through the committed efforts of Government, the international Conventions and other natural resource based Organisations, a new era dawned in Zambia and we have seen the transformation of old policies and laws regarding the management and utilisation of Zambia's natural resource base. We have witnessed a transfer of ownership of certain land categories (including forests) to traditional management and private land use (Lands Act of 1995). This new era has enhanced joint management and utilisation of forests and other land use systems. So far we have had a number of jointly managed programmes on pilot basis and these have included the Luangwa Integrated Rural Development Programme (LIRDPA), the



Administrative Management Design (ADMAD) and the Provincial Forestry Action Programme (PFAP). These are natural resource based management programmes, which have so far shown that, well managed; joint programmes may lead to the achievement of sustainable management and utilisation principles.

Communities are therefore actively getting involved and accruing benefits from the consumption and sale of both wood and non-wood forest products. Positive results are being achieved in these programmes because the best knowledge on forest products and services in each locality is usually found in local people who traditionally use different forest products in their daily lives.

## **8. NON-WOOD SERVICES**

Non-wood services are usually associated with the various roles that forest play beyond the direct tangible benefits that we get as food medicine, dyes, resins, etc. Services therefore, include intangible indirect benefits such as game viewing, ornamental and/or amenity tree planting, watershed/catchment protection and management, grazing and improvement of weather and climatic conditions. Other services include trees used for shade, live fences and windbreaks, soil conservation and improvement.

### **1.10 Game Viewing**

This is covered under the non-consumptive utilisation aspect of game in National Parks and is exclusively achieved through tourism. South Luangwa and Kafue National Parks are well stocked with game and attract a lot of international tourists, while Kasanka and Blue Lagoon National Parks have the potential to attract tourists, but are not well marketed (Kapungwe, 1996). Tourism in the form of photographic and game viewing has a high potential of bringing benefits to the country through earning of foreign currency. For example, Park entry fees for 1996 were US\$176,923 for South Luangwa National Park (Kapungwe, 1996).

### **1.11 Ornamental Amenity Tree Planting**

The most popular trees for ornamental planting in Zambia are exotics because they are fast growing and have attractive and showy flowers. However, there are a number of indigenous trees which are reasonably fast growing and attractive and can therefore be very suitable for amenity planting. The indigenous trees have the added advantages relating to suitability to local climate, soils and fire/termite resistance (Storrs 1982). Examples of trees that have so far been used for this purpose include the Ficus, Cassia, Bauhinia, Khaya and Trichilia. Other species are Sterculia, Afzelia, Albizia and Ochna, just to mention a few.

### **1.12 Watershed and Catchment Protection**

Watersheds and Catchment areas are usually Gazetted as Forest Reserves and managed under protected forests. All these areas are therefore protected by law (Forests Act, CAP 199 of the Laws of Zambia) from any form of deformation (physical, biological and chemical) and alteration of their natural state.

Zambia is dissected by a number of rivers and streams which all thrive because of the adequate vegetative cover provided by forests in watersheds and catchment areas. The Watersheds and Catchments therefore, ensure that there is perennial water in rivers and

streams, ensuring irrigation, hydro-electricity, domestic and industrial consumption. Quantified in these terms, we find that watersheds earn the country millions of US Dollars in form of electricity and water tariffs, industrial/agro-products and services and creation of employment. The destruction of watersheds and catchment areas, therefore, leads to multiplier adverse effects that are detrimental to the environment and the development of the country. We would experience siltation and drying up of rivers and streams, high electricity and water tariffs/bills, loss of agro and industrial based employment, high costs for agricultural inputs and produce, etc. And the list is endless.

Currently we see such effects where in certain places, perennial rivers and streams have become seasonal and communities along such areas tell a lot of devastating stories on how aquatic life and their general living conditions have been adversely affected.

### 1.13 Grazing

One rarely needs to be informed of the many pastures that forests provide to 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. Grasslands are therefore, either edaphic or secondary and cover most of the wetlands in the country (Chidumayo and Marjokorpi, 1997). The dominant grasses belong to the genera *Acroceras*, *Leersia*, *Oryza*, *Panicum*, *Paspalum*, *Sacciolepis* and *Vossia*. Grasslands in Zambia include dambos, flood plains and the margins of pans, swamps and lakes.

### 1.14 Trees for shade

Shade trees are important because they reduce on high temperatures experienced during the day. Other benefits of shade trees are beauty, fruits, as a windbreak and in improving the microclimate of the area.

#### **Tree/shrub species for shade include:**

<b>Specie</b>	<b>Known as:</b>
<i>Acacia albida</i>	Winter thorn
<i>Cassia siamea</i>	Yellow Cassia
<i>Cassia spectabilis</i>	Golden Cassia
<i>Cordyla africana</i>	Wild mango

#### **Ficus species (Figs):**

<b>Specie</b>	<b>Known as:</b>
<i>Mangifera indica</i>	Mango
<i>Manihot glaziovii</i>	Mtambula, N
<i>Melea azedarach</i>	Bead tree
<i>Tamarindus indica</i>	Tamarind
<i>Trichilia emetica</i>	Musikili, N, Cape mahogany

\*(Simute, 1992; Mulofwa, 1994)

## 1.15 Live fences and Windbreaks

### 1.15.1 Live fences

These are barriers of closely spaced trees or shrubs for protection against livestock and human interference. Fencing of fields, gardens, fodder banks, woodlots and around homesteads makes improved management practices possible. With a fenced field, a farmer can improve his/her management of crop residues, pastures, trees, etc., by keeping out livestock and other people.

Live fencing is an economic way of fencing large areas because once established living fences become permanent. They are cheap to establish and maintain as compared to barbed wire and other dead fences, which need constant maintenance. Living fences may also produce fruits, fodder and medicines (Simute, 1992; Mulofwa, 1994).

Characteristics of tree species for live fencing include:

- thorny and or densely branched
- Easy to establish and maintain
- Able to withstand temporary water logging when planted in gardens
- Fire resistant Providing useful by-products

**Suitable species for live fencing therefore are:**

<b>Specie</b>	<b>Known as:</b>
<i>Acacia albida</i>	Winter thorn
<i>Acacia ataxacantha</i>	
<i>Acacia polyacantha</i>	Hook thorn
<i>Agave sisalana</i>	Sisal
<i>Bougainvillea</i> spp.	
<i>Ceasalpinia decapetala</i>	Mauritius thorn
<i>Balanites aegytiaca</i>	Desert date
<i>Commiphora africana</i>	
<i>Commiphora mollis</i>	
<i>Dovyalis caffra</i>	Kei apple
<i>Euphorbia tirucalli</i>	Rubber hedge euphorbia
<i>Ricinus communis</i>	Castor oil plant
<i>Ricinodendron rautanenii</i>	Mungongo
<i>Ziziphus abyssinica</i>	Kankande
<i>Ziziphus mauritiana</i>	Indian jujube
<i>Tharacantha</i> spp.	
<i>Thevetia peruviana</i>	Yellow oleander

### 1.15.2 Windbreaks

Trees and/or shrubs can be planted around fields, homesteads, etc to protect crops and buildings from strong winds. Yields of crops are known to increase when windbreaks are established in areas with strong winds. Windbreaks can also produce fruits, fodder and medicines.

**Suitable species that are used as windbreaks in Zambia:**

<b>Specie</b>	<b>Known as:</b>
<i>Azadirachta indica</i>	Neem
<i>Cassia siamea</i>	Yellow cassia
<i>Cassia spectabilis</i>	Golden cassia
Casuarina spp.	Whistling pine
Eucalyptus spp.	Gums, especially for commercial farmers
<i>Grevillea robusta</i>	Silky oak
<i>Melea azedarach</i>	Bead tree
<i>Tamarindus indica</i>	Tamarind
<i>Trichilia emetica</i>	Musikili, cape mahogany

\*Simute, 1992; Mulofwa, 1994

### 1.16 Trees for soil conservation and Improvement

Trees and/or shrubs can be left in the field when opening up new land for agriculture because of their ability to fix nitrogen, or to take advantage of leaf fall which will add organic matter to the soil and conserve soil moisture through mulching.

Trees and/or shrubs can be planted on grass strips (buffer strips), soil conservation structures (bunds), storms drains, marker ridges etc. The main benefits are:

- stabilisation of soil conservation structures
- preservation of conservation structures
- marking of contour ridges
- in the case of shrubs, acting as barriers to water run-off
- provision of ground cover and fertility improvement
- Provision of both wood and non-wood forest products.

Some trees and/or shrubs can be planted or sown for improvement of fallows. These perform the function of ground cover and fertility improvement through litter fall and nitrogen through root nodules.

Suitable species include:

<b>Specie</b>	<b>Known as:</b>
<i>Acacia albida</i>	winter thorn
<i>Azalia quanzensis</i>	Mupapa, pod mahogany
<i>Albizia harveyi</i>	
<i>Cajanus cajan</i>	Pigeon pea
<i>Cassia siamea</i>	Yellow cassia
<i>Cassia spectabilis</i>	golden cassia
<i>Grevillea robusta</i>	Silky Oak
<i>Leucaena leucocephala</i>	lusina, lukina
<i>Pericopsis angolensis</i>	Mubanga
<i>Psidium guajava</i>	Guava
<i>Sesbania sesban</i>	River bean

\*(Simute, 1992; Mulofwa, 1994)

## 9. PAST, PRESENT AND FUTURE TRENDS IN NWFP

### 1.17 Ornamentals

As earlier mentioned elsewhere in this report, most trees used for ornamental purposes are exotics. This type of planting has been a pre-requisite of Local Authorities, a few elite farmers, Parastatal and Private Companies and individuals with resources to pay for landscaping costs. At one time the Mining Conglomerate, the Zambia Consolidated Copper Mines (ZCCM), had made it mandatory for occupants of houses in its townships to do landscaping and ornamental tree planting. This in a way served a dual purpose, that of beautifying the environment and that of regulating excesses Carbon dioxide in the atmosphere. This trend has now changed and we see a lot of uncoordinated ornamental planting and landscaping which is not compatible with environmental requirements for healthy standards.

The use of indigenous species has been confined to areas where these are in abundance and are, therefore, deliberately left standing and managed for purposes of shade and amenity. The aspect of establishing indigenous trees from seeds has not been well received by stakeholders because as a Department we have not ventured much into cultivation of such tree species for people to be able to have a practical test case which can motivate them to take up ornamental tree planting. However, *Bauhinia petersiana*, *Khaya nyasica* and *Trichilia emetica* have found a place in past planting programmes conducted by Local Authorities in most urban areas where you find them planted and growing along major streets.

This past trend in ornamental tree planting has continued to this day except that the three mentioned indigenous species are no longer propagated. This trends seems most likely to continue unless the Forestry Department can come up with a deliberate programme to encourage propagation of indigenous tree species for the purpose.

The notion that indigenous trees are slow growing should not hold because in most cases indigenous trees are cut in preference to exotic tree species. Where suitable trees for ornamental tree planting may not be found, it may be prudent to try raising these in nurseries, rather spend thousands of US Dollars annually on exotics which end up getting destroyed by termites. Ten (10) years of experimenting with indigenous could mean ten (10) years of success with indigenous species. Already experience has shown that it is almost impossible to raise exotic species in termite prone areas without having to spend lots of money on termiticides. What is needed are educational campaigns on the value of indigenous trees for ornamental or amenity planting.

### 1.18 Fodder

Fodder trees have been used in the past mostly as browse by livestock in open forest areas (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.

Loss of soil fertility in farmlands has led to a situation where other land uses have had to be foregone for agriculture. This has resulted in the depletion of indigenous tree fodder and the prescribing of a recipe for the introduction of exotic multipurpose trees and shrubs for soil fertility improvement, fodder, food and other multiple functions of trees.

However, these introduced species have not been received well due to lack of programmes aimed at transforming research findings into practical field activities. With this inadequacy, critical shortages of fodder for livestock have continued in most parts of the country. So much research has been done in this field and all that needs to be done is the formulation of programmes and/or projects that will transform these research findings into practical activities. There will be need to supplement natural regeneration with fast growing exotic species, which will act to form a buffer during the period of natural regeneration.

#### 1.19 Bamboo

The common *Oxytenanthera abyssinica* has always been harvested from natural forests and woodlands and used for making of products that command a market on both the local and international scene. However, with so much of bush fires, these species' regeneration has been seriously affected and we have seen reduction in their population sizes and structure. This is diminishing the highly potential product that could create an industry upon which so many Zambians could depend for income and raw material for construction. Bamboos have been used widely for fencing, hut construction, chair making, basketry, mat making etc. With local shortages, bamboo collectors have to travel long distances to find the commodity and this is bearing a negative impact on the pricing of bamboo products and therefore confining their use (especially in urban areas) to only the elite who can afford.

Future trends are presumed to be declining productivity unless forest management aimed at controlling and/or averting late forest fires are put in place and natural regeneration encouraged. Otherwise, the future of this industry will lie in balance and may tilt to the wrong end - extinction. We also need to improve production technology so that value-added goods will command a good price on both local and international markets.

#### 1.20 Rattan

Rattan products have been widely used for thatching, hat making and basketry in areas where they exist, but you find other products selling at almost all tourist centres and major towns. The only problem has been the limited resource base, which does not appear in many areas of the country.

There is therefore need to investigate on the propagation of these very important commercial NWFP tree species so that plantations could be established which will expand on the resource base. Otherwise the few existing tree populations may be depleted in the not so distant future.

#### 1.21 Fibres

Fibres have been used since time immemorial for rope and/or string making. The ropes are used in hut construction, tying of bundles and for basketry in the case of *Agave sisalana*.

The resource base is plentiful only that in most cases fibre extraction, if not properly done, leads to death of trees. Trade in fibres, apart from sisal, is not advanced presumably because they can not be produced on a large scale as doing so may deplete the resource base. Therefore, fibre from trees is only obtained when there is real need and in most cases from young branches and shoots.

In future there may be need to expand on the resource base through tree planting on a large scale for fibre production. Alternatively, we may need to research on fast growing exotic tree species in order to cushion indigenous species from further abuse.

#### 1.22 Resins and Latex

Resins and latex are not well documented especially in regard to their processing into final end products. Their use has, therefore, been confined to a local scale. However, knowing their potential and use elsewhere on the global scale, the need for future research into production and processing on a commercial scale becomes inevitable.

#### 1.23 Tannins

Tannins have been well documented in the past and are used both at the local and national levels, but their use on specific end products is not well documented. Lack of adequate information on specific use and market outlets has led to this field not to emerge fully. This trend should therefore, be reversed and studies on appropriate use and marketing embarked on.

#### 1.24 Essential oils

These could be grouped together with resins, latex and tannin in their importance for local consumption and trade. On a local scale, these have been used together with medicines for various ailments. Some have been used for cooking while others have been mixed with various lotions as body ointments. However, there still remains much research to be done to investigate their possible use on a commercial scale and to determine the exact marketability.

#### 1.25 Fruits

Fruits have been so important as a food security commodity for both rural and urban households while at the same time providing extra income through sales that are conducted almost throughout the year. Zambia is endowed with so many fruit trees, both exotic and indigenous us, which have been used as food. Some fruits are crushed to form juices, drinks and jams.

Exotic fruit trees such as Mangoes, Guavas, Pawpaw, Avocado and Mulberry, have been a permanent feature homesteads and some even grow naturally in open areas without any human interference. These, together with a number of wild fruits form a nutritious supplementary food in seasons when agricultural crops become scarce. Species like *Anisophyllea* and *Uapaca* are common features along main roads and at markets during the period from October to January, when they are offered for sale. The other species that are offered for sale include *Annona senegalensis*, *Azanza garckeana*, *Diosphyros mesipiliformis*, *Flacourtia indica*, *Strychnos cocculoides*, *Strychnos spinosa*, *Tamarindus indica* and *Syzygiums*.

Almost all exotic fruits have been on the market and still continue to command a place in almost every market countrywide. With the present harsh economic conditions, many more fruits are entering into the trade market and are gaining importance as major household income and food security commodities. Trade in fruits and fruit trees is therefore creating a lot of employment for many Zambians and offering a potential commodity that can break into international markets if well researched on.

There is a vast diversity of fruit trees, the list of which is difficult to exhaust especially for indigenous species. Many of these are highly consumed in many rural and some urban settings but have not been offered for sale previously because of the great abundance in the past years when they could not fetch a good price. However, most fruit trees are becoming significant trade commodities as many species continue to become scarce at the local level due to deforestation brought about by the demand for woodfuel and agricultural expansion. Fires have also had their toll whereby a number of fire tender species have been completely wiped out in certain localities.

The future trend is, therefore, expected to be an upward trend in sales of many fruit trees (both exotic and indigenous) as the population rises and alternative income sources become scarce. The high costs of agricultural inputs has forced many people to abandon farming because fertility levels of most land can not support crop production without use of inorganic fertilisers and other pesticides/agrochemicals to ward-off pathogenic infections. This, therefore, means that many people are turning to the forests where, in certain areas, fruits are consumed even before they become ripe. This is scaring the resource base that in other areas is almost depleted.

There will be need to improve on processing technology so that value added products could be made from these fruits as a way of deterring constant visitations to the forests for fruit collection. Storage facilities will have to be provided and the whole industry transformed so those durable products could be processed and preserved for use in times of need. Currently, there is a lot of wastage because of lack of storage technology. Fruits, which could be consumed throughout the year, are made to be consumed in four months- many just rotting to waste. Zambian fruits have a high potential to be processed into juices, jams and other assorted drink types if only appropriate technology could be adopted.

#### 1.26 Edible seeds/nuts

Seeds and nuts have been important at the national scale because of the wider coverage of tree species from which they are obtained. Even though most are not offered for sale, seeds such as those for *Adansonia digitata*, and *Cajanus cajan*, have established a niche in the trade market especially in drought prone areas. Others are mainly used as household food security commodities. Livestock also browses many of the tree species for edible seeds and nuts.

What needs to be done is to determine how these NWFP could be processed on a large scale and possibly offered for sale. Research could also be carried out on possibilities of vegetative propagation because trees raised from seeds take too long to mature before they start fruiting.

#### 1.27 Spices and edible oils

Spices have not been well documented but there are a number of tree species that are used at the local level (from experience). There are a number of herbs that could be researched on because of the great potential they have to offer aromatic subsistence for use in many relishes.

Edible oils on the other hand are used widely on the national scale although the production is very low due to lack of appropriate processing facilities. What we need to explore are possibilities of extracting these with a high recovery rate and to a greater precision of quality so that these could compete with the conventional oils (cooking oils) that are offered for sale on the market.



### 1.28 Dyes and Colorants

Dyes and Colorants are used widely through out Zambia and there is abundance of knowledge on tree species for such NWFP. They have always commanded a good market on both the national and international scale even though such trade has not been well documented. Every day we see clothes adorned in different colours and when you inquire you are told to say dyes or colorants used are from indigenous tree substances.

The future vision should be that of trying to organise people involved in this business and seeing what other improvements could be made so that these dyes do not fade easily. Market outlets will also have to be determined so that value added and market specific dyes could be produced.

### 1.29 Gums

Gums like latex are widely used on the local scale but have got a high potential to break even into international markets if well processed according to market demands. What we need are adequate and appropriate processing facilities and market surveys. A number of lessons could be derived from other gum producing countries.

### 1.30 Mushrooms

Mushrooms like honey and beeswax have got a well established market both locally and internationally. We only need to improve on the processing and seasoning of these mushrooms so that they can attain the quality that can be accepted that can be accepted and therefore command a good price on the international and national markets. The Miombo Project and Amanita Zambiana are already doing this while at the same time trying to educate local people from whom they buy the mushrooms, on the need for quality products and the necessity of sustaining the resources base. Deforestation and late forest fires should be avoided at all costs, and where these have already occurred, afforestation programmes in indigenous tree planting should be embarked on, or natural regeneration encouraged.

As the situation stands at the moment, we expect an increase in local trade with mushroom prices going up beyond the reach of many Zambians unless the current rates of deforestation and late fires are reduced.

### 1.31 Edible Roots

Edible roots are some how many, but the lack of well documented information, especially on identification, has restricted the number of species that can be consumed. Many people have ended up dying after eating poisonous roots while yet others have suffered severe stomach pains, diarrhoea and/or vomiting ending up in hospitals. However, the easily identified species are widely used as foods and drinks and they command a good market price.

The rate of extraction of roots for food and drinks has increased in this decade when Zambia has experienced a lot of food shortages due to heavy rains and/or droughts. *Rhynchosia* spp. and *Satyria siva* are widely used and sold such that they have now become national goods in providing income and food security to many Zambians. What needs to be done is to determine how much of the resource base is being used up with increased extraction, and also to determine the distribution of the resource base countrywide.

The distances from production areas are already increasing and there is a likely chance these resources, if not well conserved, may soon be depleted or become extremely expensive.

### 1.32 Reeds

Information on reeds is not well documented, but experience has shown that these are widely used for basketry, mat making and thatching wherever rivers with reeds occur. Reeds commands good trade. Recently, cross-border trade has been noticed even though it still remains to be verified on the actual destinations.

However, future efforts will have to be directed at investigating whether their production from within rivers and streams may not have any ecological effects on aquatic life and future flow of rivers.

### 1.33 Beverages

Beverages are well documented and widely used across the country. Some beverages command a good market price, such as beer made from roots of *Rhynchosia* spp. Efforts by the National Council for Scientific Research to produce a wine from *Uapaca kirkiiana* almost bore fruits, but as usual, lack of appropriate technology and other ingredients, made this project not take off as expected.

Further research is, therefore, needed in order to determine the actual potential of these beverages to break into the trade market. We will also need to determine how these beverages could form an essential component of household food security.

### 1.34 Live animals

Live animals have been used mostly as tourist attractions in National Game Parks and in Zoological Parks. Other animals are tamed at the household and/or organisational levels, but all for purposes of offering aesthetic value and tourist attraction. These animals fetch hundreds of US Dollars and earn the Country a lot of foreign currency.

However, there seems not to be adequate documentation of information, especially on small animals and/or big game or livestock in open areas outside the mandate of the Department of National Parks and Wildlife Service. Without this information we risk extinction of certain species like the case of Chimpanzees in the Democratic Republic of Congo, where these primates are extensively killed for consumption and many others exchanged for cash.

We will, therefore, need comprehensive information on a number of species that are used live for business purposes and/or aesthetic reasons. We will also need to know how much this industry is worth and how it affects total animal populations in areas from which they are obtained. Other studies may have to look at the possibility of any effects of this trade on ecosystems and the balance of nature.

### 1.35 Bushmeat, insects, etc.

Bushmeat and edible insects were used in the past to provide a cheaper and more accessible means of animal proteins for most rural households. This was attainable as long as animal populations were optimal. Abundance of animals was courtesy of the well-stocked forest areas that provided a good habitat for these wildlife forms. With change in time, however, increasing human populations exerted more pressure on both the forests and wildlife resources. More forests were cleared for agricultural food production to meet the needs for

vitamins and carbohydrates. Massive deforestation, therefore, set-in and most animals that depended on these forests disappeared with them. This created local shortages and consequently resulted in increased prices for bushmeat and other edible insects, to levels where the local poor could not afford. Coupled with increased demand for these NWFP in urban areas, rural population have almost been deprived of access to these resources. Licence fees for game are extremely high making it impossible even for those living near to where these resources are, to gain access for food security and income generation.

The ADMADE Programme has, however, tried to address this problem that the rural poor are facing, by involving them in the management and protection of wildlife resources. Cost and benefits are shared and in this programme, signs of sustainable management are being noticed.

Insects such as caterpillars, termites and grasshoppers have been major sources of income and proteins for many rural households probably because harvesting or collection of such animals does not require any form of licence. There is, however, a risk of over utilising these resources if proper management practices and educational campaigns are not instituted at the local community level. This is very important because harvesting of insects also involves larvae and therefore affecting total populations in subsequent generations.

Looking at such trends we expect continued increases in prices of these commodities as their overall populations continue to dwindle. The way forward will therefore, be to combat and reverse the trend of deforestation and to enforce laws regarding the conservation/preservation of wildlife species.

### 1.36 Beekeeping and beekeeping

Past trends indicate that beekeeping was in most cases done illegally in forest reserves and other open areas. Collection and processing was seasonal as most people did not have their own land and resources to make beekeeping a profitable venture. Harvesting was only for household consumption because only inappropriate traditional hunting methods were used. The honey produced was thus of poor quality to be offered for sale.

Harvesting was from standing trees, holes in the ground or any other place where bees could collect and produce honey. Whole trees were cut down and smoke/fire used to inactivate or kill the bees. Unripe combs were also collected and used in honey beer and beeswax production.

Collection of unripe combs with brood in them led to destruction of future genetic material for the procreation of bee populations. This had an impact on subsequent honey production levels, as bees were greatly reduced in numbers. Burning of bees during harvesting further complicated this problem, endangering even the very continued existence of bee populations. Such disturbances caused a lot of absconding of bees from particular localities resulting in local scarcities of honey and other bee products. In certain areas these scarcities have become almost permanent.

Bee forage on the other hand was affected by deforestation, which depleted certain tree species in particular areas. Deforestation had an impact also on water availability in such areas making bees to abscond in search of water and forage.

The other group that was involved in beekeeping were the farmers who operated on a part time basis. This was mostly through extension programmes conducted by the Forestry Department. Production was at a small scale due to lack of adequate market information and

production/processing technology. Beekeeping was, therefore, only a secondary venture and mostly for crop pollination and honey production for household consumption. As long as crop yields were stable or increased, beekeeping remained a farm activity. It was only when production started to decline when beekeeping was abandoned in order to concentrate resources on farm inputs like fertiliser.

The other major Group that was and still is involved in beekeeping is the Forestry Department. Due the importance attached to the production of honey at a national scale, a Division was created within the Department to specifically address issues pertaining to beekeeping. The Division was mandated with the responsibility of ensuring that adequate amounts of honey and beeswax were produced to the greatest possible benefit of the Zambian population and some for the international market. But lack of a clear Policy on the exportation of local goods by a government department, made international trade not to be achieved. Inadequate production and processing facilities also affected honey and beeswax production levels.

Efforts to establish a modern processing facility in the 1970s could not materialise due to lack of the same policy framework and other logistics. Honey and beeswax production was, therefore, mainly for the local market that could not satisfied either.

With the liberalisation of the economy, however, came parallel policies in government circles that accommodated the aspect of international trade. Export and import restrictions were, therefore, removed and anybody was free to enter or remove the trade market as they desired or as determined by market forces. We consequently saw the establishment of a number of beekeeping programmes; some run by NGOs and other private companies and individuals. Most of these were trade based and produce a lot of honey for both the local and international markets. The most pronounced are the Kabompo Bee Products Development Company in North Western Province and the Mpongwe Beekeeping Development Project on the Copperbelt. The new government policies encouraged stakeholder participation in all sectors of national development, with the main thrust being that of transferring production and processing technology to private ownership and control. Government Departments are envisaged to provide the technical backup to these programmes. The Forestry Department has, therefore, enhanced its extension programmes on beekeeping and today we see a number of individuals venturing into beekeeping on a commercial basis.

The Mpongwe and Kabompo Beekeeping Projects are development projects that aim the fulfilment of socio-economic needs at both the local and national levels. The main thrust of these two Companies, therefore, is to produce honey and beeswax that meet international quality standards for both local and international markets.

These Projects use box hives for honey production. They have also trained a number of farmers in modern methods of beekeeping for quality honey and beeswax production using both traditional barkhives and improved frame hives. Farmers are trained in quality standards that meet customer requirements and the international market.

The Provincial Forestry Action Programme (PFAP), a joint venture between the Governments of Zambia and Finland, has conducted a number of beekeeping courses for selected communities in Central, Copperbelt and Luapula Provinces. Even though these ventures have not fully matured, a lot of potential exists to further improve their performance if they are to be converted from consumptive to commercial ventures. The knowledge, human resource and raw material base are there in abundance and all that remain are financial resources to meet processing, transportation and bottling costs so that the products

can reach and be accepted at both local and international markets. The programme will also need to explore potential markets within and outside Zambia.

Kaloko Trust in Mpongwe District is also involved in the training of farmers in commercial beekeeping as a way of improving their food security and income levels. So far the Project has trained over 80 contact farmers (Handavu, unpublished, 1998).

Outside the PFAP areas, the Forestry Department has trained a number of farmers using both government and Donor resources. These programmes are on-going, and with improved funding, it is hoped to greatly improve the standards of living in rural households.

Looking at the beekeeping industry in Zambia as it stands at the moment, future prospects for further development will depend on how well market research is done and the provision of inputs to resource poor farmers. We will need to formulate sustainable joint programmers based on inventory surveys, in order to be able to determine forest stocking for bee forage tree species. Comprehensive forest inventories were last conducted in the 1960s and therefore, need updating.

These inventories are inevitable if the forest resource base and associated resources are to be managed in a sustainable manner. Deliberate publicity and educational programmes will have to be put in place so as to sensitise the general public on the dangers of deforestation, especially on how it affects sustainable production of NWFP.

Existing projects in beekeeping must be supported financially if they are to continue operating profitably. Already this industry has created a lot of employment and it is hoped that this will continue as long as the resource base is maintained or expanded.

From all the aforesaid, it can be pointed out that bee products will continue to command a steady and rising market for both consumptive and commercial functions. Trade will continue to increase as long as more people are trained in quality honey and beeswax production. With the opening up of further market outlets, more people are expected to enter into the industry.

## **10. CONCLUSION**

Current statistics on non-wood forest products and services indicate that the levels of dependence on these by local communities is ever increasing with the rise in production costs and offer prices for the so called 'modern products and services'. Highly processed medicines, foodstuffs and other wood and/or substitute commodities are becoming very expensive beyond the reach of the common people, the group that forms the greater percentage of the Zambian population.

Analysing such trends carefully, one would be excused to suggest that non-wood forest products have the greatest potential to offer a cheaper and more accessible alternative, as long as they are properly managed and utilised on sustainable management and utilisation principles. To do this, we will need to remove the obstacles that preclude the emergence of NWFP, not as substitutes, but as equal and/or priority commodities in the improvement of the standards of living of Zambian people. These obstacles include, among other things, the lack of documented information on the true value of non-wood forest products and services and market outlets for such products. In most instances, NWFP are considered secondary and are,

therefore, only appreciated when other first class commodities become scarce and/or expensive.

Other obstacles include inaccessibility of production areas for NWFP due to bad roads and, therefore, high transport costs. There are also barriers associated with non-documentation of vital information on the multiple uses of NWFP across the country and internationally. In certain cases, even information to do with cross community boundary trade is missing.

There is, therefore, urgent need for commodity and value specific research. Natural Resource and/or biodiversity economic studies could just offer viable options for the improved management and sustainable utilisation of non-wood forest products and services. We will need to conduct Participatory Appraisal Surveys in order to get to the greatest possible in-depth problems and/or solution levels. There is already abundant knowledge on the value of NWFP and services in traditional circles and all that needs to be done is to mobilise such, organise and document it (knowledge) in a more accessible and usable form.

The era of valuing traditional wood products such as timber and wood fuel for example, more than NWFP and services should now be relegated to the past. After all, promotion of NWFP will reduce on deforestation related to cutting down of whole trees and agricultural expansion for food and income generation because NWFP can as well equally meet the demands for food and income by local communities and the nation at large. Promotion of NWFP and services will, therefore, lead to conservation of biodiversity and other ecosystems that our socio-economic development depends on.

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## **APPENDIX I: DEFINITIONS AND LEGENDS USED IN THE REPORT**

For the purpose of this report, the following working definitions, as used by FAO, have been applied.

Non-wood forest products (NWFP)	NWFP include all goods of biological origin, as well as services, derived from forests, or trees outside forests or any land under similar use, and exclude wood in all its forms. (Chandrasekharan, 1995).
Non-wood goods	Things, articles, objects worth attaining; movable properties. An economic good is defined as any physical object, natural or man-made, or service rendered, which could demand a price. (Chandrasekharan, 1995).
Non-wood services	Provision of assistance; act of serving; work done to meet some needs; intangible, non-transferable economic goods, as distinct from physical commodities. Services as grazing and camping facilities, wilderness trails, viewing and hunting, etc. are included in the definition of NWFP. Benefits such as watershed values, environmental conservation are considered separately. (Chandrasekharan, 1995).

Also, the following legends used by FAO have been applied in the report, regarding the importance of NWFP.

Importance		
1	Important on the national level	Most important exported NWFP, and other important NWFP, used on the national scale.
2	Important on the local level	Exported NWFP of minor importance as well as other NWFP, important on a local scale in limited parts of the country.
3	Important but not documented	NWFP which are believed to be important at the local and/or national level, but for which no information/ literature is available.
4	Not important	NWFP of minor importance at the national as well as at the local level.
5	Not known	No information is available regarding the importance of the specific NWFP.

Production system		
F	Natural forests and wooded land	Please refer to definitions of natural forests and other wooded lands given in the report “Provisional data elements, definitions and tables for outlook study national reports”.
P	Plantations	As above.
O	Others	Other production systems (“trees outside forests”) like grasslands, agroforestry systems, homegardens, etc.

Source		
W	Wild	NWFP collected from wild resources.
C	Cultivated	NWFP cultivated in-or outside the forest.

Destination		
National		NWFP mainly used for subsistence as well as NWFP commercialised on local, regional or national markets.
International		Mainly exported NWFP.