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Non-Wood Forest Products:

A Regional Expert Consultation for English-Speaking African Countries

Arusha, Tanzania
17 - 22 October, 1993

PROCEEDINGS

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REGIONAL EXPERT CONSULTATION

ON

NON-WOOD FOREST PRODUCTS

FOR ENGLISH-SPEAKING AFRICAN COUNTRIES

Arusha, Tanzania

17-22 October 1993

Organized by

Commonwealth Science Council

and

Food and Agriculture Organization of the United Nations (FAO)

In co-operation with

Ministry of Tourism, Natural Resources and Environment, Tanzania

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REGIONAL EXPERT CONSULTATION ON NON-WOOD FOREST PRODUCTS FOR ENGLISH-SPEAKING AFRICAN COUNTRIES ARUSHA, TANZANIA, 17-22 OCTOBER 1993

1 INTRODUCTION

At the invitation of the Government of Tanzania, a Regional Expert Consultation on Non-Wood Forest Products (NWFPs) for English-speaking African Countries was held in Arusha, 17-22 October 1993, with the following objectives: i) to discuss the current status of production and utilization of NWFPs in the countries involved, the need for improvement in their production, management, harvesting, processing and marketing and the development opportunities they provide for the benefit of rural communities, ii) to update available information on the different aspects of NWFPs, iii) to suggest broad guidelines for the development of NWFPs and iv) to facilitate exchange of ideas regarding the need and feasibility of establishing a Regional Co-operative Network on Non-Wood Forest Products. (The Expert Consultation Programme can bee seen in Annex I).

The expert consultation brought together some twenty-five experts and observers from Lesotho, Malawi, Sudan, Uganda, Tanzania, Zimbabwe and those representing the International Development Research Centre, the International Union for the Conservation of Nature, the Natural Research Institute of the Overseas Development Agency as well as the Food and Agriculture Organization of the United Nations. (The list of participants can be seen in Annexe II).

2 OVERVIEW OF NON-WOOD FOREST PRODUCTS

Mr G P L Mbonde, Senior Forest Officer welcomed the participants to the Regional Expert Consultation on Non-Wood Forest Products on behalf of the Director of Forestry and Beekeeping of the Ministry of Tourism, Natural Resources & Environment of Tanzania.

Mr Mwaheleje, on behalf of the Minister of Tourism, Natural Resources & Environment of Tanzania, expressed a feeling of pride and honour for the choice of Tanzania as host to this Regional Expert Consultation on NWFPs and extended his sincere thanks to CSC and FAO for organizing this important event. He further stated that sustainable use of forests for environmental and bio-diversity protection are key issues in the world following the adoption of

Agenda 21 at the United Nations Conference and Development (UNCED). Emphasising the need for involving local people in decision making and implementation process, he pointed out the importance of raising awareness and educating people on the multiple uses of forests. Mr Mwaheleje expressed the hope that the deliberations of this meeting will pave the way for the development of NWFPs as an important component of the sustainable and multipurpose management of the forests in Africa.

Dr C Chandrasekharan, Chief, Non-Wood Products & Energy Branch of the Forest Products Division, welcomed the participants and expressed his gratitude to the Government of Tanzania for having agreed to host this meeting, which is jointly sponsored by the CSC and FAO. He pointed out that this meeting is the second of a series of Regional Expert Consultations to bring together individuals of different backgrounds to discuss the current status of production and utilization of NWFPs and to provide proposals for their development. A first meeting was held in Bangkok, Thailand, 5-8 November 1991 for the Asia and Pacific Region.

Dr J A J Perera greeted the participants on behalf of the Commonwealth Science Council. He stated that his organisation is looking forward for continued and increasing contribution at international and national levels, in support of activities to promote NWFPs.

The meeting was organized in four parts. The first part provided global and regional overview of the situation relating to NWFPs. The second part involved the presentation of Pilot Country Studies from the participating countries and special reports by observers. The third part was devoted for discussions of main issues. The fourth part involved group discussions on specific issues to elaborate broad guidelines and suggestions to be incorporated in the proceedings of the meeting. A field visit was organized to observe some activities related to the subject of the consultation.

Dr C Chandrasekharan provided a global overview of the issues involved in the development of the NWFPs while presenting his paper entitled "Issues Involved in the Sustainable Development of Non-Wood Forest Products". Non-Wood Forest Products play economic, social and cultural roles in the daily life of the local population through provision of food, fodder, organic matter, fibre, medicinal plants, gums, resins, thatching and raw materials for cultural products. They promote income generation, compatible with environmental conservation. They support commerce and trade through supply of raw materials for processing, for instance pharmaceuticals, flavours

and fragrances.

Mr J D Keita, Regional Forestry Officer, presented a paper entitled "Non-Wood Forest Products: an Overview in Africa". He pointed out that early man's interaction with, and dependence of forest, was exclusively centred on non-timber forest products. They are still important for rural communities but their relevance is undermined by lack of technical information. Unfortunately, most forest management plans have been based on principle of sustained yield of timber production where NWFPs are secondary. A change in the pattern of forest management entails change in the perceptions and an understanding of how the community is using the forest resources. He stressed the need for meaningful research in order to develop forest management systems which will ensure a sustainable flow of benefits to local people, as well as the need for sharing the knowledge and experience among countries and the regions.

3 COUNTRY REPORTS ON NON-WOOD FOREST PRODUCTS

The discussions at the meeting were supported by a number of Pilot Country Studies, prepared by National Experts and the authors presented the main points of their study indicating the current country situation in terms of production and utilization of NWFPs, constraints and opportunities for further development. In the following pages, a brief summary is presented. Important Non-Wood Forest Benefits in selected countries in Africa are listed in Annex III while Pilot Country Studies and other Reports are included in Annex IV.

Lesotho: A number of Non-Wood Forest Products are used by rural populations i.e. fodder, fruits, nuts, berries, wild spinach, honey, game meat, birds, insects, medicinal plants, tannin, ornamental trees. The major bottlenecks in the development of NWFPs include inadequate legislation and national policy on forest conservation, lack of awareness, lack of technical information available to the people, and lack of statistical information for forest management planning. Lines of action required to reduce these constraints include those to raise the awareness among foresters and policy-makers about the full value of NWFPs, to involve rural populations in all the activities concerning the development and promotion of NWFPs, and to establish village nurseries in suitable sites to supply seedlings of plants providing NWFPs.

Malawi: Non-Wood Forest Products are in abundance in the country but are not properly managed. There are limited information on their quantity and value. The exploitation of NWFPs varies with type, time and location. Commercially bee products, mushrooms, caterpillars

and medicinal plants are important. Game products seem to attract illegal practice despite the stringent effort of the Government to regulate their utilization. Management and utilisation of NWFPs, on a sustainable basis, are needed in Malawi. Relevant policies and legislation need to be revised and improved. The Government, NGO's and international development agencies ought to co-ordinate their efforts to draw up viable sustainable development strategies.

South Africa: The indigenous people derive a multiplicity of NWFPs i.e. fruits, nuts, spinach, fungi, honey, construction materials, medicine, forage, poison for arrows, tannin, fibre, raw materials for basketry, handicrafts, ornamental articles, wild meat and fish. Legislation in South Africa is currently punitive. Research and institutions are adequately developed, but rural dwellers have had no real benefit due to lack of extension. NGO's and national institutions could adopt community participatory approach for the sustainable development and management of forest resources.

Tanzania: Forests of Tanzania, like those in other tropical countries, provide many Non-Wood Forest Products such as food, fuel, fodder, housing materials and medicine to the rural communities. These provide income to the rural population, yet little research has been done into improving the protection and management of these products. Far less is known about their role in conservation or about market share. With the exception of chincona bark, wildlife-based products, honey and beeswax, grading is usually not done. In general, there is little processing and quality control requirements are not being enforced for NWFPs. Most NWFPs are traded in raw forms. The majority of the rural population live in and around the forests and are greatly dependent upon NWFPs for their subsistence.

Production figures for NWFPs in Tanzania are mostly based on estimates. However with appropriate assessment methods, it would be possible to determine the sustainable rate of extraction with minimum impacts on the environment. The importance of the NWFPs in Tanzania extends beyond local subsistence economy. In 1991, for example, the value of wildlife based activities exceeded US$ 1.3 million, wildlife based tourism contributed about US $ 94 million, honey and beeswax contributed about US $ 2.5, while gum arabic contributed US $ 0.9 millions. The value of NWFPs lies not so much as indicated in the above figures, but in that so many people in rural Tanzania rely on these products for their survival. Thus the challenge is to marry the concepts of natural and social sciences in order to design methods that would allow the people living in and around the forests to manage and conserve, on a sustainable basis, the forest resources.

Uganda: Rural communities in Uganda rely on a multiplicity of NWFPs for their livelihood, ranging from leaves, stems, roots and fruits, to bamboo and wild mammals. Local people are also involved in beekeeping activities which provide food supplement and additional income. A large number of plants with medicinal properties are found in the forests of Uganda, and rural communities rely on traditional medicines for the treatment of a variety of disease. Further research, scientific investigations, studies and surveys are required in order to assess Uganda's biological diversity and their development potential. It is also necessary to design and implement an awareness campaign about the importance of biological diversity and NWFPs in natural resource management.

Zambia: The formal assessment of the economic role that forests play often overlook the importance of non-wood forest products in the daily lives of the people who live in and around forests. This is often the result of a biased idea that the major benefits derived from forests is in the form of wood products. But in reality forests yield food in form of fruits, leaves, roots and mushrooms. They also supply building and construction materials in the form of fibre, bamboo, rattan. For most rural people, medicinal plants from the forest provide the only form of medicines throughout their lives. The collection of these items support people with employment and their sale supplements their income.

Of the different NWFPs in Zambia, the ones that are highly promoted and developed are those connected with beekeeping activities and basket and mat making. Baskets and mats are made from bamboo, reeds or rattan. The income from these activities goes a long way to assist the rural populations. Statistical information on NWFPs is scarce or non-existent because the harvesting, processing and marketing of these products are realized by individuals who keep no records of their activities or are produced in small-scale informal units. A number of constraints which hinder the development of NWFPs have been identified: shortage of skilled labour, inadequate funding, poor infrastructure and under-developed economic structure.

Zimbabwe: Importance of NWFPs is recognised in the forest-based operations of large and small scale sectors, commercial farm lands, forest lands, wildlife estates and tourism and hunting farms. Handicrafts, forest litter as farm manure and medicinal plants are the worthy contributors. Apart from organised tourism and game hunting, there are no institutions covering the full range of NWFPs. Extension, education and data system on NWFPs are still lacking. Legislation is restrictive and tend to favour outsiders as opposed to local entrepreneurs.

4 CASE STUDIES RELATED TO NON-WOOD FOREST PRODUCTS

4.1 Monetary Valuation of Tree-Based Resources in Zimbabwe: Experience and Outlook by Mr. Campbell, University of Zimbabwe

The focus on NWFPs has been at a primary stage, with analysis at a superficial level. The work at present is concentrated on descriptive list of food, fibre and other plant products and broad or general recommendations. The next logical step is to quantify the value of these tree-based resources or non-wood forest products, but qualification in itself will not be sufficient. An analysis has to be differentiated by geographical scale (regional, national, local), by sectors (commercial or subsistence), by wealth status (rich or poor, small-scale farmers), by gender and by system components.

A significant understanding of all the interactions among components, including the historical developments of how products are used, collected and substituted, how traditional and new systems influenced the roles of NWFPs and how commercialisation and domestication occurs for developing NWFPs are very important in any attempt to value these resources.

The paper covered various methods of monetary valuation, the steps involved and their limitations. It was also noted that monetary valuation is not the only mean of quantifying the value of tree-based resources.

4.2 Pines and Eucalyptus - Sources of Non-Wood Forest Product in Africa by John J W Coppen, Natural Resources Institute

Pines and Eucalyptus are widely planted throughout the world; they yield resins and oils as by products of considerable economic value. Around 850 000 tonnes of turpentine and rosin are produced annually from resin tapped from pine trees. China accounts for over half the total production. The main producers of turpentine and rosin in Africa are Zimbabwe, Kenya and South Africa. Their total production is about 4 000 tonnes of crude resin per year. The tree species which are tapped in Zimbabwe, Kenya and South Africa are *Pinus elliottii*, *P. caribaea* and *P. radiata*.

World production of eucalyptus oil is around 3 500 tonnes per year, of which 2 500 tonnes is medicinal type. The remaining production is of perfumery type. Africa's production of eucalyptus oil is about 250 tonnes and it is divided between South Africa, Swaziland and Zimbabwe. Zimbabwe, however, provides only about than 10 tonnes. Most African production of oil has been from trees planted specifically for that purpose, namely from *Eucalyptus camaldulensis* (Petford provenance). It is possible that Tanzania will start production in the near future.

5 MAJOR ISSUES RELATED TO NON-WOOD FOREST PRODUCTS

While non-wood forest products have been in use from time immemorial, some of them have moved to the status of intensively managed agricultural and horticultural crops, due to their obvious attributes. Others remained grouped as "minor products" of forests, in spite of their real and potential value. This resulted in the benign neglect of most non-wood forest products reflected in a serious lack of information on almost all aspects. However, there has recently been a new and increasing awareness about the important contribution of non-wood forest products and benefits in ensuring sustainable forest development. This has further been underlined in the deliberations and decisions of the United Nations Conference on Environment and Development (UNCED).

There are several factors constraining the sustainable development of NWFPs: lack of information, overemphasis on timber production, absence of inventory systems, inappropriate regulations, unplanned land use changes, lack of integration of wood and non-wood forest products in forest management, lack of processing and storage technology, market fluctuations, lack of serious research and technology development, lack of clear and appropriate legislation and policy support.

Based on a discussion of problems and potentials, the meeting considered six major issues related to further development of NWFPs:

i- Need for a clear definition and an internationally accepted classification of NWFPs. A precise definition and clear classification is required to facilitate collection/collation and recording of statistical data and provide information required for planning development of NWFPs;

ii- Need for the integrated management of natural forests and other ecosystems for wood and non-wood products/benefits where

systems would be designed and implemented to ensure resource sustainability;

iii- Need for domestication of NWFPs, wherever appropriate and feasible, involving genetic improvement and intensive cultivation practices. This is often considered as a means of ensuring controlled production and economic success of the ventures, apart from supporting conservation of genetic resources. Intensive cultivation can take place under monoculture, mixed cropping or agroforestry systems;

iv- Need to develop appropriate systems for harvesting and processing. Harvesting of NWFPs, of both wild and cultivated sources is different from wood harvest in terms of seasonality, cycle, use of tools, equipment, technology, and pre-harvest and post-harvest treatment. Harvesting does not normally involve a whole tree or plant, but only parts thereof. Primary and downstream processing of NWFPs adds value to the product, provides local employment and helps increasing the retention of value in the country of origin;

v- Need to improve utilization, trade and marketing of NWFPs. Because of the multiplicity of NWFPs, ranging from food to aroma chemicals and pharmaceuticals, the markets show corresponding variation: bartering in subsistence economy, local village markets, national markets (i.e. large cities) and international markets. Some NWFPs are not traded, but collected and consumed. A large number of vendors are locally involved in selling NWFPs. Many of them sell their own production to supplement their income, others are supported by a network of merchants and several levels of buyers and sellers down to the village.

Traders and merchants are the main intermediaries who buy NWFPs cheaply from collectors in cases where the products are sold outside the locality where they are collected and sell it to exporters or processors at high prices. Because of the absence of appropriate organizations of collectors, market and price information are almost non-existent. Traditionally, the supply of NWFPs has involved networks of local collectors and intermediaries bound by long-term, often debt-based relationships. It is a trader dominated system and it is not conducive for the birth and growth of enterprises. Therefore, the system is, to some extent, exploitative and non-supportive of sustainable development.

It is necessary to develop a market orientation rather than simple accent on production. Production emphasis on has the effect of creating increased supply, with or without sustainable level of production, thus reducing price and profitability. A successful market orientation of NWFPs should increase demand, thus allowing more of the products to enter the market without reducing the overall price of the commodities. Product and market developments as well as market research are aspects related to this approach.

vi- Need for strengthening institutions. Inadequacies of institutions are often responsible for failures of efforts to develop NWFPs. Institutional aspects cover forest policy and strategy, legislation and regulations, legal right and arrangements, incentives, human resources development, health and safety considerations, access to information and streamlined support of public administration. In most forest policies, NWFPs get a mention in passing, but without clear objectives, targets and development strategies.

6 OUTCOME OF GROUP DISCUSSIONS

A session was devoted to address issues related to NWFPs. In order to discuss and propose broad guidelines for future development of NWFPs, participants were divided in three groups. The three groups dealt with 1) Definition and Classification, 2) Integrated Management of Natural Forests and Other Ecosystems; Domestication; and Harvesting and Processing, and 3) Utilization, Trade and Marketing, and Institutions. Following are the results of the group deliberations.

6.1 Definition & Classification

6.1.1 Definition:

The Group proposed that Non-Wood Forest Products be re-tilted as Non-Wood Forest Benefits and defined as "All vegetal and faunal products and services derived from forests and other wooded land and trees outside the forest. Excluded are industrial roundwood, wood used for energy, horticultural and livestock products".

The term "Non-Wood Forest Products" may be defined as above but excluding services.

6.1.2 Classification:

The basis of discussion for the group has been the classification proposed at the Regional Expert Consultation on Non-Wood Forest Products for the Asia and Pacific Region, held in Bangkok, Thailand, November 1991. The Group proposed few modifications so as to take into account the African context and to removed certain anomalies such as the placement of fodder and grasses under fibres. Where there are uncertainty about the placement of an item, reference was made to the Standard International Trade Classification (SITC - revision 2 and 3) to assist in placement.

The Group proposed the following classification:

1 **PRODUCTS**

a Food

- Animal feed
- Human food

  * Plant foods: flowers, bark, bulbs, roots, nuts, leaves, vegetables, shoots, fruits, seeds, spices & flavourings, fungi, beverages, etc.

  * Animal foods: bushmeat, honey, eggs, insects, nests, fish, snails, etc.

b Medicinal and Other Bio-Active Products

- Medicinal products (plants & animals)
- Insecticides (moluscides, termiticides)
- Toxins (venin)
- Stimulants (Catha leaves)

c Extractive Products (other than A or B)

- Gums, Resins, Latexes, Fixed and Essential Oils, Colorants, Tannins, Lacs, Dyes

d Other Animal & Animal Products (other than A, B or C)

- Live Animals
- Animal Products: Feathers, Fur, Horns, Teeth, Hide, Skins, Silk, Trophies

e Other Plant & Plant Products (other than A, B, C & D)

- Live and Ornamental plants
- Materials for making crafts, household utensils and items, agricultural equipment, ropes, games and housing components (includes thatch, fibre, cork, bamboos, rattans)
- Wrapping materials (beedi and palm leaves)
- Chewing Sticks
- Mulch

2 SERVICES

- Environmental Services
  - * Bio-Diversity
  - * Soil Protection
  - * Water Quality and Quantity
  - * Climatic Effects
- Social and Cultural Services
  - * Recreation
    - . Non-Consumptive
    - . Consumptive (Hunting & Fishing)
  - * Historical Importance
    - . Spiritual Values (sites for burial, rain making)
    - . Trees of Cultural Value (meeting place, boundary trees)
    - . Heritage Value

The group also suggested that the NWFPs categories listed in this classification, be cross-referenced to the SITC where possible.

6.1.3 Suggestions/Guidelines

The following broad guidelines were suggested by the group:

- that each country undertake to identify main NWFPs and assign priority for their development;
- that each country work out effective conservation and utilization strategies for the main NWFPs;
- that necessary institutional arrangements and/or strengthening be undertaken and capacity building in the sector promoted, as necessary;
- that necessary exchange of information between countries be promoted and facilitated by FAO and other International Agencies through appropriate means;
- that FAO encourage and enable the establishment of adequate statistical data base at the national and international levels and help to disseminate them widely;
- that the countries in the region carry out the necessary research on NWFPs in order to guarantee sustainable production as well as to improve the standard of living of the local people;
- that appropriate networks on NWFPs be encouraged and promoted; and
- that the International Donor Community provides appropriate assistance to develop and promote NWFPs in the Region.

6.2. Integrated Management of Natural Forests and Other Ecosystems

6.2.1 Background:

The group assumed that traditional and modern systems, if properly applied, could support sustainable development. However, the multiplicity of products coming from integrated systems of management tends to make it more difficult i.e. the more the products, the more difficult it is to manage the system. A definition of integrated management has first to be outlined for specific situations and conditions, especially as it applies to rural communities. The problems are compound by the fact that we do not understand or know what traditional management systems exist (or existed) in various areas; and it is essential to find out and study these management systems in order to understand them and assess their efficacy and shortcomings. Information on local community participation in the management of natural forests/ecosystems is lacking, and will therefore need to be addressed through surveys and appraisals (for example, using Rapid Rural Appraisal Methodologies).

The main issues, in this context, are local management of natural forests and other ecosystems as well as its sustainability.

6.2.2 Suggestions/Guidelines:

The following broad guidelines were suggested by the group:

- that inventory and assessment of existing traditional management systems in the different countries be carried out in order to evaluate their sustainability as well as the extent of participation of local communities. This will entail:

  * outlining the various components of existing systems;

  * outlining the local social and administrative structures geared towards the management of natural forests and other ecosystems;

* identifying wood and non-wood products derived from natural forests and other ecosystems;

* assessing the impact of the above on resource sustainability.

- that modifications be made on existing systems or alternatives systems be developed based on information gathered from the inventory and assessment exercise;

- that national policy and legal systems be reviewed and modified and/or strengthened as far as it relates to the management of natural forests and other ecosystems.

6.3 **Domestication**

6.3.1 Background:

Is it necessary to domesticate species providing NWFPs ? Although domestication of NWFPs resource base is not necessary in situations of subsistence economies of low populations and/or high resource availability, such situations do not prevail in Africa today. Due to the rapidly increasing population and the diminishing resource base, especially in Africa, domestication has to be seen as being potentially necessary in order to counter the current pressures on the land, and the need to feed the multitudes.

Domestication provide a number of benefits as follows:

. conservation and maintenance of bio-diversity;
. improved quality of NWFPs;
. increased quantity and supply of NWFPs;
. reliable and sustainable supply of NWFPs, ensuring food, medicine, and environmental security
. improved socio-economic benefits for the rural communities;
. better management of the resources base.

Different types of domestication, i.e. mono-cropping, multi-cropping and agroforestry systems, exist with their advantages and disadvantages. Domestication of wildlife should also be considered for meat production, especially

in situations of protein deficiency as well as for breeding with a view to re-stocking and re-introduction in depleted areas.

The main issues involved are appropriate technology for domestication, maintenance and conservation of bio-diversity, adequately trained human resource, market and marketing as well as land tenure.

6.3.2 Suggestions/Guidelines:

The following broad guidelines were suggested by the group:

- that special inventories and assessments be carried out in order to:

  * identify important species providing NWFPs and ascertain their status-i.e. threatened and/or endangered;

  * identify species of potential economic importance;

  * establish the marketability of NWFPs identified as being of potential importance.

- that research be carried out on aspects of domestication through on-station and on-farm trials, and results disseminated by establishing extension mechanisms;

- that small-scale production and processing enterprises be promoted and adequate support provided to local entrepreneurs;

- that land use and land tenure issues be resolved in order that the communities involved are provided necessary incentives.

6.4 Harvesting and Processing

6.4.1 Background:

Harvesting and processing add value to the resource of NWFPs by making them suitable for consumption. They also provide employment and income to rural communities and support technology-based development.

6.4.2 Suggestions/Guidelines: Harvesting

The following broad guidelines on harvesting were suggested by the group:

- that the harvesting practices and tools for different NWFPs assessed and improved;

- that the pre-transportation storage facilities and transportation methods be improved;

- that consideration be given for gender issues and that harvesting of NWFPs be made efficient, sustainable and scientific;

- that appropriate training programmes, appropriate for harvesting of different NWFPs be designed and implemented.

6.4.3 Suggestions/Guidelines: Processing

The following general guidelines were suggested by the group:

- that the existing technology and methods of processing of different NWFPs be assessed and improved;

- that the linkages of primary, secondary and downstream processing be strengthened in respect of the different types of NWFPs, particularly those which are important to rural communities; due consideration be given to gender issues in the processing of NWFPs;

- that the need for improving and maintaining product be emphasized;

- that appropriate training programmes for processing of NWFPs be designed and implemented.

6.5 Utilization, Trade & Marketing

6.5.1 Background:

Trade and marketing are means by which a product is made available to the consumer for use or utilisation. Efficiency in utilisation is an important aspect in ensuring sustainability. The group expressed the view that before promoting market for a product the implication of it on sustainable resource management should be investigated. It is also necessary to institutes continuous monitoring of the resource base of marketed non-wood forest products.

6.5.2 Suggestions/Guidelines:

The following broad guidelines were suggested by the group:

- that appropriate market information systems be established in order to provide basic information on all aspects of trade, marketing, including domestic consumption;

- that local organisations in the form of membership organisations or associations be promoted to the extent feasible in the production, trade and marketing of NWFPs;

- that the role of middlemen in the production/collection and trade of NWFPs, where ever found necessary, be rationalised;

- that lessons may be drawn on mechanisms of trade and marketing of NWFPs from experiences in other regions and/or countries.

6.6 Institutions

6.6.1 Background:

Strong institutions and institutional instruments are crucial to support development of NWFPs. However, the NWFPs sector is afflicted by lack of adequate institutional support.

6.6.2 Suggestions/Guidelines:

The following general guidelines were suggested by the group:

- that a Board or Council be established in each country in order to coordinate the development strategy and programmes on NWFPs. Such a Board or Council may include various Ministries involved in the management of natural resources, as well as Non-Governmental Organizations, private sector and other NWFP users. The functions of such a Board/Council could include, among others, the following:

  * Reviewing, periodically, legislation and policies, particularly those concerned with land tenure;

  * Identifying constraints and proposing remedial measures;

  * Coordinating the formulation of development strategies and activities;

  * Supporting social and environmental impact assessment studies on a regular basis;

  * Ensuring that consultation takes place at grass root levels, and that every level of NWFP users are able to participate in the decision-making and implementation process.

- that additional information be generated on the resource bases and use patterns. (A good start would be case studies using Participatory Rural Appraisal (PRA) Methodologies);

- that technical information on sustainable management of NWFPs and appropriate methodologies be generated and disseminated suitably;

- that statistical information on NWFPs including quantitative and qualitative indicators be developed and disseminated;

- that methodologies for surveys, assessments and prospecting of specific NWFPs be developed;

- that projection and outlook studies on NWFPs be carried out, to provide a basis for development planning;

- that up-to-date bibliographies on NWFPs be prepared;

- that research on NWFPs, especially those with socio-economic themes, be incorporated into the existing forestry research programmes, with special emphasis on applied research and extension of research results;

- that researchers working on NWFP issues be provided incentives in the form of fellowships for specialisation;

- that NGO's, at national and regional levels, be involved in activities to promote NWFPs;

- that Regional and Sub-Regional Networks on NWFPs on the basis of Technical Co-operation for Developing Countries (TCDC) be developed and promoted.

7 CONCLUSIONS

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 are just but a few benefits which can be derived from the sustainable production of NWFPs.

Under natural conditions, NWFPs can be managed along with timber in an integrated manner, thus increasing overall forest productivity and value. Selected NWFPs can also be grown as pure or mixed crops under aggro-forestry and or community forestry systems. NWFPs can be harvested from an ecosystem in quantities and ways that do not alter its basic reproductive functions. NWFPs have strong linkages and complementarities with component activities of environmentally sustainable development.

These attributes of NWFPs have led to increasing awareness on the role and socio-economic importance of NWFPs. This Expert consultation was a further attempt at re-enforcing that awareness and to promote action aimed at development of NWFPs at national, regional and international levels. In that regard the consultation has proposed broad guidelines covering the different aspects on NWFPs development.

REGIONAL EXPERT CONSULTATION ON NON-WOOD FOREST PRODUCTS FOR ENGLISH-SPEAKING AFRICAN COUNTRIES, ARUSHA, TANZANIA 17-22 OCTOBER 1993

Programme

Sunday, 17 October, 1993

18:00 - 19:00	Registration
19:00 - 21:00	Informal Dinner

Monday, 18 October, 1993

08:30 - 09:00	Registration
09:00 - 09:30	Opening Ceremony . Mr G Mbonde, Ministry of Tourism, Natural Resources and Environment . Dr C Chandrasekharan, Chief, Non-Wood Products and Energy Branch, Forest Products Division, FAO . Dr J A J Perera, Project Officer Commonwealth Science Council . Mr A R Mwaheleje, Ministry of Tourism Natural Resources and Environment
9:30 - 10:00	Coffee Break
10:00 - 10:40	Issues Involved in the Sustainable Development of Non-Wood Forest Products by Dr C Chandrasekharan

10:40 - 11:10	Non-Wood Forest Products in Africa: An Overview by Mr J D Keita
11:10 - 12:10	Pilot Country Study: Lesotho by Mr Maliehe
12:10 - 14:00	Lunch
14:00 - 15:10	Pilot Country Study: South Africa by Mr Maliehe
15:10 - 15:50	Gum Arabic from Sudan by Mr Wasila
15:50 - 16:20	Coffee Break
16:20 - 17:10	Pilot Country Study: Tanzania by Mr Chihongo

Tuesday, 19 October, 1993

08:30 - 09:15	Pilot Country Study: Malawi by Mr Nyirenda
09:15 - 10:10	Pilot Country Study: Zimbabwe by Mr Campbell
10:10 - 10:40	Coffee Break
10:40 - 11:10	Statistical Information on Non-Wood Forest Products by Mr Padovani
11:10 - 11:40	Programme and Project Review of the International Development Research Centre (IDRC) by Mr Seward
11:40 - 12:10	Programme and Project Review of the International Union for the Conservation of Nature (IUCN) by Mr Broekhoven
12:10 - 14:00	Lunch
14:00 - 15:00	Pines and Eucalyptus Sources of Non-Wood Forest Products in Africa by Mr Coppen, Natural Resources Institute
15:00 - 15:30	Coffee Break

15:30 - 16:30	Monetary Valuation of Tree-Based Resources in Zimbabwe: Experience and Outlook by Mr Campbell

Wednesday, 20 October 1993

08:30 - 12:30	Plenary Session: Discussions of Issues related to NWFPs: . Defintion and Classification . Integrated Management of Natural Forests and other Ecosystems . Domestication
12:30 - 14:00	Lunch
14:00 - 17:00	. Harvesting and Processing . Utilization, Trade and Marketing . Institutions

Thursday, 21 October, 1993

08:30 -12:30	Group Session: Discussions on the Issues
12:30 - 14:00	Lunch
14:00 - 17:00	Group Session: Discussions on the Issues

Friday, 22 October, 1993

08:30 - 11:15	Plenary Session and Adoption of the Regional Expert Consultation Report
11:15 - 11:30	Closing Remarks by J.D. Keita on behalf on FAO and Dr. Perera on behalf of the Commonwealth Science Council
11:30 - 18:00	Lunch and Field Trip to Arusha National Park

Some of the participants who attended the meeting in Arusha, Tanzania

Seated from right:
Dr Chandrasekharan, Mr Mwaheleje, Mr Mbonde, Dr Perera

First row standing from right
Mr Chihongo, Mr Mushi, Mr Padovani, Mr Maliehe, Mr keita, Mr Kamweti, Mr Kimishua

Second row standing from right
Professor Ishengoma, Mr Seward, Professor Campbell, Mr Wasila, Mr Broehoren, Mr Copen, Mr Leger

ANNEX II

REGIONAL EXPERT CONSULTATION ON NON-WOOD FOREST PRODUCTSFOR ENGLISH-SPEAKING AFRICAN COUNTRIES, ARUSHA, TANZANIA, 17-22 OCTOBER 1993

List of Participants

	NAME, TITLE & ADDRESS	
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IMPORTANT NON-WOOD FOREST BENEFITS IN SELECTED COUNTRIES IN AFRICA

PRODUCT	LST	MLW	SAF	TAN	UGD	ZAM	ZIMB
FOOD/ ANIMAL FEED							
Fodder	1	3	2	1	3		
FOOD/ HUMAN FOOD Plant Foods							
Bamboo (shoot/stem)					2		
Beverages				2	3		
Condiments				3			
Fruits	1	1	1	3	2	1	1
Leaves		2		3		3	3
Mushroom		2	3	2		1	3
Seeds				3			
Spices				2			
Oils				3			
Nuts	3			3		2	3
Roots						2	3
Stem						3	
Tuber		3				2	3
Flower						3	3
Wild Spinach	1		1				
Animal Foods							
Eggs				3		3	
Fish	1		1	1		1	2
Game meat	2		1	1	3	1	3
Invertebrate						1	
Insect				2		2	2
Frog meat				3			
Honey	2	1	2	1		1	3
Mopane worms			2				
Ostrich meat			2				

IMPORTANT NON-WOOD FOREST BENEFITS IN SELECTED COUNTRIES IN AFRICA

PRODUCT	LST	MLW	SAF	TAN	UGD	ZAM	ZIMB
MEDICINAL & OTHER BIO-ACTIVE PROD.							
Medicines		2			2	3	1
Azadirachta indica				2			
Cinchona bark				1			
Caesalpinia decapitala				2			
Croton megalocarpus				3			
Agave sisalana				2			
Carica papaya				3			
Eugenia caryophyllata				1			
Faidherbia albida				2			
Acacia mellifera				2			
Alchornea cordifolia				2			
Annona senegalensis				2			
Bridelia micrantha				2			
Byroscarpus orientalis				2			
Combretum molle				2			
Entada abyssinica				2			
Maytenus buchananii				2			
Rauvolfia caffra				2			

IMPORTANT NON-WOOD FOREST BENEFITS IN SELECTED COUNTRIES IN AFRICA

PRODUCT	LST	MLW	SAF	TAN	UGD	ZAM	ZIMB
MEDICINAL & OTHER BIO-ACTIVE PROD.							
Trema orientalis				2			
Trichilia emetica	2			2			
Artemisia afra	1						
Aloe ferox	2						
Protea caffra	2						
Acacia karroo	2						
Eucomis spp.	2		1				
Euclea spp.	2						
Buddleja salviifolia	1						
Tarconanthus camphoratus	2						
Warburgia salutarias			1				
Ocotea bullata			1				
Betulina agathosma			1				
Tetradenia riparia			1				
Boweia volubilis			1				
Acacia xanthophloea			1				
Casine transvalensis			1				
Terminilia sericea			2				

IMPORTANT NON-WOOD FOREST BENEFITS IN SELECTED COUNTRIES IN AFRICA

PRODUCT	LST	MLW	SAF	TAN	UGD	ZAM	ZIMB
OTHER ANIMAL & ANIMAL PROD.							
Hides						3	2
Horns				2		3	
Skins	3		2	1		3	
Tusks						3	2
Feathers	3		3	3			
Furs				1			
Shells				3			
Live Animals				1			2
OTHER PLANTS & PLANT PROD.							
Fibre	2	3			1		
Bamboo				2		1	
Rattan/Canes					1	3	
Wraps					3		
Bark				3		1	1
Grass		3				1	
Leaves			1			3	
Stem						3	
Vines			1			3	
Juncus krausii			1				
Mats				2			
Basket				2			
Cork				3			
Wood Handicraft	2		1				2

IMPORTANT NON-WOOD FOREST BENEFITS IN SELECTED COUNTRIES IN AFRICA

SERVICES	LST	MLW	SAF	TAN	UGD	ZAM	ZIMB
ENVIRONMENTAL SERVICES							
Soil Protection	2		2	1			
Climatic Effects (Amenity)	2		2	2			
SOCIAL & CULTURAL SERVICES							
Recreation Non-Consumptive -Tourism	1		1	1			1
Recreation Consumptive -Hunting -Fishing	3 2		3 2	1 1			
Historical Importance Spiritual Values							
Trees of Spiritual Values							
MISCELLANEOUS							
Beeswax			2	1		1	
Propolis						3	

Legend:

1. Very Important
2. Moderately Important
3. Less Important

-. Blank: No Value

ANNEX IV

LIST OF REPORTS

1 Opening Ceremony Speech, by A R Mwaheleje, Ministry of Tourism, Natural Resources and Environment, Tanzania.

2 Issues Involved in the Sustainable Development of Non-Wood Forest Products, by Dr C Chandrasekharan, Chief, Non-Wood Products and Energy Branch, Forest Products Division, Forestry Department of FAO.

3 Non-Wood Forest Products in Africa: an Overview, by J D Keita, Regional Forestry Officer, FAO Regional Office for Africa, Accra, Ghana.

4 Pilot Country Study on Non-Wood Forest Products: Lesotho, Malawi, South Africa, Tanzania, Uganda, Zambia, Zimbabwe.

5 Monetary Valuation of Tree-Based Resources in Zimbabwe: Experience and Outlook, by B Campbell, University of Zimbabwe.

6 Pines and Eucalyptus - Sources of Non-Wood Forest Products in Africa, by J J W Coppen, Natural Resources Institute of the Overseas Development Administration, UK.

7 Gum Arabic Report from Sudan, by O El Wasila.

8 Information Notes on Statistical Information, by F Padovani, Forestry Officer, Planning and Statistics Branch, Forestry Policy and Planning Division, Forestry Department of FAO.

9 Dependency on Forest and Trees for Food Security, by the Tanzania Food and Nutrition Centre, Tanzania.

1 Opening Ceremony Speech, by A R Mwaheleje, Ministry of Tourism, Natural Resources and Environment, Tanzania.

SPEECH BY THE HON. JUMA H. OMAR, (MP) MINISTER FOR TOURISM, NATURAL RESOURCES AND ENVIRONMENT AT THE REGIONAL EXPERT CONSULTATIVE MEETING ON NON-WOOD FOREST PRODUCTS ARUSHA, TANZANIA - 18 OCTOBER, 1993

Mr. Chairman,

Distinguished Guests,

Distinguished Participants,

Ladies and Gentlemen

Please allow me in opening this Consultative meeting to express to you in my name and on behalf of the Government and people of Tanzania our feelings of pride and honour for the choice of Tanzania as host to the first Regional Expert Consultative Meeting on non-wood forest product.

On this occassion I would like to extend my sincere thanks to the Commonwealth Secretariat for calling upon us to host this important event.

Mr. Chairman,

I would also like to welcome our honoured guests. I wish all a pleasant stay among us and success in your work.

Our country has a lot to offer and as you may well know, Tanzania is endowed with some of the most beautiful national parks in the world to be found not far from Arusha. It is my hope that you will manage to snatch a few moments of your busy schedule and utilize this chance to visit such places as the world famous Ngorongoro Crater, Serengeti and Lake Manyara National Parks just to mention a few.

Mr. Chairman,

I am informed that in this Consultative Meeting of Experts on non-wood forest products, you are going to deliberate on the current status of production and utilisation of non wood forest products in your respective countries through information and statistical data gathering; review the need for improvement in the areas of collecting, processing and marketing of these products and also examine the issue of economic dimensions of non-wood forest products as well as proposing development interventions for national level action through regional project profiles.

Mr. Chairman,

Your gathering here today has come at the most opportune time when the conservation and sustainable use of forests for environmental and biodiversity protection are the key issues in

the wake of the Agenda 21 deliberated in Rio de Janeiro, Brazil last year.

As we are all aware, forests supply not only timber, poles and fuelwood, but also an extensive range of goods for food, fodder, medicine and industry, collectively termed as non-wood forest products.

Non-wood forest products comprising of vegetal, faunal and forestry services have been important among our rural population living in and around the forest areas, who have depended to great extent on a large variety of forest products for their subsistence. The harvesting, processing and trade of these products constitute basic activities providing the goods and cash required for the welfare of millions of rural people, including improved food security and better nutrition increased income and job opportunities as well as increased market opportunities for new products.

Mr. Chairman,

While we recognise the potential and advantages of the Non-wood products, however, deforestation and degradation of forests, due to unsustainable timber harvesting, wild bush fires, over grazing, shifting cultivation, increasing population among other reasons have aggravated the situation of rural people living in

or near the forest and impaired the sustainable supply of these products. Consequent to this there has been reduction of income and employment opportunities in the rural areas.

Mr. Chairman,
Ladies and Gentlemen,

In order to ensure that the potential and supply of non wood forest products and other forest based products is maintained and contribute to the economic and social development of our people and nations, the issue of protecting our forests and woodlands against deforestation and degradation must be emphasised, as outlined in the Tropical Forest Action Plan, which was born out of the global concern over deforestation and degradation of forest resources in tropical countries and their far reaching implication at local, national and regional levels.

For the forests to play their potential role in every facet of our life, the issue of sustainable management of our forest is of paramount importance. In its broadest sense, forest management should deal with the administrative, economic, social, legal, technical and scientific aspects of conservation and use of forests within the frame work of technically sound and politically accepted overall land use plan.

Mr. Chairman,

This implies various degrees of human intervention, ranging from action aimed at safeguarding and maintaining the forest ecosystem and its functions to favouring given socially or economically valuable species or groups of species for improved production of goods and environmental services is taken. This would require, technically, the formulation of management plans, which will help to control and regulate harvesting of specified goods, combined with silvicultural and protective measures applied in varying intensity to sustain or increase the social, ecological and economic value of the forests in subsequent generation.

For the successful implementation of forest management plans, the people and the countries concerned must be convinced that the land under forest is at least equal or more valuable as forests than if converted into other land use. People living in or adjacent to forests must be closely involved in all stages of decision making and implementation; moreover social and economic benefits emanating from the forests and its sustainable use must be maintained and enhanced at local as well as at national level.

Mr. Chairman,

In addressing ourselves to non-wood forest products we are

opening another dimension of the multiple use of forests. Non wood forest products such as, gum copal, gum arabic, wild rubber to mention a few, had been very important export products in Tanzania in the mid fifties and late sixties of this century. However, lack of marketing strategies, development of the products and proliferation of synthetic products as substitutes has contributed to the decline in importance of these products. The revival in looking into developing these products will once again reinstate the importance of these products and the potential of enhancing and improving the rural economies and social welfare of our people. Most important, since the production and marketing of these products is done by the rural people in and around the forests, this will further enhance the participation of people in forest development and management activities.

Mr. Chairman,

It is my conviction that your deliberation on this subject will enlighten and pave ways of developing these products to reach the desired levels of production and utilisation of our forests on sustainable basis and catching all advantages which will further justify the development, conservation and protection of our forests.

Mr. Chairman,

With these few words may I once again, welcome you to Tanzania and declare this meeting open.

Thank you.

b:wp\dfob.d\non.wood meeting

2 Issues Involved in the Sustainable Development of Non-Wood Forest Products, by Dr C Chandrasekharan, Chief, Non-Wood Products and Energy Branch, Forest Products Division, Forestry Department of FAO.

ISSUES INVOLVED IN THE SUSTAINABLE DEVELOPMENT OF NON-WOOD FOREST PRODUCTS[1]

by

C. Chandrasekharan [2]

ABSTRACT. Non-wood forest products play a crucial role in the daily life and welfare of the local population, as significant sources of food, fodder, fertiliser, (biomass) fuel, fibre, medicine, gums and resins, and organic construction materials. They provide raw material to support processing enterprises such as of rattan and bamboo furniture, essential oils, resin and pharmaceuticals. Small scale units of these are amenable to be linked to central refining and further processing units. Some of the non-wood forest products are internationally traded commodities used in food, flavourings, perfumes, medicines, confectionaries, paints and polishes. At the local level they help to provide additional employment and income.

While non-wood products have been in use from time immemorial, some of them have moved to the status of intensively managed agricultural and horticultural crops, due to their obvious attributes. Others remained grouped as 'minor' products of forests, in spite of their real and potential value and heterogenous nature. This resulted in the benign neglect of most non-wood forest products reflected in serious lack of information on almost all aspects. However, there has recently been a new and increasing awareness about the important contribution of non-wood products (and benefits) in ensuring sustainable forestry development. This has further been underlined in the deliberations and decisions of the UNCED.

A comprehensive strategy for development of NWFP, appropriately covering resource inventory and management, harvesting and processing, utilization and marketing, research and extension support and training and institutional arrangements is an urgent need.

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[1] *Paper prepared for the Expert Consultation on Non-Wood Forest Products for English-Speaking African Countries. This paper provides a global overview of issues involved in the development of non-wood forest products, relating it to the situation prevailing in Africa, wherever relevant.* Arusha, TANZANIA, 17-22 Oct. 1993.

[2] *Chief, Non-Wood Products and Energy Branch, Forest Products Division, Food and Agriculture Organisation of the United Nations, Rome.*

INTRODUCTION

There is a wide range of non-wood forest products and services differing in their source, nature, characteristics and utilization. Their conservation, management, utilization, trade and socio-economic roles present a complex array of problems and potentials. From time immemorial these products and services have contributed greatly to human welfare and progress.

Once designated as minor forest products (MFP), this very important group of forest benefits have recently been receiving increasing recognition and attention. Depending on the scope and coverage they are grouped and defined differently. The term non-wood forest products (NWFP) generally includes all tangible products other than timber, fuelwood and charcoal derived from forests or any land under similar use as well as woody plants. The term non-timber forest products (NTFP) includes all tangible products other than timber and includes wood energy (fuelwood and charcoal)[3]. The other term in use, non-timber forest benefits, includes, in addition to all tangible products other than timber, environmental and socio-cultural services.

No position is taken on which of the grouping is to be preferred, since it is an issue to be discussed. However, the emphasis given in this paper is on NWFP, due to the limitation of information on forest services and benefits.

A universally applicable classification of NWFP also presents a problem due to the diversity of and overlaps in their sources, properties, characteristics and uses. More than one classification is possible depending on the following criteria: group of organism from which products originate; specific parts of plants or animals yielding the products; manner of collection or harvest; properties (physical and chemical) of the products; and uses in industry and trade. (Some of the classifications seen used in literature and reports are given in Annex 1). A consistent system of classification for NWFP is essential for purposes of data collection and planning.

Non-wood forest products include a number of products under the broad categories of food and food additives, fodder, fibre and flosses, (biomass) fertilizer, phytochemicals and aroma chemicals, oils, latex, resins and other exudates, organic construction materials, decorative articles, and animal products. A large number of items of our everyday use such as medicines, perfumes, suntan lotions, nail polish, mouth wash, hair conditioners, toiletries, cheese, chewing gum, ice cream, soft drinks, juice drinks, peanut butter, edible nuts, breakfast cereals, culinary herbs, canned fish, dairy deserts, fancy bags, decorative buttons, chess pieces, golf balls, paints, corrosion inhibitors, fungicides and a host of others, contain varying proportion of NWFP.

Apart from the crucial importance of NWFP in the daily life and welfare of local

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[3] *It is often contended that if oils and chemicals obtained by destructive distillation of wood is treated as non-wood forest product, then wood energy should also be so treated and the differentiation between NWFP and NTFP becomes redundant.*

communities in meeting their diversified subsistence needs as well as providing additional income and employment, many items of these products have social and cultural roots. Some of these products are among the oldest traded commodities whereas others are known only locally within traditional systems of use. Non-wood forest products support local craft production. Activities related to collection and primary processing of NWFP lend themselves suitable for equitable participation of women. They provide raw material to support processing enterprises such as essential oils, gum rosin and pharmaceuticals. Small scale units of these are amenable to be linked to central refining and further processing units. Processing of NWFP into consumer products can result in considerable value addition. They are in many cases an important source of foreign exchange earnings. Under natural conditions, non-wood products can be managed along with wood in an integrated manner, thus increasing overall productivity. Their proper management can support conservation of genetic wealth and variability. Some of them can also be grown as pure or mixed crops and under agroforestry systems. Often non-wood products can be harvested without cutting down trees or destroying forests. They are, therefore, environmentally more friendly. Overall, non-wood forest products have strong linkages and complementarities with component activities of environmentally sound and sustainable development of forestry.

In the UNCED Agenda 21 and Forest Principles (1992), NWFP has been identified as an important area requiring concerted action for capturing their potential for contributing to economic development and employment and income generation in an environmentally sound and sustainable manner.

SITUATION OF NON WOOD FOREST PRODUCTS IN AFRICA

The estimated area of tropical forest cover in Africa region in 1990 was about 528 million hectares of which some 350 million hectares are in Central and Tropical Southern Africa. These forests are rich in plant genetic resources. They are the home for multipurpose plants providing fruits, nuts, oil, resin, palm heart, beverages, perfumes, essential oil, medicinal extracts and materials for handicrafts and cultural products.

For millennia, forest dwellers in the region have thrived on products gathered or harvested from the forests. Over centuries of close relationship with the forests and nature, the people have discovered innumerable natural products, many of them of non-wood origin. Their knowledge about medicinal and food plants were particularly interesting and valuable. It has been suggested by several experts that the importance of non-wood products is comparable to that of wood products, for the wellbeing of the rural society in the African continent. However, statistical information to underpin this statement is sorely lacking. With few exceptions, the non-wood forest products have never been studied in depth, neither in respect of quantities produced nor of their socio-economic importance. Except for few case studies, the situation is marked by an almost total lack of information particularly of those products that are consumed locally.

Forest/tree foods are of particular importance to rural communities: *Cola nitida* (Cola), *Cola cordifolia* (wild cola), *Adansonia digitata* (Baobab), *Balanites aegyptiaca* (desert date),

Spondias spp., *Zizyphus spp.* are only some examples of a large variety of food plants of the forest. They provide foods that supplement and complement traditional agricultural sources and contribute to household nutrition and food security. Wild leaves and fruits contain many essential vitamins. Seeds, nuts, roots and tubers supply fats and carbohydrates. Mushrooms, gums and saps provide protein and minerals, and wild animals from the forest often supply the major portion of meat consumed by people living in or near forest areas. Forest foods are also important because they are frequently available for longer periods or during "hungry" or "lean" seasons, thus ensuring that people have food supplies when traditional agricultural products are not available. For example, in Burkina Faso and neighbouring sahelian countries farmers plant or protect mango trees in their fields primarily to provide fruit during the planting season when other foods are scare. In Nigeria, traditional home gardens can contain more than 60 species of trees that provide food products. Children in lowland Kenya snack on forest foods that provide an important supplement to their diet. In West Africa the seeds from *Parkia spp.* provide a nutritious protein and fat-rich food called "dawadawa" in Nigeria.

Fodder is an important requirement in the rural areas, and there are large numbers of forest species which help to meet this requirement. In the arid areas, the multipurpose species as such as *Acacia spp.* and *Prosopis spp.* also provide fodder. In the Sahel, *Acacia albida* may account for 30 to 45 percent of the total livestock feed in the dry season.

Medicinal Plants, as a valuable NWFP, are important in all countries of the region. It is known that the indigenous people had developed complex and sophisticated knowledge systems about the use of a vast diversity of plants for medicinal purposes.

The origins of traditional herbal medicine predate all existing records, and the knowledge accumulated over thousands of years in different parts of the world is enormous. It is estimated that some 30 000 plant species have at one time or other been used in some culture or other for medicinal purposes. Even though some 75% of the world's population by and large depends on traditional natural medicine, particularly in developing countries, it suffered some set back with the introduction of allopathy. There is now a re-awakening of the importance of herbal medicine and it has resulted in a more scientific approach to the use of medicinal plants. Recent advances in the medical science, especially pharmacology, have been very closely connected to the knowledge of native people about the therapeutic value of plants.

A large number of medicinal plants are used in the traditional medicines in Africa, and they are known by different local names. Some examples are: *Ocotea buccata, Curtisia pentata, Cryptocarya myrtifolia, Gnetum africanum, Rhabhia spp., Dacryoides spp., Xylopia spp., Thaumatococcus danielli.* Ethnobotanical studies carried out throughout Africa confirm that plants make up the main constituent of traditional African medicines. With about 80 percent of Africa's population relying upon traditional medicines, the importance of the role of medicinal plants in the health care system is obvious.

Medicinal plants are at present obtained from both cultivated and wild sources. Some of the studies on the source of medicinal plants used in traditional and modern medicine indicate that the vast majority of them come from wild sources. Only a small percentage of

the plant species has been examined for pharmacological activity. Those which are yet to be studied may hold valuable secrets for preventing and curing human ailments. The destruction and degradation of natural habitats of medicinal plants, in the meanwhile, may seriously affect the future potential of this valuable resource. Policy and action in this regard are urgently needed.

Medicinal plants can support economic growth through activities related to growing, harvesting, processing and marketing of products. Given its direct relevance to health, social well-being and economic performance, the manufacture of products from medicinal and herbal plants is one of the most people-oriented industrial sectors. However, there are several constraints: inadequate policy measures and support infrastructure, restricted access to technology, lack of systematic research, scarcity of production units of scientific and commercial scale, lack of proper quality control, pharmacological evaluations and regulatory arrangements. These constraints call for action on many interrelated fronts.

Aromatic plants (which often are also medicinal plants), are the source of essential oils and aroma chemicals. Essential oils contain an aroma or an essence that stems from organic compounds known as Terpenoids. Essential oils, unlike fixed oils, are volatile, i.e. they are ethereal substances. This characteristic makes them suitable for perfumery, cosmetics, pharmaceuticals and food flavourings. Each type of essential oil contains several chemical compounds. There are a number of plants yielding essential oil, such as *Eucalyptus spp.*, *Tagetes glandulifera, Brachyleana hutchinsii* and *Cedrus spp.*, even though Africa does not figure prominently in their production and trade. However, this appears to be an area with potential.

Occurrence/cultivation of dye yielding plants, such as *Bahia nitida* (suitable for textiles) and *Bixa orellana* (suitable as food colourant), fibre yielding plants such as *Ceiba pentandra* and *Agave sissalana*, palms such as *Raphia venifera* and *Borassus spp.* providing fronds and leaves suitable for weaving into mats and other articles, tannin yielding plants such as *Rhizophora spp.* and *Cassia spp.*, species of rattan suitable for furniture such as *Calamus spp.* and *Erismosphata hookerii*, different bamboos and several others indicates the scope and potential for developing NWFP in Africa.

In case of some plants which were not considered important as providing NWFP, new uses are being identified and products commercially developed. One such plant grown in abundance in the drier parts of Africa is neem (*Azadirachta indica).* A range of products including neem oil, neem soap and an insecticide (*Azadarchtine*), have been developed from the seeds of neem tree.

Development of non-wood forest products can go a long way in providing additional rural employment and household income, and thus contribute to a better livelihood to the rural people.

Apart from their traditional, cultural and socio-economic importance locally in a number of countries, NWFP is also an important source of export earning. For example, gum arabic from *Acacia senegal* is a very important source of foreign exchange for Sudan. Spices are an important item of export in Tanzania. Kenya exports Annatto seeds. Some

countries in the region exports unprocessed cashew nuts, wild life products (e.g. crocodile skin), honey and wax. Quantitative information available is limited. However, it is sufficiently indicative of the vast potential.

In terms of foreign exchange earning, wild life tourism is very important to some of the East African countries. Potential for wildlife tourism and ecotourism exists in most countries of the region. However, it is an area requiring detailed planning and sizeable investment in infrastructure and facilities.

In spite of their indicated importance, the resources of non-wood forest products, have been dwindling at a fast rate.

The future of NWFP, in spite of its apparent scope and potential, would depend on the integrity and stability of the forest resource - not only as the land base, but also as the biological base. The estimated annual rate of deforestation, for the period 1981-90, in the Africa region is about 4.1 million hectares, equivalent to 0.7%. This is a serious matter with implications on sustainable forest management in the future, calling for appropriate policies and actions.

CONSTRAINTS TO THE DEVELOPMENT OF NON-WOOD FOREST PRODUCTS

Globally, many products which figured prominently in the past have undergone a substantial decline in production and trade over the last 20 years. There are several factors constraining the sustainable development of NWFP, especially of those of purely forest origin.

- Due to overemphasis on timber production in recent times, non-wood products were neglected by foresters and policy makers leading to lack of attention on their scientific management and conservation.

- Extensive gathering and inappropriate management regulations have often caused resource depletion. Gathering or extraction of natural resources can only support low human population densities, and increasing population pressure have negatively affected the sustainability of NWFP resources.

- Organized and unplanned land use changes also have caused destruction of the proper habitat for NWFP.

- Lack of integration of wood and non-wood products in forest management, wasteful harvesting, lack of stability and reliability of supply, and lack of efficient and proper market chains are other constraints on the supply side.

- There is lack of processing and storage technology and facilities; quality standards of products are often poor.

- Most traditional NWFP activities are labour intensive and cheap, so they tend to be inversely related to general economic development. They tend to become early casualties in the process of economic development, and succumb to competition, unless measures are taken to improve them to the new needs and situations.

- For many of the non-wood forest products, the markets are ephemeral in nature often due to competition from cheaper and more convenient substitutes (e.g. from cultivated source) or synthetic products.

- NWFP being mostly of local/rural importance, small in scale, associated with traditional uses and low in technology, there is often a policy bias against them - considering them as difficult to develop or unimportant.

- There is serious lack of research and technology development related to NWFP.

- Information is scarce on all aspects of NWFP. These products are not adequately treated (or not treated at all) in official statistics and surveys.

- There is general absence of inventory of NWFP, and their planning often lacks scientific basis. The extent of variation in the nature, quality, characteristics and uses of the products compounds the problem. Products which do not contribute significantly to the national economy, tend to get less attention.

- Exploitative commercialization of NWFP in some countries results in the collectors or extractors of products receiving only insufficient incentive to manage the resources sustainably.

- Finally, there is lack of clear and appropriate policy support for NWFP development in spite of their positive attributes and potential.

INTEGRATED MANAGEMENT OF NATURAL FORESTS

The natural forests of Africa are rich in species. The number of species of higher plants in the tropical rain forest is estimated to be 30,700. The number is 13,000 for moist deciduous forest, 1,900 for dry and very dry zone and 12,300 for upland formations. Many of the plants providing NWFP are found only among the biological richness and ecological complexity of primary forests. Some of them can only thrive within natural habitat 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 dependant 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. Thus the genetic wealth and variability are crucial for future development of NWFP. However, deforestation and other anthropogenic influences are causing loss of species and their variability. The indicative

species loss during 1981-90 in Africa has been 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.

Integrated management of forests under a holistic approach for wood and non-wood products and benefits is an essential strategy in many situations. The practice of managing forests for wood production alone has therefore to change. Integrated multipurpose management of forests is highly demanding on scientific knowledge and technology. It involves, in addition to timber inventory, detailed investigation and prospecting of non-wood forest resources for fibre, phytochemicals, aromatics, gums, resins, etc. These investigations have to consider the nature and extent of distribution of the specific plant resources and their density of occurrence. They need to be scientifically screened for active and valuable ingredients, their potential supply from wild sources, their suitability to be grown under multi-species environment (e.g. enrichment planting under natural forest cover and agroforestry) or under monoculture. Traditional knowledge and ethno-biology can contribute considerably in planning integrated development of the resources.

In-situ genetic conservation of areas with greatest number of plant varieties of known economic value, as well as those with potential, should be part of integrated forest management. It will help to **"Save the Plants That Save Lives"**.

It may often be a compatible objective of management to allow controlled extraction of NWFP from natural forests which are included as part of protected area systems, especially in the buffer zones of protected areas.

An important point to be stressed, in promoting integrated management of forests is the need and urgency of developing proper scientific and situation-specific management systems. Another and equally important need is adequate institutional arrangements, considering that without such arrangements commodity based natural resource management, if solely left to market forces, could lead to fast depletion of resources. It is necessary in this connection to understand that: trees and plants yielding wood and non-wood products can co-exist in the forests; many non-wood products are available from timber species; harvesting of wood and non-wood products is not mutually exclusive and needs to be carried out with great care; wood harvesting, if improperly done, can be deleterious to production of NWFP; and, production of some non-wood products may substantially affect production of others. These suggest the need for appropriately balanced and integrated system of forest management combining ecological and economic prudence.

At present natural forest management in Africa is very weak, almost non-existent in many cases. The challenge involved to improve the situation is enormous. Faced with this challenge, some countries regard their ability to promote NWFP as a key to their ability to manage forest resources in a sustainable way.

Foresters have been developing and refining silvicultural techniques of managing tropical forests for over 100 years. These systems, however, have been specifically designed to maximize the production of commercial timber. Silvicultural systems for enhancing the growth of non-wood resources in forests such as wild fruits, edible nuts, mushrooms, gums and latex which can be harvested non-destructively and in combination with timber, have

received much less attention. This is not to say that such systems are unknown or do not exist. Many indigenous or other local communities in the tropics have developed their own form of 'silviculture' for managing their non-timber resources. Such (indigenous or local) systems of forest management have been little studied, largely because of the lack of economic interest in many non-timber resources, but also due to the relative 'invisibility' of these (indigenous) practices. Both indigenous silvicultural practices and conventional forestry can contribute in designing or improving systems for managing non-timber forest resources on a sustainable basis.

Some specific issues to be addressed in this regard are:

a) Compatibility of management systems for different products and the need for compromises - e.g. tapping of latex and the quality of timber from tapped trees;

b) Conflicts likely to arise in situations where rights are separately assigned to wood and non-wood products;

c) When, where and to what extent NWFP production could be or should be through domestication under intensive NWFP plantations, agroforestry and in combination with timber plantations;

d) In cases where harvest would result in killing the plant (e.g. extracting tubers/roots) how can conservation of genetic resources and diversity be ensured?

e) Compatibility of NWFP production with services like watershed protection.

The role of non-wood forest products in upland conservation and watershed protection, is a special aspect of integrated management. Some of the attributes of NWFP, relevant in this regard, are the following:

- Controlled, and regulated exploitation of NWFP is normally fully compatible with forest hydrologic and other protective functions of watershed forest cover;

- NWFP are often of high value per unit of weight or volume. They are therefore highly suitable for production in areas far away from road networks and markets;

- Income from NWFP provides a strong incentive for forest conservation, as well as one of the most important alternatives to shifting cultivation in remote upland areas.

- NWFP are often well known to indigenous forest dwellers, and therefore represent a potential source of income where they have a competitive advantage, provided they are ensured recognition and protection of resource tenure and fair access to outside markets;

- Income generation from NWFP often involve all members of the family, including children, men, women and old people;

- NWFP cannot only generate income but also, and sometimes more importantly, provide

a higher nutritional and health standard. This is particularly important in remote upland areas without access to preventive or curative medical services;

- Weaker groups in the uplands, women, the poor, the landless and old people, often have easier, informal access to NWFP than to timber and other wood products. (Formalisation of land and resource tenure in the uplands and watershed areas may further deteriorate the position of the weaker groups, as their access is based on informal tradition rather than legislation and written property rights).

CULTIVATION OF NON-WOOD FOREST PRODUCTS

The impacts of deforestation on NWFP resources can partly be averted or minimized by cultivating them as a crop. Domestication of plants yielding NWFP, involving their genetic improvement and growing them under intensive cultivation practices is often considered as a means of ensuring controlled production and economic success of the ventures. Intensive cultivation can take place under monoculture, mixed cropping or agroforestry systems. Certain non-wood products (such as cardamom) can be grown artificially under the shade of natural or man-made forests.

It has been the experience that once a product achieves commercial importance, its supply from the wild sources tends to be replaced by cultivated source with a view to bring production, quality and cost under control. Oil palm, rubber, cashew, coffee, cocoa and pepper are but a few of the many wild forest products that have been largely replaced by production from cultivated sources. The productivity of the cultivated crop can be enhanced through improved agro-technology, and this would also help to support resource sustainability by facilitating conservation of the genetic resources in the natural forest.

Agro-forestry systems are particularly suitable for certain non-wood forest products (e.g. spices, aromatic plants) and for certain situations (such as land scarcity). Trees are generally planted or maintained in agroforestry systems to increase agricultural productivity and/or to provide a wider range of products (timber, fuelwood and non-wood products) for household use or for sale.

Multipurpose tree species - those which provide both ecological benefits and products, are most commonly used in agroforestry systems. The range of trees or woody species integrated into agricultural land use systems in Africa is vast and their products are varied. The development of NWFP in agro-forestry systems has the advantage of diversifying the economic base and enhancing the supply of products for household use.

If trees are to be successfully integrated onto agricultural land, the species and their management and use must be compatible with the farming system in biophysical, economic and social terms. Accordingly, all the relevant factors must be considered in examining the potential for development of non-wood forest products in agro-forestry systems.

Consideration must be given to the ecological interactions between the tree and crop

and tree and livestock components of the system, the economic viability and efficiency, and marketing needs. Problems of resource depletion are less likely to occur when the development of NWFP is carried out on private agricultural lands.

HARVESTING OF NON-WOOD FOREST PRODUCTS

Harvesting of non-wood forest products of 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 does not normally involve a whole tree or plant, but only parts thereof. It varies from collection of nuts and leaves to tapping of latex, harvesting of palm hearts, honey hunting, extraction of wax and collection of decorative plant materials.

The harvesting techniques vary considerably for the various NWFP. For edible nuts it involves: collecting raw nuts, cleaning, drying and grading; for fibres it involves: cutting relevant parts of the plant (leaves, branches), removing thorns and hard coating, boiling, beating and separating fibres, dressing or treating, drying and bundling; for some latex/gum it involves: making incision on the tree trunk, treating as necessary with acid for enhancing exudation, collecting of crude exudate, boiling it to pasty consistency, cooling it into balls or blocks for packing and transport; for Annatto seeds it involves: collecting pods, drying, threshing, winnowing, screening and fumigation; in the case of some medicinal plants it involves: digging up tubers or rhizome, ensuring that some reproductive materials are left in the ground, slicing, dehydrating, grading and packing. The cycle of harvesting also varies from a few weeks for tender shoots, to longer periods in the case of mature fruits or rhizomes.

Since volume involved for individual NWFP is in most cases small and extractive in nature, the attention devoted to their harvesting also tends to be less. The collectors are mostly unskilled and untrained in scientific methods. As a result, the harvesting standard of many non-wood products are poor and rudimentary, and hence wasteful, destructive and unsustainable. Efforts are also not made, usually, to harmonise harvest of wood and non-wood products. Planning and control harvesting operations, introducing more efficient harvesting methods and systems, reducing harvesting waste and keeping overall costs of operations at the lowest possible level are essential for utilising forest resource on a sustainable basis.

There are variations in the system of organizing NWFP harvest. One common system is the collection by local people under rights bestowed, for sale in the local market, or with some form of patronage and financial help from a purchasing agent. Another is by the employment of casual or contract labour by those who have obtained collection rights on lease. Local collectors of NWFP are often exploited by middlemen who control access to the market, or by those who control access to the resource. Thus the millions of NWFP collectors have no adequate incentive for practising properly controlled and sustainable harvesting.

Post harvest care is also poor in most cases, and wastages are high. Wastage happens in quantitative and qualitative terms during collection, transport and storage. Physical infrastructure is more important when harvested products are delicate or perishable compared to those which can stand rough handling and long storage.

An urgent need, therefore, is to rationalize and improve harvesting systems and practices, involving improved tools and techniques, training and skill improvement, incentive systems, institutional arrangements, promoting local facilities for processing and value addition, and linking harvest to processing.

PROCESSING OF NON-WOOD FOREST PRODUCTS

Primary and downstream processing of NWFP adds value to the product, provides local employment and helps increasing the retention of value in the country of origin. However, in developing country situations, harvested products reach the market, local or foreign, either after some intermediate processing in the form of cleaning and grading or after primary processing.

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 country situations.

The processing taking place uses a range of technology and equipment - semi-mechanical or mechanical processes with equipment mostly locally fabricated to those with improved processing technology and equipment. The following are indicative of the range: crude extraction of palm oil from fruits of *Elaeis guinensis* using wooden presses; simple distillation for essential oil involving passing of steam through a charge of fresh or partially withered grass or leaves and condensing the vapours; making ornamental baskets, bags, etc. from palm leaves at cottage level; fairly sophisticated processing of wattle bark for producing tannin. There are also facilities established in the Africa region, especially in the bigger countries, for producing medicinal preparations/pharmaceuticals from phytochemicals, for manufacturing fragrances and toiletries using essential oils and so on. These productions essentially meet local and national demands.

Most processing of non-wood products for local use, whether herbal medicine or straw basket, is done in very small family units, employing persons without any training, often working on part-time basis. They are low-return activities. Their 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.

Provided that appropriate management capability, skills and technology are available, several of the countries in the Africa region have the potential to install export oriented

processing of NWFP, such as natural extracts and colours of adequate quality. However, it is necessary to know the specific market needs as well as the product specifications and standards required, before deciding to venture export oriented production. There is also need to link the production to a reliable and captive source of raw material supply. More efficient modern technology can cause more destruction if tied to inconsistent supply. Although adding value locally is important, attempting to produce end-user commodities without adequate preparation or studies will be risky.

A national industrialization strategy to add value to the non-wood materials of the forests does not exist in most countries. 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 NWFP will call for appropriate process technology capable of producing market 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 galenicals (extracts, powders, tinctures, etc.).

Before launching on an actual production, pilot trials are necessary. Polyvalent pilot plants, such as the one designed and developed by UNIDO, can be used to carry out operations in extracting flavour, aroma and medicinal constituents from plant material, such as aqueous or solvent extraction, continuous extraction, preparation of solid extracts and oleoresins, distillation of essential oils, fractionation of essential oils and processing of other economic plant-derived products.

MARKETS AND MARKETING OF NON-WOOD FOREST PRODUCTS

The non-wood forest products were traded over long distances for many centuries, while wood products have become major international commodities only during comparatively recent times. The ancient Egyptians, for example, imported gum arabic from Sudan and used it for preparation of colours for painting and mummifying. In France this commodity was considered an important article of commerce as early as 1349, when the Treasury of Philippe VI imposed a tax on it.

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. Some of the products meet bulk demands (e.g. edible nuts, resin) and others reach specific niches (special types of honey, aroma chemicals). Some non-wood product are not traded but only collected and consumed.

A large number of vendors are involved locally in selling NWFP. Many of them sell products collected by them for making extra income, others are supported by a network of merchants and several levels of buyers and sellers down to the village. The main products locally sold include fruits, leaves, tubers, bags, baskets, thatch and other building materials, meat and skins, palm oil, and medicinal plants.

In cases where the products are sold outside the locality where they are collected local traders and merchants are the main intermediaries who buy NWFP cheaply from collectors and sell it to exporters or processors or their agents at a high price. Because of the absence of cooperative organizations of collectors, non-availability of market and price information, and lack of access to credit to meet operational needs, these collectors are at the mercy of the intermediaries. Traditionally the supply of NWFP has thus involved networks of local collectors and intermediaries bound by long-term, often debt-based, relationships. It is a trader dominated system and it is not conducive for the birth and growth of enterprises. The system is exploitative and non-supportive of sustainable development. For supporting development, it is essential that the community of NWFP collectors are assisted to form into cooperatives and directly sell their products to the processor or exporter through their organizations on the basis of long term contracts.

There are rare cases where processing units are supported by captive sources of NWFP and other arrangements for collection and supply of the products. There is, however, a strong case for rationalizing the domestic market chains for NWFP.

A recent FAO study identified 116 items of NWFP as commercially important, including 26 essential oils, and considering the group of medicinal plants as one item. Available information suggests that 500 to 600 different medicinal plants enter international trade. Compared to other regions, Africa's share in the international trade is low. Some of the important export items are gum arabic, medicinal plants and extracts, spices, food colorants, honey and animal products. Additionally exports of some unique items, such as cage birds and butterflies from some countries take place occasionally.

General quality standards for internationally traded products are established by the International Organization for Standards. Quality and safety regulations 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, essential oils and fragrances. In respect of specific groups of products there are international federations overseeing, among others, quality standards (e.g. the World Federation of Proprietary Medicine Manufacturers and the International Federation of Essential Oils and Aroma Traders). Quality specifications, sanitary regulations, packaging standards (and lack of adequate knowledge about consumer preferences) often become a non-tariff barrier for many countries to obtain access to international markets. There is no alternative to meet this situation except improving efficiency and production standards.

For various reasons there has been an erosion of international market share of NWFP over the years. Prices have generally fallen, and considerably in some cases. There has almost been a crash in respect of some commodities.

While some indications of the constraints being faced by the NWFP sector have been given elsewhere in this paper, it is difficult to analyze the situation adequately and objectively due to lack of appropriate information and data. Product grouping followed in statistical reports and the aggregation of products in International Standard Trade Classification (ISTC) make it almost impossible to isolate NWFP by specific products and by sources (forest vs. non-forest and country). Many items of NWFP fall under "vegetable materials and vegetable products". Edible nuts from forest are included under the group of all edible nuts, along

with groundnut, cashew, almond and others. For similar reasons it is also difficult to analyze all the factors involved in price changes and to see whether the prices and the costs reflect the true values and whether production controls can improve the situation.

One aspect which gives some indication about the possibility of controlling costs and improving economic efficiency is the vast difference between the price paid to the collector or local producer and that obtained for it in the market without involving sophisticated downstream processing and refinements. It has been reported that for several items of NWFP the local producer receives only 2% to 3% of the price for it in the developed country markets. Most of this price difference is in the nature of windfalls to the traders or middlemen whose tendency (unlike that of entrepreneurs) is to maximize the windfall as long as the opportunity lasts. And this is a serious handicap for market promotion. As suggested earlier, development of local entrepreneurship is essential.

The new attitude of green consumerism resulting from concern for environmental conservation and consequent preference for natural products is providing an advantage and new acceptance to NWFP. An example is the emerging popularity of aroma therapy which is a fast growing area of natural therapy requiring essential oils obtained from plants grown without using chemical fertilizers. The United Kingdom alone uses essential oils worth US$ 15 million annually for aroma therapy.

If technology is improved, collection and trade channels rationalized and made efficient, and appropriate processing developed in NWFP producing countries, it will undoubtedly be possible to effect a positive change in the situation, towards sustainable development of NWFP. It is necessary also to develop new products and new uses for known products as well as to ensure steady supply of products.

It is further necessary, especially in respect of commercially important products, to have a marketing orientation rather than simple production orientation. Simple production orientation have the effect of creating increased supply, thus reducing price and profitability. A successful marketing orientation for forest products, on the other hand, should increase demand and value, thus allowing more of the products to enter the market without reducing the overall price of the concerned commodities. Product development, market development and market research are aspects related to this approach.

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 thus becomes vital.

RESEARCH AND IMPROVEMENT OF TECHNOLOGY

The generally poor situation of NWFP in most producing countries is partly attributable to inadequate technology in use and lack of research support.

Research needs for improving technology related to NWFP are tremendous, touching upon all aspects of their management and development. This would cover among others: enhancing knowledge about NWFP resource; methods of inventory for different NWFP; gathering scientific data on the nature of the products; prospecting, screening, evaluating and classifying plant species (such as by pharmacological and toxicological studies on medicinal plants) and identifying candidate species for development of specific products; domestication and cultivation including aspects of monoculture and agroforestry; control of pests and diseases; on-farm experimentation; species introduction trials; plant breeding and genetic improvement including use of germ plasm resources in the wild for improving yield and resistance of established crops to pests and diseases; improving of agronomic practices; improving harvesting methods and practices to reduce wastages and damages and to increase yield; adaptation of imported technology; improvements in processing, packaging and distribution of products; and product diversification including improvement of quality.

Thus, for example, on the establishment and improvement of the NWFP resource, some of the research issues to be addressed and information to be generated/analyzed are: can the species desired be domesticated?; if so, what are the specifics involved?; is there variation in the desirable characteristics?; if it exists, is this variation genetic in nature or caused by environmental factors?; can improvement in desirable characteristics be best achieved by genetic (phenotypic) selection, by silvicultural interventions, and/or by a combination of both?; is such improvement economically practical and feasible?; what parallel action will be needed to ensure the conservation of the genetic resources of the species. Considering the variety of non-wood forest products and related management situations, need for strengthening research to support development is obvious.

Some of the research institutions in Africa (such as the Forestry Research Institute of Nigeria, Tanzania Forestry Research Institute, and Institut des Forêts of Côte d'Ivoire) have been doing research on different aspects of NWFP. 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. An aspect to be stressed here is the importance of research-extension linkage and provision of appropriate information materials and technical handbooks.

Development of NWFP depends on how far it succeeds in the market place. Therefore, to be effective, among others, research institutions need: competent scientists, support staff and research managers; ability to conduct continual strategic evaluation of market conditions and opportunities, as it relates to research; opportunities to be self-financing and autonomy; means to interact directly with producers and users to influence production and marketing.

INSTITUTIONAL SUPPORT FOR DEVELOPMENT OF NON-WOOD FOREST PRODUCTS

One of the major ills afflicting the NWFP 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 get a mention in passing, but without clear objectives, targets, and strategies for 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 lacuna leads to the lack of appropriate plans, programmes and projects related to NWFP, and inadequacy of investment. Because of this, there is hardly any emphasis on developing and maintaining a database on NWFP. 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 NWFP calls for appropriate provision regarding legal rights to encourage long term investments and improvements. The issue of the rights and involvement of local community in harvesting and managing NWFP have social, economic and ecological implications. When value of products accrue to the intermediaries, the people engaged in their collection remain poor, regardless of the value of the products involved. Consistent and equitable income from harvesting of NWFP gives the people involved, an incentive to conserve and sustainably manage the forest. This is necessary also for facilitating availability of loans/funds for developing NWFP.

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 NWFP and these funds get used primarily for buying and marketing and not for sustainably managing and harvesting the resource.

Broad-based and organized participation encompassing local groups, women, indigenous community 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 to improve the effectiveness and benefits of NWFP 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 NWFP resources with national and international markets to support sustainable development, each country has to design arrangements appropriate to its situation covering access, control, management and ownership of the resource and involving local

people and groups, management agencies, industry and trade. International support and assistance can considerably facilitate and help to accelerate the process.

The countries can learn from the experience of others through regular exchange of information and undertaking collaborative activities. A Regional Information Network on Non-Wood Forest Products will be extremely useful in this regard.

MAJOR AREAS OF ACTION

The foregoing discussion has identified major constraints and broad areas of action involved in NWFP development, as well as indicative options. The following listing provides a general basis for developing a framework for action. Depending on the actual situation in countries, the order of preference and emphasis of actions may vary.

- An assessment of NWFP resources by appropriate categories and a detailed prospecting for specific products (e.g. phytochemicals) in selected priority areas is an essential step. This will help to identify candidate species or group of species and distribution of suitable areas to be developed for specific products. This will in addition serve as a sound basis for planning.

- Planning and implementation of integrated forest management for wood and non-wood benefits is important to improve sustainable productivity and to balance the functions of forest including conservation of plant genetic resources. Planning in this regard should take into consideration the limits of sustainable supply of goods and services involved. Supply offered to the market can be so adjusted as to help the achievement of conservation objectives.

- The objectives of natural forest resource conservation can be served by domestication of wild species and intensive cropping of plants yielding NWFP wherever feasible. This would help to provide stable and uniform supply of raw material, and can be made captive to processing units. In this connection studies and investigations on the suitability of different agroforestry and agronomic systems are important.

- Harvesting is a particularly weak link in the utilization of NWFP due to the variety of tools, techniques and situations involved. Poor harvesting results in product wastages and resource damages. Special care is required to improve harvesting along with pre-harvest preparations and post-harvest treatments.

- The existing systems of harvesting of NWFP do not have adequate technological and management back-up and its linkage to the chain of middlemen and traders is not conducive to sustainable management of resource. The system needs to be rationalized, by developing autonomous participatory enterprises with long term sustainability objectives.

- Development of value adding local processing of appropriate level of technology and

scale needs to be undertaken to capture and retain as much benefits as possible within the country. Since consumer products based on NWFP are highly specific on quality and safety standards, development of related technology should be an integral part of promoting NWFP.

- Ensuring of standard and stability of supply are vital conditions in international trade. This has to be achieved along with cost control to avoid the product being replaced by cheaper synthetic products. Development of new products, improvement of old products, capturing of lost markets and promoting new markets will have to be undertaken, as relevant and appropriate, as part of the strategy for NWFP development. While promoting trade, local market for NWFP should not be neglected.

- A major constraint related to all the above areas of action, in most countries, is the lack of basic information related to almost all aspects of NWFP. Setting up of a comprehensive database and information system is not easy, but essential for rational planning.

- The need for strengthening research for solving of problems and improving technology cannot be overemphasised. Transfer of technology and adaptive research also need to get adequate emphasis in the overall scheme of NWFP development. Cooperation in research activities among the countries of the region through collaborative programmes can help avoid duplication and quicken the process of NWFP development. A Regional Information Network on Non-Wood Forest Products proposed earlier can also be used to exchange research information.

- Other vital and essential ingredients in the whole process are adequate investment and efficient institutions. These include credit facilities on easy terms, extension support, an effective system of incentives linked to key objectives and target groups, and organized participation of people.

- International assistance as appropriate in key areas of NWFP development can play a very valuable and catalytic role.

An urgent need therefore is a comprehensive policy and strategy for development of NWFP appropriately covering the above areas and aspects, backed by commitment for action.

CONCLUSION

Non-wood forest products are an important natural resource which can support sound and sustainable forestry. There is significant potential for NWFP-based development in the Africa region but this has not been adequately utilized due to several constraints which are technological, institutional and financial in nature.

In this regard a number of issues have been identified. They include among others:

lack of a clear definition and classification of NWFP; lack of basic information; inadequate resource development, management and conservation; lack of adequate integration of management of wood and non-wood products; deforestation and land degradation; wasteful and inappropriate harvesting practices; lack of incentives for introducing and implementing sound technology; hurdles in the development of organized people's participation and entrepreneurship; unscientific and uncontrolled system of NWFP collection and the influence of exploitative middlemen; lack of market orientation, supply fluctuations and inadequate adherence to quality; lack of competitiveness in the international market due to weaknesses in the chain of NWFP management and utilization; inadequate local processing facilities; inadequate research, lack of appropriate extension facilities, lack of facilities for skill development and training in areas related to NWFP; lack of adequate investment, an appropriate policy and strategy for development of NWFP; and lack of an adequately strong system of regional cooperation and collaboration.

For developing non-wood forest products, old ways of doing things would no longer suffice. Considerable and drastic improvements are needed, urgently.

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ANNEX 1

SOME EXAMPLES OF THE CLASSIFICATIONS OF NON-WOOD/NON-TIMBER FOREST PRODUCTS/BENEFITS SEEN USED IN STUDIES AND REPORTS

NON-WOOD FOREST PRODUCTS

Fiber products
Food products
. plant food
. animal food
Medicinal and cosmetic plant products
Extractive products
Animals and animal products other than food
Miscellaneous products

Animal products, of:
- Insects
- Birds
- Reptiles
- Fish
- Mammals/larger animals

Plant products, of:

Leaves	Grasses
Buds	Vines
Fruits	Palms
Flowers	Larger plants
Roots	Fungi/mushrooms
Bark	

Animal products:

- Bush meat
- Fur, hides and skin
- Feathers/plumes
- Bones and horns
- Venom
- Secretions
- Honey
- Dyes/lac
- Silk

Plant products:

- Food
- Fodder/feed
- Fiber
- Fertiliser
- Medicinal extracts
- Fragrances/flavourings
- Essential oils
- Dyes/colorants
- Excudates
- Thatch (organic construction materials)
- Bamboo
- Rattan
- Non-wood ligno cellulosic materials
- Ornamental materials

Wild animal products	Honey and wax
Beverages	Latex
Chemicals	Mulch
Cork	Pharmaceuticals
Dyes	Resin
Distillates	Silk
Fibrous materials	Stimulants
Fodder	Edible products
Gums	

Food products	Latex/gums
Spices and condiments	Insect products
Culinary herbs	Incense woods
Industrial plant oils	Essential oils
Plant gums	Plant insecticides
Natural pigments	Medicinal plants
Oleoresins	Wild plants
Fibres and flosses	Animals and animal products
Vegetable tanning materials	Miscellaneous products

Cork and bark
Food
Fodder
Wool and skins
Tannins
Christmas trees
Decorative materials
Essential and aromatic oils
Other

NON-TIMBER FOREST PRODUCTS

Addition of biomass fuel/fuelwood
and charcoal
to
those included under NWFP

NON-WOOD BENEFITS

Non-wood products
- Animal products
- Plant products

Services
- Conservation of genetic wealth and bio diversity
- Watershed management
- Climatic influences
- Soil improvement
- Support to agriculture and range management
- Ecotourism
- Heritage values
- Amenity values

Non-wood products
- Animal products
- Plant products

Environmental services
- Protection
- Water quality and quantity
- Global climatic effects
- Nature conservation
- Bio diversity
- Local environmental functions (microclimate, absorption of noise/pollution)

Social and cultural services
- Hunting and fishing
- Other leisure pursuits
- Landscape effects
- Historical importance

NON-TIMBER BENEFITS
Addition of biomass fuel/fuelwood and charcoal to those included under NWFP

3 Non-Wood Forest Products in Africa: an Overview, by J D Keita, Regional Forestry Officer, FAO Regional Office for Africa, Accra, Ghana.

NON-WOOD FOREST PRODUCTS IN AFRICA

An Overview

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1 - INTRODUCTION

"Early Man's interaction with and dependence on the forests was, for many years, almost exclusively centred on Non-timber Forest Products.

Somewhere down the course of history, timber and timber products assumed such major importance in human affairs that they appeared to be the only significant output of the forests. They dominated in national and international trade statistics, were promoted rigorously in all sorts of media, adapted readily to the changing tastes of urban consumption, and generally basked in an exagerated measure of self importance.

For most rural populations, however, this prominence is ill founded. For those who come face to face, without relief, with the harrowing experiences of ill health, hunger and other forms of deprivation, the reality is the enormous contribution Non-wood Forest Products, in all their varied forms, make to all aspects of their lives." (John François, December 1991, Accra).

This declaration seems to be a fair reflection of the truth, especially in the tropical belt where no obligation of heating homes during severe winters did confer to timber any early credentials of nobility. Yet it is hard to give proof of the importance of these Non-wood Forest Products (NWFPs), because of lack of reliable sources of information.

Most of the forest management systems, now applied throughout the World, generated in the temperate zone and are based on the principle of sustained yield of timber production, considering NWFPs as secondary, even "minor" products.

Changing this patern of the forest production is not just changing the technical prescriptions of the management systems, but also putting in more interactions beetween the forest systems and the communities using the resources.

The main objectives of this overview are :

- to review the definitions commonly accepted of goods and services other than timber, provided by the forests;

- to review a few sources of information, in view of ascertaining the importance of these goods and services in the life of the rural folks, especially in Africa;
- to suggest some steps on the way ahead, in promoting the NWFPs to the same rank as timber products in the forest management systems to provide more benefits to communities.

2- DEFINITIONS OF NON-WOOD FOREST PRODUCTS

In one of its last publications on the subject, (FAO Forestry Paper n° 97, March 1991), the FAO gave the following list of NWFPs : "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, etc... and the services of land for conservation and recreation". In this definition, NWFPs are divided into products sensu stricto, and services; products are themselves grouped into animal products and plant products.

However, FAO would prefer a definition which will make mention of the sustainability of the supply of these products and therefore, NWFPs are defined as all goods and services for commercial, industrial and subsistence use derived from forests and their biomass which can be sustainably extracted, i.e. extracted from a forest ecosystem in quantities and ways that do not alter its basic reproductive functions.

A meeting of the Joint Working Party on Forest Economics and Statistics of the Timber Committee of the Economic Commission for Europe and the FAO European Forestry Commission, to prepare a study on the outlook for the Non-wood Goods and Services of the forests in Europe, gave a preliminary classification. In this attempt, mention is made of Goods and Services with greater emphasis on Services grouped into environmental services and social and cultural services.

Specifically, the Group mentioned that, "as a result of UNCED Agenda 21, the Conventions on Biodiversity and Climate Change, internationally agreed priorities had already been given to services of the forest such as biodiversity and carbon storage and the exchange of CO_2 between forests and the atmosphere".

Considering however the rural communities in Africa, one can wonder if it is not more appropriate to define the NWFPs by calling the functions they play in rural households and agro-forestry and community forestry production systems and therefore sustaining rural life. These functions are : food production and food security, forest medicines, house construction materials, agricultural production equipment, income generating by gathering, processing and trading extractive products such as

gum, resin, oils, leaves, fruits, etc...It is only in that way that it will be possible to really ascertain the significance of the non-wood forest resources for rural communities and therefore, determine what priority should be given to the different products and services which play an important role in the very subsistence life of people.

3- THE IMPORTANCE OF NON-WOOD FOREST PRODUCTS

3.1- Even though some of the NWFPs are used and traded on long distances inside as well as outside Africa, since a long time ago, it is still very difficult to come across reliable figures concerning their production and trade. Some of these products like tree gums, shea butter, rubber, cola, tamarind, ivory, etc..., were the first most important products traded between Africa and the other continents.

After the end of the slave trade, it was the trade in Arabic gum that fuelled the trade between France and West Africa, leading to the signing of the first "Traités d'Amitié et de Libre Circulation et de Commerce", with the States along the Senegal River, later transformed into "Traités de Protectorat" and the whole process ended finally with the colonial conquest.

Arabic gum, (*Acacia senegal* and other *Acacia spp.*), is still traded in Mauritania, Senegal and Mali, but, data concerning it, are now aggregated with Miscellaneous items. However, it is still a very important commodity for Sudan where a production of about 40,000 T. was registered in 1987; its export represented a value of 267.1 million Sudanese Pounds, (18% of Sudan total export in value).

The shea nuts and butter, (*Butyrospermum paradoxa*, *Gaertn. f var. Parkii*), had also retained its status of traditional export commodity in most of the countries located in the Sudano-Guinean belt in West Africa; data are however often aggregated with Miscellaneous exports in official statistics. In Burkina Faso, one of the least developped countries, 70,000 T of shea butter and nuts were traded in 1985/86, earning 4.9 billion CFA Fr., (175 million US Dollars). This trade represented 1.16% of the GDP and 11.5% of the total export earnings of the country that financial year.

The trade of cola nuts, (*Cola nitida*, Scott and Endl), between the forest belt of West and Central Africa and the Sudano-Sahelian belt, is at the very origin of the creation of major States and Kingdoms. Merchants in this trade helped a lot in building links between tribes and clans as well as regions, thus creating conditions to build up larger economic environments and finally setting into motion the process of creating political states.

Official statistics mention the cola trade in non-formal trade commodity and generally, only estimates are available. In Ghana, it was estimated that cola export amounted to 740 T in 1990, which is very far from the reality. In Cameroun, estimates gave a production of 22,500 T in 1981 and an export of 1,100 T earning 122.6 million CFA Fr.

3.2- When it comes to locally traded NWFPs, it is even more difficult to get quantitative figures on their production, trade and value. However, there is already an abundant literature on the trade of game meat, known also as bushmeat, particularly in the forest belt, (Ghana, Nigeria, Cameroon, Central African Republic and Zaire), but also in some parts of southern Africa, (Botswana, Zimbabwe, etc...).

In Central African Republic, surveys revealed that 197 traders, (out of whom 177 are women), are registered in Bangui as only bushmeat traders; the total sale of bushmeat amounts to 730 T. per year. It has also been found that the national average consumption of bushmeat in the whole country reaches 25 kg. per person per year. The contribution of bushmeat to the GDP of Central African Republic, is 37 billion CFA Fr which represent a little more than 10%.

Another survey conducted in Bukavu, Zaire, (1987), indicated that 72% of the population in the town consume bushmeat regularly and that about 400 T.represent the yearly bushmeat consumption of the town.

Similar studies were conducted in Ghana, Nigeria and Botswana, leading to some reliable figures on the intake of wild animal protein in these countries; some studies focused their interest on the importance of cash income from sale of bushmeat, (Nigeria).

3.3- Many other NWFPs are traded locally but their shares in the local economies are significant, even though they are often products of very local nature. There are already a lot of studies on them; some of these studies are recorded in an FAO Community Forestry Series, (n° 6).

In a study in Southern Ghana, it is for instance noted that *Marantaceae* leaves play a very important role in Ashanti region in the industry of wrapping "vegetables, fish, cola nuts, soap, and salt and are the only material used to wrap cooked foods, notably rice, yam, beans, kenkey, (fermented maize dough), and fried plantain". Out of 300 food sellers interviewed in Kumasi market, only one uses alternative material to wrap food, especially cooked food. *Marantaceae* leaves give better flavor to food and withstand boiling.

The report goes on giving quantitative information on the number of people, (generally women and children), engaged in gathering the leaves, quantity of leaves gathered and value; information on the traders and the trade pattern are also recorded.

The same report mentions the trade in Chewstick, which involves the production of about 4-20 million bundles sold in Kumasi for a value of 280 million cedis monthly. The chewsticks "provide the main means of dental care for more than 90% of the people in Southern Ghana".

Medicinal products from the forests are among the locally traded products with low value in monetary terms, but play a fundamental role in the rural production systems by providing almost the entire health care to the people. It is therefore easy to have an indication of the real value of these medicinal products by estimating the opportunity cost. If, for instance, the whole population of Ghana would have to rely on modern medicine, it will be necessary to multiply the national bill for drug supply by 90, as almost 90% of the population, rural as well as urban, rely on traditional medical treatments, mainly based on natural products from the forests.

3.4- Apart from this fundamental health care function, NWFPs play a major function in food production and food security, the scale of which however varies; NWFPs provide food and cash income by gathering, processing and trading them; they provide in some cases, the only source of cash in the rural areas. Food security was defined as "the economic and physical access to food, of all people, at all times". Forest foods are the only ones rural dwellers have direct and free access to and therefore, are the first to be called upon in cases of emergencies, (drought, famines, etc...). Forest foods are also generally dietary supplement, providing the bulk of supply in minerals and vitamins. While the Pygmies of Central African Republic get all their food supply from the forests, the Ferlo desert herdsmen in Senegal, get their vitamin requirements and indispensable salts from the perennial shrubs like *Boscia senegalensis,* (Barbara Becker, 1983).

There are presently a lot of local studies on this subject of forests contributions to food security, giving interesting figures on foods produced by the forest ecosystems and the NWFPs'contributions to the cash economy in rural areas. Added to that, but may be most important, is the large array of services rendered to the agric sector by trees and forests, which improve the food production : soil improvement, water conservation, fodder production for livestock, etc... These services are more and more tapped to develop agroforestry technologies and other low cost and environ-

ment friendly production systems. The development of these technologies gives hope to setting up sustainable agricultural production systems.

It may be interesting to mention here the case of the relation 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 caroten, the nitrogen elements represent only 1% of the dried matter; thus the only source of digestible nitrogenous matter comes from the leaves of trees and shrubs. It is therefore easy to imagine the importance of trees and shrubs in the ranges for these pastoral communities where milk is one of the most important staple foods.

3.5- There are other very important services which, even though very newly promoted, forests are rendering to humanity as a whole. These are, firstly the overall regulating function of life on the Earth and secondly, the preservation of the biodiversity and therefore the gene store function forests are playing.

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. Carbon dioxide, (CO_2), is one of them. 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 CO_2, and therefore, can be used in the regulation process of the content of this gas in the atmosphere.

Retaining all the genes and forms of life is also one of the greatest service forests can render to humanity. It is obvious that progress that man could, and in fact must make, so as to improve his living conditions, will greatly depend upon the gene reservoir constituted by the forest ecosystems.

We are not however going to dwell on these two special services; we are not even going to pay too much attention to traditionally mentioned services such as the diverse forms of support given to agricultural production systems by forests and trees, nor forest contributions to leisure and tourism industries. Rather, we are more concerned here with the goods and services the supply or deficit of which have direct impact on rural communities. These are : the food products from the forests, the role it plays as food insurance store and food supplement to improve the quality of diet, materials for building and construction, products to be gathered, processed transformed and traded for cash income, etc...

The ideal situation would be for mankind to harvest all these goods and enjoy the benefits of these services on a sustained basis. It will be of course difficult to attain this on the same land; the solution will be therefore to find diverse appropriate com-

binations to harvest locally valued goods, but at the same time, cater for the needs to preserve the Earth's diversity.

4- THE WAY AHEAD

4.1- We are here going to limit ourselves to two questions :
- First, how to manage forests in order to obtain a sustainable yield of products, i.e. timber, fuelwood and/or the multiplicity of NWFPs.
- Second, how to organize the cooperation between countries and Regions so that knowledge and experiences could be shared.

The first question should be tackled locally. It is in essence at threee levels: it is social, i.e. the communities should be involved in the full process of forest resource management and land ownership or land tenure agreements should be granted; it is technical, ecological knowledge and sustainable resource management ; it is economic, i.e. incentives should be given to encourage and improve methodologies for natural resource valuation and accounting. These problems have a common denominator, it is a political issue.

The second problem is an institutional and communication issue. Networks could be an appropriate mechanism or tool to monitor and evaluate progress at national, regional and inter-regional levels.

4.2- Let us first concentrate on the problem of people's and communities' participation. It is finally the most important and of course the most difficult one. As already stated, most of the forestry management systems applied throughout the World, were born in the temperate regions, where winter temperatures compelled the people to build and heat their homes, using timber, the most appropriate and available resource. Later on, management systems of the forests were set up to secure the supply of the timber. This management system, looking at only one product, the timber, is finally very simple.

In the Tropics, timber is on the contrary, a secondary product of the forests, in fact the less utilized resource; for communities in the Tropics, the most valued resources of the forests are the non-wood products like the forest foods, the medicinal plants, the land for agriculture, etc...

It is not therefore surprising that communities in the Tropics did not understand the logic of the temperate zone style of forest management systems and, in fact, activities of foresters in the tropical belt, generated a lot of controversy. However, one has to credit the foresters for the fact that they realized themselves very early that

they were venturing into a more difficult terrain and that they have, more than in the temperate zone, to involve the communities in the more complex management systems which they should promote. This is why they come out with a lot of conceptual frameworks, all of them geared towards involving in one way or the other, people and communities : community forestry, rural forestry, participatory forestry, "foresterie villageoise", "bois de village", agroforestry, etc....

However, the main objective, (but hidden), of all these promoted concepts, was in fact, to get communities involved in preserving the forest reserves. They foccused on creating forest resources outside the established Forest Estate by plantation and natural forest management programmes, in view of allowing communities to continue using forest resources without any kind of "disturbances" in the forest reserves.

4.3- Recently, some other conceptual approaches were designed, but are yet to be implemented. Among them is the "collaborative forest management" system. It is one of the programmes of the Forest Resources Management Project, (FRMP), of Ghana. "It is taken to mean all forms of interaction between local people and the Forestry Department which enhance the management of the resources and improve the flow of benefits to local people".

This approach is in fact very flexible. "It encompasses a range of initiatives. It may begin with simply talking to people living near reserves about Forestry Department activities or occasional liaison on specific resource use issues. It could take the form of negotiations with user groups over NWFPs permit rates or the incorporation of local knowledge into silviculture of an NWFP. Alternatively, a local community might formally accept responsibility for developping a resource in return of guaranteed rights of access. The potential is there for collaboration to assist the Forestry Department in its efforts to sustainably manage the forest estate. The form the interaction will take will depend on local circumstances....". Foresters therefore, become partners of all those interested in the uses of NWFPs of the forests.

4.4- The very end result of the collaborative management is the concept of "common property" approach to forestry management, (gestion patrimoniale des forêts), where the unit responsible for the management is composed of groups, each of which considers the resource as their common property. Resource management, forest operations and use of common property rights need consensus of all stakeholders who will have to implement his part of the activities freely, but towards a commun goal. Negotiation will be favoured rather than confrontation over ownership rights and duties.

The result will be of course a more complex forest management system; it will need more research into technical, ecological and economic problems, as well as social and political ones. Once again, one has to emphasise on the complexity of forest management systems based on sustainability of non-wood goods production. This is due to the multiplicity of products, their actual uses, the uncertainty on their future uses the biological diversity of the systems and finally, the anthropogenic influences.

4.5- It is essential to encourage and help countries to implement projects dealing with the problem in all its various forms, to test promising approaches and mechanisms, to promote applied research in developping improved silvicultural management systems, to set up a proper monitoring and evaluation system of all programmes and projects implemented to promote NWFPs.

It will be important that experiences gained be known by and benefit the people concerned. Countries should be encouraged and helped to establish data banks to store all valuable information and organize networks among institutions, (governmental and non-governmental), and experts working on NWFPs, to share the experiences gained.

The search for information and experiences on NWFPs should concern two aspects : sustainable resource management and resource valuation.

Concerning the problem of resource valuation, it has been already mentioned that a lot of information has been generated on the subject. However, it may first be necessary to design and formulate methodological guidelines for quantitative surveys of the products and for exercises aiming at giving them economic values; The use of the already existing data will be facilitated and of course, gathering and disseminating the information will be facilitated by simplifying and uniformizing the methodologies. The use of the information will be more productive if there are possibilities of comparison between results.

Concerning sustainable resources management, the process will not be very different : collection of data from available experiences, review and evaluation of them, designing and formulating guidelines to orient future actions.

4.6- The survey and evaluation of the socio-economic importance of the NWFPs and the technical evaluation of experiences on forest management based on the sustained production of NWFPs, should lead to the building up of data banks at national, regional and inter-regional levels, managed by corresponding networks.

For a start, databanks and networks should cater for socio-economic as well as management problems. However, different guidelines should be designed for va-

luing the socio-economic benefits of the NWFPs and for the management of the resources. It will also be usefull to establish two lists of experts with a high degree of competence, one on socio-economic aspects and one on sustainable natural resource management systems.

To improve the knowledge and skills of people engaged in promoting the NWFPs through sustainable resource management systems, it will be very usefull to organize good exchanges of experience : study tours, workshops and seminars designed to make in-depth analysis of some success stories and failures.

5- CONCLUSION

NWFPs are caracterized by their multiplicity and the fact that they are products generally of very local significance. It is difficult to make quantitative surveys and value their roles and functions for the communities, particularly in terms of economic importance. It will be therefore a very difficult task to establish resource management systems providing a sustained flow of these products. While their multiplicity does make technical problems more complicated, especially combining in an optimum manner the biological forces, the uncertainty surrounding their future uses for the human societies concerned and other anthropogenic factors which can interfere in the process, will call into question the objectives of resource management programmes.

However, these constraints should be considered opportunities for actions and should stimulate research in developing the NWFPs sector. There is now a growing concern about communities participation in conservation and management of the natural resources and the massive presence of the non-governmental organisations represent good opportunities in dealing with some of the grassroot level problems to which governmental agencies are desperately confronted. The recent UNCED meeting has further raised awareness among Governments, on the importance of NWFPs, thus giving good momentum to activities related to sustainable natural resource management.

The following activities can be recommended :

a)- to undertake a classification of NWFPs,
b)- to develop a standard method for the inventory of NWFPs,
c)- to undertake studies in order to acquire information on the sustainable harvesting levels of NWFPs,

d)- to review and propose, if necessary, appropriate harvesting techniques,

e)- to undertake social and economic evaluation of NWFPs; (this is one of the best ways to gain political and financial support),

f)- to undertake studies on marketing and market information systems,

g)- to organise, on a continuous basis, the gathering and sharing of indigenous knowledge, data and experience through studies, databanks and networks,

h)- to develop, on a partnership basis, with rural communities and local existing institutions, guidelines and tools for assessing their needs, involving them in the decision-making and in the implementation process of managing their resources,

i)- to undertake studies in the area of applied research in the field of agro-forestry and community forest management systems.

Finally, it should be recommended to avoid any precipitation and ill-considered extrapolation.

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4 Pilot Country Study on Non-Wood Forest Products: Lesotho, Malawi, South Africa, Tanzania, Uganda, Zambia, Zimbabwe.

PILOT COUNTRY STUDY - LESOTHO

1. INTRODUCTION

Lesotho is rated among the poorest countries in the world. Indeed it is ironic that the country and its people seem to survive, even under the most daunting of economic recessions, due mainly to its precarious position right in the middle of South Africa.

Lesotho is often referred to as "the Kingdom in the Sky" by virtue of its mountainous and rugged terrain, ranging in altitude from 1 400m in the south-west to 3 480m in the east. The country is divided into four physiographic regions, namely, the mountain region in the east, the foothills in the central parts, the Senqu (Orange) River Valley from the north-east to the south-west, and the lowlands in the west.

Most of the country is devoid of natural tree vegetation, the existing trees being mainly exotics in government-established woodlots found in most of the lowlands and foothills. Patches of natural indigenous forest can be found in a few areas in the north and south of the country. How these escaped exploitation is still a mystery, considering that most of the country's tree vegetation has been used for fuelwood for many years, hence the scarcity of fuelwood in the country.

Although the whole of Lesotho can essentially be considered to be rural, for practical purposes the country is divided into both rural and urban areas, the latter being those found in and around major town centres such as the capital, Maseru. The majority of Basotho live in the rural areas, where about 80% of the population were counted during the 1986 census. Migratory tendencies indicate that the people prefer the lowlands and urban agglomerations.

Employment opportunities within the country are scarce, with the government providing almost half of formal employment. Many Basotho men used to work in South African mines, but recently there has been a lot of retrenchments.

Lesotho's economy is mainly based on the agricultural sector. Although only about 10% of the land is arable, efforts are made to improve farming methods for the production of staple crops such as maize, sorghum, pulses and wheat. Several agro-industries have been developed, mainly for the export market; these include a cannery which processes fruit and vegetables, mainly for export, but also for local sales.

Afforestation in Lesotho is the responsibility of the government, and as already mentioned, this mainly involves the establishment of woodlots for the production of fuelwood and building materials (mainly poles). Recently the government has also been looking into the introduction of species which can provide fodder and other products. The main species used for woodlot establishment are *Eucalyptus* spp. and *Pinus* spp., although *Acacia* spp. and *Cuppressus* spp. have also been tried in the past with limited success.

The remaining indigenous forest consists mainly of species such as leucosidea (*Leucosidea sericea*), the white stinkwood (*Celtis africana*), the wid olive (*Olea africana*), the mountain cabbage tree (*Cussonia paniculata*) and the highland protea (*Protea caffra*).

THE USE OF NWFP IN LESOTHO

Although in the past Basotho depended on NWFP for many of their daily requirements, today NWFP which feature prominently in their livelihood are very few; such is the extent of the destruction of natural resources and the environment in Lesotho. Most of the people rely on the meagre production from their fields, and even more on products purchased from various retail outlets.

Although the NWFP found in Lesotho are few, they however still play a significant role in the lives of many Basotho.

VEGETAL NWFP

Food

Most food NWFP in Lesotho are in the form of exotic fruits, which in some cases are semi-naturalized in Lesotho. the main ones are peaches (*Prunus persica*), apples (*Pyrus malus*), apricots, (*Prunus armeniaca*), pears (*Pyrus communis*) and quinces. All of these grow very well in all the bioclimatic regions of the country and provide important nutrition to some of the poorer members of both the rural and urban communities.

A species which is not common in Lesotho, but which certainly grows very well in the eastern highlands of the country is the walnut (*Juglans regia*). At a mission station in the town of Thaba-Tseka, three very big walnut trees are in evidence. The trees are said to be more than 50 years old and are still bearing plenty of nuts annually. The nuts are mainly eaten by school children and mission workers. *J. regia* is a species worth following up in the highlands of Lesotho, and in fact, the author has set up trials of the species with two farmers in the area.

Various types of wild spinaches can also be found in many parts of Lesotho, the main one being *Amaranthus* spp. which have still not been domesticated in Lesotho although the people have used them for many years, and are still a very popular Basotho food even today.

The sweet briar (*Rosa rubiginosa*) is also an important traditional food of the Basotho. It produces rosehips which are very rich in vitamin C. There have been attempts recently by the local cannery to market rosehip jelly and dried powdered rosehip commercially. Bramble, of which there are two species in Lesotho (*Rubus rigidus* and *R.ludwigii*), is also important for the berries it produces.

Forage

A few of the indigenous species found in Lesotho serve as important fodder for livestock, especially in times of drought. Probably the commonest is the mountain cabbage tree (*Cussonia paniculata*). Of the naturalized exotics, there is the century plant (*Agave americana*) whose immense inflorescence is used as cattle feed in the spring, the honey locust (*Gleditsia triacanthos*), black locust (*Robinia pseudo-acacia*) and the weeping willow (*salix babylonica*). Recent introductions of fodder trees in Lesotho include tagasaste (*Chamaecytisus palmensis*), tree lupin (*Lupinus arborea*) and salt bush (*Atriplex* spp.), all of which have performed very well so far in the country. Forage NWFP are particularly important for Lesotho since the number of domestic livestock kept is way beyond the carrying capacity of the available grazing lands. It is estimated that overstocking in Lesotho is about 300%!

Medicines

A large number of the plants found in Lesotho are used for traditional medicinal purposes. Indeed, one of the main commercial activities in the country is based on traditional medicines. Some of the more popular species in this respect are the wild wormwood (*Artemisia afra*), the bitter aloe (*Aloe ferox*), the wild sugar bush (*Pollichia campestris*, the bush guarri (*Euclea crispa* var. *crispa*) and the parsnip tree (*Heteromorpha arborescens*).

Traditional medicines in Lesotho are used to cure a wide variety of physical ailments and conditions of both humans and animals, and for spiritual purposes, although whether the latter works or not is another matter.

The use of medicinal plants in Lesotho has been poorly documented.

Ornamentals

Surprisingly, there is quite an interest in ornamental species among Basotho, particular those in the urban and peri-urban areas of the country. Ornamental species are grown around the homestead as hedges of (usually) privet (*Ligustrum* spp.) or cypress (*Cuppressus* spp.), and also as single trees for shade such as the pepper tree (*Schinus molle*). Roses (*Rosa* spp.) are also very popular among the urban communities of Lesotho as objects of beauty.

FAUNAL NWFP

Wild animals

In days gone by Lesotho used to be a haven of wild animals of all types. However, today only a few small mammals can be found in various parts of the country. These include hares (*Lepus* spp. and *Pedetes* spp.) , rabbits, rock-rabbits, porcupines (*Hystrix africaeaustralis*) and a few buck (*Oreotragus oreotragus*, *Raphicerus campestris* and *Sylvicarpa grimmia*). People do still hunt these for meat, but unfortunately populations have been drastically reduced due to man's instinctive urge to kill wildlife, and also probably due to the disappearance of the animals' natural habitat.

Fish

Many of Lesotho's rivers are well stocked with fish, especially trout (both *Salmo gairdneri* and *S. trutta fario*). Other fish species are found in dams scattered around the country; the main dam species are the catfish (*Clarias* spp.), the Cape carp (*Labeo capensis*) and the barb and yellowfish (*Barbus* spp.). Many Basotho view fish as a cheap source of protein which can be caught for free. Very often local men and boys can be seen fishing in rivers and dams using rather hastily assembled fishing tackles. Most of the fish caught is for home consumption, although occasionally some may be sold.

Insects

Despite the shortage or lack of natural vegetation in Lesotho, bees can be found throughout most of the lowlands of the country. This is probably because of the many flowering plants that can be found in the region. Although Basotho enjoy honey, they do not seem to be very keen on going into bee farming, even though there is a definite market for home-grown honey. Most of the honey used in Lesotho is imported from South Africa, as are a number of other foods including vegetables and fruit. There have been efforts in the past, mostly by expatriates working in the country, to start small-scale apiculture operations, but with no significant success as the locals always seemed rather reluctant to embark on such schemes, mainly for fear that "the bees could attack at any time". So far in Lesotho, there is probably only one bee farmer, in the southern town of Mafeteng, who has made a modest success of bee farming, which he combines with fruit farming. The honey he producesis sold locally.

Birds

Again the scarce vegetation of Lesotho has tended to diminish bird populations in the country. However, for the ornithological enthusiast, there are still about 288 species of birds in Lesotho. At the subsistence level, game birds which were once plentiful in most of the lowlands and foothills are now becoming rarer and rarer. However, the following can still be found and their hunting for meat still continues. The greywing francolin (*Francolinus africanus*) is very common in the lowlands where it can be found in wooded areas, and also in some of the mountain areas. The common quail (*Coturnix coturnix*), is a great favourite among Basotho hunters and herdboys for its edibility. The helmeted guineafowl

(*Numida meleagris*) is fairly common in the lowlands and can be found in the popular and willow trees along river banks. It can also be found in some of the larger woodlot areas. Several species of ducks and geese also occurs in the lowlands.

FORESTRY SERVICES

Although forestry development in Lesotho is rather slow, and to a certain degree, haphazard, the importance of tree planting and forests has filtered through to most Basotho, who have now come to realize the benefits that can be derived from trees.

Range

Through the influence of a handful of rural development projects in the country, some livestock farmers, mainly in the mountain areas, have come to realize the importance of trees in the rangeland. Currently, most rangelands in Lesotho are almost totally devoid of tree vegetation, but the introduction of a number of fast-growing browse species such as tagasaste (*Chamaecytisus palmensis*), is set to change the whole situation. The management of rangelands in Lesotho is based on a system of Range Management Areas (RMA's) which emphasizes full participation by local livestock farmers, with minimal assistance from government authorities, and this seems to have taken quite appreciably in some areas.

Soil improvement and protection

One of the main catastrophes to befall Lesotho is that of soil erosion. The country, particularly the lowlands, is scarred with huge gullies which continue to grow because of the little effort that goes into soil conservation. However, most of the gullies in the western lowlands have so far been under a certain degree of control, due mainly to the tree vegetation growing in them. The grey poplar (*Populus canescens*) can be found growing quite happily in most lowland gullies, thus keeping such in check, as well as providing much-needed fuelwood to the local people. Other tree species can also be found growing on degraded lands; these include *G. triacanthos* and *R. pseudo-acacia*. Most of these tree species are self-regenerating and need no further attention other than to occasionally harvest for fuelwood or fodder. The latter two species are leguminous, and are therefore important in improving the soil through nitrogen fixation and litter fall.

Parks and reserves

The 7 500ha Sehlabathebe National Park, located in the south-east corner of the country, is Lesotho's first and, to date, the only one. The park serves mainly to conserve some rare plant species, and also a few wild animals and birds, including the the rare white lily (*Aponogeton ranunculiflorus*), the Maluti minnow (*Pseudo-barbus quathlambae)* which was once thought to be extinct, a few species of buck, wild cats and baboons. However, as far as tourism is concerned, the park still has to reach its full potential. The park offers fishing, hiking bird watching and game viewing, and is quite popular with foreign visitors.

Aesthetics

A few areas in Lesotho can be considered to be aesthetically important in terms of the sights they offer, and the history attached to some of them. One of the more important ones is the Mission Cave House at Masitise in the south of the country. It is one of the few areas in Lesotho where a dense and untainted indigenous forest can still be found, giving one a glimpse of what the country might have looked like a few centuries ago. Another area of scenic beauty if found in the north of Lesotho; this one is probably the only area in the country which boasts an extensive forest of the indigenous tree species *Protea caffra*, the highveld protea. During summer when the tree is in flower, the area becomes one attractive landscape of pink to white flowers. Tourists often visit the area between November and February, which is when the trees are in flower.

Most of Lesotho, with its spectacular falls, rivers and valleys is also an attraction in itself, particularly on horse-back.

THE IMPORTANCE OF NWFP IN LESOTHO

Although Lesotho is not well-endowed with natural and even exotic forest areas, Basotho have long learned to appreciate the value of forest- or tree-related products. Obviously, the country being in the state it is in today in terms of natural vegetation, foremost among the priorities of most Basotho is energy. When the people see a tree, or hear about trees and forests, they think about fuelwood. However, it is encouraging to

note the increase in the planting of fruit trees in Lesotho. Almost without exception, this is done at household or individual level, and it goes to show how important the people rate food production.

In villages in the lowlands and foothills people grow several varieties of peaches (*Prunus persica*), apples (*Pyrus malus*) and pears (*Pyrus communis*), as indicated already, mainly for home consumption; but an increasing number are going into semi-commercial production, because they realize the potential benefits to be gained from growing fruit trees.

It is sad to note that at the national level, the only recognition given NWFP is their importation from South Africa. There is absolutely no recognition for the fruit produced by the people of Lesotho, hence each semi-commercial producer has to try and find a market for his produce.

NWFP OF RELEVANCE IN LESOTHO

In the last year there has been a spate of deaths, particularly among toddlers and babies, in Lesotho. The main reason, according to the authorities, is starvation and malnutrition. In a country where peach trees sometimes grow wild, it is totally unacceptable that people should go hungry. In any case, it is very clear that food is the main issue to be addressed in Lesotho. The fruits that grow in Lesotho have already been mentioned. However, besides the domesticated fruit, there are a few wild species such as the prickly pear (*Opuntia* spp.) and the rosehips (*Rosa* spp.) which are both very nutritious and can probably be easily be cultivated in Lesotho. There are also many wild spinaches just waiting for domestication. However, urbanization would seem to be leading Basotho further and further away from their traditions, judging by the number of people who do no care much for wild NWFP.

Besides food NWFP, fodder or forage is also very important since many rural Basotho keep large numbers of animals, in areas with very little or no pasture at all. Trees which have grown in Lesotho since the last century, such as the weeping willow (*Salix babylonica*) are still very popular among livestock owners, because of the leaves they feed to the animals. However, most of these trees are either self-regenerated, or were planted many years ago and their ownership is uncertain. This shows that although there is a poor tree planting tradition in Lesotho, the

people are very much aware of the benefits. The planting of fodder trees in Lesotho has already received much attention from both government and a number of non-governmental organizations, giving recognition to the potential importance of this resource.

As in many other African countries, traditional medicines are very important to Basotho. Although the country has been stripped of most of its important vegetation, many plant species still exist which are popularly used by traditional practitioners. However, the practitioners have lately tended to go over into South Africa for some of the more popular herbs which are no more available in Lesotho.

Basotho craftsmen use some of the few remaining tree species such as the white stinkwood (*Celtis africana*), the wild sage (*Buddleja salviifolia*) and the camphor bush (*Tarchonanthus camphoratus*) to make wooden articles and fighting/walking sticks. This great tradition is also dying because of the shortage of raw material, which now has to be fetched from very remote areas of the country, or even from South Africa. The articles made from wood are usually of very good quality, and the craftsmen make a reasonable living from this trade.

Institutional Aspects

Until very recently, there was no specific authority in Lesotho charged with the responsibility for natural resources, although legislation existed that protected certain flora and fauna. Indeed, even today responsibilities of the different government ministries are not very clearly defined as regards natural resource conservation, management and protection.

In any case, the Ministry of Agriculture, Co-operatives and Marketing is responsible for all afforestation, and tree planting matters, soil conservation, land use planning, range and fisheries in the country. The Ministry operates through various department and divisions, each of which is responsible for a particular discipline. Then there is the Ministry of Natural Resources which is responsible for all the natural resources in the country, their exploitation and protection; there is a certain degree of overlap between this and the Ministry of Agriculture. The Ministry of Natural Resources also operates through several departments, some of which have recently been established, as the Ministry itself is a new one.

Other than government agencies, there are private organizations such as the Lesotho Conservation and Preservation Trust whose main goal is to foster and aid financially the conservation, preservation, and proper utilization of Lesotho's natural heritage, including endangered flora and fauna species.

There are a number of other non-governmental organizations in Lesotho which are concerned with environmental protection and natural resource management; but these are mostly in the form of foreign-funded projects which have a limited life-span.

Personnel

Most of the government personnel responsible for matters pertaining to NWFP are usually either not technically qualified at all, or poorly qualified to do their job, and usually such NWFP responsibilities have to be taken over by expatriates. For example, most of the government's forestry staff are only aware of the management of exotic woodlots for the production of fuelwood and poles; the government's horticulture staff are mostly concerned with the propagation of fruit trees and not in developing the interest of the community in such trees; it is usually assumed that those who need the trees will come to the government establishment dealing with such trees.

Also the research carried out is mainly concerned with the development of new cultivars or varieties of species such as peaches and apples, and not with the use or development of indigenous NWFP.

Funding

The government funds its own programmes, sometimes with the assistance of foreign aid. The Lesotho Conservation and Preservation Trust depends mainly on donations from the public and the commercial sector. Foreign-funded projects usually only exist for a given period and then die a natural death, as is the case elsewhere in Africa.

Legislation

Although legislation exists for the protection of Lesotho's natural resources, it does not seem to have any impact on the illegal use of such resources. This is mainly because of lack of law enforcement. Even right up to today many important and endangered plant and animal species are still being misused by many rural and urban communities. An example is *Protea caffra* which is found at two locations in northern Lesotho; in one of the locations, this beautiful tree has been virtually wiped out by the locals who use it for fuelwood, and also debark it for medicinal purposes, even though it is a legally protected species in Lesotho. Legal Notice N0. 36 of 1969 (the Proclamation of Monuments, Relics, Fauna and Flora) is the legislation currently in effect. It is supposed to protect a number of fauna and flora, as well as relics and national monuments. The Forestry Act No. 11 of 1978 also protects government managed forest reserves, but people still manage to damage these.

Policy

The government has had a forestry policy for a long time now, but it has never really been implemented. To a certain degree, the agricultural policy, which includes fruit trees, has been implemented, but not to any significant degree. An environmental policy exists for Lesotho although it has never been implemented mainly because, until recently, there was no government agency to implement it or other policies relating to natural resources and their management.

Education and Research

The National University of Lesotho only established a Faculty of Agriculture in 1990. This offers mainly courses in various aspects of agriculture, with very little forestry, and no natural resource management courses at all. The Lesotho Agricultural College, which is affiliated to the University, also offers diploma and certificate courses in a combination of forestry, soil conservation and range management subjects.

A few of the lecturers at the University do some research with regard to the distribution of certain indigenous plant and animal species, and occasionally study their reproduction as well, but virtually nothing on the potentially economic indigenous flora and fauna.

TECHNICAL DESCRIPTION

In view of the disturbing environmental situation prevailing in Lesotho it would seem reasonable to suggest that the most important NWFP in the country are food, forage and soil improvement and protection.

Food

The harvesting of food NWFP in Lesotho simply means picking the fruit from the tree, or going into the veld or field to collect wild spinaches. Since most fruit trees, especially peaches (*Prunus persica*) and apples (*Pyrus malus*) are located near the homesteads, the fruit is easily harvested, placed in baskets, bags or large bowls and taken indoors to cleaned and eaten. Not all of the harvest is eaten all at once. Some of the fruit are cut in half or smaller pieces and then dried in the sun. The dried fruit can be stored for several years and used when necessary. Fruit are also canned by most Basotho women. This involves the cooking of the fruit in a glass jar of water and sugar; the fruit thus preserved can then be stored for a number of years. Jam is another favourite fruit product in Lesotho, especially that made from apricots (*Prunus armeniaca*) and peaches.

The main wild fruits collected are the prickly pear (*Opuntia* spp.) and rosehips (*Rosa* spp.). Both are a bit difficult to harvest because of their prickly nature. However, the prickly pear is usually harvested using a piece of cloth or paper or a stick, to avoid contact with the spines. The fruits are placed in a large bowl and taken home where the spines are removed using the same piece of cloth used for their harvesting. Some people throw the fruits briefly in a fire to remove the spines, after which the fruits are sliced open and enjoyed. Herdboys usually enjoy the fruit fresh in the veld. They also eat the rosehips, which they collect very carefully by hand to avoid the spines of the rosehip bush; they then roll the fruits on a stone to squeeze out the hairy seeds, after which the fruits are enjoyed. Rosehips are being commercially processed for the making

of a delicious jelly, and are also dried and exported to South Africa as a health product component, probably becuase of their high vitamin C content. Boiling fresh rosehips is said to extract about 40% of the vitamin C while drying is said to extract about 64%.

Wild berries such as *Rubus* spp. are also harvested by Basotho women in February and March. Some of these are consumed at home, while a sizeable amount is sold locally.

The principal purpose for which the Basotho have traditionally planted trees is fruit production for home consumption, as already stated; however, if the harvest is good some of the produce may be sold; this is especially the case with apples, peaches and apricots. The fruit may be sold from the household, or at a roadside market; sometimes the children will go from household to household selling the fruit. Basotho women also sell some of their canned fruit at local markets. All the selling is usually not done too far from the homestead, so walking is usually the main mode of transport. If a large quantity of fruit or wild spinach has to be sold, then public transport is used to go to the nearest market centre. Incidentally, wild spinach is also a very popular item in the vegetable markets of Lesotho, the most popular species being *Amaranthus paniculatus*, *A. thunbergii, Lotononis dieterlenii* and *Chenopodium album.* Some Basotho women will rise very early to go to the fields to collect as much of the wild spinaches as possible for selling at the local markets, and also for home consumption. The wild asparagus (*Asparagus africanus*) is also enjoyed by some of the rural people of Lesotho, especially its young shoots which are boiled and eaten.

Forage

It has already been shown that the Basotho are basically a nation of livestock farmers despite the acute shortage of grazing land and pastures. The livestock are kept mainly for wool and mohair production (sheep and goats), and it is taboo to talk to Basotho livestock owners about the introduction of livestock reduction programmes, even in the light of the desperate situation regarding animal feeding.

The harvesting of forage species for animal feed involves mainly the removal of leaves, pods and small branches or twigs of the few species which are available in Lesotho. These include the mountain cabbage tree (*Cussonia paniculata*), the weeping willow (*Salix babylonica*), the basket willow (*S. viminalis*,) the goat willow (*S.capensis*), the honey locust (*Gleditsia triacanthos*), the black locust (*Robinia pseudo-acacia*), various poplars (*Populus* spp.) and the privets (*Ligustrum* spp.). In most cases, the tree forage is cut using pruning shears and fed to the animals waiting nearby; this usually happens during the dry season. In some cases animals such as cattle and goats are allowed direct access to the trees where they browse freely.

Privet is a popular hedge species in Lesotho and has to be cut back to a pre-determined height periodically. The leaves thus removed are fed to animals, who seem to enjoy them although the privets are not widely known as fodder species. With the honey locust and the black locust, the pods are usually collected in bags, taken home and fed to livestock, especially because the honey locust being so thorny, it is not advisable to allow animals to get too close to the the trees; even the harvesting of the pods can be very tricky because of the thorns, so these are usually collected when they have fallen from the tree. Tagasaste or tree lucerne (*Chamaecytisus palmensis*) is a new forage species recently introduced into Lesotho, where it has performed very well, although it is not quite widespread yet. Tagasaste forage is very nutritious to all types of animals (both domestic and wild) and can be used, for instance, in rabbit production as feed. Animals can be allowed to browse tagasaste trees or the leaves can be harvested and stored for use during times of grazing scarcity.

A number of tree and shrub species in Lesotho are useful as bee-forage. These include several of the eucalypt species (*Eucalyptus spp.)*, the pepper tree (*Schinus molle*), the wattles (*Acacia* spp.), tagasaste (reputed to be particularly good for this purpose), privet, peach, apple, apricot and pear. Usually the hive is placed somewhere among or near the trees so that the bees can easily access the flowers and therefore the nectar.

Soil improvement and protection

To most visitors to Lesotho it is very clear that the country has serious erosion problems which seem to be accelerating with no end in sight before all the country's topsoil goes down the rivers into South Africa. The problem is much less obvious to the Basotho who have lived all their lives in the country, and presumably should care deeply about what is happening to their land. The problem of soil erosion in Lesotho is such that fields which were ploughed and productive in the early 1970's are now useless after two decades of sheet and gully erosion. The problem is worsened by the fact that poor agricultural methods have also resulted in nutrient-deficient soils which are structurally unstable.

The authorities in Lesotho have long recognized the importance of curbing soil erosion by any means, especially in the lowlands. In 1936 the Soil Conservation Division of the Ministry of Agriculture began using exotic trees to complement its other conservation works, and up to 1972 more than 60 million trees had been planted. Very few of these trees survive today, and most that do are poplars, particularly *Populus canescens* varieties which have reproduced from root suckers. The bulk of the remainder is made up of wattles, pines, eucalypts, honey locust and black locust.

P. canescens is today a permanent feature of most of the lowland dongas (gullies). Although the trees are regularly harvested for fuelwood and poles, they quickly regrow, thereby giving stability to the donga. The wattles and the locusts are also found in some dongas. They are particularly useful because they are legumes and therefore improve soil fertility and structure through nitrogen fixation and leaf fall. The pines (*Pinus* spp.) would appear to be more effective in containing erosion on slopes, their leaf litter forming an erosion-resistant mat of interwoven needles. Pines can be found growing on most lowland plateaux and hill slopes.

Recent developments have tended to encourage Basotho in rural areas to take over a piece of eroded land or donga and plant it to a wide variety of trees, shrubs and ground vegetation. This, it is hoped, will serve as a barrier to further erosion, as well as providing fodder and fuelwood for use by the locals and their animals.

Most Basotho farmers cannot afford the expensive inorganic fertilizers required by modern agriculture. The use of leguminous tree species for the production of green manure would also help in increasing crop productivity. A rural development project in the south of Lesotho has been encouraging farmers to adopt this approach, and the initial response has been encouraging.

Many Basotho have taken to planting trees around their homes in the form of hedges or windbreaks, as well as for shade and amenity. All these efforts go some way towards protecting the country's soils.

The main problem facing the people, however, is ensuring good survival and establishment of the trees, especially in areas where water is scarce. Fortunately there is enough expertise (both local and expatriate) to advise on these matters. Certain establishment techniques have been developed to assist tree establishment, and the people are also encouraged to water their trees at least once fortnightly until they are firmly established.

During establishmenmt, it is particularly difficult to try and plant seedlings on the donga wall. So a method has been devised of directly sowing pelleted seed in the wall of the donga. This method has worked very well in the south of the country. Seedlings from pelleted seed do not require much attention once they have germinated, except protection from animals. Planting on other types of land and on the donga floor simply involves the digging of pits (about 75cm x 75cm x 30cm) and then planting the trees. The dimensions of the pit (especially the depth) can be reduced if the soil is very rocky. Pitting is usually done with a traditional hoe or pick-axe and spade.

A problem which often crops up is that of seedling availability. In this instance, farmers are usually shown methods of taking cuttings from existing trees (especially in the case of poplars and willows), which they can then plant directly in a suitable area. With other tree species, farmers either have to buy the seedlings themselves, or have the seedlings given to them free of charge (this is usually the case where a project emphasizing people's participation is in progress). Where the people have to buy their own seedlings, transport can usually be a problem if they live far from government nurseries. In such situations the people have to rely on the local forester or extension agent to bring them the seedlings.

RENEWABILITY AND SUSTAINABILITY

All the tree and shrub species discussed already grow in Lesotho, and the advantage is that since they are used for food and forage, they are unlikely to suffer any major damage that could result in their total eradication. For example, once Basotho have planted fruit trees they make sure that they survive and protect them from damage by animals and other agents. There are many very old specimens of fruit trees found all over the country, some of which are more than 50 years old, but are still bearing fruit.

However, with forage species a lot of care has to be exercised in order to protect the trees from damage by animals; this can easily happen in situations where animals are given unlimited access to the trees to browse.

Species such as the rosehips (*Rosa* spp.) hold much promise for the Basotho and are not browsed by animals. However, their germination still has to be ascertained as they have proved rather difficult to propagate from seed in the past. But generally, most of the other species are already being propagated in government nurseries throughout the country and should be easily accessible to most Basotho.

Even those species that are used for the protection of the soil as well as fuelwood, such as *Acacia* spp. and *Populus* spp., should prove extremely difficult to eradicate because of their root-suckering habit, therefore productivity from them can be expected to continue sustainably for a long time.

Propagation material is easily available in Lesotho (or even from South Africa) for most of the species discussed, therefore, renewal and development of the resource base should not be too difficult.

ENVIRONMENTAL IMPLICATIONS

For many decades, Lesotho has faced enourmous soil losses from agricultural lands, as can be seen from the networks of gullies that scar most of the lowlands and foothills. The steady decline in indigenous vegetation has definitely contributed to this sad state of affairs, which will continue for as long as the country's natural resources are exploited without replacement.

The use of the three NWFP identified as being of most relevance to Lesotho, is unlikely to have any major destructive environmental consequences if sustainable management practices are adhered to. In situations where trees and other vegetation are to be used for forage, unlimited direct browsing by livestock may damage the resource base; similarly, if vegetation planted for the control of soil erosion is harvested, for example for fuelwood, without due regard to its sustainability, then the main purpose for which it is planted will be defeated, and environmental degradation will continue.

It is of the utmost importance therefore, for the people of Lesotho to be careful in their approach to NWFP use, conservation and management, lest the environmental problems they are trying to address become worse.

PROBLEMS AND CONSTRAINTS

There are many constraints which have proved time and again to be stumbling-blocks to the promotion and development of natural resources in Lesotho; and as long as these continue to exist, it will be extremely difficult to make any progress in the NWFP sphere in Lesotho. The following are some of the constraints:

- Inadequate social and administrative structures with respect to the management of natural resources;

- Insufficient awareness and understanding among those concerned, of the ecological interactions in the spheres of agriculture, forestry, animal husbandry and natural resources;

- Shortage of adequately trained manpower. In order for NWFP promotion and development work to proceed without a hitch, it will be necessaryto have appropriate manpower forplanning, guiding and supervising development activities which may also require a broad multidisciplinary approach;

- Unavailability of information and know-how necessary for the introduction of sustainable and economically sound environmental and natural resource management systems; without such information, it is difficult to plan properly.

- Lack of funds to carry out the necessary NWFP promotion and development work. It will be very difficult to introduce new natural resource management systems without a large capital outlay;

- Cultural barriers pose a great problem particularly when the local people have to be convinced of the necessity to introduce drastic new measures, and to abandon practices they have grown accustomed to over the years.

RECOMMENDATIONS

It will be very difficult to find solutions to all the problems related to the promotion and development of NWFP in Lesotho, especially as some of these are of a very complex nature, requiring input from virtually all sectors of the community. However, some steps can be taken towards attaining a solution, and these area as follows:

- Efforts should be made to train, as a matter of urgency, manpower to co-ordinate NWFP promotiion and development in Lesotho; such training should take into consideration the uniqueness and multidisciplinarity of the problem as pertains to Lesotho;

- Although funds are always difficult to come by, especially for redressing problems of an environmental nature, the relevant authorities should make it a priority to set aside adequte funds to cover all aspects of the work to be done, including staff incentives;

- Awareness about the causes and consequences of environmental degradation, and also about appropriate counter-measures, must constitute a key element of any action plan intended to prevent further destruction of the natural resource base. It is therefore recommended that in influencing people's attitudes, and hence their actions with regard to natural resources, a well-orchestrated effort be made through schools, higher education institutions, rural extension services, the media, NGO's and international development organizations;

- Involvement of the concerned people must be uppermost in the promotion and development of NWFP, otherwise they might feel that the problem is not theirs, and therefore requires none of their input.

- The people must be kept up-to-date about any new developments regarding NWFP intheir areas; this will also tend build trust;

- A detailed database on available NWFP in Lesotho should be set up; this should encompass all aspects of such NWFP, including their status in the wild, renewability, propagation methods and uses.

- Village nurseries should be established throughout the country to ensure that there is never a shortage of seedlings for the promotion and development of NWFP in Lesotho; such nurseries should be run by the people themselves;

- Finally, the land tenure system must be very clear and unambiguous regarding tree ownership and the use of NWFP.

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ANNEX I

CLASSIFICATION OF NWFP

CATEGORY OF NON-WOOD FOREST PRODUCTS	PRODUCT	IMPORTANCE OF NWFP
Fibre	*Agave americana*	2
Food (Vegetal)	Peach Apple Pear Apricot Prickly pear Wild berries (*Rubus*) Rosehips Nuts Wild spinach	1 2 1 1 1 1 2 3 1
Food (Faunal)	Honey Bushmeat Fish	2 2 1
Non-Food (Faunal)	Animal skins Feathers	3 3
Cosmetic & Medicinal	Artemisia afra *Aloe ferox* *Protea caffra* *Acacia karroo* *Eucomis* spp. *Euclea* spp. *Buddleja salviifolia* *Tarconanthus camphoratus*	1 2 2 2 2 2 1 2
Extractive	Tannin	2
Forage	Livestock fodder Bee forage	1 2

Wood (handicrafts)	*Buddledja salviifolia* *Olea africana*	2 2
Ornamentals	Amenity	2
Range	Grazing and browse Shade and shelter	1 2
Soil improvement and protection	Green manure Humus N-fixation Soil stabilization Windbreaks & hedges	2 2 2 1 2
Parks and reserves	Tourism Conservation Hunting Fishing	1 2 3 2

ANNEX II

STATISTICAL DATA ON NWFP

PRODUCT	YEAR OF REFERENCE	UNIT	QUANTITY	UNIT PRICE (US$/T)	VALUE (US$ 1000)
Peaches	**1992**	**T**	**17**	**N/A**	**N/A**
Apples	**1992**	**T**	**6.5**	**N/A**	**N/A**
Pears	**1992**	**T**	**2.5**	**N/A**	**N/A**
Apricots	**1992**	**T**	**5**	**N/A**	**N/A**
Rosehips	**1992**	**T**	**12**	**650**	**7.8**

Legend:

T: Tonne
L: Litre
B: 50kg bag

PILOT COUNTRY STUDY - MALAWI

Non-Wood Forest Product Development in MALAWI

A Pilot Country Study Prepared for the Regional Expert Consultation on NWFP (Non-Wood Forest Products) Arusha, Tanzania, October, 1993.

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SUMMARY

Non-wood forest products (NWFP) play a major role in social development in Malawi. Despite this, there is very limited information about the management and exploitation of such products. Though there have been deployed various intervensions, mainly through Government, the development and management of NWFP in Malawi is still in its primary stages.

This study has revealed that the exploitation of NWFP in Malawi varies with type, time and location of such products. The forests, especially those under public control, are the most productive. On a commercial basis, food NWFP, especially bee and game products, seem to be the most exploited. Other NWFP, including fruits, mushrooms, and medicinal products, are at present being exploited mostly for subsistence purposes. It has also been found that NWFP are being exploited legally or illegally. The Malawi Government is trying hard to reduce illegal harvesting by promoting legal approaches through various extensional strategies and physical intervensions.

In conclusion, sustainable development of NWFP in Malawi requires a review of all relevant policies and legislation, the development of appropriate technologies and the provision of useful extension and marketing techniques.

It is the view of this study that for the above recommendations to be transformed into viable strategies there is need for such an undertaking to be initiated through a multidisplinary approach. This calls for the involvement of both Government and Non-Governmental Organizations in Malawi as well as international inistitutions like the Commonwealth Secretariat and the Food and Agriculture Organization of the United Nations. This would help plan, implement and monitor such strategies in the development and exploitation of important NWFP.

1.0 INTRODUCTION

Non-wood forest products (NWFP) which according to FAO refer to market or subsistence goods and services for human or industrial consumption derived from renewable forest resources and biomass, bearing promise to augument man's basic needs of food, clothing and shelter, have played a major role in human development in the past and present in Malawi. To a certain extent man has since time immemorial depended on NWFP fo. his social, physical and economic development. This is quite relevant for Malawi as can be seen from the way NWFP are being exploited from natural forests. It is a common practice to see people enter fprests in Malawi to collect various forest products including honey, fruits, medicinal products, and mushrooms. Game is also hunted seasonally in most forests for meat, hides and other products. It is unfortunate that such activities, which are important to various rural communities, have not been well investigated for sustainable development in Malawi. There is very limited data on such investigations to evaluate the role NWFP in Malawi's development especially at community level. This pilot study is therefore aimed at carrying out such an investigation. Most of the information used has been obtained through interviews with a number of foretry and wildlife officers in the various districts and also from some members of the public especially in rural areas. It is therefore hoped that recommendations made in this study will be put to use in the sustainable development, management, and utilization of non-wood foresty products in Malawi.

2.0 GENERAL BACKGROUND INFORMATION

The Republic of Malawi is a long narrow, land-locked country situated south of the equator in South-East Africa, between 90 -17 degrees South and 32 - 35 degrees East. The total surface area of the territory covers approximately 118, 484 square kilometres (sq. km.), of which land is 94, 274sq.km. (80%) and water 24, 210 sq.km. (20%) with Lake Malawi being the predominant feature.The country is located along the East African Rift valley, and is ecologically and physiographically varied. Of the total land area, about 68,3000 sq.km. (72, 43%) are held under customary land tenure; 4,700 sq. km. (4.98%) under estates (freehold and leasehold titles); and 21300 sq.km. (22.59%) under public land with a large proportion being used for the indigenous forest reserves, national parks, game reserve, large-scale forest plantations, urban and infrustructural development. For administrative purposes, Malawi is divided into three regions: north, center, and south (see Map in Annex 2).

Malawi experiences a tropical continental climate, characterized by two clearly defined seasons, the rain season (November/December-April/May), and the dry season (May/June - October/November).The mean annual precipitation varies widely from a minimum of less than 635mm to a maximum of 3,050 mm. boundary. The mean annual temperature is most strongly influenced by altitude, and varies on average from less than 16 degree C to 24 degrees C.

The total human population is over 8 million persons growing at an average rate of 3.5% per annum which is expected to rise to an estimated 10 million by the year 2,000.

The average national population density is 59 persons per sq. Km, but with an uneven distribution varying from 14-220 persons per square kilometer. 92% live in rural areas deriving their livehood chiefly from agriculture, forestry, livestock farming and allied rural and agro-based industries. The per capita land area has decreased from 1.42 hectares in 1984 to an estimated 0.94 hectares by the year 2000. This will put severe pressure on the already scarce land resources.

The majority of the population subsist on agriculture. Agro-based industries and other economic sectors are limited to provide alternatives to farming. This means there is an ever increasing pressure on the exploitation of natural resources including forests. It is estimated that about 3% of the total land area under forest cover is lost every year in Malawi. This is mainly due to the high population groth rate (3% per year) that is exerting tremendous pressure on natural resources especially natural forests. In order to reduce such a high rate of deforestation, the Malawi Government has intoduced a number of strategies through policy and legislative review. It has created a number of institunions for this purpose.

3.0 FOREST RESOURCES OF MALAWI

Forest and woodlands are of outmost importance to Malawi's society, providing the bulk of country's energy, timber, non-wood forest products, and environmental benefits. Malawi's total forest resource covered 3.51 millions ha. or 37.2% of the total land area in 1990. The Northern Region with only about 11% of the population has the largest forest resource (39%) while the Central and the Southern Regions with 89% of the population have considerably less. A large population of the natural forest is located on reserved land (National Parks, Game Reserves and Forest Reserves ie 48%) of the total forest resource.

Fuelwood makes up the great bulk of wood removals from the forest.

4.0 NON-WOOD FOREST PRODUCTS IN MALAWI

4.1 INTRODUCTION:

The potential use of natural forests has been recognised and exploited in Malawi for decades. These forests have provided malawians with various products including timber, energy, shelter and food in form of fruits, honey, vegetables, game meat, mushrooms, tubers, and fish. Although recognized, the role of such forests has been taken for granted, as a natural event, until the balance between supply and demand for the resources has titled for the worse. In Malawi, the need to formally manage the indigenous forests on a multiple use system was advocated some decades ago. Despite this development, acceptance such schemes were to be subordinate to the paramount objectives of commercial timber production and water catchment protection.

At the same time, because of the nature of indigenous forests in Malawi, maximization of revenue from the primary objective of timber production could not be achieved easily on a sustained yield. Poor stocking, low incremental rate and the difficulties experienced in regenerating the forests were the major causes. To manage indigenous forest in Malawi for the production of non-wood forest products (NWFP), the following areas were proposed for further exploration in the 1960's; grazing,beekeeping, wildlife management, tourism and mushroom production. Unfortunately, these interventions appear not to have achieve the prescribed goals. The management of forest resources mainly for wood production has contributed to this shortfall.

4.2 IMPORTANCE OF NWFP IN MALAWI

Malawi's forest resources can be divided into five categories in terms of location (Table 1).

Table 1. Distribution of Forests in Malawi

Type	Area (Million ha)	% of Total Forest Area
Customary Land Forest	2.7	57
Forest Reserves	0.98	21
National Parks and Game Reserves	1.0	21
Industrial plantations	0.07	1

Source: Forestry Department

Because of the free access to forest products on customary land, the limited distribution of NWFP in industrial plantations, and the limited time for this study, it was not possible to quantitatively evaluate the potential for exploitation of NWFP in all forests. This study has therefore concentrated at the potential for the exploitation of NWFP in forest reserves, national parks and game reserves. This should provide usefull information since such forests account for over 50% of the total forest area in Malawi. There are 98 proposed and gazetted forest reserves in Malawi covering an area of about 10,000 square kilometers (sq. km.) (Table 2). There are also about 4 national parks and 4 game reserves in Malawi covering an area of over 10,000 sq. km.

Table 2.

Proposed and Gazetted Forest Reserves.

Region	Number	Area(sq km)
Northern Region	38	3120
Central Region	29	3437
Southern Region	31	3598
Total	98	10,155

Source: Forestry Department

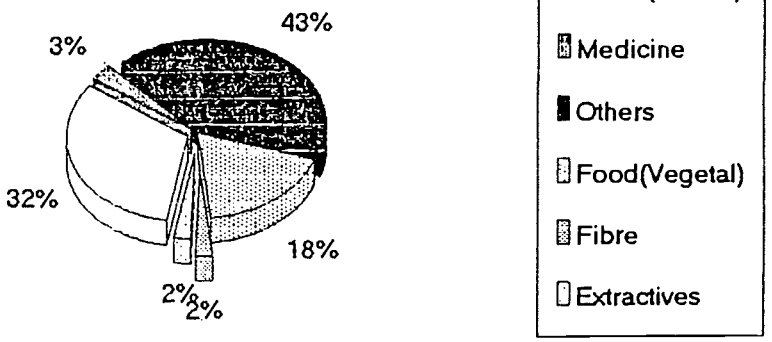
To get an insight into the utilization of NWFP in these reserves, various people including forestry and wildlife officers were interviewed. The approach was to find out which NWFP were

being exploited the most, legally or illegally, and for what purpose. Time that such an activity took place was also investigated. Information was also sought as to whether such exploitation was for subsistence or commercial purposes and whether this was done mostly by men or women or both. This survey was conducted through the three regional forestry offices in the north, centre and south (RFO-N, RFO-C, and RFO-S) respectively. The results are summarised in Annex 1 and Figures 1-3. It has been found that NWFP are exploited in all the three regions of Malawi. Where as the northern and southern regions are dominated by faunal food NWFP the centre is dominated by vegetal food NWFP. Considering the exploitation of faunal food NWFP, meat, honey, termites, and caterpillars dominate in the northern region(Figure 2). In the central region, the exploitation of caterpillars is more significant than that of honey,termites and meat. In the southern region termite harvest has been ranked higher compared to meat, honey, caterpillars and fish. With regard to vegetal food NWFP, the harvesting of mushrooms and fruits is significant in all the three regions (Figure 3).

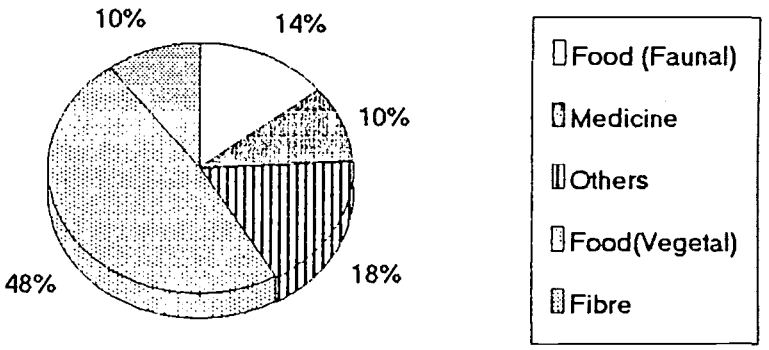
The major weakness with this method of investigation is that it does not indicate the magnitude of occurence in a particular area. At the same time, the only major advantage with this approach, given the various constraints including the limited time for this study, is that it gives a useful overview of the current situation in the absence of comprehensive data It also narrows down the scope for future investigations to only those NWFP that are comparatively significant.

Figure 1:

Non- Wood Forest Produce (RFO-N)



Non-Wood Forest Produce (RFO-C)



Non-Wood Forest Produce (RFO-S)

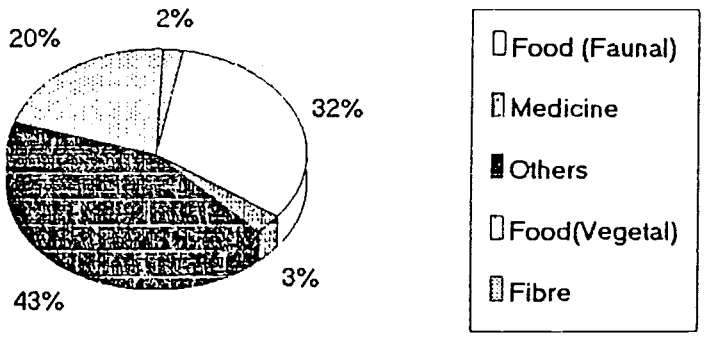
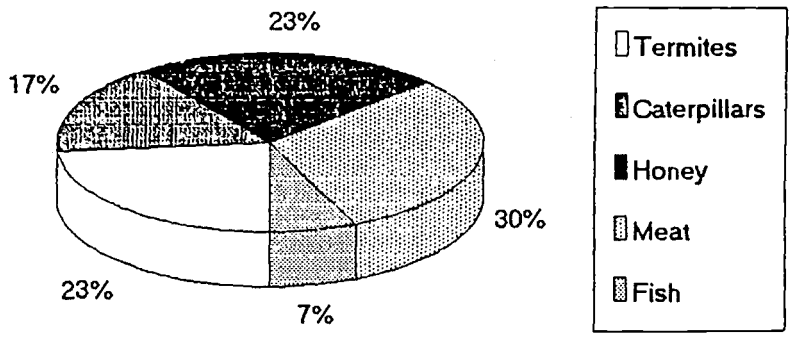
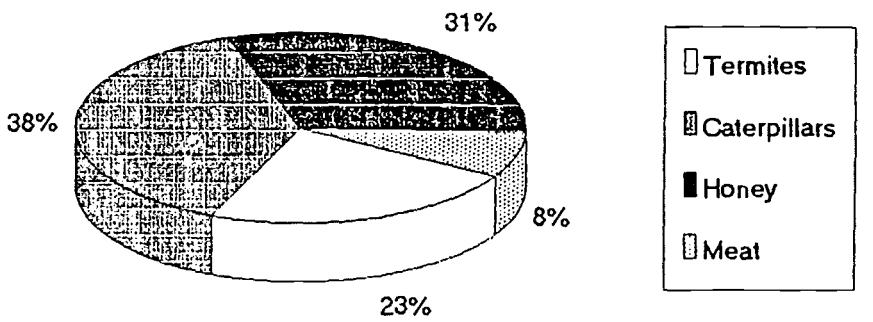


Figure 2:

Faunal Produce - RFO (N)



Faunal Produce - RFO(C)



Faunal Produce - RFO(S)

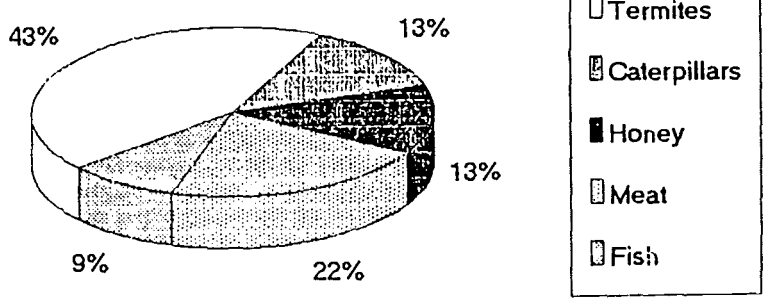
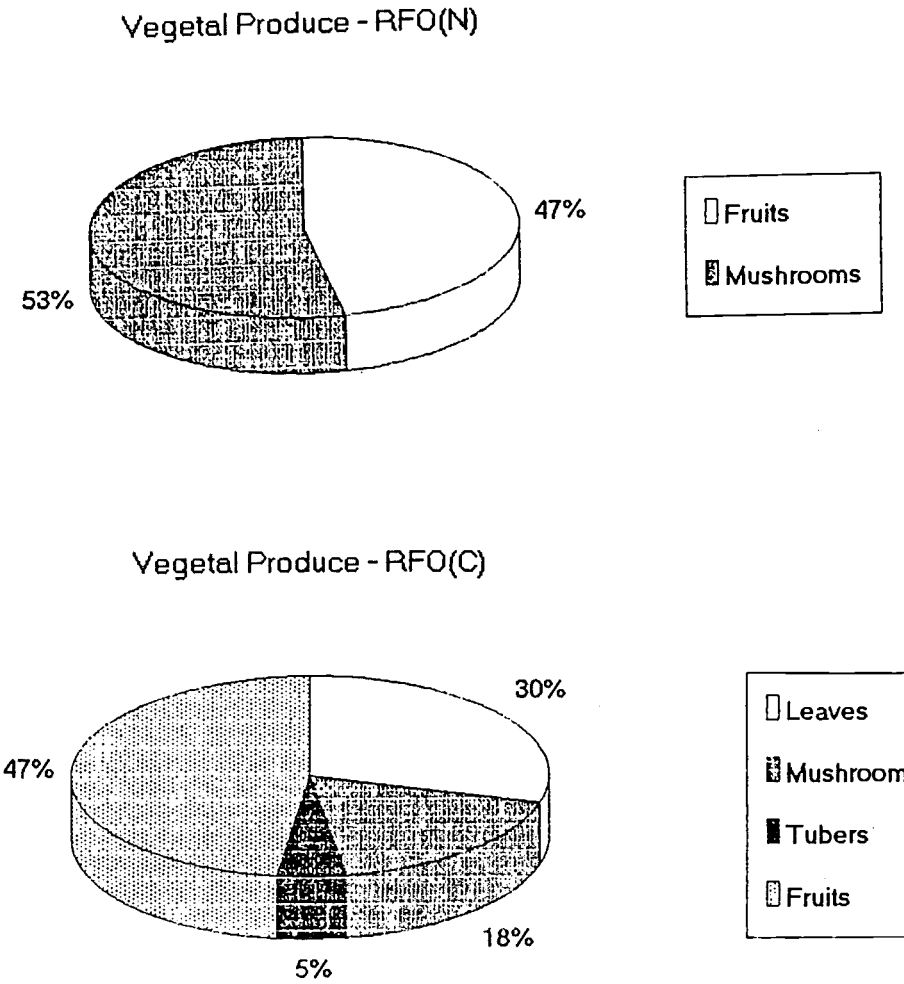


Figure 3:


Vegetal Produce - RFO(N)
47%
53%
Fruits
Mushrooms
Vegetal Produce - RFO(C)
30%
47%
18%
5%
Leaves
Mushrooms
Tubers
Fruits
Vegetal Produce - RFO(S)
11%
21%
16%
52%
Leaves
Mushrooms
Tubers
Fruits

4.3 SIGNIFICANCE OF NWFP TO RURAL COMMUNITIES IN MALAWI.

A quik survey conducted by interviewing some district forestry officers in eighteen of the 24 districts of Malawi, in which most forests are located, revealed some interesting trends with regard to the importance of NWFP at various community levels in Malawi (Table 3).

Table 3. The Socio-economics of NWFP in Malawi.

Product	Involvement	Utilization	Marketing	Potential Production	Level for Demand	Environ. Impact	Availability	Effect on Income
Edible products								
Honey	X	M	S +C	H	H	O	Y	H
Fruits	X + F	L	S	L	H	O	Y	M
Murshrooms	F	M	S(+C	H	H	O	Y	H
Insects	X + F	L	S	L	L	O	Y	?
Game	M	M	S +C	M	H	O	P	H
Tubers	F	L	S	L	?	?	P	?
Leaves	F	?	S	L	?	?	S	?
Non - Edible Products								
Medicines	X+F	M	C(+S	L	H	?	P	H
Rasins	X	L	S	?	?	O	P	L
Fibres	X	M	S	L	?	O	P	L
Grass	X+F	L	S	L	?	O	Y	M
Fodder	O	L	S(+C	L	H	H	Y	?
Soil	X+F	L	S(+C	L	?	H	P	?

KEY: X : Male, F : Female, H : High, M : Medium, L : Low, S : Subsistence, C : Commercial, Y : Seasonal, P : Permanent.

It has been observed in this study that the production, collection, and/or processing of NWFP in Malawi involves both men and women and that utilization of such products ranges from very low to medium. Most of these products are used for subsistence purposes. Only honey, mushrooms, game meat, medicinal products, fodder and soil are sometimes harvested for sale. Of these products, honey seems to be the only product with a marketing system that is developing well. Whereas the production of honey, mushrooms, and game meat can be improved, that of the others have very limited potential.

Currently, there is high demand for honey, fruits, mushrooms, game meat, medicinal products and fodder in Malawi. Only fodder and soil harvesting could be considered as having an impact on the environment. Whereas some NWFP are available seasonally eg. honey, fruits and mushrooms, the rest are available all the year round.

This study has revealed that only honey, fruits, mushrooms, game and medicinal products, and grass for thatch have a strong potential to improve the incomes of the rural communities in Malawi. An attempt has been made to rank each NWFP in terms of its importance in the categories of food security, nutrition, health, employment and income (Table 4).

Table 4

Importance of NWFP to Local Communities in Malawi.

Product	Food Security	Nutrition	Health	Employment	Income	Total Score	Rank
Honey	3	3	3	3	3	15	High
Fruits	3	3	3	2	2	13	High
Mushrooms	3	3	1	1	2	10	Medium
Insects	3	3	1	1	1	9	Medium
Leaves	1	3	3	1	1	9	Medium
Game	2	3	1	1	1	8	Medium
Tubers	1	1	1	1	1	5	Low
Medicine	0	0	3	2	2	7	Medium
Raisins	0	0	0	1	1	2	Low
Fibres	0	0	0	1	1	2	Low
Grass	0	0	0	1	1	2	Low
Fodder	0	0	0	1	1	2	Low
Soil	0	0	0	1	1	2	Low

Rank : 0-5 + Low, 6-10 = medium, 11-15 = high.

Such ranking has revealed that honey and fruits are the most significant products followed by mushrooms, insects, leaves(vegetables), game and medicine. Tubers, raisins, fibres, grass, fodder and soil have ranked low.

In an effort to quantify statistically the exploitation of the most important NWFP,it has been observed that this is only possible, to a limited extent, with honey, caterpillar and game products as follows.

According to the Department of National Parks and Wildlife (DNPWL), communities surrounding some parks, game and forest reserves are allowed to hang bee hives in these areas harvest bee products. Through a Government supported beekeeping project a total of 894 people are currently participating in beekeeping. During the 1992-93 beekeeping year, a total of 4,188.9kg of honey and 174.7kg of bee-wax were harvested and sold. Money realized from honey sales was MK25,133.40 (about US$5,000) and that from wax was MK1,222.97 (about US$350). There is also one commercial bee-keeper operating on the Nyika National Park and South Viphya Forest Reserve. In the Nyika alone he has 185 hives which are estimated to harvest about 1,000 kg of honey a year. Where as the bee products from the rural communities around the park are sold to the project, the commercial bee-keeper sells direct to retail outlets. Honey is also amongst the products that are harvested illegally from most parks and reserves. In the Kasungu National Park, people are also allowed to install bee hives. In 1992 which was the initial harvest year 70 kg of honey was harvested. In Nkhota-kota Wildlife Reserve, bee-keeping has started but due to the drought of 1992 very few hives were colonized hence no harvest has been reported yet.

Apart from bee-keeping, rural communities around Kasungu National Park have been allowed to collect caterpillars (Matondo and Vilungulungu) for food. In 1991, according to the DNPWL, over 170 people participated in the exercise. They harvested about 1,850 kg of caterpillars. The market value of these products in 1991 ranged between MK8.00/kg (about US$ 2/kg) and MK29.00/kg (about US$ 7/kg) depending on their availability.

In most of the national parks and game reserves there are a number of illegal activities (Table 5).

Table 5

Illegal activities in National Parks & Game Reserves

Park/Reserves	Illegal Activity
Nyika	- harvesting of honey, meat, hides, mushrooms, thatch grass, and wild fruits.
Vwaza	- harvesting of meat, hides, ivory, mushrooms, thatch grass, and wild fruits
Kasungu and Nkhota-kota	- (Similar to Vwaza but include leaves for food e.g. Chinaka (Orachidace family) and Bwaka
Lake Malawi National Park	- fish harvest, and meat
Liwonde and Majote	- fish, meat, hides and ivory harvesting
Longwe and Mwabvi	- harvesting animals for meat and masawu (Ziziphus sp) as fruit

Source : Department of National Parks and Wildlife.

The major annual species that fall victim to poachers include elephant, hippo, antelope, buffalo, warthog, fish, and rock hyraxes. Between 1981 and 1990 an average of 30 antelopes of different species per year were killed illegally. The average figure for elephants for the same period was 25 per year. Culling is a periodic exercise in Lengwe National Park. Nyala antelope, warthog and buffalo have been culled in the past. The meat is sold (at reduced prices) to the people. Legal harvest by local communities has not been introduced yet. Government is trying hard to reduce these illegal activities by making them legal.

This is being done through an intensive public awareness programme amongst other strategies. In areas outside national parks and game reserves, licences (at a fee) are issued to sport hunters. The licence authorises the holder to kill five common duikers, one worthog and one male bush buck. Over 200 hunters are licensed annually. The success of the hunters has not been closely monitored by the Department of National Parks and Wildlife (DNPWL) but the zeal to renew the licences shows that the activity is viable. Government hunters also shoot several animals on crop protection. According to DNPWL, an average of 0.3 million kg of meat are sold to the public from this exercise every year giving (estimated revenue not available). The bulk of the meat is from hippo, elephant and buffalo in decreasing order of contribution.

4.4 PROPOSED DEVELOPMENT OF NWFP IN MALAWI

The sustainable development of NWFP in Malawi is still in its infancy. It would appear only the harvesting of bee products is advancing to commercial levels. Other products (Table 4) including fruits, mushrooms, insects, leaves, and game products show potential for further development at both subsistence and commercial levels.

For such development to advance in Malawi, the following factors (or constraints) need to be well looked into:

(i) Suitable environment must be available, particularly with regard to climate and vegetation,

(ii) Conducive policies and legislation, ie laws and institutions,

(iii Appropriate technologies, ie adaptive research to combine local with new knowledge, the provision of capital to finance equipment if necessary,

(iv) Extension and training, ie training in relevant technical field plus business management training such as accounting,

(v) Marketing system (local - urban, ie infrastructure, traders and buyers (small and large), capital.

5.0 CONCLUSION AND RECOMMENDATIONS

NWFP in Malawi are abundant but not well managed and utilized. Most of these are located in National Parks, Game Reserves and Forest Reserves. Where as only bee products appear to be exploited economically this activity could be improved. In Malawi, there is limited policy and legislative frame work governing the management and exploitation of NWFP. Since the Malawi economy is agro-based and that agricultural expansion is declining , management of NWFP for sustainable development is an attractive option. In order for this to be achieved, this study recommends the following:

(i) Reducing the pressure on the environment by developing and introducing appropriate alternative management practices and technologies for the utilization of NWFP from forests.

(ii) Improve on legislation and provide for the institutional capacities to enforce the legislation.

(iii) Upgrade the existing extension and training facilities by developing adequate training programmes and appropriate extension packages and logistics for the various target groups.

(iv) Establish suitable marketing systems and provide the necessary capital for the development and management of the relevant NWFP.

In Malawi NWFP can therefore be sustainably developed and exploited if there is a multidisplinary approach to the whole exercise at legislative, policy, and implementation levels. This can be facilitated through the initiative of the Ministry of Forestry and Natural Resources and other relevant Government and Non-governmental Organization.

Annex 1:

Table 1 Non-Wood Forest Produce in Malawi

(Frequency Distribution of Faunal & Vegetal Produce)

	RFO(N)		RFO(C)		RFO(S)
Food (Faunal)	30	Food (Faunal)	13	Food (Faunal)	30
Medicine	3	Medicine	9	Medicine	3
Others	39	Others	16	Others	39
Food(Vegetal)	17	Food(Vegetal)	44	Food(Vegetal)	19
Fibre	2	Fibre	9	Fibre	2
Extractives	2	Extractives	0	Extractives	0
Total	93		91		93

Table 2 Non-Wood Forest Produce in Malawi

(Frequency Distribution of Faunal Produce)

		RFO(N)	RFO(C)	RFO(S)
Food(Faunal)	Termites	7	3	10
	Caterpillars	5	5	3
	Honey	7	4	3
	Meat	9	1	5
	Fish	2	0	2
	Total	30	13	23

(Percentage Distribution of Faunal Produce)

	RFO(N)	RFO(C)	RFO(S)
Termites	23	23	43
Caterpillars	17	38	13
Honey	23	31	13
Meat	30	8	22
Fish	7	0	9
	100	100	100

Table 3 Non-Wood Forest Produce in Malawi

(Frequency Distribution of Vegetal Produce)

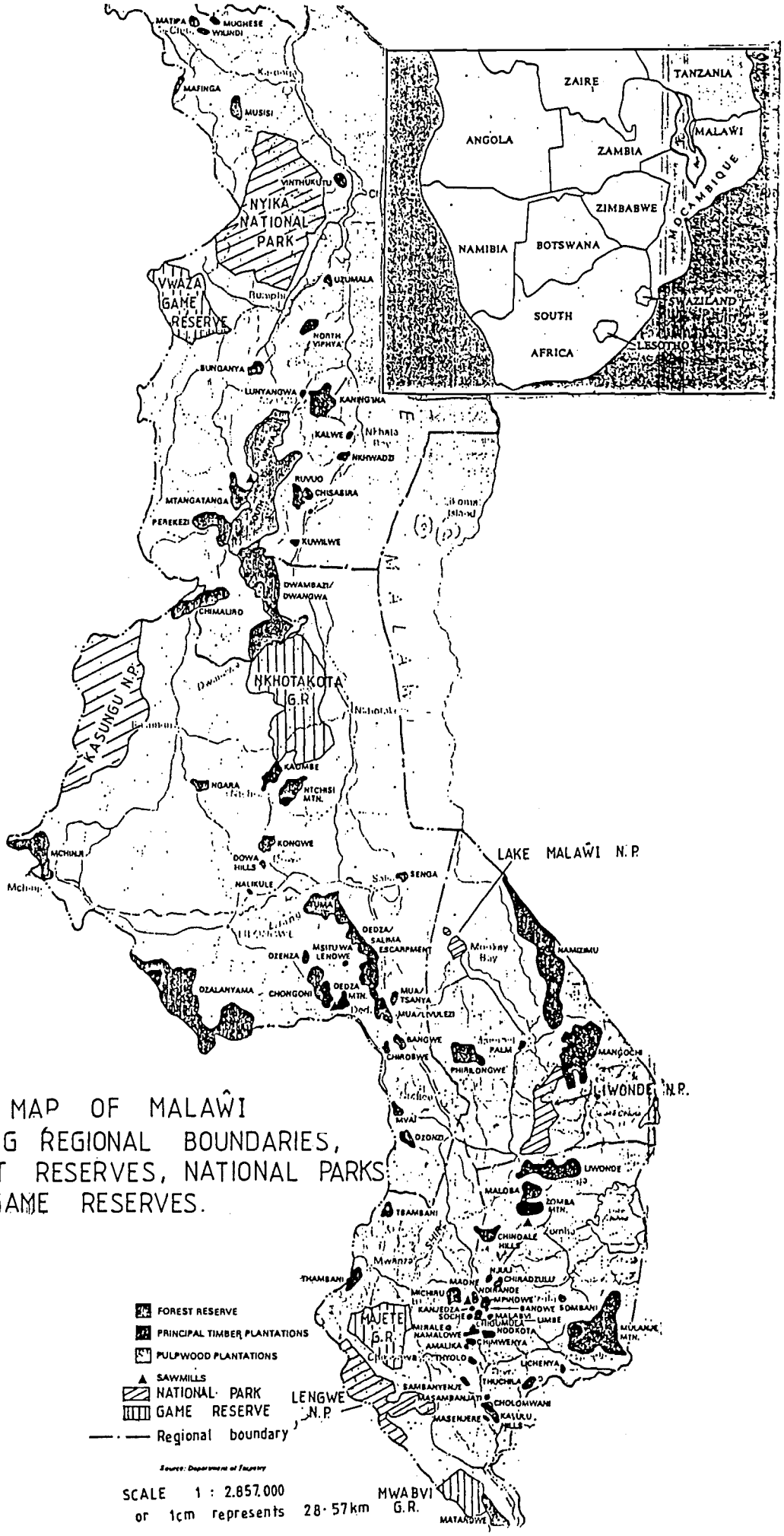
		RFO(N)	RFO(C)	RFO(S)
Food(Vegetal)	Leaves	0	13	4
	Mushrooms	9	8	10
	Tubers	0	2	3
	Fruits	8	21	2
	Total	17	44	19

(Percentage Distribution of Vegetal Produce)

	RFO(N)	RFO(C)	RFO(S)
Leaves	0	30	21
Mushrooms	53	18	53
Tubers	0	5	16
Fruits	47	48	11
	100	100	100

Source: Questionnaire survey conducted through District Forestry Officers

Annex 2



MAP OF MALAWI
SHOWING REGIONAL BOUNDARIES, FOREST RESERVES, NATIONAL PARKS AND GAME RESERVES.

PILOT COUNTRY STUDY - SOUTH AFRICA

1. INTRODUCTION

In 1991 it was estimated that 16 million people in South Africa would live below the bread-line. This figure has probably increased quite considerably since then, and will most likely continue to do so, because modern South African agriculture, as is the case in many developing countries, is failing to meet the challenge to fight hunger, mainly due to the destruction of the environment through pollution, soil erosion, overgrazing and unco-ordinated development. The situation is made still worse by unreliable climatic conditions.

The food security of millions of rural dwellers all over the world depends to a large extent on the survival of nature, and the ability of man to manage natural resources sustainably for the production of his basic needs.

Man has always depended on natural resources in various ways for his survival. The number of wild plants and animals which have served, and still serve man today is astounding. In almost every country in the world, including South Africa, both rural and urban communities use various plant and animal products from, or adjacent to forest areas for their daily requirements.

South Africa has widely varying climatic, topographic, edaphic, social and cultural conditions, and its floral and faunal composition is equally diverse, ranging from the sparse vegetation of the dry semi-desert climates in the south-west, to the species-rich lowland, coastal and dune forests in the moister areas of the south.

Most afforestation activities in South Africa are commercially undertaken by private companies, government or individuals on private land, and as such are usually of little benefit to rural communities, except for job creation, the main benefit being that of jobs to carry out the various forestry operations, thus earning much needed cash incomes. An innovation introduced by Sappi Forests, one of the major forestry companies in South Africa, five years ago, is to allow local individuals living around the company's plantations access into freshly-established forest compartments (usually *Eucalyptus* spp.) and grow food crops such as tomatoes and beans and before the canopy closes. The system is mutually beneficial to both the locals and the company; the locals get to grow their crops on well-tilled ground for free, and the company gets

free weeding as the crops are weeded. The crops so raised are usually sold for profit. This practice has so far not been widely adopted in South Africa, but other forestry companies are posed to implement it as it has been shown to reduce establishment costs.

A very large proportion of the natural forest areas and largest forests in South Africa are managed and controlled by local governments in the various regions. A relatively small portion (18.7% in the Transvaal, 28.8% in Natal, and 23.3% in the southern Cape) are privately owned. In Natal, the Kwazulu homeland controls 34.8% and in the Transvaal Lebowa (another homeland) controls 22.5% of the forests. The Transkei homeland forest reserves cover an area of 73 505 ha.

Ownership of the forests in South Africa usually determines the type of management and use made of them. In many of the privately owned forests, rural communities have limited or no access at all.

The value of the forests to the rural communities of South Africa has long been recognized. A number of direct and indirect benefits of South African forests have been listed by several authors. However, use of NWFP from the various forest types depends also on the particular ethnic group existing in a particular region. The country has approximately 26 different ethnic groups distributed throughout the various bioclimatic regions.

Black South Africans represent the largest (73%) and fastest growing sector of the total population of the country, their numbers increasing from 3.5 million in 1904 to 20.6 million in 1980, due to an average growth rate of 2.35% per annum. The rural portion of this population is particularly dependent on indigenous plant and animal resources, although urbanization does not preclude the use of these wild indigenous resources. Fuelwood, traditional medicines, wild spinaches, wild fruit and animal skins are all items of trade from rural forest areas which regularly supply urban demands.

Although this paper is intended to describe the NWFP situation in South Africa, it is worth mentioning that the exotic forest plantations of pines, eucalypts and wattles, provide the urban structural timber needs of the region, the furniture timber being provided mainly by the relatively large southern Cape forests where this industry had an annual turnover of about US$ 5 million and employed 650 people in 1986 (Geldenhuys, 1990).

The important species used here are the yellowwoods (*Podocarpus* spp.) and the stinkwood (*Ocotea bullata*). Another species of significance is the sneezewood (*Ptaeroxylon obliquum*) which is used for a number of purposes including railway sleepers and beautiful furniture (Palgrave, 1977).

One of the main problems facing rural communities in South Africa today is housing. Many rural people cannot afford the expensive modern building materials which are on the commercial market; therefore they usually have to rely on the available forest resources in order to erect some sort of shelter. These resources are either free, or cost very little. A number of building materials from the forest have been reported; these include climbers, leaves, leaf petioles and tree bark. The use of wood for building varies with building style and availability of materials; however, a number of different tree and shrub species have been identified as being of importance in the construction of rural dwellings in South Africa (Johnson, 1982).

Another major use of forests by both the rural and urban communities of South Africa is that of fuelwood. Basson (1987) has reported that fuelwood accounts for 51% of the domestic energy use in South Africa, as well as representing the highest volume of forest product use by rural communities. Le Roux (1981) estimated that 6.6 million people in the rural areas of South Africa were dependent on wood as a source of energy. This has put a lot of pressure on the forest resources of the country. There are, however, a number of projects in the country which are intended to address in particular the fuelwood problem, mainly through the establishment of community woodlots.

The use of NWFP in South Africa

For many years the use of NWFP has represented an important aspect of the daily life of the lesser developed rural communities in South Africa, and to a lesser degree, also the urban African communities. Today many rural communities still depend for their livelihood on natural resources of their immediate environment. However, modern agricultural and forestry systems and technologies have reduced the awareness of most rural people that their physical well-being depends, to a large degree, on the way they use and manage their natural resources. The ignorance of the people can mainly be blamed on lack of education, since most of them are not bothered to sustain or replenish the resource in question.

Conventional agricultural crop production, however, still plays a significant role in the sustenance of rural South African communities. But poor seasonal yields and lack of variety mean that the daily rural diet lacks many of the mineral and vitamins essential for good health and disease prevention. The diet of most rural South Africans, as is the case elsewhere in Africa, is typically based on starchy staples such as maize and sorghum. In order to supplement the normal diet, a number of forest foods are used, the types and quantities varying according to region.

The range of NWFP available to rural communities in South Africa is quite extensive; this is reflected by number of uses made of them. Trees provide by far the largest number of NWFP.

VEGETAL NWFP

Food

South African forests provide a quite startling range of foods. These include edible fruits, nuts, plant leaves, wild spinaches and edible fungi, which all provide important dietary supplements to the black communities in the less developed areas of South Africa, by providing nutrients deficient in the normal starchy diet. This role of providing food supplements becomes even more important during drought periods, particularly in areas of marginal agricultural potential (Grivetti, 1979). Wild spinaches are not very common in South African forests, however, there are species such as the vine *Pyrenacantha scandens* whose leaves are a popular spinach in the Maputaland area of Natal (Cunningham, 1985). A number of tree and shrub species are very popular for their delicious fruits, seeds, nuts and sometimes roots. Among these, mention can be made of the cashew nut (*Anarcardium occidentale*), the marula (*Sclerocarya birrea*), buchu (*Agathosma betulina*), the mango (*Mangifera indica*), the guava *(Psidium guajava*), the avocado *(Persea americana)*, wild rosemary (*Eriocephalus* spp.), pecan nuts (*Carya illinoinyensis*), wild date palm (*Phoenix reclinata*), the ilala palm (*Hyphaene coriaceae*), the carob (*Ceratonia siliqua*).

Forage

Many trees and shrubs, and other plants are found in South Africa which are used as forage for various types of domestic livestock, wildlife (both animals and birds), and insects (particularly in apiculture). As with food-producing plants, various parts of forage species are used by different types of animals (both domestic and wild). Forage species are especially important in those areas of South Africa where conventional grazing and pastures have been degraded due to overstocking and human population pressure. A case in point here would the Kwazulu region of Natal where the degenerate grass, 'Ngongoni (*Aristida junciformis*), occupies large areas of land. This grass is virtually useless as animal feed or for anything else, and eradicating it is virtually impossible. In order to improve the carrying capacity of such 'Ngongoni veld, various authorities in South Africa have recommended the introduction of exotic fodder trees and shrubs which can also provide other products. This has been done to a certain degree, albeit amid strong resistance from certain groups and government authorities who consider many exotic tree and shrub species of the Leguminosae in particular, to be noxious weeds. However, introductions have been made in areas such as the Transkei and Kangwane, where species such *Leucaena leucocephala* in particular are doing quite well.

Although rural black communities in South Africa have kept livestock for many years, the growing and use of trees specifically for fodder production among such communities is relatively unknown. For some years now white farmers have been aware that trees can be grown and managed for fodder production, and indeed some have integrated this aspect with other types of agriculture to a very successful level, an example being the Lion Match Company, whose integration of sheep farming with their poplar growing opreations has been found to be quite profitable.

Local knowledge of trees for a long time was restricted to the use of indigenous species such as the buffalo thorn (*Ziziphus mucronata subsp. mucronata*), shepherd's tree (*Boscia albitrunca*) and the Elephant bush (*Portulacaria afra*) for fodder. In the tree-rich savannah veld of South Africa, such as parts of the eastern Cape, northern Natal, the Transvaal Lowveld, northern Transvaal, the Transvaal Bushveld and the Kalahari,

where livestock farming is practised, indigenous trees are sometimes deliberately protected for supplementary fodder production, particularly during drought periods.

Extension efforts by various groups in the promotion of agroforestry in South Africa have resulted in a number of rural farmers (both black and white) eagerly wanting to initiate fodder production schemes, and it is indeed gratifying to record that in various parts of the country some promising schemes have been started.

A number of tree and shrub species (both exotic and indigenous, wild and domesticated) already feature, or have recently been introduced for fodder production in South Africa. Some examples are the sweet thorn (*Acacia karroo*), tagasaste (*Chamaecytisus palmensis*), mesquite (*Prosopis* spp.) and the honey locust (*Gleditsia triacanthos*).

Medicines

An important aspect of rural life in South Africa for many years has been the use of plants for medicinal purposes. Traditional medicines are important to rural communities for medical, psychosomatic and economic reasons. Traditional medicinal NWFP include the roots, bark, leaves, branches, stems and flowers of trees, shrubs, climbers, epiphytes and parasites. Some of the most popular species used in traditional medicine are the bastard onionwood (*Cassipourea malosana*), the Swazi ordeal tree (*Erythrophleum lasianthum*), the stinkwood (*Ocotea bullata*) and the pepper-bark tree (*Warburgia salutaris*). Traditional medicines are also important to the rapidly growing urban black population, and they have a local and national multi-million dollar trade between rural sources and urban markets and shops.

Toxins

Many forest plants in South Africa have toxicc properties, some useful, some not. Some actually have lethal substances in their different components, be they leaves fruit, roots or some other part of the tree. However, the most important use of plant toxins by rural populations in South Africa is probably that made by the Bushmen; they use the poisons of certain plants to give their arrows more lethal power; an

example of this is the violet tree (*Securidaca longepedunculata*). Some plant poisons are also used to stun fish so that they can be easily caught. Examples are the bead bean (*Maerua angolensis*) and the confetti tree (*Maytenus senegalensis*).

Biochemicals

There are a number of plant species in South Africa which are sources of biochemicals. The best known is probably the black wattle (*Acacia mearnsii*) which is widely grown, especially in Natal, for the economic value of its bark from which tannin (used in the leather tanning industry) from which tannin is extracted. Another species whose bark has been used in tanning is the weeping boer-bean (*Schotia brachypetala*). A number of species are used particularly by rural communities because of the dyes they produce; these include *Adansonia digitata*, the horse radish tree (*Moringa oleifera*) and the small sourplum (*Ximenia americana*) whose seeds also produce an oil which is used by the rural people to soften leather and to rub on their bodies as a cosmetic; a similar oil is also found in the seeds of the large sourplum (*X. caffra*).

Fibre

A number of plant species lend themselves to exploitation by South Africa rural communities for the production of fibres which are an important component in the making of various household items, crafts and clothing items. For example, the bark fibres of the baobab are widely used for cordage, basketry, mats and cloths. Its root bark is also a useful string for nets, socks and mats (Booth and Wickens, 1988). Another useful species in this respect is the bastard brandy bush (*Grewia bicolor*) whose bark fibres are stripped and used for string, rope and cordage; this is the most important *Grewia* species for this use. The bark of the horse radish tree (*Moringa oleifera*), when beaten, produces a fibre which is plaited to make small ropes and mats. A tree which is much appreciated by rural South Africans for its long, durable and and tough fibres is the violet tree (*Securidaca longepedunculata*). Its fibres are used to make string and rope for fishing nets and lines, bird and animal snares, thread to sew bark cloth, coarse bark cloth, and bead string for necklaces. Besides trees, a number of climber and grass species are also used for cordage, basketry, brooms and clothing. *Abrus precatorius* and *Flagellaria guineensis* are some of the more commonly used climber species.

Handicrafts

This is one area where the rural populations are able to make a decent living. South African wooden handicrafts can be found in many urban markets and tourist shops, where the prices are rather high compared to what the rural craftsmen are paid for their wares. Since the 1970's, there has been a dramatic increase in the production and sale of handicrafts by rural private entrepreneurs and non-profit organizations (Preston-Whyte, 1983; Cunningham, 1987). Due to low capital outlay and use of locally available resources and traditional skills, handicraft production has become an important cottage industry in many rural areas of South Africa. Indigenous plant species provide the major source of raw materials for this trade. Some of the species used for handicrafts are the ilala palm (*Hyphaene coriacea*) (leaves used for weaving beer baskets, beer strainers), the pod mahogany (*Afzelia quanzensis*), the velvet bushwillow (*Combretum molle*), *Terminalia sericea*, (wood used for the making of grain stamping mortars), the Natal mahogany (*Trichilia emetica*), the torchwood (*Balanites maughamii*) the tamboti (*Spirostachys africana*) (wood used for making bowls, spoons and carved animals), the mat-rush, *Juncus krausii* (used for making mats), the monkey oranges (*Strychnos madagascariensis* and *S. spinosa*) (the fruits are used decoratively). Walking sticks made of the bastard tamboti (*Cleistanthus schlechteri*), the Cape plane (*Ochna arboea*), the Natal plane (*O.natalitia*), the hairy drypetes (*Drypetes gerrardii*) and the coffe-bean strychnos (*Strychnos henningsii*) are much in demand by tourists and urban dwellers (Geldenhuys, 1990). Magic rope (*Oncinotis inandensis*) stems are used for the making of basket frames and handles.

Ornamentals

South Africa provides a glimpse of paradise for the floricultural enthusiast. The southern and western Cape especially, with their variety of indigenous flowering plants, are regarded as one of the richest sources of flowering plants in the world today. South Africa's floral wealth has sprouted a prosperous new industry, namely the production of indigenous cut flowers. For example, fronds of the seven-week fern (*Rumohra adiantiformis*) are used extensively in the florist trade, both locally and abroad. The development of the export market for the fern since 1981 has flourished into an industry earning over US$300 000 per annum,

giving employment to about 250 - 300 people (Milton, 1987; Geldenhuys and van der Merwe, 1988). Epiphytic mosses have been harvested from Transvaal forests as packing material for flowers, floral arrangements and for exhibition purposes (Jacobsen, 1978).

Indigenous flowers and bulbs contribute approximately 1% of the total national value of agricultural production in South Africa. Not only are local markets served, but foreign currency is generated through the export of cut flowers and other plant material. The South African "fynbos" is the smallest of the globe's six plant kingdoms, but it exceeds all the others in its diversity of higher plant species. Many of the species found in the "fynbos" have become important floricultural products, and high priority is given by different institutions to research on this great natural resource of South Africa.

Other than the highly developed flower trade in South Africa, many tree and shrub species exist in the country which are important in horticulture and because of their amenity value. Many nurseries have been established in South Africa to cater for the growing ornamental tree and shrub markets, especially in the urban and peri-urban areas.

FAUNAL NON-WOOD FOREST PRODUCTS

For centuries the rural communities of South Africa have relied quite strongly for some of their requirements for survival on animals (both domestic and wild) and animal products. This is still very much the situation today, although the numbers of wild animals have tended to dwindle due to uncontrolled hunting in some areas.

The uses made of animals and animal products by rural South Africans are many and varied. Foremost among many rural people is the need to supply the family with much needed protein to accompany the usually mainly starchy diet. Hunting has always been regarded as part of the existence of the rural poor. As far back as 1770, when the first contacts between the white and native black inhabitants of South Africa took place in what is today the Eastern Cape Province, the nomadic natives (then called the Khoisan, later to become known colloquially as Bushmen and Hottentots) were already roaming the interior of the country in hunting

bands looking for game to kill (Becker, 1975). Even up to today hunting is still an important aspect of the daily life of the Bushmen. Hunting, however, is not restricted to the Bushmen; the Nguni tribes, the Sothos and Tswanas of South Africa also do some hunting although the methods tend to be different from those employed by the Bushmen.

The forests and the sparsely forested areas of South Africa provide habitats for a wide range of animals, birds, reptiles, insects and fish, all of which are exploited to varying degrees, and for various purposes, by the rural communities in particular.

Wild animals

For communities living in the vicinity of forests, natural woodlands and forest fallow areas, wild animals often play a significant role in local diets; in some cases they provide the single largest source of animal protein. Wild animals of different kinds can be found in all the physiographic regions of South Africa. Rural South Africans, and indeed the urban dwellers as well, are great lovers of most forms of meat. They like protein foods, however the problem is that these may be scarce at times and there are relatively few places where they can be obtained with ease. Of course, there are exceptions, but the majority of the rural population are rarely able to enjoy adequate protein in their daily diet. The slaughtering of domestic animals such as goats, sheep, cattle and poultry occurs very rarely, usually done only for special occasions such as wedding, burial or thanksgiving ceremonies. Domestic animals are kept mainly for milk production, draught purposes, or simply as a status symbol, therefore meat protein has to come from wild animals.

The methods used to snare and hunt wild animals are basically the same among the different ethnic groups, however some differences do occur. The Bushmen, whose skill in tracking, stalking and snaring game is unparalled in South Africa, rely most heavily for their protein on wild animals, because they do not keep any domestic stock, which also means they have no access to milk protein. Their hunting weapons consist of a light metal- or bone-tipped arrow (the quiver is made from the roots of the quiver tree (*Aloe dichotoma*) which they fire at close range with a short but sturdy bow, a tiny spear and a hunting club. Mindful of the limitations of their weapons, especially when in pursuit of the eland (*Taurotragus oryx*) or other of the larger antelopes, the Bushmen daub their arrows with poisons extracted either from selected roots, bark and

berries, or from the venom sacs of snakes, spiders or scorpions. Poisons are also prepared from the cocoons and grubs of a reddish-brown desert (Becker 1975). These vary from band to band, depending on what is available. The other ethnic groups tend not to use bows and arrows for hunting; their hunting weapons usually comprise of spears, sticks, clubs and small axes, and they are usually accompanied by dogs which chase the animals.

Wild animals which are hunted for their meat include various species of buck, genets, field mice, rock rabbits, porcupines, bush pigs and hares occasionally monkeys, which are relished particularly by the Zulus. Some tribes will not eat certain animals because of traditional beliefs.

Sometimes if the catch has been good, some of the meat is sold for cash, but this is not a very common occurence in the rural areas of South Africa.

Besides meat, which is the main product from wild animals, a thriving industry based on animal by-products such as hides, skins horns and bones exists in South Africa. The hides and skins are also used by some communities to make bags, cordage, and items of clothing such as dresses, shoes, belts and hats. Some of these items may be used locally, but most are sold at roadside markets. Sometimes the skins are sold to more sophisticated entrepreneurs in urban areas for the production of better-looking, and more expensive, leather items. Occasionally the hides and skins are used by the rural communities as mats or blankets.

The horns and bones are used by local craftsmen to produce beautiful artefacts which are then sold for extra income. The bones are sometimes collected until a sizeable amount has been accumulated, at which stage they are then sold to commercial bonemeal producers.

Another use made of wild animals is that of traditional medicines. Various animal parts are believed to have curative properties by some tribes. Animals whose body parts have been used in traditional medicine include the scrub and cape hares (*Lepus saxatilis and L. capensis*), the porcupine (*Hystrix africaeaustralis*), the polecat (*Ictonyx striatus*), and the pangolin (*Manis temminckii*) which is considered to be a particularly potent medicine by the Lobedu tribe of the north-eastern Transvaal.

The effectiveness of medicines made from animal parts has never been

ascertained. The use of wild animals in traditional medicine is, however, not as widespread as that of plants.

Birds

Birds are also an important aspect of the daily life of the rural communities of South Africa, which abounds with various species of birds. A number of different birds are eaten by the various ethnic groups, which is probably by far the main use made of them. Birds used for meat include the guinea fowl (*Numida meleagris*), the ostrich (*Struthio camelus*) whose meat is also commercially sold as biltong, the francolin (*Francolinus sephaena*), the common quail (*Coturnix coturnix*) and various types of geese and ducks. Most of these birds sometimes feature on South African restaurant menus, at very exorbitant prices.

The eggs of most birds are also collected for consumption by rural communities. The enormous eggshells of the ostrich are used by the Bushmen to store and carry water, once the contents have been eaten. The eggshells are sometimes sold to tourists as decorative objects.

Skins, especially those of the ostrich, are a valuable commodity in South Africa, where they are used for the manufacture of quality ostrich leather goods. Ostrich feathers, and those of a few other birds such as the peacock, whose plumage is one of the most ornate, are also trade objects. The feathers are normally used to adorn the head as part of traditional attire.

A number of birds are also caught alive and sold as pets, mainly to the white urban communities. These include the louries (*Tauraco* spp.), the parrots (*Poicephalus* spp.) and the buntings (*Emberiza* spp.). This is quite a thriving business in South Africa. Some birds are also used in traditional medicine, but again the efficacy of medicines produced from birds is uncertain.

Fish

Rural South Africans do eat fish, but it does not comprise a significant source of protein in their diet, particularly those living inland. This is probably because many of the smaller rivers tend to dry up during the dry season and therefore it might require a long journey to nearest source where plenty of fish can be caught. For those nearer the coastal areas,

such as the mangrove areas of northern Natal, subsistence fishing is almost a daily occupation. If the catch is good, some of the fish may be sold for cash, otherwise it is for home consumption. There is no doubt, however, that fish is a popular food item among South Africans of all races; for example, the most popular type of fish among the black peri-urban communities is the canned variety (sardines, pilchards, etc).

A number of ways are employed by rural South Africans to catch fish. The most common is the line and hook method. In the Maputaland area of Natal nets made of plant fibres are used. Another method, used particularly by the rural communities of the Limpopo valley in the Transvaal, involves the use of a poison prepared from the latex of the candelabra tree (*Euphorbia ingens*) and the lesser candelabra tree (*Euphorbia cooperi*). A bundle of grass is soaked in the latex, tied to a stone and thrown into a pool in the river. The fish are said to rise to the surface after 15 minutes, paralyzed but still breathing. Presumably this is a safe fishing method as there are no records of deaths having occurred due to the eating of fish caught this way. This shows how far the poor will go just to get protein for their families.

Recent innovations have tried to encourage the establishment of small fish production units, particularly in the Natal midlands, because of the realization that fish can be a cheap but important source of protein for the rural communities of South Africa.

Reptiles/Amphibians

The uses made of reptiles and amphibians by rural South African communities are almost the same as those made of wild animals and birds. South African forests are crawling with all types of reptiles and amphibians. Several members of the *Reptiliae* occasionally find their way into the cooking pot of a rural family, although less often than with wild animals and birds. Those eaten are usually regarded as delicacies. These include lizards, leguaans (*Varanus* spp.), frogs and toads, turtles or tortoises, and a number of snakes, including venomous ones such as the puff-adder (*Bitis* spp.) For various reasons snakes would seem to make up the largest percentage of reptilians used as meat by rural South Africans, judging from the number of cases cited regarding their use for local consumption.

The skins of many reptiles are in great demand inthe leather and fancy

goods industries. They are used in the manufacture of shoes, suitcases, bags, belts etc. The reptiles used include crocodiles, leguaans, lizards and snakes, particularly the larger types such as the python.

There are records of poisonous snakes, such as puff-adders and mambas, being used by some native South African tribes to kill buffaloes. The snake is caught and then anchored by its tail to the ground in the middle of a buffalo track, and is supposed to bite the passing animals (Fitzsimons, 1962).

Many urban South Africans delight in keeping reptiles as pets and quite a thriving business is carried out in this respect. The favoured reptiles are snakes, including pythons, chamaeleons, lizards, frogs and tortoises.

Finally, snakes, or more precisely their venoms, are very much in demand for their therapeutic properties. Many uses of the two types of venom, haematoxin and neurotoxin, have been evolved, the former in combating haemophilia, and the latter in providing sedatives and pain killers. South African medical scientists are continually working at finding new ways of using snake venom, which is also used as arrow poison by Bushmen.

Insects

Despite their small size, some insects contribute to the livelihood of man in quite a big way. Their importance in the ecosystem varies from place to place. In South Africa, the subsistence use of insects for the benefit of man is mainly limited to a few species considered edible by the rural communities, and bees (*Apis spp.*) which are probably by far the most important insect in the country, in terms of economic products and their role in pollination.

Honey is by far the most popular (and profitable) insect product in South Africa, both among the rural and urban communities.

Honey bees occur either wild or in farming in South Africa. In the rural areas, wild colonies are regularly raided for honey. Among the Bushmen in particular, honey is a great favourite. Other ethnic groups in South Africa also enjoy wild honey, which they use as a substitute for sugar, and often in the brewing of local beer.

The caterpillars of a number of moths and butterflies are relished by some rural communities. The mopane worm, a great delicacy of both the rural and urban communities of the northern Transvaal, is sometimes sold in local markets (Gelfand, 1971), when the harvest has been good.

FORESTRY SERVICES

The use of trees and forests in providing services is well known to both the rural and urban populations of South Africa, although the urban communities tend to be much more aware of the service role of trees than the rural dwellers. The rural communities of South Africa tend to perceive trees or forests as an unending resource to be exploited for their own well-being, and not because it can protect the soil, feed animals (both domestic and wild), and at the same time enhance their immediate surroundings, and protect rural homes against bitter South African summer and winter winds.

Range

For many years, both the rural and urban South African communities have used trees (both indigenous and exotic) in their livestock management systems. In some cases, trees have been deliberately protected in order to give shade to livestock against the searing heat in the summer and the harsh winter. Both animals and crops need protection from the elements, as has been shown by research, which suggests that shelter from hot or chilly weather can improve production from all types of agricultural crops and livestock. White farmers in particular, are now aware that trees can be managed to increase productivity from their animals. The rural communities, however, are only aware that the foliage of certain trees is useful as animal feed, but they do not seem to consider management of such species for the sustained production of fodder.

In some regions of South Africa, the management of trees and pasture in a single system sometimes improves animal productivity. This is especially the case in the Karroo where *Acacia karroo* is commonly associated with the sparse dryland pasture in the rearing of sheep. Other systems found in South Africa involve the use of species such as *Dichrostachys cinerea, Acacia albida, Boscia albitrunca* and *Euclea spp.*

Most trees which are browsed by domestic stock also tend to be eaten by wild animals and birds.

Soil improvement and protection

The use of trees for the protection and improvement of the soil is relatively unknown among the black rural communities of South Africa; can also be said about the white farming communities, who, even though they may be much more aware of the importance of trees in their local environment, do not deliberately use them for their soil protection and improvement qualities. However, a few farmers have begun to realize this potential, and tree planting, especially among the white farmers, is on the increase. The species favoured are those that tend to provide several products and services such as erosion control (*Acacia* spp.) shelter (*Crataegus pubescens*) hedges or windbreaks (*Casuarina cunninghamiana*) and bee forage (*Eucalyptus* spp.).

Parks and reserves

South Africa is one of the leading countries on the sub-continent in terms of efforts to protect and conserve its flora and fauna, particularly species considered to be endangered or over-exploited. There are many parks and nature reserves in the country which not only serve to conserve theindigenous biodiversity, but also earn much-needed incomes for those involved in their day to day management. Many of the parks and nature reserves offer a number of recreational facilities such as hunting, fishing, bird watching, nature trails, hiking, camping, and the occasional "braaivleis" (barbecue) party (non of which can usually be afforded by the locals. Tourists come from all over the world to visit South African game parks and nature reserves. The poor rural communities of South Africa,(at least those that live near the parks) however, often do not benefit directly from these establishments, the only legal beneficiaries being those who are lucky enough to be employed as game rangers and assistants; the other beneficiary is the poacher, who often plies his trade at the risk of severe punishment by the authorities.

Aesthetics

South Africa boasts some of the most spectacularly beautiful forestry areas in the region, not only such, but also some unique structures of old, set in forestry landscapes. These are usually much appreciated by foreign tourists and do indeed attract a lot of trade from outside the country, but a lot of South Africans also visit these areas.

Many scenic routes, such as the wine, fruit and flower routes of the Cape, are found throughout the country. Another example is the "fynbos" of the south-western Cape; no region of comparable size in the world is richer in plant species that the narrow zone bounded by the south-western Cape's fold mountains and the sea. The Afrikaans word "fynbos" (literally "delicate bush" or "fine bush") used to describe the indigenous vegetation of the area is almost inadequate, considering the wealth of flora that includes some 600 kinds of heath (*Erica spp.*), almost 70 proteas (Proteaceae), and over 50 *Disa* species. To walk through the "fynbos" in spring can leave one with the impression of not being in the wild, but in a prolific garden (Readers Digest, 1990).

ASSESSMENT OF THE IMPORTANCE OF NWFP IN SOUTH AFRICA

Undoubtedly NWFP have a very important role to play in the local economics and nutrition of the various ethnic groups of South Africa, as well as the daily subsistence of the rural communities in particular. It was mentioned earlier that agriculture, on which the rural people of South Africa have depended for centuries, has been modernized, but still cannot feed the masses. Asibey and Child (1990) point out that sustained high rates of population growth characterize almost every country in sub-Saharan Africa. The associated urgent demand for increased food production has prompted many rural African farmers to shorten fallow periods, in an effort to try to obtain increased yields from low fertility soils, and to grow crops on marginal lands. This usually results in the steady degradation and impoverishment of arable land. And, where livestock populations are growing as fast as, and in some areas, faster than the human population, Africa's vast grazing lands are also undergoing similar destruction. This is particularly the case where the loss of traditional grazing land to crop production intensifies the pressure on the remaining area.

In South Africa, resource-poor rural communities cannot afford the type of costly inputs required by modern agriculture in order to obtain reasonable crop yields. This problem is compounded by ever-increasing unemployment coupled with the rapidly escalating cost of living in the country, as well as rapid population growth. In order to make ends meet, and to add variety to their regular starchy diet, rural communities in South Africa rely to a large degree on their immediate natural resources in the form of NWFP. Although many are not aware that the natural resource base is not inexhaustible, particularly if it is not properly managed, they do however, place great importance on various NWFP. Many rural families in various parts of the country are continually searching for alternative means of livelihood, and local NWFP have offered an opportunity. The use of NWFP among rural dwellers may either be for home consumption, or for sale to earn extra income for the purchase of other basic household necessities (e.g. salt, tea, sugar, paraffin), and sometimes to send the children to school. Examples of community-based subsistence economies based on local NWFP can be found in areas of Natal, where the "muti" (traditional medicine) trade is quite literally big. The importance placed by rural communities on NWFP is further shown by the willingness of some of the locals to try and sustain the resources through small-scale agricultural production, and also to manage existing ones (such as paw-paws, guavas and bananas) sustainably.

The extent to which rural communities rely on NWFP in South Africa has been shown by several authors and researchers. Cunningham (1990 a, b,) has shown that the palms *Hyphaene coriacea* and *Phoenix reclinata* are very important to the rural people of Maputaland coastal plain in Natal because they are a source of weaving material, palm wine and edible fruit. Despite their small size, resulting from tapping, the high density of the palms provide a commonly used resource for the local Thembe-Thonga people who also use the area for cattle grazing, subsistence cultivation, and the gathering of wild fruits and traditional medicines.

At the district level culms of the saltmash rush (*Juncus krausii*) are a favoured and extensively used material for the weaving of traditional articles by rural women in Natal/Kwazulu (Heinsohn and Cunningham, 1991). Geldenhuys (1990) also points out that in the Transkei the use of certain NWFP has become important to the livelihood of the local communities; he reports that in the Port St. John's area of the Transkei,

climbers are the basis of a craft industry, mainly baskets and mats, which form an important part of the local economy and traditions of the local Pondo people. The industry is worth more the USD40,000 per annum and grows rapidly with organized marketing methods. In the Karroo region, the sweet thorn (*Acacia Karroo*) is the basis of extensive sheep and cattle farming in the area, mainly because of the nutritious fodder (leaves, flowers and pods) it produces (Aucamp *et al.*, 1984).

At the national level, mention has already been made of the booming trade in cut and dried flowers, both locally and internationally. Furthermore, a number of fruit trees such as *Psidium guajava*, *Persea americana, Mangifera indica* and *Carica papaya* are the basis of a booming local and export business. This shows that with proper management NWFP can actually contribute quite significantly to the national economy, not only in terms of job creation, but from foreign exchange earnings as well. Another NWFP of national significance in South Africa is the wild fruit liqueur which is prepared from the marula fruit (*Sclerocarya birrea*) and is marketed locally and for export. Again at the national level, South Africa's game parks and nature reserves with their kaleidoscope of flora and fauna, attract thousands of local and foreign tourists each year.

RELEVANT NWFP IN LOCAL COMMUNITIES

As already indicated, there is an astounding wealth of NWFP in South Africa, which are used for various purposes and to varying degrees by local communities. Some are considered as vital to the day to day existence of certain communities, some are regarded purely as luxuries, while others are only important in times of acute need, such as the case may be during severe droughts.

The following are some NWFP which already feature significantly have the potential to play a major role in the general livelihood of both rural and urban communities of South Africa.

VEGETAL NWFP

A number of vegetal NWFP provide regularly for the needs of the rural people of South Africa. The resource base includes food producing species such as fruit trees, of which there are several types whose current productivity at the national level is quite high, and which can certainly be improved in the rural areas. Fruit species which are considered important among local communities include the marula (*Sclerocarya birrea*), which is so highly esteemed by the rural population that it is seldom cut down, the guava (*Psidium guajava*), the avocado (*Persea americana*), the mango (*Mangifera indica*), the banana (*Musa sapientum*), the pawpaw (*Carica papaya*), and cashew nuts (*Anacardium occidentale*). All of these species already grow in some areas of South Africa and the development and expansion of their production in the rural areas should not pose many difficulties.

Mushrooms are another food NWFP with a lot of potential in South Africa. Reports of mushroom eating by rural communities in South Africa date back as far as the early 1920's; for example, the Zulus have always been known to enjoy the beefsteak mushroom (*Schulzeria umkowaani*). Fox and Young (1982) also indicate that in the Ciskei the Xhosas roast the this particular mushroom over hot coals. Cunningham and Pieser (1991), while studying the traditional foods of the Zulus, showed that mushrooms featured quite significantly in their diet. Today mushrooms are a very common item in South African supermarkets and are enjoyed virtually all by the different ethnic groups.

Medicines are nother NWFP of importance to the rural communities of South Africa. Many plants are used for the treatment of a variety of ailments and diseases, some are effective while others are not so effective. Some of the favoured species have already been mentioned above. But of note is the fact that the traditional medicine trade is very important to a large section of the rural and urban population in South Africa. The growing of some of these medicines could easily constitute a full-time and profitable occupation for some of the rural people. However, another two medicinal species which are worth a mention these are the mountain Buchu (*Agathosma betulina)* and the wild ginger (*Tetradenia riparia*) (formerly *Iboza riparia*).

FAUNAL NWFP

The importance of bees and their products has already been mentioned. Enjoyed by millions of South Africans, both rural and urban, the main be product, honey, is not as easily accessible to the rural people as it might sound. The urban communities have relatively easy access to honey because they can buy it (most being employed) in markets and shops. For the rural communities, however, the only honey is natural honey, and gathering it has been made somewhat easy the fact that they know their environment and do not need specific gadgets for the collection of the product.

There are approximately 2 000 bee farmers is South Africa; whether any of those are rural and/or black, is uncertain at the moment; but it would appear that they are all white farmers.

Honey production in South Africa has been reported at 3200 metric tonnes/year (van Hoven, 1991). It is obviously an industry with much potential for the rural poor; the only lacking factor being education in this regard, and for rural South Africans should give much needed nutrition, and if commercialization is the idea, much-needed income.

Institutional Aspects

South Africa is in a unique position regarding the institutional handling of all aspects of its natural resources. Unlike many other developing countries, South Africa has the infrastructure and the manpower required to oversee all types of natural resource development, management and protection. However, the institutional infrastructure is mostly geared towards assisting the urban commercial sector and the big white commercial farmers. Only recently have efforts been increased to address the problems of feeding and creating employment for the poor rural and urban communities, through the responsible use of natural resources.

Institutions and government

Several institutions and organizations, as well as the South African government have responsibility relating to the development, preservation and sustainable use of natural resources in the country. Different NWFP are handled by different organizations.

Government

The responsibility for many of South Africa's natural resources is vested with the Department of Community Development (formerly the Department of Agricultural Credit and Land Tenure). According to relevant legislation such resources are deemed to belong to the state although they are for the benefit and use of the general public. This category includes resources such as the sea and its shores, state forests, (including forestry nature reserves, protection forests and wilderness areas), national parks, provincial and local nature reserves, rivers and certain dams.

The government is directly charged with the management of the mentioned natural resources. Although not always the owner of specific NWFP, which are relevant to rural communities, the government nevertheless controls the use of such resources in the public interest even, where such resources are privately owned. Examples are soil conservation, wildlife, (birds, animals and fish) plants, some lake areas, mountain catchment areas, mineral resources and underground water.

The government is also entrusted with the planning of how land (both private and government land) is to be used. Land-use planning at the national level is the responsibility of what used to be the Department of Constitutional Development and Planning. However, the responsibility for environmental matters and natural resources lies with a number of government agencies. Most government departments are fully manned and equipped for their various tasks; however, as mentioned before, the channelling of such efforts is questionable, judging by the help given rural white farmers as opposed to rural black communities.

Institutions

The South African government, through its various agencies, works very closely with a number of institutions in the country in order to manage various natural resources and the environment in general. South Africa has also been involved in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) from the very early stages of its formation. It is also one of the founder members of the International Union for the Conservation of Nature and Natural Resources (IUCN) which produces the International Red Data Books (RDBs). South Africa was one of the first countries in the world to

publish its own regional RDBs, the production of which is currently a joint venture undertaken by the Council for Scientific and Industrial Research (CSIR), the Endangered Wildlife Trust and the Department of Environment Affairs.

In terms of the South Africa Constitution, the responsibility for the protection of fauna and flora, and specifically the control on the use of vegetal and faunal NWFP is vested in the four Provincial Administrations. The nature conservation authorities of the Transvaal, the Orange Free State, Natal and the Cape Province have been designated as CITES Management Authorities. The Department of Environment Affairs acts as the central co-ordinating and policy-making authority in respect of environmental conservation in South Africa, and as such, has also been designated a CITES Management Authority with the responsibility of co-ordinating the implementation of the Convention internally, and to act as a channel of communication between the CITES secretariat and the provincial management authorities and other bodies involved.

Several South African universities also have institutions which are very active in promoting the development and sustainable use of natural resources in rural areas. The Institute of Natural Resources of the University of Natal has done some appreciable work in this regard with the rural communities of Natal. Others of note are the Univeristity of Zululands's Centre for Low Input Agriculture and Research Development, and the Wits Rural Facility of the University of the Witwatersrand in the Transvaal.

The provincial nature conservation authorities, and other conservation and research institutions such as the National Parks Board and National Botanical Institute have at their disposal the services of a devoted corps of biological scientists, almost all of whom are whites, the other race groups being poorly represented. One of their main responsibilities is to monitor the protection status of all species on a continuous basis. Their work is supplemented by scientific research at various South African universities.

One of the results of this comprehensive effort is the production of the South African Red Data Book series. Red Data Books have already been produced on terrestrial mammals, birds, reptiles and amphibians, fish, butterflies as well as the "fynbos" and Karroo biomes.

The homelands of South Africa tend to have their own nature conservation set-ups, but these are not as well-staffed or well-organized as the provincial ones. They depend almost entirely on expertise and funding from the central South African government.

Research and Development

There is a number of research organizations in South Africa whose work is important in the study of natural resources and the environment, but very few of these are private bodies. The majority are controlled and funded by universities, government departments and the Council for Scientific and Industrial Research (CSIR). The limited number of research bodies and the means at their disposal make close collaboration essential. Of particular importance in this respect is the CSIR's Co-operative Scientific Programmes (CSP). The CSP administers a series of National Programmes which offer mechanisms and means for co-operation and collaboration between research organizations, universities, government departments and individual scientists.

There is also a number of voluntary organizations which help in the fight to save South Africa's environment and its natural resources. Such organizations range from permanent scientific and professional associations, to pressure groups which exist for only as long as the issue in question remains unresolved; examples are Earthlife Africa, the Wildlife Society, the Botanical Society, the Ornithological Society and the Dendrological Society.

Education

A number of South African universities and colleges offer training in a number of disciplines ranging from environmental and natural resource management to nature conservation. Of note is the University of Cape Town's environmental courses which are quite popular in South Africa; however, once again this type of training seems to be mostly for white students, although this situation is beginning to change, giving the disadvantaged youth of South Africa access to environmental and nature conservation courses. This would indeed be to the advantage of the rural communities as they will be in a position to manage their own natural resources; they will be much more aware of the problems inherent in the sustainable utilization of local NWFP.

Funding

Funding for work on NWFP in South Africa comes from a variety of sources. The government funds its own departments and affiliated organizations, and also offers assistance, in funding or in kind, to some private organizations particularly if they are non-profit making. The majority of private organizations get their funding from donations by the business sector and individuals both from South Africa and outside. In this respect, the South African Nature Foundation (SANF), which is the World Wildlife Fund (WWF) representative in Southern Africa, helps to raise and distribute funds for nature conservation projects in South Africa and other countries in the sub-continent. The SANF also assists in all forms of nature conservation, and in the education of the public. In gaining monetary commitments from major financial houses the SANF has helped increase private sector participation in the environment. A few organizations get their funding from consultancies, while professional associations and the smaller societies depend mainly on membership fees and the sale of promotional materials.

Legislation

Comprehensive legislation exists in South Africa for the protection of the environment and natural resources. South African environmental provisions are contained in an extremely wide variety of parliamentary acts, provincial ordinances, local by-laws and ministerial regulations. Some statutes regulating environmental affairs deal exclusively with such issues. For example the National Parks Act 57 of 1976 and the various provincial nature conservation ordinances, fall into this category. Other statutes, although not exclusively environmental statutes, may be regarded as being of a predominantly environmental nature. Examples are the Forest Act 72 of 1968, the Mountain Catchment Areas Act 63 of 1970 and the Lake Areas Development Act 39 of 1975. Legislation has also been enacted for the control of the exploitation of, and trade in endangered species. High penalties (up to US$ 50 000) and long periods of imprisonment (up to ten years) are applicable.

The law enforcement authorities in South Africa have a force of almost 1 000 law enforcement officers at their disposal. They work in very close collaboration with the Endangered Species Unit of the South African Police. In 1991 this co-operation resulted in 81 cases being brought to court.

TECHNICAL DESCRIPTION

Because of the potential they are deemed to have in improving the livelihoods of rural South Africans, three NWFPs will be discussed in this section.

Food (both vegetal and faunal)

The rather heavy reliance of rural South African communities on NWFP has already been discussed. The different black peoples use NWFP more or less similarly although there are some variations. The importance of the various wild and domesticated foods also vary from place to place, but it is generally acknowledged that food and nutrition, being some of the most basic needs of the rural people of South Africa, are also some of the most important products obtained from South Africa's natural forest areas.

CULTURAL PRACTICES

Harvesting

For most food NWFP, harvesting by rural communities simply means going into the area where the food is growing and collecting it. Methods of collection vary depending on the type of food and/or plant species. The leaves, fruits, seeds, nuts, flowers, sap and sometimes roots of various plants may be used as food.

The leaves of wild spinaches such as the cockscomb (*Amaranthus* spp.), fat hen (*Chenopodium album*), milk thistle (*Sonchus oleraceus*) and black jack (*Bidens pilosa*) are simply picked from the plant, placed in a bag or basket, and taken home.

Wild spinaches are usually first washed, the fibrous parts being removed and fed to livestock, and the cooked to be eaten with maize porridge. Occasionally, if the harvest is good, the spinaches may be dried and stored in bags to be eaten at a later date. Wild spinaches are usually collected not far from the homestead, in any case, not more than a three hour walk to the collection area and back.

Various parts of a number of tree and shrub species are popular in the diet of may rural people in South Africa. Again collection is done from trees in and around the community. Harvesting methods differ for the various species, but in most cases the edible part is picked straight from the tree, placed in a bag or basket and taken home, where it is either eaten fresh, processed or preserved in one of a variety of ways. For example, the monkey orange (*Strychnos madagascariensis*) fruit is picked green to protect it from wildlife, and buried in the ground to ripen (van Wyk, 1974) after which the fruit pulp (which does not shrink on drying) is sun-dried and kept as a food for lean times; the fruits of the natal mahogany (*Trichilia emetica*) are picked when they ripen in January/February. They are then taken home where the seeds are removed from the capsules and soaked until the scarlet arils are a light yellow, at which stage the seeds are separated from the arils. The arils are then mixed with sweet potatoes, squash or peanut flour and eaten as a main meal; this is a popular dish of the Natal communities (Cunningham and Pieser, (1991).

Generally, the rural people do not have to walk very long distances to gather traditional foods from the forest or veld, in whose vicinity they usually live. Very occasionally, they may have to travel from dawn to dusk, on foot, to gather a particular food which is abundant elsewhere, mainly for home consumption, sometimes, if a lot has been collected, some will be sold to the neighbours.

Other methods of harvesting fruit or nuts involve their collection once they have fallen down from the tree. A good example is the marula (*Sclerocarya birrea)*, whose fruit, a great favourite with South African rural communities (Palmer and Pitman, 1973), is usually collected when it is about to ripen (around February/March in South Africa) and has dropped dropped to the ground. Another species whose fruits drop before they are quite ripe is the mobola plum (*Parinari curatellifolia*); both fruits go through the final ripening phase on the ground (van Wyk, 1972).

Another food-harvesting method is that employed in the tapping of certain palm species for sap which is used in the making of a traditional wine. The main palm species used for this purpose in South Africa are the wild date palm (*Phoenix reclinata*) and the ilala palm (*Hyphaene coriacea)*. Although pastures, fuelwood, wild fruits and game animals are traditionally considered to be natural resources under communal

ownership, palm wine tappers are traditionally allocated "territories" in the palm veld for their exclusive use in producing palm wine (Cunnigham, 1990a). In Natal persons wanting to tap palm sap for the first time must first approach the local headman, who will then indicate a suitable area; thereafter a payment of cash, or a quantity of palm wine, is made to the headman and a further, equal quantity of wine during the course of tapping. Boundaries of these tapping areas are respected by all concerned and any disputes are taken back to the headman (Cunningham, 1990a).

The tapping process involves selecting clumps of palms and preparing large stems within these for tapping after burning each clump to remove the undergrowth and leaf spines. Selected stems are trimmed to initiate sap flow using razor sharp bush knives. A woven palm leaf is placed over the palm stem and collection container, protecting it from rain, dust, sun and insects. The stem and young leaf bases are cut at a slight angle to guide sap onto a leaf gutter and into the clay collection container. By the end of the tapping period these young leaf bases have been removed by trimming two to three times per day over a five to seven week period.

Although rural South Africans like to eat faunal NWFP when they are available, they are unfortunately not as easy to harvest, and not as abundant as the vegetal food NWFP. However, some do play an significant role in the diet of some rural communities.

As mentioned earlier a number of wild animals are caught and eaten by some rural communities, although it is difficult to determine the extent to which wild meat contributes to local diets. The hunting of large game animals is legally forbidden in South Africa, although it still occurs in some areas, and many of the more commonly consumed faunal NWFP such as caterpillars, locusts and grasshoppers, tend to be eaten as snacks, with the result that their consumption goes unrecorded(FAO, 1989).

Most animals and birds are usually caught during a hunt, which may include the use of sticks, spears, clubs, bows and arrows, and the odd gun. Other than hunting, most wild animals are trapped using a variety of snares devised by the rural people themselves or purchased from stores in adjacent urban areas. Favoured animal include springhares, porcupines, rabbits, and wild fowl (ducks, geese). Again, most rural South Africans are not concerned with the legalities of hunting and trapping wildlife.

Of the insects eaten by rural South Africans, one of the most popular is the emperor moth (*Imbrasia belina*) caterpillars which are found on the mopane tree (*Colophospermum mopane*). Rural people collect the protein-rich larvae in sacks or baskets from the mopane trees.

Another insect of importance, not only to rural communities, but also to commercial farmers, is the bee (*Apis* spp.). Honey from the bees has long been used by the rural people of South Africa as a food and a sweetening agent. The collection of wild honey, although not without its risks, is a simple matter for the rural people. When honey is known to be in a tree a fire is lit underneath to smoke out the bees. No special clothing is worn for protection. A lighted stick, still smoking, is thrust into the hole from which the bees emerge dazed. A hole is then made in the hive with an axe just below or above the natural opening, or sometimes in both places. The honey is then taken out through one of the openings and placed in a container. For bees which nest in holes in the ground, after they have been smoked out, a spade or some other digging instrument is used to dig out the hive from which the honey is then extracted.

One of the most important means of livelihood for the rural people of South Africa, craftwork, demands the collection of various materials from a number of different plants either by the craftsmen themselves or by commercial harvesters of craft materials.

Again, as with the food NWFP, the harvesting of craft materials simply means any individual going to an area where the resource is found and harvesting it, as craftwork resources in the rural areas of South Africa are also regarded as common property. Harvesting methods differ according to plant species and the plant part to be harvested.

The plant parts mostly used in craftwork are tree roots and bark (used in the making of dyes) and leaves/culms/thin stems used in the making of woven articles.

Various implements are used for harvesting craft materials. These include knives, sickles, axes, bush knives and various types of saws. Thin stems of species such as *Acalypha glabrata, Canthium setiflorum* and *Dalbergia obovata* are cut off with bush knives and tied into headload size bundles. Branches bearing leaves are also cut off in a similar way, after which the leaves are removed by hand and also tied

into bundles. Leaf-yielding species include *Cyperus latifolius*, *Digitaria eriacantha*, *Hyphaene coriacea* and *Phoenix reclinata*. Bark is usually stripped off the tree trunk in long strands after making an initial cut with an axe or a bush knife; pieces of bark can also be removed by repetitive (almost vertical) blows of the bush knife or small axe on the tree trunk. Species whose bark is used for dye production include *Ficus trichopoda*, *Trichilia emetica* and *Schotia brachypetala*. Roots of species such as *Acacia burkei, Aloe martothii* and *Terminalia sericea* are usually collected by digging around the tree and cutting off pieces with a bush knife or small axe. Culms or stems of species such as *Cyperus natalensis*, *C. sexangularis*, *C. textilis* and *Juncus krausii* are usually harvested using a sickle, small sharp knife or bush knife, after which they are tied into bundles ready for transportation.

Traditional medicines

Many rural people in South Africa still believe strongly in the use of traditional remedies for a variety of illnesses; consequently the harvesting of vegetal NWFP for traditional medicines can be found virtually throughout the whole country.

The harvesting of traditional medicines in South Africa takes many forms. In some case it is done for practical purposes while in others it is based on traditional harvesting methods. Here again, various plant parts are gathered. The main parts used are leaves, small branches or twigs, bark, fruits and roots. The methods used to harvest these are almost similar to those employed for wood and fibre for handicrafts, except that traditional medicine practitioners tend to use only their bare hands for harvesting, except when digging roots and bulbs.

The species used for traditional medicines are too numerous to mention here, but some of the more important ones are *Warburgia salutaris, Ocotea bullata, Agathosma betulina* and *Boweia volubilis*.

Transportation

This is one area which poses a few problems for the rural South African. The road infrastructure is often very inadequate in most rural areas, therefore most journeys have to be done on foot. Some areas are lucky enough to have a main road passing through or near their collection areas, in which case the gatherers may catch a taxi or bus to and from collection points and vice versa.

For most wild foods (both vegetal and faunal), collection or gathering is done in the surrounding adjacent forest or natural woodland areas, and usually the only means of transport is walking since large quantities of food are not usually gathered, that is, only enough is gathered for home consumption. If large quantities of a particular wild food are gathered, then some of the family members may help to carry the produce on the head or shoulder in bags, baskets or bundles, and also in hand-held baskets. Occasionally, the gathering of wild foods may require a whole day trip, but it is often a matter of three or four hours, and this usually only happens in times of scarcity.

The main problem arises when large quantities of material, such as palm leaves and culms of *Juncus krausii* for weaving, have to be transported from the source to the homestead or processing centre. In such cases road transport is often used. For example, in Natal, syndicates of women who use *Juncus krausii* for craftwork usually hire a vehicle for the collection of this material, which may be up to 25 km away, thereby sharing the transportation costs; otherwise they have to rely on suppliers to bring them the materials, thus incurring extra costs.

South Africa's modern and extensive transport system plays an important role in the national economy and also those of neighbouring countries. For the rural communities of South Africa, the transport system is particularly important in the marketing of their craftwork, medicines and fruits such as bananas, mangoes, guavas and pawpaws further afield from their areas.

Occasionally, some of the rural people may have a horse or ox-drawn cart which they use for the collection and transportation of bulky NWFP, and sometimes this is hired by other commercial NWFP operators.

PROCESSING AND STORAGE

A number of NWFP found in South Africa have to undergo some form of processing before they can be consumed, marketed or stored.

Food

Most wild fruits are eaten fresh in the veld or as a supplement to the main meal at the homestead; others such as the rubber vine (*Landolphia kirkii*), the Zulu milkberry (*Manilkara concolor*), the large sourplum (*Ximenia caffra*) and the spiny monkey orange (*Strychnos spinosa*) are mainly added to thin porridge (Cunningham and Pieser, 1991) after being washed and cut up into small pieces.

Some fruits such as bananas, are harvested just before they are fully ripe, and taken home where the ripening process is allowed to run its full course. Sometimes the fruits are sold in the partially ripe state to avoid wastage as the shelf life of ripe fruit is rather short (sometimes only a few days); this is especially the case with bananas, mangoes, guavas and pawpaws.

If they are not eaten fresh, fruits may be processed. In South Africa several methods exist of doing this. Sun-drying one of the more common methods. The categories of sun-dried foods are fruit, fungi and wild spinaches.

An example of fruit-drying in Natal is that of *Strychnos madagascariensis* fruit pulp. The fruit shells are first broken open and the pulp removed along with the seeds. These are then placed on mats and then dried over a fire in a pit. When the pulp has changed to an orange brown colour, but is still moist, it is separated from the pips with a sharp, flat instrument. It is placed in the sun to dry, then finally over the fire again. The dried pulp is then stamped in a wooden mortar until sticky, in which state it can be stored for up to five years.

Other fruits are dried directly in the sun. For example, bananas may be sliced, spread out on mats and placed in the sun for drying, a process lasting up to two weeks, after which the dried product can be stored.

Fungi or wild mushrooms and wild spinaches can also be sun-dried. Dried mushrooms are ground into a powder and then added to soups made with peanut flour and wild spinaches which can also be dried to be eaten at a later date. Cunningham and Pieser (1991) report that two species of fungi are eaten raw in Natal, although they do not give the names of the species.

In South Africa, cooking is by far the most common method of processing wild and domesticated foods, although the heat may reduce the content of some essential nutrients in some of the foods. The Bushmen are probably the only rural South Africans whose vegetal diet is not commonly subjected to cooking; they eat most wild foods raw, which is probably why they do not suffer from many diseases as they get the full complement of nutrition from plants. Cooking applies mainly to wild spinaches, fungi and some fruits, but generally it is not common to cook fruits in the rural areas of South Africa. In the urban areas, fruits such as guavas may be cooked in canning bottles, with sugar added in order to preserve them for later consumption.

Fermentation is another processing method employed by rural South Africans. For example in Natal and the Transvaal palm and marula wine are quite popular, the former being made from the fermentation of palm sap, and the latter from that of marula fruit juice. The fermentation may be done in a clay or plastic container; the wine is also stored in these.

In the more commercial sector, processing methods include juice extraction, canning, and the production of liqueurs and wines.

The seeds of some species, such as the marula, are edible, and may be extracted by various means such as cracking the shell with a stone to get at the kernel.

Fibre

The processing of fibre materials normally means their actual weaving into specific products such as mats and baskets. As mentioned earlier, the main types of fibre used by South African rural communities are climbers, thin tree stems, palm leaves and culms of certain reeds and grasses.

Climbers and thin stems, which usually form the basic framework, are used while still green so that they can be easily bent into the required shape; they are kept in water to maintain their flexibility. Baskets are constructed of fibre coils comprising narrow strips of palm leaf pinnae wrapped around an inner core of the same material, grass leaves or the stems of climbers. This material is prepared by cutting and drying young, unopened palm leaves, tearing them into strips, and soaking them in water before use to make them less brittle. Designs are worked into the weave by using palm leaf strips dyed in extracts of the bark and roots of certain tree species.

After harvesting, culms of the reed *Juncus kransii*, are dried and then cut into different lengths depending on the articles to be made, the lengths of reed are then woven into the required product, usually mats of varying sizes and designs, being held in place with twine woven across the culm length.

Medicines

As already indicated traditional medicines for the treatment of innumerable diseases and conditions are many and varied in South Africa, and methods employed for their processing before they can be used or marketed are equally numerous. Some traditional medicines require several stages of processing before they can become useful.

Generally, however, drying is the commonest processing method employed although some plant parts and used fresh. Almost every medicinal plant part imaginable is usually first dried before it can be processed further or stored.

Boiling the relevant plant part to extract the active medicinal ingredients (infusion) may be the next step of processing; sometimes this is preceded by grinding the part into powder, which in itself is also considered as the final processing stage, particularly if the powder is to be used as a snuff.

Sometimes the plant parts are squeezed to extract the juice which is then used, usually immediately, as a medicine. The juice can also be extracted by tapping the stems of some plants.

Insects

The main insect product in the rural areas of South Africa, honey, does not undergo any special processing, except for the squeezing of the honeycombs to extract it. It is then stored in a jar for later use. Of course, in the commercial sector honey and beeswax are processed into a variety of products in the food, confectionery and pharmaceutical trades.

After being harvested, mopane worms, another insect product, are squeezed to remove the intestinal contents and then washed in water. They are then cooked immediately in water, and the following day they are spread out on a mat or rocky place to dry in the sun. They are sometimes also fried after cooking and then stored for future use.

Marketing and Trade

There is a wide variety of practices regarding the trade and marketing of the various NWFP found in the different parts of South Africa. Most NWFP and their secondary products are disposed of in several ways: they may be used directly by rural households, marketed locally by individuals (at roadside markets), marketed by small-scale traders or co-operatives (syndicates), or marketed by a government agency, although the latter is not very common in South Africa; it is found, for example, where rural farmers want to sell large quantities of fruit such as bananas, avocados or guavas.

The sophisticated marketing and trade system in South Africa is mainly applicable to large-scale production of domesticated food NWFP such as the ones mentioned above. By-products of naturally-occuring indigenous fruits such as the marula also benefit from this system.

Food

Most wild and cultivated South African NWFP are directly consumed by the household. In seasons of plenty, the surplus is sold locally and at roadside markets; this is particularly the case with the marula, the mobola plum (*Parinari curatellifolia*), and a few other indigenous fruits, as well as the domesticated ones.

A rural food NWFP whose marketing and trade is probably better organized than most is palm wine. A study conducted by Cunningham (1990b), showed that nearly 980 000 litres of palm wine were sold during the 12-month period between November 1981 and October 1982, generating US$145 113 (1982), although individual profits were small. The marketing of palm wine entails its sale and resale. The palm sap tappers or palm wine producers set up pre-determined sales points which are "advertised" by word of mouth. The re-sellers then buy the wine from the producers in order to re-sell to the general community. Cunningham (1990b) points out that palm wine for resale is diluted to increase its volume, and therefore, the profit margin. The dilution ratio of wine to water is kept at about 1:1 by consumer demand. Undiluted palm wine is sold within the local production area. The wine to be resold is transported to centres outside the production area, but it does not reach the urban market.

Fibre

The various types of fibre mentioned above are, as mentioned earlier, either harvested directly by the user (craftworker) or by commercial harvesters (those whose job is purely to harvest the NWFP and sell to others who use the NWFP for the production of certain articles). The commercial harvesters usually arrange for the transportation of the NWFP to the user, for which they charge accordingly.

Once articles have been made of the fibre, a few are sold locally, while the majority are either marketed at roadside to passing motorists, or are collected by commercial businessmen who buy in bulk to sell at established urban craftwork markets. In some cases the marketing system is very well organized. For example, syndicates of the estimated 8 000 women involved in the rural weaving industry (using *Juncus krausii*) in Natal, send representatives to urban areas to sell their products. Their goods also sell in curio shops all over the country, and a few outside the country.

Medicines

The traditional medicine trade in South Africa is very big indeed. It is estimated that 80% of the black people in the country choose to consult a traditional healer before resorting to the consulting rooms of a qualified practitioner of orthodox western medicine. Although there is no reliable figure of the number of traditional practitioners in South Africa, the figure may be as high as 200 000, of which probably no more than half are trained.

Most traditional practitioners usually set up some sort of consulting rooms where the local people come to consult and/or buy specific medicines. A number of "muti" (medicine) shops also exist in most South African towns and cities from which anyone can buy; these are not necessarily run by practitioners, but can be run by anyone who is business-minded and knows a bit of botany.

The financial transactions involved in the trade are estimated to run into a few million dollars, and indeed some of the practitioners are very rich (usually those who have built up an awesome reputation as herbalists over a period of several years; people will travel very long distances from all over South Africa and neighbouring countries to consult such practitioners).

There is no set marketing system for traditional medicines in South Africa, except by consulting a traditional practitioner, buying from one of the numerous "muti" shops, or from the many unqualified hawkers who can be found in urban market places or roadside markets, and who sometimes have absolutely no idea of what they are selling.

Some medicines are particularly costly, regardless of who is selling; a good example is *Warburgia salutaris*, whose bark is probably the most expensive traditional medicine in South Africa.

Insects

The traditional use of wild honey and mopane worms, the main insect products in rural South Africa, at the household level, ensures that no marketing or trade in these products can take place. This may have to do with the quantities harvested annually in the wild, which are too small to market with any reasonable profit in mind.

RENEWABILITY AND SUSTAINABILITY

It is all too well to harvest from nature's great storeroom without any consideration of what would happen should the supply run out. However, this is precisely what is happening in the rural areas of South Africa. Obviously the natural resources on which the rural people are so dependent cannot continue to exist *ad infinitum*, therefore ways to conserve and replenish the resource have to be found.

The resource base of the four NWFP discussed, *viz* food, fibre, medicines and insects, can be sustained at a production level sufficient to maintain the livelihood of the rural communities in South Africa, and increased to cater for population growth. Most plants yielding the first three NWFP can easily be propagated and grown in appropriate areas of the country, and indeed much research has already been done in this respect with some of the relevant species. For example, *Amaranthus* spp. are semi-naturalized in some parts of the country, meaning that with a little more effort rural communities can take to their production in a sizeable way, particularly considering that the genus required little attention once established. The same goes for many tree species.

Regarding bee farming, it should be mentioned here that South Africa is at the fore-front of this business in the region, and there is absolutely no reason why this resource (bees) cannot be sustained in rural areas. Honey production in this country speaks volumes about the ease with which bees can be managed to produce not only honey, but beeswax as well.

South Africa is blessed with knowledgeable scientists in all aspects of resource management and conservation; if this knowledge could be imparted to the rural communities, it would be a major step towards ensuring the sustainability of NWFP in the country.

ENVIRONMENTAL IMPLICATIONS

It is inevitable that in any situation where natural resources are exploited without due consideration of their renewability problems will arise. The harvesting of NWFP in South Africa has already had serious environmental consequences in some areas.

With regard to food NWFP, the impact on the resource base is usually not much of a concern because, as pointed out earlier, trees known by the rural communities to produce large amounts of fruit, are often protected and looked after; even when clearing land for agriculture, such trees are usually left standing, as is the case with the mobola plum and the marula, and exotics such as guavas and avocados. Problems usually arise when tree roots, for example, have to be dug up as a source of food. If this is done too often and big quantities of roots are harvested, then the tree may be undermined. Fortunately, instances of such use of trees are very seldom encountered in South Africa, except for species such as the sweet-root commiphora (*Commiphora neglecta*) whose roots the Zulus peel and eat like sugar cane, but then this does not represent a significant part of the local diet, so the tree usually survives.

Palm-tapping for sap poses a threat to the two main palm species of Natal, where the palm-wine trade is quite important to the local communities. Cunningham (1991a) showed that sap-tapping resulted in the death of on average 2.9% of the tapped palms in Natal, depending on tapping intensity. Obviously if care is not taken to regulate palm-tapping, it may be a very short time before the resource is used up.

The harvesting of fibres for craftwork also has an impact on the environment and sustainability of the resource base. For example, the steady increase in the number of people harvesting *Juncus krausii* in Natal has steadily grown since 1970, and this has placed a tremendous strain on the resource base. In 1970 there were 400 *J. krausii* harvesters, but now there are more than 1500 cutters during the harvesting season, which lasts about three weeks each year. *J. krausii* grows in ecologically sensitive wetlands of northern Natal, therefore, the harvesting of the resource on a large scale could easily cause disequilibrium in the system, resulting in the loss of some ecologically important species.

In the past, under subsistence demand, plants providing dye material were not ring-barked and only some of the roots were dug up. But under commercial demand this has resulted in the opportunistic scramble for dye material, and ring-barking and uprooting of trees occurs. This is aggravated by the demand for dyed fibre for articles woven for commercial purposes. Tourist demand for heavily decorated woven materials has similarly resulted in increased pressure on dye material. Dye resources can easily become extinct due to the destructive effects of

harvesting for commercial purposes, therefore care has to be taken in dealing with such materials.

The use of plants, especially trees, for medicinal purposes has been a constant cause for concern for some years in South Africa. Unsustainably high levels of exploitation are not a new problem, although the problem has escalated in areas with large urban areas and high levels of urbanization since the 1960s. Many plant species are on the verge of extinction due to harvesting for medicinal purposes. For example, by 1938, only poor coppices, cut right down to the bottom, of *Warburgia salutaris* could be found in Natal. Cooper (1979) has estimated that 95% of all *Ocotea bullata* trees in South Africa have been exploited for their bark, with 40% ring-barked and dying. Many such examples abound in South Africa. Such a loss of biodiversity will obviously leave many areas of the country pre-disposed to many factors of environmental degradation.

Bees, which are the producers of honey, require nectar in order to produce, and nectar is found in plants. Lack of plant biodiversity in the rural areas of South Africa has meant that most rural people do not have ready or easy access to honey, and indeed they have not made any efforts in this regard. The more trees are destroyed for various purposes in the rural areas, the less bees will be found in such areas, and the people will be denied a nutritious and potentially important commercial resource. The same goes for the mopane worm. Its *host, Colophospemum mopane*, is valued for its fine timber;, however, the greed for timber could lead to the destruction of this species, along with that of the mopane worm, thus putting paid to another important source of nutrition to the rural people of South Africa.

PROBLEMS AND CONSTRAINTS

Although the rural communities of South Africa have used NWFP for many generations, they however still need to become aware of the range and variety available to them, or that can be made available through the establishment of various tree and shrub species. They also need to know and practice different management systems for natural resources, so that they can be in control of their resources.

For a long time now, the management of natural resources in the rural areas of South Africa has been in the hands of those who do not live in these areas, and therefore do not benefit directly from the local resources. Not through their own choice, rural communities have been left to try and find solutions to their dwindling resources; each day they have to walk further and further away from their homes to collect food and other NWFP for their livelihood. To most of them, it has still not occurred that NWFP are resources that can be replenished, or sustainably managed in perpetuity to yield their daily requirements.

Efforts so far have been very poor in bringing knowledge and information about NWFP and their importance to the rural communities. Instead scientists are more concerned with the management or studying of the dynamics of indigenous forests which are out of bounds, and therefore of very little importance to the rural people. Not that such forests should not be studied, but the information derived from such studies should be available to the rural people also, which is currently not the case.

What the authorities, scientists, nature conservationists and environmentalists in South Africa have so far failed to notice is that human beings, particularly the deprived rural communities, are a nation's most valuable natural resource. Any approach to the environment that ignores, demeans, or regards people as in any way dispensable or susceptible to manipulation in the interest of any other objective, is untenable and virtually doomed to failure.

Land tenure is another constraint which hampers progress in the promotion and development of NWFP in South Africa, and it is clearly an issue of great concern to the rural people particularly regarding tree planting activities and tree ownership. The people will only take the risk of planting trees and protecting them if they are confident that they will be the ultimate beneficiaries, and this can only happen if their claim to the land and the trees is secure. The land tenure system in South Africa, especially for the rural and displaced people, is rather vague and complicated, and varies from area to area. This uncertainty tends to create the feeling that the land does not really belong to the people, consequently they are reluctant to undertake long-term "risks" such as tree planting for fear that the land might be taken away from them, even with the realization of the benefits to be derived from, for example, fruit trees.

If the promotion of NWFP is to be successful, particularly, among the rural communities, seedlings of various tree, shrub and herb species should be readily available to the people who require them. Unfortunately, in South Africa, most nurseries are located in urban areas, and the cost of seedlings is way beyond the means of most rural people, which does not augur well for NWFP development.

There is virtually no trained manpower in South Africa to lead the way in the development of NWFP in the rural areas. Most of the available manpower is more concerned with commercial forestry, nature conservation and environmental management at the national level, aspects in which black students in South Africa have received very little exposure, and these are the people most likely to understand the needs of the rural communities in South Africa.

Finally, funding for initiatives to promote and develop NWFP in rural areas is very scarce. Institutions which have made efforts to address the sustainable management and exploitation of natural resources have often failed to see the job through because of lack of funds.

RECOMMENDATIONS

In view of the prevalent problems and constraints with regard to the promotion and development of NWFP in South Africa, the following recommendations are made:

- A full complement of manpower should be trained to initiate the NWFP promotion and development activities in the rural areas of South Africa. The country is very big, therefore, this fact should be taken into consideration when deciding on the numbers of manpower to be trained;

- Extension services have to be developed and strengthened as an integral part of the existing extension system in South Africa, especially for technology transfer regarding new ways of managing the resource base for NWFP. This should include such aspects as nutrition and propagation of species;

- Nurseries should be established in rural areas so that the locals have easy access to seedlings. These rural nurseries should be run by the people themselves, who should also receive basic training in plant propagation techniques;

- The relevant authorities in South Africa should make funds available for the development of NWFP; these should also include funds for nursery establishment and training of technical staff, as well as the rural people themselves.

- A detailed assessment of the use of NWFP in South Africa should be carried out;

- Finally, the rural people must be kept informed at all times about developments in their areas regarding various aspects of NWFP.

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ANNEX I

CLASSIFICATION OF NWFP

CATEGORY OF NON-WOOD FOREST PRODUCTS	PRODUCT	IMPORTANCE OF NWFP
Fibre	Palm leaves	1
	Climbers	1
	Juncus krausii	1
Food (Vegetal)	Marula	1
	Mobola plum	2
	Guava	1
	Banana	1
	Mango	1
	Pawpaw	1
	Avocado	1
	Mushrooms	3
	Wild spinach	1
	Trichilia emetica	3
	Palm wine	1
Food (Faunal)	Honey	2
	Mopane worms	2
	Bushmeat	1
	Ostrich meat	2
	Fish	1
Non-Food (Faunal)	Animal skins	2
	Reptile skins	3
	Bird (Ostrich) skins	2
	Feathers	3
	Bees wax	2

Cosmetic & Medicinal	*Warburgia salutaris* *Ocotea bullata* *Betulina agathosma* *Tetradenia riparia* *Trichilia emetica* *Boweia volubilis* *Eucomis* spp. *Acacia xanthophloea* *Cassine transvaalensis* *Terminalia sericea*	1 1 1 1 2 1 1 1 1 2
Extractive	Tannin Dyes	1 1
Forage	Livestock fodder Mopane worm fodder Bee forage	2 1 1
Wood (handicrafts)	*Trichilia emetica* *Afzelia quanzensis* *Balanites maughamii* *Ochna* spp. *Strychnos henningsii* *Oncinotis inandensis*	1 1 1 1 1 1
Ornamentals	Flowers (cut & dried) Amenity	3 2
Range	Grazing and browse Shade and shelter	3 2
Soil improvement and protection	Green manure Humus N-fixation Soil stabilization Windbreaks & hedges	3 3 2 1 2
Parks and reserves	Tourism Conservation Hunting Fishing	1 2 3 2

ANNEX II

STATISTICAL DATA ON NWFP

PRODUCT	YEAR OF REFERENCE	UNIT	QUANTITY	UNIT PRICE (US$/T)	VALUE (US$ 1000)
Avocados	1992	T	35 000	1 045	36 575
Mangoes	1992	T	25 000	N/A	N/A
Bananas	1992	T	182 000	550	100 100
Pawpaws	1992	T	30 000	410	12 300
Guavas	1992	T	40 000	N/A	N/A
Apples	1993	T	25 540	460	11748
Pears	1993	T	15 980	380	6 072
Marula fruit	1991	T	1 700	N/A	N/A
Honey	1992	T	3 200	N/A	N/A
Palm wine	1989	L	980 000	0.15	147
Beeswax	1991	T	60	N/A	N/A
Flowers (cut & dried)	1990	N/A	N/A	N/A	460
Medicines (top 20)	1988	B	15 700	18	282.6

Legend:

T: Tonne
L: Litre
B: 50kg bag

PILOT COUNTRY STUDY - TANZANIA

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

NON WOOD PRODUCTS AND ENERGY BRANCH
(FOPN)

PILOT COUNTRY STUDY ON NWFP FOR TANZANIA

DECEMBER 1992

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ACRONYMS AND ABBREVIATIONS

ABA	Arusha Beekeepers Association
BET	Board of External Trade (Foreign Trade Statistics)
BoT	Bank of Tanzania (Tanzania Central Bank)
BoS	Bureau of Statistics, Tanzania, Planning Division
BTI	Beekeeping Training Institute (Tabora)
CDC	Commonwealth Development Coorporation
DSM	Dar es Salaam
E	Export figures
ERP	Economic Recovery Programme, Tanzania
FAO	Food and Agricultural Organization of the United Nations
GAPEX	General Agricultural Products Export Company (of Tanzania)
GDP	Gross Domestic Product
GFR	Germany Federal Republic
HHPP	Handeni Honey Processing Plant
IUCN	International Union for the Conservation of Nature
Kg	Kilogrammes
Nos	Numbers
NWFP	Non-wood Forest Products
P	Production figures
RNRO	Regional Natural Resources Office
SPM	Southern Paper Mills Ltd. (Mufindi)
T	Tonnes
TAFORI	Tanzania Forestry Research Institute
TANAPA	Tanzania National Parks Authority
TanWatt	Tanganyika Wattle Company Ltd. (Njombe)
TBCS	Tabora Beekeepers' Cooperative Society
TFAP	Tropical Forestry Action Plan
Tsh	Tanzania shillings
UAE	United Arab Emirates
UK	United Kingdom
USA	United States of America
WHO	World Health Organization
WWF	World Wildlife Fund

RATES OF EXCHANGE

Aug.	1980	1	US $	=	8.18 Tsh.
	1981	1	US $	=	10 Tsh.
	1984	1	US $	=	17 Tsh.
	1985	1	US $	=	17 Tsh.
	1986	1	US $	=	40 Tsh.
	1987	1	US $	=	65 Tsh.
	1988	1	US $	=	100 Tsh.
Feb.	1989	1	US $	=	124.9 Tsh.
Aug.	1989	1	US $	=	145 Tsh.
	1990	1	US $	=	195 Tsh.
	1991	1	US $	=	210 Tsh.
	1992	1	US $	=	400 Tsh.

TERMS OF REFERENCE:

By letter dated 9th October 1992, FAO engaged Alexander Wilson Chihongo of Tanzania Forestry Research Institute (TAFORI), Morogoro through contract No. 7-54391 to carry out consultancy work for the preparation of Pilot Country Study for Tanzania on Non-wood Forest Products (NWFP) in line with the Tropical Forestry Action Plan (TFAP).

The terms of reference were:

1. To gather and collect information and statistical data on Non-Wood Forest Products (NWFP).

2. To provide a brief, concise and realistic overview of the importance of NWFP of the country and prospects for further promotion and development.

3. Identify the rate of NWFP production in the Natural Resources Sector as a whole.

4. Identify constraints and issues warranting intervention.

5. Review the role of the Government, cooperatives, individuals and private sector in management and utilisation of NWFP resources and make recommendations to further promote and develop NWFP sector.

6. Provide a proposed filed project to address issues mentioned in the Country Study on NWFP.

7. Last, the Pilot Country Report is to be utilized for Regional Expert Consultation of NWFP, 1993 and for the Interregional Expert Consultation on Economics and Resource sustainability of NWFP as well as to sustain FAO/FOPN database on NWFP.

Responsibility:

Although this report has been commissioned by FAO, the organization bears no responsibility for, and is not in any way committed to, the views and recommendations expressed herein.

Report Data Collection:

In October/November 1992, Alexander Wilson Chihongo (Senior Forest Research Officer, TAFORI) undertook a Country Study of the informal NWFP sector within Tanzania. This took the form of field visits to selected areas of major NWFP activities such as Arusha, Kilimanjaro, Morogoro and Dar es Salaam. Discussions were also held with related sectors of NWFP especially those based in Dar es Salaam. Personal contacts with personnel at the Sokoine University of Agriculture (SUA) were also done concerning the subject on NWFP. A few relevant literatures have also been

consulted in respect to NWFP, and are cited accordingly in the report. A seminar held at Kilimanjaro Hotel, Dar es Salaam on 10 November 1992 on Investment Opportunities in Forestry in Tanzania raised the awareness of economic values of NWFP.

The outcome of my study is presented in this report. Based on my conclusions, a number of recommendations are given, which I believe will help to relieve constraints on the NWFP sector and lead to overall sustainable development in line with the TFAP objective.

1. INTRODUCTION

Forests are a valuable environmental and economic resource for supporting natural systems and improving human welfare. Human activities have always modified the forest environment. Every one has benefited when the forests have been treated as a renewable resource, protected them to preserve biodiversity or transformed them to support other economic activities on sustainable basis. Conversely, destructive exploitation of forests has caused serious social, economical and environmental losses.

1.1 Size of the Country

Tanzania, located between latitudes 1°S and 12°S and longitudes 36oE and 40oE is, one of the larger countries in Africa, being the eleventh in size and occupying a total land area of about 88.6 million hacters (939,702 km^2). Zanzibar occupies 264 000 ha. or 0.3% of total land area.

1.2 Ecological zones

The land rises gradually from the Indian Ocean in the east to about 2000m some 400 km inland where the Eastern arm of the Great Rift valley divides it from north to south west towards Lake Malawi. From this lake northwards, the western arm of the Rift valley demarcates the boundary between Tanzania and neighbouring Malawi, Zambia, Zaire, Burundi and Rwanda into Uganda. On the floor of the Western Rift valley there are a number of lakes such as L. Malawi, L. Rukwa, L. Tanganyika, L. Edward and L. Albert. The valley is about 70 km wide and 300 m. deep with precipitous walls in some parts. In the eastern Rift valley, the lakes are usually very shallow and these include L. Natron, L. Eyasi, L. Manyara and Momella, which are mainly caused by local barriers to drainage on the floor of the valley. Most of the active volcanoes are associated with the rift valley, especially the eastern arm. The whole rift valley and the highland zone in Northern Tanzania is overlain by volcanic rocks. Some of the largest individual cones: Hanang, Meru (4565m) Kilimanjaro 5895m) appear to be on lines of weakness. Other blocks of Mountains include the Pare, Usambara, Nguru, Uluguru and Udzungwa forming the Eastern Arch; and Southern Highlands, Poroto, Rungwe, Livingstone, and Ufipa Highlands forming the Western Arc, are all bounded by major faults. These Montane Uplands are cool, wetter and form important water catchments, forest reserves and agricultural zones. The Central plateau consisting of a number of basins and averaging 1200m. a.s.l. stretches from Lake victoria in the north to Ruvuma river in the south.

The plateau covers most of the country and receives seasonal rainfall. Miombo woodland is the major vegetation of the central plateau. The coastal belt including Zanzibar Islands consists of a strip of low-lying country between 20-60 km wide (below 500 m.a.s.l), with comparatively fertile soils. In isolated areas, especially along river deltas the coast in lined with mangrove

forests. Whereas, remnants of lowland forests are also seen occupying very localised areas of coastal belt.

1.3 Forested areas

Tanzania forest resource supporting the environmental and economic needs is based on 44 million ha. of natural forests consisting of riverine and montane high forests (1.4 mil. ha. or 0.3% of total forested land), savannah woodlands and grasslands (32 mil. ha); mangrove forests along the coastal belt (80 000 ha.) and man made industrial plantations (115 000 ha) and community forests (66,700 ha) existing as reserved and unreserved forests. The total area of productive forest land is estimated at 34.6 million hectares (78% of total forest area). The rest 9.8 mil. ha. is unproductive for physical reasons such as inaccessibility, stand terrain features or legal reasons such as catchment forest reserves, forest lands in the National Parks and Game reserves. The forestry industry as well as rural population living around these forested areas have been relying heavily on the use of material from the natural forests. Due to many factors including forest fires, increased population pressure on land and enhanced agricultural activities, natural forests are disappearing at an estimated rate of 130 000 hectares per annum. Forests and wetland habitats are under special threat because of the potential use of these areas for agriculture.

1.4 Population Statistics

The World Development Report 1992 (World Bank 1992) estimates Tanzanian population of 25.6 million in 1990, with 33% of the total population living in urban areas. The population growth rate has been slowly increasing over the last 25 years from 2.9% in the period 1965-80 to 3.6% for 1980-90. The population is projected to continue to grow at a rate of 3.6% for the period 1990-2000. Zanzibar Islands are densely populated than any other country in Africa with an annual growth rate of 2.7% and 850 000 inhabitants (1988). The mountainous regions on the mainland are thickly populated.

1.5 Forests as source of non wood products

Forestry in Tanzania has a great potential which largely remains to be developed. Its importance for maintenance and improvement of environment, climate, water resources, soil enrichment etc. is crucial. Potentiality of forest and non wood forest products in particular, in rural development efforts ought to be pursued. Products from the forests include the wood products like timber, fuelwood, poles and a wide range of non wood products such as fodder as forage for livestock and wild-life including insects; trees as a source of nectar for honey and beeswax production and increasing pollination of agricultural crops; palm nuts; tannin extracts; bark; gums; resins; medicinal plants; aromatics; fruits; edible fungi; wild animals and

trophies and many others. Though the forestry sector plays minor role in the economy of Tanzania in terms of its contribution to the GDP which hardly exceeds 2-3% and contributing about 1% only to the exports; the forests and woodlands have a very positive effect on both the subsistance and national economy through appropriate management practices ensuring sustainable supplies of wood and non-wood forest products.

The Objective of this paper is to give an overwiew of the current utilisation aspects of both within and outside Tanzania with respect to non wood forest products (NWFP) and to present some suggestions and possible strategies of what should be done to further promote and develop these towards a sustainable socio-economic performance in future.

2. DEFINITIONS, CLASSIFICATION OF NON WOOD FOREST PRODUCTS

2.1 Definitions

In Tanzania, beekeeping, wattle mimosa extract cultivation, gum arabic production, tradition medicinal and aromatic plants processing, fodder crop farming, fibre handicrafts making, edible insects collection, fruits and nuts from the wild flora, latex tapping, tourism and environmental improvement and potential naval stores extraction are all predominantly forest - based activities. On the other hand Cinchona barks and spices production, though depend upon agricultural lands, their cultivation is closely related to well forested sites. The forest products and services derived from the above named activities, other than wood, and presented in detail in Annex I may be classified as non wood forest products (NWFP). Usually their extraction from a forest ecosystem does not alter the basic reproductive functions of the forest. (FAO, Paper No. 97).

2.2 Classification

2.2.1 Fibre:

The mountain bamboo, Arundinaria alpina found on the moister mountainous sites between 2400 and 3000 asl. provide building poles and fibrous materials for communal handicraft industry in rural Tanzania. On drier sites, the Borassus palm supports matts and baskets making industry for the rural people, an activity which is of great importance to certain areas. Other vegetal fibres used in rural areas include the plaiting and tough - weaving fibres used for straw hats, baskets, chair-seats and matting for which stems of various palms, grasses and the baobab Adansonia digitata are used. Morereover, in special cases, natural fabrics consisting of tough interlacing fibres that can be extracted from bark in layers and used as a substitute for cloth are obtained from Ficus species. Such fabrics are commonly used in rural Kagera areas.

2.2.2. Forage:

The forests provide forage and shelter to both domesticated as well as wildlife populations-key component to food protein and tourism, upon which mankind depends. The role of forestry in the semi-arid zones and savannah grassland areas of Tanzania is partially reflected by the provision of fodder and shelter not only to livestock but to wildlife populations within the National parks. These animals do not only feed on grass but obtain a considerable part of their nutrition, and the part most rich in protein, from the pods and buds of trees and bushes, of which the most valuable are the Acacias. From the utilitarian point of view, forage plants for domesticated as well as wildlife may be looked upon as a means of turning plant carbohydrate and protein into meat and dairy products. Suffice it to say that practically every item of food of all animals comes from plants; as these alone are able economically to build up complex food substances from simple inorganic materials. (Nicholas, 1960).

2.2.3 Food - Vegetal

2.2.3.1 Nuts:

Products of the nut-bearing plants are often obtained from wild sources. Some of the important chewing materials like betel, obtained from the widely cultivated Betelnut palm Areca catechu provide food and cash requirements to the rural as well as national economies.

2.2.3.2 Edible fungi:

A number of usually minor foods are afforded by the lower plants. Thus the use of mushrooms, morels, truffles and other fungi is ancient and familiar. Mushrooms provide valuable sources of certain food proteins and vitamins. Mushrooms in particular are being widely cultivated, though in Tanzania these are only collected from wild sources. The commonly consumed mushrooms in the country belong to the locally important orange-red Amanita species native to the Miombo woodlands. They are related to Amanita caesarea the most highly appreciated edible mushroom in ancient Rome. Other edible species of mushroom are also common in rural Tanzania. Food yeast is another important fungal product used in brewing and baking processes.

2.2.3.3 Spices:

Many of the non wood forest products are taken with fair regularity as a kind of crop, sometimes from cultivated trees. Spices, condments and other food adjuncts are almost innumerable, and the value of spices and condiments lies in their ability to increase the attractiveness of food, usually owing to the presence of essential oils. Besides their use as food adjuncts, spices are employed in various industries including perfumery, drug and soap manufacture and dyeing. The vast majority originate in seeds and fruits of the cultivated vegetals e.g. cardamon, chillis and peppers; others from flowers or flower-buds

like cloves, while from leaves are obtained peppermint, spearmint etc. Spices obtained from barks include cinnamon and cassia; from roots and rhizomes include ginger, turmeric grown in the tropics (Nicholas, 1960).

2.2.4 Food-Faunal

2.2.4.1 Honey:

In Tanzania, the woodland and savanna areas are not only important as producers of large quantities of wood. They also constitute the main basis for industry of some national importance, beekeeping. Most of the Acacias, - A. tortilis subsp. spirocarpa, A. xanthophloea; Brachystegia and Julbernadia species are excellent honey trees. Honey is widely used domestically in making an alcoholic beavarage.

2.2.4.2 Game meat:

As source of cheaper protein for rural as well as urban populations, is of vital importance particularly for people living around the parks and forest reserves. Fish and insects also provide vital feed protein requirements to people.

2.2.5 Non food-Faunal

Bees wax: A by-product of honey, bees wax is of national importance and most of it is being exported because there are very few domestic industries which process the wax for other end uses.

2.2.6 Medicinal plants:

The medicinal value of plants is due to the presence in them of special substances having a particular physiological action on the human body: commonly such substances are alkaloids, some of which are powerful poisons if administered unwisely, while others are dangerously habit-forming. Yet in small quantities skilfully administered, even the most poisonous or dangerous drugs can be of value to human health and well-being (Nicholas, 1960). Throughout the world, there are used for medicinal uses some thousands of different plants, many of them only locally by rural populations in the developing countries. Some are widely cultivated, like Cinchona species but many more are collected entirely in the wild state and are still important commercially. It is estimated that as many as 80% of Tanzania's rural people rely on herbal traditional medicines from the indigenous forests, as their primary health care, though commendable efforts have been made to avail medical facilities. A few of the most significant plants cultivated in the country include: Opium, obtained from fruits and seeds, as an exudation from the injured fruits of the widely cultivated Opium Poppy containing principles effective in relieving pain but fragrantly misused as a narcotic. In Tanzania, the Opium poppy is cultivated to a limited scale on wetter, well drained soils in the highlands. Quinine, extracted from the cultivated cinchona barks, is a great anti-malaria drug.

Papain, an enzyme obtained from papaya plant, Carica papaya fruits though of limited use in medicine, is employed as a digestive enzyme for treatment of intestinal and gastric disorders. Other potential notable sources of medicinal drugs include the agricultural fibrous product - Agave sisalana which is used in the production of a steroidal sapogenin called Hecogin as its by-product. Hecogin is an important therapeutic agent used in modern medicine. The sisal plant is used to a very limited extent for the synthesis of these drugs in Tanzania, though its potential is great. The exotic Neem tree, Azadirachta indica is grown in the country as a multipurpose tree for fuelwood, shade and ornamental as well as medicinal source of Azadirachtin that is widely used for the manufacture of insecticides elsewhere. Locally, the decoction from the bark of the Neem is believed to cure a number of ailments including malaria. Among the introduced blue gum trees, E. globulus, E. saligna, E. maidenii and E. regnans are known to produce eucalyptus oil Cineole from their leaves that is extensively used in medicine for the treatment of nose and throat disorders. Actual production of cineole in the country has not been developed. Shortly, there are many species of plants in Tanzania (more than 90% of the flora) whose significance as potential sources of important drugs and/or cosmetics have not been appreciated, simply because their chemical composition has not been studied (Rulangaranga, 1991).

2.2.7 Aromatics:

Essential oils or volatile types as stated elsehere, have a pleasant taste and strong aromatic odour, easily volatilizing in air. They are complex in chemical composition but are readily removed by distillation, or solvent extraction from the plants that produce them. Their major uses are for scenting, flavouring, or medicinal purposes for example in the manufacture of soaps, perfumes, and other toilet preparations. Other uses are as clearing agents and solvents; deodorants, shoe-polish etc. In the country a few of the useful aromatics include the sandalwood oil, muhuhu oil, camphorwood oil, clove oil. Cedar oils, extracted from Juniperus procera wood is used as a laboratory clearing agent in microscopy studies. Of potential importance is the Cassie oil, obtained from flowers of Acacia farnesiana, a tree whose distribution is restricted to Morogoro region only. For many aromatics, maximum concentration within the plant is to be found in those plants inhabiting drier sites.

2.2.8 Extractives

2.2.8.1 Tannins:

In the tanning, strongly astringent tannins are reacted with proteins present in animal hides and skins, to form the strong and resistant, flexible product leather. Although tannins are very widespread in plants, relatively few species are known to contain a sufficient proportion to be of commercial importance. In Tanzania, the wattle mimosa and mangrove barks are the main sources of tannin extract.

2.2.8.2 Natural dyes:

Stains and natural dyes obtained from plants are especially useful in dyeing fabrics and other products. These normally are extracted from seeds and fruits, flowers, leaves, wood, bark, roots and even tubers. A redish-brown dye obtained from the bark of wild kapok Bombax rhodognaphalon; is used to dye fabrics (Bryce, 1967). Due to recent competition from synthetic dyes obtained from coal-tar products, the use of vegetable dyes has been on a decline.

2.2.8.3 Latex:

Of the products obtained from the milky juice (latex) of various plants, rubber is by far the most important. Crude rubber is mainly used in tyre manufacture and inner tubing; footwear, packaging, tubing, electrical insulation and waterproof clothing etc. Of a number of woody plants that produce rubber, the plantation rubber tree Hevea brasiliensis is by far the most important source of rubber. In Tanzania, the rubber tree is planted in the humid East Usambara Mountains at Muheza and Kwamkoro areas, Nguru ranges in Morogoro at Turiani and Zanzibar Islands, where about 1270 ha. are planted to support the domestic as well as export trade in tyre manufacture. Rubber is also tapped from wild sources, though of no much economic value.

2.2.8.4 Gums:

The gums which exude from plant stems either naturally or in response to wounding, and the resins which are secreted in definite cavities (resin ducts) are both exudates. Gums which can dissolve in water, does not dissolve in organic solvents like alcohol or ether. Main uses of gums include as adhesives, as sizing for paper, in medicines and polishing, in cosmetics, chewing-gum and ice-cream making, etc. Gum arabic is one of the chief commercial varieties, obtained from Acacia trees notably A. senegal A. seyal, A. tortilis and A. spirocarpa. Gum arabic is of considerable economic importance in some African countries with arid and semi-arid climates like the Sudan, Kenya, Senegal, Chad and Tanzania, to mention a few.

2.2.8.5 Resins:

These, are more important than gums, though tapping is essential to obtain resins in commercial quantities. Resins of potential development in Tanzania include the turpentines, obtained by tapping coniferous trees and yielding on distillation, oil of turpentine (oleo-resin) and rosin. Oil of turpentine is used in the paint and varnish industry as a solvent and thinning agent. Rosin is the chief sizing material for paper, and is also used in manufacture of adhesives, printing inks, rubber products, greases and lubricants. Of the introduced industrial pine species, Pinus patula, P. elliottii and P. caribaea, their resinous woods could be utilized as sources for

naval stores - turpentine and rosin. The best turpentine comes from P. elliottii, followed by P. caribaea. On the otherhand, P. patula at maturity produces a resin - free wood. These naval bases have so far not yet been tapped in this country, despite their potential.

2.2.9 Services Functions of Forest Lands

2.2.9.1 Amenity:

Trees are planted sometimes mainly for their aesthetic and amenity values. Amenity forestry together with environmental protection and tourism form part of Services Functions of Forest Lands Sector. Amenity plantations include roadside trees, parks and plantations to beautify the landscape and to make living conditions more pleasant. The value of these plantations is extremely high, though cannot be assessed in terms of cash. Multipurpose plantations are of great use; for instance, those that have roadside trees that bear honey flowers and also act as windbreaks to conserve the soil; or those that have trees like Black wattle for fuelwood which may also yield bark from which tannin can be extracted. In the country a number of tree species have been planted with the cooperation of the public, as amenity trees on different sites. In the high mountainous areas, conifers, eucalypts and Cedrella odorata are used. On the central plateau species like Neem, Casuarina, Grevillea, Senna siamea and Eucalyptus species are often planted. Under more arid conditions, Acacia species, some eucalypts, Azadirachta indica may be planted. On humid lowlands and coastal plains Saraca indica is favoured. Where flowering trees are desired, Delonix regia, Jacaranda species; Senna siamea, Grevillea robusta, Acacia spp. and certain eucalypts are planted.

2.2.9.2 Environmental protection:

Forests for environmental protection and climatic improvement-checking soil erosion and water run off, stabilizing soil surfaces, shelter-belts and windbreaks to protect fields, enhancing soil fertility and rehabilitation of wastelands and industrial sites all play a desirable role. The impacts of forests in ensuring environmental stability and productivity by mitigating the effects of climatic fluctuations, by improving the micro-climate for animal and plant production and by conserving soil and water resources, cannot be overemphasized; because attempts to disturb various ecological systems have had serious implications to Man and his surroundings. The economic return of the protection plantations is indirect.

2.2.9.3 Tourism:

In Tanzania, the tourism industry to a greater extent depends on services functions of Forest Lands, since land has been gazetted as National parks/game reserves which provide habitats for wildlife populations that provide tourist attractions. Within these reserves, we also find varied flora communities.

3. SOCIO-ECONOMIC IMPORTANCE OF NON WOOD FOREST PRODUCTS

With the exception of industrial production of forest products, it is very difficult to establish the current production levels of some of the products because the same are produced in small scale by private individuals who sell their produce to the local markets, or outside markets that offer attractive prices.

3.1 At Community Level

3.1.1 Forage:

One of the main preoccupation of rural people in Tanzania, especially in the savannah woodland of Tabora and semi-arid zones like Shinyanga, Mwanza, Singida, Dodoma, parts of Arusha and Kilimanjaro regions where animal husbandry forms a major income source is to cultivate enough fodder to meet food scarcity especially for their livestock. To a greater extent, the forage needs for their huge stocks of cattle, goats and sheep still is afforded from the wild sources - the grasslands and forests close to their habitats. During the dry season, grazing animals may have only branches and leaves of fodder trees to live on. In some of these areas, we also find higher concentrations of wildlife in the parks and game reserves which depend upon dry season browse for their survival. Crude protein contained in the leaves of some trees, makes certain tree species to be very palatable for animals. Several species of Prosopis: P. juliflora, P. chilensis which produce pods that are highly palatable and nutritive, and the leaves are eaten by cattle. These multipurpose trees also yield poles and timber and can be established on saline soils in arid areas where other fodder plants are rare. Pods and leaves of browse species of Acacias - A. nilotica, A. arabica, A. tortilis, A. senegal, A. farnesiana and Faidherbia albida are readily eaten by both cattle and wildlife populations, and these species can be established in semi arid zones on commercial basis. Tamarindus indica, with its wide, rounded crown and drooping branches provides both shade and fodder crop to grazing animals in dry savannah sites. However, in densely populated highland areas of Arusha, Kilimanjaro, Southern highlands, Usambaras, Uluguru mountains and Kagera, fodder trees and shrubby species which have high production potential and produce good quality fodder are cultivated. Leucaena leucocephala, L. diversifolia, Pithecelobium dulce, Acacia farnesiana, Erythrina spp., Senna siamea, Grevillea robusta and Prosopis juliflora are planted, sometimes as green hedges (living fences). These species are also useful for agroforestry activities as soil conservation and nitrogen fixing species.

Tree fodders may complement, but will not replace herbaceous fodder species, such as elephant grass, in montane areas where zero-grazing in animal husbandry is largely practised. Selling of fodder crops in these fertile and densely populated areas is a lucrative business at community level.

Kowero and Hofstad (1989) have reviewed economic aspects of Tanzanian forestry. They have estimated a theoretical total annual output from fodder crops of about 900 m Tsh. as shown in Table 1 below, reproduced from their report:

Table 1: Total value of Primary forest production

Item	Value (m Tsh)
Industrial wood	169
Non-traded wood fuels	515
Non-traded construction materials	210
Non-traded wood for implements etc.	2
Fruits, medicines etc.	2,000
Game meat	200
Honey and beeswax	8,500
Fodder (forage)	900
Water	20
Soil conservation	1,000
Climate amelioration	-
Gene pool	-
Total	13,516

On this basis, from their work, fodder contributes about 7% to this estimated total value of primary forest production. However, the actual contribution of fodder crops, like other non wood forest products to total annual value of primary forest production is usually more than these figures presented above. This is so because, for example, fodder crops that are browsed by wildlife populations in most cases, their contribution is not supported by statistical evidence.

3.1.2 Fibres:

Most of the handicrafts are woven in the rural Tanzania, as a source of income, not only to the rural communities, but also for urban traders, who buy these from rural craftmen and resell the products to urban dwellers and tourists. Bamboo grass and Borassus palms are the major sources of woven handicrafts. In 1989, about 280,000 m^3 of bamboo grass Arundinaria alpina were extracted from bamboo forests for handicrafts as well as building purposes. Lowland bamboo species have already become extinct. In Tanzania, like other East African countries, the bamboo is potentially among the most important non wood product resources, yet, it is one of the least developed (Ogana, 1991). However, bamboo cultivation and processing provide employment and income

generating opportunities for rural communities. Some of the most diverse uses of the bamboo can be found in the handicraft trade on the domestic market, though the indigenous species A. alpina is not as versatile as bamboos found elsewhere for example in South East Asian countries. At present, there is an insatiable market for bamboos in the country for basket making, tooth picks, matts weaving, tree seedling's support, fencing, building poles and making of baskets for tea picking. Bamboos are also used in onion and tomato gardening especially in Arusha, Iringa and Mbeya regions. Borassus palms woven handicrafts are important at community level especially in Kigoma, Iringa, Kilimanjaro Morogoro, Mwanza, Tabora, Singida and Shinyanga regions.

The legume Erythrina excelsa which occurs naturally on humid sites at higher elevations in Kagera region, its bark is known to produce cork, though not of commercial value as that produced by the cork tree Quercus suber. Rural communities around Lake Victoria seldomly used the product cork from this tree to float fishing nets. Because of its usefulness, the tree has become over-exploited. The floss from fruits of the wild kapok Bombax rhodognaphalon, at one time was used in upholstery. Again, there are no reliable statistics for production and sales of fibre related products, because most of these items are produced and sold unofficially, though a few enter export market as tourist articles.

3.1.3 Food-vegetal:

3.1.3.1 Fruits:

Trees and other woody plants that are extensively cultivated in Tanzania for their edible fruits of importance to mankind include the mango Mangifera indica, papaya Carica papaya, coconut Cocos nucifera, jack fruit Artocarpus communis and pears Pyrus communis. Some of the exotic tree species like avocado Persea americana that are multipurpose and planted in humid, upland parts of the country, produce edible fruits as well as provide shade and wood fuel. In the floral habitats of Tanzania, though a number of wild trees and shrubs produce fruits and seeds that are edible to rural communities, the variety and nature of food and food products obtained from trees are not fully appreciated. Moreover, many of these fruit-bearing species occur naturally in forest environments which are under pressure to yield land for agriculture. Greater knowledge of the potential of these species and their capacity to improve man's way of life will add weight to efforts to conserve these forests or woodlands, while making them more productive (FAO,1983). A detailed study carried out by the Silviculture Research Centre of the Forest Division under the auspices of FAO in 1983, on 40 forest food and fruit-bearing species of Tanzania has helped to highlight knowledge and promote an appreciation of their usefulness. A brief description on some of the commonly used indigenous fruit-bearing trees is given:

- Allanblackia stuhlmannii (msambu), the seed of this tree yields an edible fat used for cooking, lighting and as a liniment. The species can be planted on large plantation

scale in the humid montane forests. Seeds of this species were once exported by GAPEX, before its dissolution in 1989.

- Allaublackia ulugurensis (msambu,mkani), a tree abundant in Morogoro and Iringa Districts at higher elevetions, produces seeds that yield a white fat which is used for the same purposes as that from A. stuhlmannii. The sap obtained from the tree produces a yellow dye.

- Annona senegalensis (wild custard apple, mtopetope), a tree of widespread occurence in Tanzania, whose white pulp of the yellow to orange fleshy fruit is edible and has a pleasant pineaple-like odour and sweet taste. If this species if fully known to people, it can be cultivated and fruits sold in the markets, contributing to their economy. A yellow/brown dye is obtained from its bark. The bark, roots and leaves are used in preparation of traditional medicine.

- Parinari curatellifolia (mbura), a tree widely distributed in Tanzania, produces edible pulp from its ripe fruit. The seed can be pounded and used to make soup. Seed kernel has a high oil content that could be extracted for export trade.

- Parinari excelsa (mbura), a species of montane rain forest produces fruit pulp and kernel that are edible. The fruit pulp could be also used in making local beer. The bark and wood also used to yield tannins for tanning and dyeing hides.

- Syzygium cuminii (mzambarau mwitu, mshwiwi, waterberry), a tree of widespread occurence in Tanzania mainland, produces ripe fruits that are sweet tasting and edible. Moreover, the fruit is used as a remedy for dysentry and a decoction of the bark is used as an anti-diarrhoeic drug.

- Trichilia emetica (mtimaji), is widespread in Tanzania with the exception of Miombo woodland and dry thicket belts. The seed aril of this species can be squashed into a fatty milky suspension that is used for cooking. The oil extracted from the crushed cotyledons is used for soap and cosmetics manufacture. Planting of T. emetica as a source oil for both soap making and cooking is greatly emphasized by the government. T. emetica is reported to be of medicinal value.

Introdution of these, and many other fruit-bearing forest trees to cultivated areas offers both opportunities of improved nutritional value and economic potential to provide cash incomes to the rural communities.

3.1.3.2 Beverages:

Edible fruits of some wild trees that occupy the drier savannah woodland and bushland sites of Tabora, Dodoma and Singida regions particularly Tamarindus indica and Adansonia digitata are used for preserves and beverages. Substantial amounts of fruits of these two tree species are exported to the Middle East mainly Saudi Arabia, hence they are a source of income to the inhabitants of such rural areas.

Bamboo species Oxystenathea abyssinica yields a bamboo wine as source of food and income for rural people in certain localities where the grass grows naturally. Recently, a privately owned plant at Iringa has been brewing the wine for domestic demand.

3.1.3.3 Fungi:

Mushroom consumption in rural areas of Tanzania is not uncommon, especially in Miombo woodland areas of Kahama, Kigoma Tabora, Shinyanga, Singida, Iringa, Mbeya, Mtwara, Lindi, Ruvuma and Morogoro regions, where there are large variety of these edible fungi compared to the few varieties found inhabiting the wetter highland sites. In Tanzania, it is estimated that the number of edible mushrooms exceeds one hundred species. Edible mushrooms in these areas also act as a source of income to communal people especially in the rainy season. Cultivation of mushrooms is not practised in the country, though this could create employment and provide income to people engaged in the industry as it is commonly experienced in other countries like Japan, China, where Mushroom cultivation is a viable economic endeavour.

3.1.4 Food-Faunal

3.1.4.1 Fish:

Fish for food from the many ponds, streams and rivers, whose sources are usually in the mountainous forested areas provide feed protein to the population in rural as well as urban centres such as Arusha, Moshi, Morogoro, Sumbawanga, Mbeya, Tanga, Iringa, Songea, Dodoma etc. Fish rearing is a very important activity in Arusha region whereby endowed with the numerous lakes - Babati, Duluti, Bassotu, Tlawi, Manyara and man made dams - Nyumba ya Mungu dam and the nearby Mtera dam in Iringa, and a number of fish ponds provide nutritional supplements of feed protein to the people within the region as well as neighbouring regions of Singida, Dodoma, Iringa, Kilimanjaro and Tanga. From available regional statistics for Arusha region it shows that there has been a sharp increase in the consumption of fish within the region from 490.8 Tonnes valued at 5. 5 m Tsh to 2,839.0 Tonnes valued at 72.2 m Tsh in 1986 and 1989 respectively (RNRO-Arusha).

3.1.4.2 Edible insects:

A number of insect species are edible, these include grasshopers, ants, beetles and termites. They all supplement protein needs in the food for rural communities throughout the country. These are eaten as seasonal sources in most cases, since their availability is seasonal too. Termites, have been, and indeed are still utilized as food by man over a large area of the World where termites occur. Where there is a scarcity of protein-containing food, the contribution which palatable termite species like Macrotermes bellicosus and M. natalensis may offer in order to make up a protein deficiency may be considerable. In some areas of rural Tanzania, the cropping of colonies of the winged reproductives at a time of leaving the nest, is a source of income since roasted alates are sold on the market. The food provided by the flying termites is also rich in calorific value (Hickin, 1971).

3.1.4.3 Game meat:

People living in or around forests and grasslands are provided with food security in the form of cheap protein supplements. Game hunting in backward districts of Kiteto and Mbulu in Arusha region, for instance is done by poisoned arrows. Certain plants are employed in manufacture of arrow poisons from the wild flora of Tanzania. The same toxins are used in water poisoning to stan fish and wild game, by the native tribes of the Hadzabe and Barbaig inhabiting Mbulu and Singida districts respectively, who are believed to be remnants of the Bushman. The Tanzania Wildlife Cooporation (TAWICO) in 1991 hunted 2573 wildgame and 25 birds, all valued at 9.6 m Tsh for game meat as well as trophies from controlled areas outside the parks and game reserves (RNRO-Arusha). Licensed individuals can also hunt animals for game meat to urban populations in the northern tourist circuit and elsewhere in the country.

3.1.4.4 Honey:

Honey and beeswax products are viable sources of rural income, not only in Tanzania, but in many areas in the SADC sub region. At the same time beekeeping provides one economic justification for the sustainable management of the natural forests particularily miombo and montane woodlands which possess a number of prolific nectar producing tree species. Beekeeping to a large extent, can serve as an important source of income for those living in buffer zones surrounding conservation areas, and the low population pressure within the forest reserves makes them particularily excellent for Honey and beeswax production. Honey is a high-carbohydrate food, valued as a source of sweetness and diversity in the Tanzanian diet (Kihwele and Bradbear, 1989). Honey is highly regarded as a tonic or medicine and is given to nursing mothers and the aged. Honey in Tanzania is widely used in the manufacture of honey beer which is a lucrative business as income earner at community level. Honey has also social value, as it is used at various important ceremonies, for example marriage and circumcision. This is especially true for Maasai

people. Since many beekeepers produce and sell their honey locally to end-users who offer better prices than cooperative societies, there are no statistics on the extent of this enterprise in rural communities. Most of the honey is consumed locally or sold through unofficial channels.

3.1.5 Non Food-Faunal

Bees wax: The contribution of the beekeeping subsector to the economy is quite substantial. Tanzania was once the leader in the world in the export of beeswax. Beeeswas is a useful commodity used locally in a wide range of processes, including floor polish, shoe-polish making, candles, taxidermy and cosmetic manufacture. However, most of beeswax so produced is exported. In many respects bees wax production does not compete with any crop for local consumption, hence is an ideal export crop for Tanzania. Beekeeping is a small scale activity spread all over rural areas in mainland Tanzania, though mainly concentrated in these regions:- Arusha, Kilimanjaro, Singida, Dodoma, Rukwa, Tabora, Tanga, Mtwara and Lindi. This makes evaluation of the extent of the industry difficult.

3.1.6 Medicinal plants:

The importance of medicinal plants to rural populations in the country has been pointed out under section 2.2.6 above. Suffice to say that, with the exception of Cinchona barks that are cultivated in the tea producing areas of Lushoto, Amani, Njombe and Mufindi; and used Worldwide for the extraction of quinine; most of medicinal plant sources come from the wild flora. As it has been pointed out elsewhere, much of forestry output remains unrecorded and goes to subsistence consumption as part of peoples basic requirements such as medicinals, fuelwood, fodder, and the alike. Most of the medicinal herbs is traded informally in both rural and urban areas and is therefore unrecorded. (Rulangaranga, 1991) reviewed indigenous important medicinal and aromatic trees from the wild flora of Tanzania that are suitable for afforestation programmes. A few of these include: Faidherbia albida, a multipurpose tree, from miombo woodlands whose bark is used for coughs and diarrhoea. The legume, being a nitrogen fixing species is used in agroforestry soil enrichment programmes. The fruits provide fodder for livestock and food for human consumption in times of famine. Acacia mellifera, also a legume from the Miombo woodlands and thorny bushland, the tannin extract from boiled bark is used as a remedy for stomach troubles, primary symphilis, malaria and sterility. Bridelia micrantha, naturally grows on Miombo-woodlands and montane forests of Coast, Iringa, Kagera, Kilimanjaro, Mbeya, Morogoro and Tanga regions. A decoction of boiled bark possess Saponins as active principle that cures stomach-ache, tapeworms, diarrhoea in young children. Erythrina abyssinica, whose active principle(s) Erythrina alkaloids

extracted from the bark of young stems and roots are used to treat a number of disorders such as trachoma, burns and general body swellings, malaria, anthrax, syphillis and snake bite. Rauvolfia caffra, with a wide range of distribution, yields alkaloids that are depressants of the Central nervous system. The plant also yields a bitter alkaloid that is reported to have anti-malaria activity. Reserpine, another alkaloid extracted from R. caffra, is used in the treatment of hypertension. R. vomitaria, of limited occurrence to Kagera and Kigoma regions only, is a source of the alkaloid reserpine which is used as a hypotensive and central nervous system sedative. Other indigenous tree species of potential medicinal value are as given in Annex I and their multiple uses are shown in Annex IV of this report. Though a number of species of plants growing naturally in the country are used as drugs in traditional medicine, there are no readily available sources of information on their active principles, supply, demand etc. There is only scanty information available on medical botany surveys carried out in the country that reveal the medicinal uses of plants for different ethnic/tribal groups for instance. This means that knowledge locked in the minds of indigenous peoples are less likely to be discovered. The Maasai for example, have a reputed knowledge of traditional medicines in Tanzania, and the selling of herbs to rural and urban communities by Maasai women in the country is a lucrative preoccupation. Indigenous knowledge is essential for the use, identification and cataloguing (Farnsworth et al, 1988).

3.2 At National Level:

As previously mentioned under section 3.1.6 and elsewhere, the contribution of forestry to socio-economic development of Tanzania is felt to be substantial, though difficult to quantify. Some of the produced products are traded informally and therefore unrecorded. Industrially important raw materials include also a wide range of informal sector products (NWFP) - where there are no reliable estimates on their supply and consumption. However, without knowledge on what forests can supply and what is locally consumed and exported, it would be difficult to even determine the contribution of forestry sector to the National economy. Moreover, many forestry outputs and services like those related to improvement of climate and promoting ecological balance are difficult to quantify despite their tremendous contribution to other sectors like agricultural livestock development, and wildlife management.

Table 2: Estimated gross value of output in forest based activities 1988 - 2008

Activity	1988 Tshs million	1988 % of grand total	2008 Tshs in 1988 price	2008 % of grand total
Fuelwwod and charcoal	9500	34.5	12500	7.0
Building poles	1000	3.7	2200	1.2
Forest industries	3200	11.5	80300	45.3
Wood Total	13700	49.7	95000	53.5
Honey and beeswax	1100	3.8	2240	1.3
Wildlife based activities:	9700	35.2	74300	41.9
Others (Wattle extract, fruits, fodder, medicinal plants)	3100	11.3	5760	3.3
Non Wood Total	13900	50.3	82300	46.5
Grand Total:	27600	100.0	177000	100.0

Source: Forestry and Beekeeping Division (1989a) Tanzania Forestry Action Plan 1990/91 - 2007/8 Ministry of Lands, Natural Resources and Tourism, Dar es Salaam - First Draft, 89 pp.

It would therefore appear a lot of vital statistics have to be generated and recorded if the role of forestry sector to the economy of Tanzania is to be realized. From the available statistics, the role of NWFP in the economic development of Tanzania can be realized by looking at Table 2 above, extracted from the TFAP 1990/91 - 2007/08 (Mgeni, 1990):

From Table 2 above, it can be realized that the contribution of the Forest sector's to Tanzanian economy is significant. It represents a total consumption of about Tsh 26 billion per year (Forestry and Beekeeping Division, 1989). Furthermore, the contribution of wood products is reckoned to be equal to the Non wood products sector . Forest Sector has also an impact on foreign trade in a form of exports or imports substitution. In 1987, for example, about 20% of Tanzania's foreign exchange earnings originated from the forest based activities.

Wildlife based activities are projected to increase their contribution seven-folds by year 2008.

Table 3 shows Foreign Trade Export statistics for the major NWFP in Tanzania between 1988 - 1992.

Table 3: Export Trade Statistics for Selected NWFP 1988/92

Value in Mill. US $

Product	1988	1989	1990	1991	(Jan-June) 1992
Honey	0.024	0.015	0.078	0.117	-
Bees wax	0.793	0.510	0.566	2.451	0.720
Gum arabic	0.356	0.264	0.370	0.940	0.099
Cinchona bark	0.163	0.266	0.265	0.258	0.098
Wattle mimosa extract	-	4.371	-	2.855	1.787
Raw rubber	-	0.369	-	0.914	-
Wood carvings	-	0.728	-	0.195	0.104
Wildlife activities:					
Animal trophies	0.258	0.395	0.587	0.013	1.338
Live animals	0.856	1.057	3.964	0.593	0.080
Tourism	40.400	60.974	65.000	94.730	138.300*
Grand Total:	-	67.974	-	104.064	-

* Projection figures, 1992

Source: Annexes II and III of this report.

3.2.1 Wildlife based activities:

From Table 3, wildlife activities contributed about 90% of foreign exchange for years 1989 and 1991. Wildlife based activities include trade in Animal trophies, live animals and Tourism itself. By far, tourism is the biggest revenue earner in the NWFP Sector. The contribution of Tourism to economic development of the country has been increasing especially since 1986 when the number of tourists who visited the National parks and game reserves for game hunting, viewing, photography, trophies collection has doubled (Annex III). This new development, is partly due to the concerted efforts by the Government in making tourism a more profitable industry.

A number of animal trophies harvested from controlled game reserves enable the country to earn substantial amounts in terms of foreign exchange. The animals so killed provide food security and income generation, employment opportunities in their collection, trade and foreign exchange from the sale of collected

trophies. Tourist hunting for live animals including birds, is done by a number of Tourist companies, mostly found in Arusha and Mara regions. Owing to Government ban on illegal bird trade of such species like brown parrots, lovebirds etc; the earnings from live animals has decreased substantially from about 4 mill. US$ in 1990 to less than 0.6 mill US $ a year after. The major markets for Tanzania's wildlife products include Japan, Federal Republic of Germany, Belgium, Norway, USA, UK, Canada and France.

Crocodile rearing is being encouraged by the private sector, as seen in Dar es Salaam and Kilombero valley in Morogoro, for skins to support the leather industry in future.

3.2.2 Honey and bees wax:

Potential honey and beeswax producing areas include western, central as well as southern Tanzania which have good environment for the production of these products. Since most of the honey is sold unofficially, it is difficult even to know the level of domestic demand for this product. It is believed that bees wax and honey are also exported unofficially, largely to neighbouring Kenya, where price offered is more attractive. Estimates put the annual production levels of honey and beeswax at 5000T and 330T respectively. Currently known honey and bees wax exports are valued at a minimum of 2.5 mill. US $ per annum. Prior to 1991, there has been a decline in exports of honey and beeswax, because of the policies within Tanzania, while world demand for these products has increased rapidly.

The major markets for honey has been the Middle East countries particularly the U.A. Emirates; whereas for bees wax main importers are Germany Federal Republic, Japan and the United Kingdom.

3.2.3 Tannin Extract:

Tannin extract from wattle bark as raw material, is produced by two export-oriented mills (Tanganyika Wattle Company Ltd. in Njombe, and Giraffe Extract Company in Lushoto) where total capacity is 11000 tons per annum; but actual production is in the region of 5,000 tons of extract per year. The Giraffe Extract mill has a rated capacity of 2000 tones per annum of grannular tannin and the other mill 9000 t/a of ordinary powder, high quality solid and green strips. Production at the Tanganyika Wattle Company has in the 1980s been 4500 to 5000 tonnes of extract per annum, whereas in recent years the output has declined to between 3500 and 4000 t of extract per annum. The raw material wattle bark for these mills come from the TanWatt's own wattle plantations as well as individual farmers' woodlots. For the Giraffe Extract mill at Lushoto, the raw materials are extracted from Magamba Forest Project nearby as well as outgrowers in the vicinity.

The mangrove species Rhizophora mucronata and Ceriops tagal along the coast, were widely used for tannin extraction until the late 1960s in Tanzania (Bryce 1967); but their harvesting has

been restricted since then. In view of the needs to protect mangrove forests, it is not realistic to consider them as a potential source of raw material for tannin production, though the Government has again opened them for harvesting. The mangroves, besides providing tanning barks and poles; they also provide good breeding zones for certain types of fish along the coast.

The bulk of the extract produced continues to be exported mainly to India, Pakistan, Bangladesh, Egypt, Syria and Thailand. Average annual exports of 4000 tonnes earning the country over 2.5 mill. US $ in foreign exchange is supplied by Tan Watt alone. A small quantity of wattle extract is used in the local tanneries as well as natural glue in plywood manufacture of potential value.

3.2.4 Gum arabic:

Annually, about 1000 tonnes of gum arabic are collected. Half of this amount is exported to Austria, Germany Federal Republic, India and Sri Lanka, earning the country foreign exchange.

Like other non wood products, gum arabic is sold locally and is also exported unofficially. The product is tapped from wild acacia woodland trees in the semi arid natural forests of Singida, Arusha, Shinyanga and Tabora regions. The products have a great potential for increased exports with sufficient economic return.

3.2.5 Cinchona barks:

The barks, collected from cultivated Cinchona species - C. calisaya, C. ledgeriana, C. officinalis and C. pubescens are important export produce that earns Tanzania foreign exchange in the region of 0.25 mill. US $ per year. Most of the product is produced by the private sector (Mazumbai Quinine factory) alongside with tea cultivation.

The bulk of Cinchona bark produced is exported to Belgium, United Kingdom and the Netherlands to be utilized in phamaceuticals. Together with Cinchona tree species, there is a large number of medicinal and aromatic plants, many of which could offer possibilities for small scale collection and processing.

Only small amounts of essential oils are exported, mainly to the United Arab Emirates.

3.2.6 Raw rubber

Labour costs in rubber tapping from living rubber trees in plantation may account for 70-80% of total production costs. Though at present, only about 20 tonnes of crude rubber is exported to mainly Singapore and Syria; the product has a high demand in the tyre industry. More land has to be planted with

rubber trees in the humid, sub-tropical areas so as to meet the growing demand for rubber products both internally and externally.

3.2.7 Wood Carvings:

The famous Makonde carvings from Tanzania, have high demand in Japan, USA, Germany, Uganda and other countries. The main wood species used in carvings are Dalbergia melanoxylon, Combretum molle, Brachylaena huillensis etc. In most cases the wood that is used in carvings could otherwise be left in the forest to rot. For the country, it is necessary to make concerted efforts to achieve drastic improvement in the export performance through better marketing of traditional exports and development of non-traditional exports like wood carvings. Most of wood carvings are made by small craftsmen in rural Tanzania especially in Lindi and Mtwara regions.

3.2.8 Naval stores:

As outlined under section 2.2.8.5 above, the existing pine plantations could be a source for naval stores, gum rosin and turpentine obtained by tapping mainly from the living trees of Pinus elliottii, P. caribaea and to a lesser extent, of young P. patula. Major potential sources of supply are within these forest projects; Sao Hill in Iringa; Buhindi and Rubya in Mwanza; Rondo in Lindi; Matogoro in Ruvuma; Ruvu in Coast region; Rubare in Kagera and Ukaguru in Morogoro region. Preliminary tapping yield trials done at Sao Hill Forest project to find out the likely yields, have indicated that there is an abundant potential supply of resins from the industrial forests; hence justifying the development of naval stores-based industry in Tanzania. The product quality and market acceptabilities have also been studied, and initial results suggested that the quality would be acceptable for export.

Since the sizing chemicals for paper making are presently imported to Tanzania by the Southern Paper Mills (SPM) as well as the Kibo Paper Mill; the development of gum rosin extraction would therefore, be well suited for the country to substitute these imports.

4. INSTITUTIONAL RESPONSIBILITY

As stated elsewhere in the proceeding chapters that, despite the potential importance of the NWFP to community as well as national economies, these products have not received desirable attention in forestry activities, which include Research, Development, Investment and Planning. The NWFP Sector, like other sectors in the country is being faced with a host of problems that hinder its development with available limited resources. However, once the constraints are identified then due attention ought to be directed towards sustainable utilisation of those NWFP that have the greatest potential for development:- Wildlife related activities, Tannin extracts, Beekeeping products, Gum arabic, traditional medicines and naval stores.

4.1 Organisational structure

4.1.1 Responsibilities:

The Wildlife Division together with the Tourism Division are responsible for state activities in the management and control of wildlife related activities. These, together with the Tanzania National Parks Authority (TANAPA) control the utilization of animal trophies, live animals through permits to tourist companies, individuals in the national parks and other controlled game reserves.

The Forest and Beekeeping Division on the other hand, is responsible for a wide range of state activities in the Management and control of wood and non-wood products such as honey and beeswax, tannin extract, bamboo and other fibre products, resins, latex and gums. The Division controls the utilization through permits and royalty collection from sales of various products. To a large extent the Private Sector, and Cooperatives (e.g. Tabora Beekeepers' Co-operative Society - TBCS and Arusha Beekeepers' Association - ABA etc) and parastatal organisations like Handeni Honey Processing Plant HHPP are responsible for honey and beeswax production. For tannin extract, the jointly - owned Government and CDC mill is to a large extent responsible for the bulk of tannin extract products exported annually. To a lesser extent, the parastatal mill the Giraffe Extract is also responsible for production and marketing of wattle mimosa extract. Mangrove bark export has been on a decline for some time now. The General Tyre (E.A.) Ltd. a parastatal organisation is wholly responsible for crude rubber production and manufacture into rubber products in the country. The Fisheries Division, is responsible for state activities and management and control of fisheries. Indeed, the traditional practitioners in Tanzania, are still responsible for primary health care to the majority of the puplation; hence with the establishment of the Traditional Research Unit of Muhimbili Medical Centre, the Government has recognized the need to gather knowledge and attitude of traditional medicines, to cultivate both medicinal and aromatic plants and consequently conserve traditional medicinal plants.

The Private Sector plays an important role in the cosmetics industry both meeting domestic and export trade. For cinchona barks production, the bulk of the export is handled by the private sector. This is also true with gum arabic extraction and marketing. The Government, through its Wildlife Division is mobilizing the private sector to establish crocodile and frogs rearing farms to support leather industry, and provide game meat, as evidenced at Hambo Crocodile farm, Boko village near Dar es Salaam.

4.1.2 Coordination structure

The present organization of the forestry sector as well as other related sectors of Natural resources, is characterized by lack of a direct chain of command, which in itself is a serious

structural hindrance to any kind of smooth flow of communication and implentation of various policies.

Suffice to say that the role of the Government extension services in NWFP informal sector is ineffectual, despite the fact that Tanzania has a large number of Government employees that possess qualifications in various fields such as beekeeping. Generally, there is a lack of information and co-ordination at national and sub-national levels in most fields. With the Government policy on decentralised organisation system whereby respective sectoral District Natural Resources Officers and respective sectoral Regional officers are responsible to Regional Natural Resources Officers; neither District nor Regional Natural Resources officers need have knowledge in every field of the Natural resources sub-sector. Moreover, none of the extensionists are answerable to Divisional Directors at the Ministry. Hence, it is impossible for NWFP sector to function in a unified way. For products like gum arabic, cinchona barks and traditional medicine, generally, there is no line authority to national agency since the Private sector buys and processes the products from producers themselves. The private sector also markets aromatic products without much intervention from the Central Government. However, there is a weak coordination structure between the Government and the private sector too.

4.1.3 Relationship with producers/Market agents.

There is limited Government intervention in production, processing and trade of major non-wood forest products through import and export duties. For certain NWFP like honey, wood carvings, handicrafts, dyeing and colouring materials etc trade is between the producer and importer. The public sector however, provides transport infrastracture for NWFP for instance, tannin extracts from Tanwatt Company, rail/road transport to Dar es Salaam port; and shipping facilities. Road and air transport facilities for live animals, birds and other related products.

Individual enterprises, such as TanWatt and Board of External Trade are represented on marketing boards. These, to an extent, do influence government policy on NWFP development.

4.1.4 Financial aspects

As stated elsewhere, nearly all large NWFP enterprises are privately owned, with exception of wildlife related products that are run by local and Central Governments. Honey and beeswax products are owned by Cooperatives as well as parastatals. None of major NWFP enterprises have ever received any government support in terms of machinery or foreign funds. Capital base structure of various plants is inadequate, hence financial constraints that affect production capacities are not easened. However, with the Government's wise decision to liberalise trade in 1986 and to make foreign exchange readily available by introducing incentives to exporters in the form of retention schemes and opening of Bureau de Change shops; the mills and Cooperative Societies within NWFP sector will benefit more, since

the much needed foreign exchange will be available, with which to import necessary spare parts and inputs necessary for improving the efficiency of these mills, paving the way for increased productivity and sales (Ndepanya, 1992).

4.2 Human Resources involvement

Proper utilisation of human resources in various spheres of the economy to promote productivity efficiency and improve the lives of the people is a pre-requisite for any sustainable development.

4.2.1 Technical capabilities

Generally, there is limited degree of scientific trainining, research, and dissemination of knowledge regarding production techniques applicable to NWFP sectoral activities in the country with the exception of beekeeping and tannin extracts industries. There is a lack of comprehensive training policy (government and private sector) to ensure that the right people are receiving the right training. In many cases, it will be noted that there is no liaison between one research institute and other institutes within the same sector. Lack of skilled manpower constitutes a major problem that results in ineffective extension services. Most of the NWFP - based mills, like many industries in Tanzania employ labour intensive production methods. The cooperatives on the other hand, employ fewer numbers of full-time staff, for example Tabora Beekeeping Cooperative Society has about 30 full-time staff and a membership of about 5400 beekeepers drawn from the five districts within Tabora Region. Research Institutions need Government subvention to support active research programmes. Usually, through extension services; local staff will be periodically informed of relevant advances in their fields.

4.2.2 Local management skills

In Tanzania, it can be generalised that there is inadequate management of the existing forest resource to sustain future demand both for wood and non-wood products. These forests are being abused in many parts of the country due to inadequate supervision.

However, local knowledge of management techniques, product processing technologies do exist; though not well documented in the following areas:

- Traditional medicines. The amount of information available at the species level is inadequate for assessing the status of medicinal plants.
- Fibre/handicrafts (including wood carvings) production of competitive quality.
- Aromatics/oils production, and spice processing.
- Game hunting and fish catching using toxins.
- Gum arabic tapping/collection from wild Acacias.

On the other hand, imported technologies and well tapped local skills are found in the Tannin extract industry, rubber industry, Cinchona bark production, Tourist based activities and the traditional beekeeping industry that accounts for the bulk of honey and beeswax production. However, there is an urgent need to reorientate and strengthen training in practical skills and extension, at the Beekeeping Training Institute (BTI) in Tabora and establishment of a Bachelor of Science degree course in Beekeeping at the Sokoine University of Agriculture in Morogoro to impart local mangement skills at professional level tailored to Tanzanian conditions. The course could also cater for the needs of other African countries.

4.3 Efficiency and impact

Banking loans to NWFP industries in most cases is not sufficient to meet various needs, which in turn leads to low productivity, low efficiency and lower revenues. Personnel and facilities utilized in NWFP sector are mostly not sufficient, in experienced and adequately not maintained respectively, to impart the desirable impact on capacity utilization of mills. In order to reverse this trend, the NWFP subsector like others, should be provided with professional skills, together with requisite resources, notable capital, trained personnel, transport, provision of incentives to use and develop forests by the private sector etc.

4.4 Policy and Legislation

4.4.1 Review of policy and legislation

Forestry and Beekeeping Division is charged with responsibility of developing and managing the forest resources in Tanzania. Furthermore the division has the main duty of contributing to the national economy by providing goods and services pertaining to the forestry activities together with the collection of lawfull dues attached to these goods and services. These policies and legislations are aimed at stopping people from cutting forestry products as if they are free commodities, but at the same time promoting better utilisation of these on a sustainable basis.

Revitalisation of existing legislative codes and policies regarding use, access (land tenure etc.), processing and trade of NWFP for instance, once implemented would lead to revitalisation of the industry. Forest policies that are both environmental protection and market oriented should be instituted. The proposed forest policy encourages private sector investment not only in wood industry but also in the non-wood products sector. The beekeeping policy prior to 1986 for instance, put more emphasis on modern methods of beekeeping in order to increase honey and beeswax production, though the bulk of these products are still produced by traditional methods. Hence, the proposed policy must acknowledge that most beekeeping in the country is done by traditional and non-chemical methods. Beekeepers in that case need assistance to obtain maximum quality

and quantity crops using materials that are now available to them. Rather than promoting only modern hives, the policy should advocate the use of whichever hives are appropriate for a given situation; whereby modern hives should only be encouraged where they have proven ecological or economic advantages.

Legislation must be drawn-up and enforced quickly to prevent the import and export of honey bees and used beekeeping equipment to avoid over exploitation of the bees, introduction of diseased strains and contamination through used equipment.

Forest policy and Forest ordinance as stated above, are currently being revised so as to make sure that they reflect present day and future vision of the place of forestry in the National Development. After revision, an aggressive campaign will be carried out to educate not only the forestry personnel but also leaders and the general public on the provision of these two instruments.

4.4.2 Effectiveness of policy and legislation

In Tanzania, and elsewhere, it is recognised that some policies have encouraged deforestation through market and policy failures (Mbonde, 1992). The forest policy at present is being reviewed and will involve participatory dialogue among stake holder both in public and private sector. For example, in tobacco growing areas deforestation rate is high owing to fuelwood exploitation for curing the crop. It is the intention of the Government that some functions are transferred to local communities and the private sector and strengthening institutions to ensure that new and leaner forestry agencies have capacity needed for effective forest management. Amongst key challenges facing Tanzania to date in the forestry sector, include: Enhancing social and cultural benefits of forest resources - that is, increasing the production of non-wood forest products to enable rural and urban people to benefit from intact forests and thereby give these people an incentive to preserve the forests. One example whereby market and policy failures has been experienced in the country, involved the establishment of GAPEX - a government export organisation in 1978/79. Since its establishment, there were no honey exports to European market because only limited quantities were produced. After its dissolution in 1988/89, more honey has been reaching European market. The cooperatives, private sector and parastatals engaged in beekeeping handle the products themselves. The Government has to look a new at various policies which affect the NWFP sector development, especially on management of forests, financing, and new investment opportunities, with a view to increasing productivity and hence their contribution towards GDP.

5. TECHNICAL ASPECTS

5.1 Major NWFP

Traditionally, NWFP which have been exported from Tanzania have mainly been Tannin extract, honey, beeswax, gum arabic and

Cinchona barks. In recent years, animal trophies and live animal exports have been introduced. Traditional medicinal herbs, though of vital importance to rural populations, are not exported. These major NWFP have been discussed in detail under chapter 3 above and their contribution to the economy of Tanzania has also been outlined, (Annex II on Statistical Data).

5.2 Geographical distribution

Suffice to say that the principal sources of the major NWFP are as follows:

- Tannin extract from grassland wattle plantations of TanWatt Company at Njombe, Iringa region and the Giraffee Extract Company at Lushoto, Tanga region. Scattered farmers' wattle wood lots are also found in the nearby Kilimanjaro and Arusha regions.

- Honey and beeswax, scattered throughout the country, but concentrated in Miombo woodlands, high rain forest areas, Acacia woodlands and agricultural lands (coffee, sunflower estates etc). Amongst the Miombo woodland high potential beekeeping Districts in the country include the Western: Tabora, Urambo, Kahama, Kibondo, Mpanda, Chunya and Manyoni Districts; the North-Eastern: Handeni, Kilosa, Kiteto and Kondoa Districts; and the South-Eastern: Liwale, Mbinga, Songea and Tunduru Districts.

- Gum arabic, from Acacia woodlands in semi arid areas of Tanzania such as Urambo in Tabora Region; Singida and Iramba Districts in Dodoma Region; Bariadi and Shinyanga Districts in Shinyanga Region; Kiteto, Mbulu and Hanang Districts in Arusha Region; Same, Hai and Mwanga Districts in Kilimanjaro Region and Handeni Districts in Tanga Region.

- Cinchona barks, from commerical tea estates in the mountainous areas of Usambaras and Southern highlands

- Animal trophies and live animals, in Game reserves, National parks and controlled public areas. The major National Parks include the World famous Serengeti National Park; Lake Manyara, Tarangire and Arusha National Parks in Arusha Region; Kilimanjaro National Park in Kilimanjaro Region; Mikumi and Udzungwa National Parks in Morogoro Region; Rubodo Island National Park on Lake Victoria; Kitavi Plains National Park in Rukwa Region; the Ruaha National Park in Iringa Region and Gombe River National Park in Kigoma Region. Among the famous game reserves in the country are the Seleous Game Reserve occupying parts of Morogoro, Lindi, Ruvuma and Iringa Regions; Ngorongoro Conservation Area in Arusha Region; Mkomazi Game Reserve in Same District, Kilimanjaro Region and Maswa Game Reserve in Mara Region. There are also a number of game controlled areas in the public lands including the Loliondo forming part of the

Serengeti Ecosystem in Ngorongoro District; Ngorongoro, Mto wa Mbu in Arusha Region; Umba River, Rungwa River, Utengule Swamps and Kilombero. Others are the Sanya Plains and Rau Forest in Kilimanjaro Region and those found on the Isles of Pemba and Zanzibar.

- Medicinal plants as outlined in detail under section 3.1.6 and elsewhere in the report, together with plant toxins are obtained largely from the wild sources in the forested areas of the country.

5.3 Yield/Management of principal resource base

5.3.1 Tannin extract

Tannin extract from black wattle has world-wide markets, though production has been on a decline overtime. This is due to declining supplies of wattle bark by farmers and plantations owned by the Government (Magamba Forest plantation, Kilimanjaro, Meru Mts. and in Mbulu District) and the TanWatt's own wattle plantations. Also the decline, is due to competition from synthetic materials, development of non-tanning uses and regional marketing stabilisation. Yields of bark for tannin extract over the past two decades has also declined due to restricted exploitation of the mangroves along the coast. For instance, in the 70's, exports of wattle bark extracts averaged about 9000 tons whereas in the 80's both production and exports averaged about 4000 tons only. Production has again improved from 1990 onwards (Annex II).

5.3.2 Honey and bees wax

Areas with the greatest potential for beekeeping include forests, woodlands, bushlands and wooded grasslands, and these account for over 70% of Tanzania's total land area. From the high rainfall forests; miombo woodlands; bushlands and Acacia thickets; wooded grasslands with miombo spp. Dombeya and Parinari as excellent sources of light coloured honey of pleasant flavour; Desert and semi-desert type of vegetation though too dry but have high potential in certain areas, Euphorbia spp. and Xerophytes are good for honey production; to cultivated areas - most fruit and vegetable crops are good sources of forage for bees and in high rainfall zones, coffee produces high quality honey; have excellent beekeeping potential. Grasslands e.g. Masai steppe, are important beekeeping areas, though generally have lower potential due to low rainfall, but the associated Acacias, attract high honey bees populations. Permanent swamps, are good beekeeping zones due to presence of flowering trees and an ample water supply. Despite the fact that the silvicultural management of miombo species is largely unknown; any management interventions must consider possible effects on the flowering of trees and thereby on beekeeping. Like other NWFP, yield of honey and beeswax for the last decade has been on a decline. In the 70's Tanzania used to be one of the leading producers of beeswax, with an annual output of approximately 600 tons. Many beekeepers produce and sell their honey locally to end users. In 1988, for

instance, the private sector was responsible for the export of at least 20 Tonnes honey (worth about 23000 US $) to the Middle East and 324 Tonnes beeswax (worth around 800 000 US $) to Europe and Japan. Export of honey and beeswax by private sector reduced considerably during 1989-90 period, but is showing signs of recovery since then (Annex II).

5.3.3 Gum arabic

The product could have potential for increased exports, since after liberalising trade in 1986, there has been an increase in the production of gum arabic, which has resulted into the increase of quantities being exported. More and more people have now gone into export trade. Frequent devaluation of local currency, has also encouraged many exporters of gum arabic for instance, to increase their export quantities. The product is being tapped by individual farmers from the Acacias. Export of gum arabic jumped from 383.8 Tonnes in 1986 to 740.2 Tonnes in 1990 (Annex II).

However, for sustainable yields, the acacia resources should be inventoried and the natural stock should be increased by plantations, since gum arabic producing trees can be easily propagated by seeds. Gum collection and sales should be adequately organized, presumably on Cooperative society basis instead of individual farmer's approach.

5.3.4 Cinchona barks

Silvicultural practices for the Cinchona trees is a well known fact. Increased acrage on suitable sites will ensure sustainable yields for the products. Tanzania, is one of the main Cinchona - producing countries. The most important alkaloids contained in the bark and used in medicine are quinine and quinidine. While quinine is used as an antimalarial, quinidine is used as a cardiac depressant to control curicular fibrillation (Husain, A. 1988). At one time, the use of quinine as an antimalarial drug had gone down and production of Cinchona bark as well as alkaloids had decreased considerably due to competition offered by synthetic drug sources. Because of development of resistant strains of the malarial parasites, the use of quinine as an antimala—rial drug has increased recently and it is expected that with the reappearance of malaria in African and Asian countries, the use of quinine will increase in those countries. For example, exports of Cinchona barks declined from 160.9 tones in 1986 to about 119.8 tonnes in 1990, but a year later, exports increased to 755.9 tonnes in 1991 (Annex II).

5.3.5 Wildlife based activities

The Tourism Division is charged with the wildlife related resources that include the National parks, game reserves and controlled areas in the country. In these reserved areas, all legal wildlife based activities are operating, like live animal cropping, animal trophies harvesting and tourism itself as outlined under section 3.2.1 above. Moreover, of lately the

Government has taken deliberate measures in making tourism a more sustainable industry by encouraging more private investors' involvement in this sector. More tourist hotels are planned to be run on either joint venture with the Government or by the private sector so as to improve the efficiency and accommodate the projected booming Tourist industry.

6. MAIN PROBLEMS AND CONSTRAINTS

There are a number of problems and constraints that hinder the promotion and further development of NWFP in the country as high lightened in the preceding chapters. These are summarized hereunder:

6.1 Resource base

(i) In relation to all major NWFP:

(a) There is over exploitation of natural resources e.g. forests due to indiscriminate harvesting of trees and other woody plant materials of medicinal value; wild animals due to poaching; dwindling fish supplies due to siltation of dams/water sources that has been caused by deforestation of catchment forests.

(b) Most of the reserved natural forests are without appropriate management plans and harvesting on public lands is widely without any control.

(c) There is unreliable statistical data on NWFP for smooth planning and management.

(ii) Specifically, in the Tannin extract industry:

(a) Control of bark quality from various suppliers (farmers) is difficult at the Giraffe Extract Company, resulting in lower processing yields.

(b) Owing to technological advancement, the Giraffe Extract mill has now to face the change in market requirement in preference of powdery extract while the present product is being sold as a solid extract. At Tan-Watt Co. modernization of product processing has been accomplished to produce a variety of products from high quality and ordinary powder to green strips.

(c) Some wattle growers are exporting bark to Poland, Kenya and India, probably encouraged by higher prices than offered by local producers or mills. However, for long-term interests of the country, trade should be properly controlled by offering remunerative prices to producers of bark.

(iii) For honey and beeswax production:

(a) Traditional beekeepers lack marketing support either from the Government or Cooperatives etc. This is also true for other products like gum arabic, traditional medicines, handicrafts including carvings, aromatics industry that are privately run, toxins preparation by peasant farmers or hunters.

(b) Traditional beekeepers are unable to both produce and market table honey commercially because they don't have the transport facilities or containers.

(c) Money is needed to buy honey and beeswax from beekeepers by the coperatives since the society does not receive payment from subsequent sales until several months later. With more funds, the cooperatives or parastatals could offer more competitive prices and hence handle larger volumes of products and ultimately be able to offer dividends to members, further stimulation beekeeping and the local economy.

(iv) For Food-vegetal products like edible mushrooms both research aimed at increasing production and marketing support is totally lacking, rendering this product to be of little economic value.

(v) For Cinchona barks produce, due to technological advancement, the Mazumbai Quinine factory is being faced with the option of rehabilitation of the aging facilities so as to produce semi-processed drugs to meet domestic as well as export demand.

(vi) The acreage under plantations can not support the local tyre manufacturing industry, hence necessitating importation of raw materials from elsewhere.

6.2 National capacity

(i) There is a low rate of capacity utilization of mills and other production units due to low working capital/weak capital base. Of particular emphasis, Tanzanian Tourism industry is facing the same draw back of low capacity utilisation due to weak capital base.

(ii) Shortage of foreign exchange which could be used to finance imports of necessary spare parts for rehabilitating aged machinery and equipment.

(iii) High cost of transport for both raw materials and finished products resulting from the bad state of roads and railway network as well as the ever rising cost of fuel and spare parts.

(iv) Clearing imports may delay up to 6 months the availability of necessary suppliers.

(v) Certain NWFP industries like the Tan-Watt Co. and Mazumbai Quinine factory are not connected with the national grid and hence, generating their own electricity is costly.

(vi) Poor management and inexperienced personnel in certain mills acts as a bottle-neck in the development of the NWFP sector.

(vii) Working skills and low working capital are the major problems hindering the establishment of the naval stores industry in the country.

(viii) Lastly, in the past the awareness of decision makers and the general public on the contribution of NWFP sector to the GDP and the physiological needs of the rural communities was very low, leading to such goods being called "minor forest products". This attitude has not changed much, though of lately, the Tanzanian government has embarked on a number of programmes aimed at the sustainable supply of NWFP.

7. RECOMMENDATIONS

Much as there has been increased efforts by the Government in exporting wood and non-wood forest products as evidenced in the export performance in recent years, Tanzania is not a major supplier of these products in the international markets (with exeption of Cinchona barks and Wildlife related products) and it has failed to exploit the existing market potential despite its having very big reserves

In recognition of these problems, the Government should develop comprehensive strategy to these diverse factors that can transform the social and economic processes. The key elements of this strategy are:-

7.1 Improved Resource Base

The present production levels of both wood and non-wood products are too low to adequately satisfy the growing demand of both domestic and export markets. Improvement of production levels can be done through:

(i) Increasing capacity utilization of non-wood processing mills.

(ii) Ensure proper maintenance of production machinery and equipment.

(iii) Application of modern technology in products harvesting and processing. Most of the mills in the country need rehabilitation so as to enhance productivity.

(iv) Improvement of knowledge relevant to forest and non-wood products management - both basic and applied research should be emphasized in order to improve techniques of forest management, and provide specific inventory data for investment opportunities in both the wood and non-wood forest products sectors.

(v) Introduction and evaluation of new forage crops - trees, grass, bushes for multiple use. Carry out phenological observation to provide necessary information on species availabilities.

(vi) Increased planting of various indigenous fruits-bearing forest tree species on large plantation scale is highly recommended. The introduction of forest and fruit species to agricultural areas and their possible domestication and improvement through breeding offer considerable possibilities, not only in the improved nutrition of rural populations but in their economic potential to provide cash incomes derived from the sale of their raw fruits or processed products.

(vii) National inventories of medicinal plants, and other non wood forest products like Acacia woodlands for gum arabic production; rubber plantations, natural aromatic tree species etc. are essential if sound programmes for their rational use and exploitation are to be developed. Such inventories, still largely to be effected in Tanzania; need to describe the geographical and climatic distribution of various products, their source and an indication of their relative abundance or scarcity. For the scarce products, efforts on their resource management including estabishment should be put into practice.

(viii) Improved market and marketing strategy by:

(a) Product advertisement through participation at trade mission/fairs.

(b) Formulating intergrated promotional strategies that would enable to attract more buyers.

(c) Offering best quality products to the export market.

(d) Quotation of most competitive prices for products.

(e) Ensuring strict adherence to sales contractual stipulations in relation to specification of the product (packaging, storage), protection during transport, punctuality of delivery etc.

(f) Diversify products range by promoting and introducing products which have traditionally not been put in the export markets - e.g. NWFP like traditional medicines, aromatics, rubber products, naval stores etc.

7.2 Improved National Capacity

(i) As of lately, the Government's decision to liberalise trade, this has accelerated latest developments in mill productivity whereby in some mills has already started to pick-up, and this trend is expected to continue. Trade liberalisation has contributed positively towards increases in importation.

(ii) Improved infrastructure (Telecommunication, road, rail, power supply) in areas to be harvested and provide accessibility and transport to market destinations.

(iii) Local transport agencies, like (TRC) - Tanzania Railways Corporation, (TAZARA) - Tanzania Zambia Railways Authority, and (THA) - Tanzania Harbours Authority should introduce preferential rates for upcoming non traditional exports.

(iv) Improve the welfare of workers in various industries. Utilize properly trained personnel both in Management and production.

(v) Improving capital base structure in order to ease financial constraints which affect production.

(vi) The Government should give exporters special incentives eg. higher retention rates, access to foreign exchange, simplified export documentation.

(vii) Promotion of Tourism and wildlife based activities through building of better-run tourist hotels; joint venture with Private investors. Taking drastic steps to prevent total loss of the country's endangered wild animal populations e.g. black rhinos, one of great attractions for tourists. New projects of translocating various species into high security game sanctuaries that are fenced could be launched. Once animals are translocated into such areas and let alone, can breed well. Management of wildlife/human inhabitants coexistance schemes should be

encouraged such as the Ngorongoro Conservation Area Authority whereby, the Maasai people attend their livestock using forage from the National Park, and are allowed to crop for game meat and trophies, while at the same time provide tougher security against poachers. Such measures are aimed at giving local communities incentives to preserve the endangered wildlife populations. The Government should think more on how to provide game meat to the people around wildlife conservation areas instead of leaving the animals to roam the widerness.

(viii) More national programmes should be drawn up to promote awareness on environmental conservation. Similar programmes involving local communities are also necessary. These programmes must include sharing benefits accrued from sustainable use of the resource, in accordance with the resolution of the Rio de Janeiro United Nations Conference on Environment and Development. Full involvement of the people during the planning stage and implementation of these programmes is a pre-requisite to ensure their success.

8. CONCLUSION

(i) The demand for nonwood forest products is very big both in the local and export markets. The Government, Private investors etc. should endeavour to exploit all potential markets in order to increase sales volumes, so as to earn more money which will guarantee the survival of the NWFP sector, and increase the contribution of the sector to the Economic Recovery Programme (ERP)

(ii) Concerted efforts should be geared towards documentation (identification, and evaluation), preparation, cultivation and conservation of medicinal plants used in traditional medicine. Quality, efficacy and accuracy in labelling the constituents of medicinal plant remedies is critical for safety evaluation and drug control.

(iii) Since, the present production levels are insufficient to satisfy the few markets which are being served now, it is necessary that production capacity is increased through rehabilitation of present mills and installation of new capacity.

(iv) Private investments should be encouraged to develop the NWFP sector by investing in the infrastructure, because the Government has little ability to do so now due to the poor state of the economy.

(v) Reliable Data analysis is a key element in any national, regional forestry development process as stipulated in the Tropical Forestry Action Plan (TFAP).

(vi) The success of TFAP depends on the programme being backed and guided by a strong research base, of which in Tanzania, like other developing tropical countries, is very weak.

(vii) Single sector approaches in forestry development need to be replaced by a broader approach to sustainable management of forest resources within the national as well subregional resources management framework.

ANNEX I

CLASSIFICATION OF NWFP IN TANZANIA

CATEGORY OF NWFP	PRODUCT	IMPORTANCE OF NWFP
Fibre	Bark	3
	Matts	2
	Bamboo	2
	Baskets	2
	Cork	3
Forage	Grass, leaves, branches, live hedges	1
Food (Vegetal)	Condiments	3
	Spices	2
	Fruits	3
	Fungi (Mushroom)	2
	Beaverages	2
	Leaves	3
	Seeds	3
	Oils	3
	Nuts, Betel	3
	Nuts, Shea Butter	3
Food (Faunal)	Fish (meat, feed protein, oil)	1
	Eggs	3
	Game meat (mammals, birds, reptiles)	1
	Honey	1
	Frogs meat	3
	Invertebrates	2
Non-Food (Faunal)	Feathers of (Ostrich etc.)	3
	Bees Wax	1
	Live Animals	1
	Animal Trophies:	
	Mammal Furs	1
	Mammal Horns	2
	Mammal Teeth (ivory, hippo)	1
	Shells (tortoise, etc.)	3
	Skins of larger mammals	1
	Skins of Reptiles	1

CATEGORY OF NWFP	PRODUCT	IMPORTANCE OF NWFP
Medicinal	Azadirachta indica	2
	Cinchona barks	1
	Caesalpinia decapitala	2
	Croton megalocarpus (bark)	3
	Agave sisalana	2
	Carica papaya (fruit)	3
	Clove oil (Eugenia caryophyllata)	1
	Faidherbia albida (bark)	2
	Acacia mellifera (bark)	2
	Alchornea cordifolia (leaves)	2
	Annona senegalensis (bark, roots)	2
	Bridelia micrantha (bark, roots)	2
	Byrsocarpus orientalis (roots, leaves)	2
	Combretum molle (roots)	2
	Entada abyssinica (seed, roots, bark)	2
	Maytenus buchananii (Leaves, stem wood)	2
	Rauvolfia caffra (bark, root)	2
	Trema orientalis	2
	Trichilia emetica (bark, roots)	2
	Eucalyptus oil/cineole	+
Cosmetics (Aromatics)	- Sandalwood Oil (Zanthoxylum gillettii)	2
	- Brachylaena huillensis Oil	2
	- E.A. green heart oil (Warbugia stuhlmannii)	3
	- Cedarwood oil (Juniperus procera)	2
	- Cineol oil/camphor (Ocotea usambarensis, Cinnamonum camphora)	+
	- Cassie oil (Acacia farnesiana)	+
	- Clove oil (Eugenia caryophyllata	1
	- Eucalyptus oil (E. globulus E. maidenii, E. regnans, E. saligna)	+
	- Piper capense oil	+

CATEGORY OF NWFP	PRODUCT	IMPORTANCE OF NWFP
Extractives	Tannins:	
	- Wattle mimosa extract	1
	- Mangrove extract	3
	Textile Dyes:	3
	Lac Latex:	
	- Crude rubber (Hevea brasiliensis)	2
	(Funtumia africana)	3
	Gums:	
	- Gum arabic (Acacia species)	2
	Naval stores:	
	- gum rosins (P. elliottii, P. caribaea)	+
	- waxes	+
	- turpentines, oleo-resin, (P. elliottii, P. caribaea)	+
Others:		
Amenity	Various tree species	2
Toxins	Various tree species	3
Environmental Protection and Improvement	Forests, Woodlands, Grasslands, Green hedges, etc.	1
Parks and reserves:	Floral and faunal conservation, Tourism, Recreation, Hunting, etc.	1

Legend: 1. Very important
2. Moderately important
3. Less important
\+ High potential product

ANNEX II

STATISTICAL DATA ON NWFP

SPECIES	PRODUCT	YEAR OF REFERENCE	UNIT	SCOPE	QUANTITY	VALUE* US $	IMPORTING COUNTRIES (Where known)
Acacia mearnsii (Black Wattle)	Wattle mimosa Extract	1980	T	E	6,065.00	28,533	Cuba, Italy, India, U S A
Julbernadia, Brachystegia, Isoberlinia, Acacia and Combretum spp.	Honey	1980	T	E	176.00	128,000	Middle East
	Bees wax	1980	T	E	285 (217)	612,465	GFR, Japan, UK
Acacias, Brachystegia and Julbernadia spp.	Honey	1981	T	E	-	-	-
	Bees wax	1981	T	E	442 (437)	1,748,552	Belgium,GF R, Japan, USA
Miombo woodland tree spp. and High Rain Forest spp. of Croton, Albizia, Ficus, Melicia excelsa etc.	Honey	1982	T	E	39.00	31,200	U A E
	Bees wax	1982	T	E	148 (197)	478,336	GF R, Japan, UK

Annex contd..

SPECIES	PRODUCT	YEAR OF REFERENCE	UNIT	SCOPE	QUANTITY	VALUE* US $	IMPORTING COUNTRIES (Where known)
A. mearnsii	Wattle	1985	T	P	5,026.00	-	-
	Mimosa extract	1985	T	E	3,889.00	153,706	-
Miombo woodland tree species	Honey	1985	T	E	1.00	750	U A E
	Bees wax	1985	T	E	66.7 (90)	168,084	GF R, Japan
A. mearnsii	Wattle	1986	T	P	2,902.90	-	-
	mimosa extract		T	E	2,439.00	65,325	-
Acacia spp.	Gum arabic	1986	T	E	383.80	255,000	-
Julbernadia, Acacia,	Honey	1986	T	E	3.00	2,250	Kuwait
Combretum, Brachystegia spp.	Bees wax	1986	T	E	21.7 (106)	58,590	-
Cinchona spp.	Cinchona barks	1986	T	E	160.90	138,000	-
A. mearnsii	Wattle	1987	T	P	3,497.00	-	-
	mimosa extract	1987	T	E	4,985.00	61,138	
Acacia spp.	Gum arabic	1987	T	E	283.90	312,138	-
Miombo woodland spp. and	Honey	1987	T	E	17.84	25,020	-
Euphorbia spp.	Bees wax	1987	T	E	216.00	616,124	-
Cinchona spp	Cinchona barks	1987	T	E	131.43	234,308	-

Annex contd..

SPECIES	PRODUCT	YEAR OF REFERENCE	UNIT	SCOPE	QUANTITY	VALUE* US$	IMPORTING COUNTRIES (Where known)
A. mearnsii	Wattle mimosa extract	1988	T	P	3,350.00	-	-
Miombo woodland spp	Honey	1988	T	E	20.50	23,475	Kuwait, UAE, Saudi Arabia
Coffee plantations	Bees wax	1988	T	E	324.00	792,514	GFR, Japan, UK
Animal Trophies:-							
-Elephants	Ivory	1988	Kg	E	2,543.73	254,373	Belgium, GFR, USA, UK
-Crocodiles	Crocodile skins	1988	No.	E	1.00	500	UK
-Zebras	Zebra skins	1988	No.	E	3.00	3,000	Canada
Acacia spp.	Gum arabic	1988	T	E	427.00	356.000	UK, Australia, India, Sri Lanka
Live Animals:							
- Ostriches	Birds	1988	Nos.	E	92,000.00	794,465	Belgium, UK,Portugal
- Vervet monkeys, Gazelles, Impalas etc.	Mammals (small)	1988	Nos.	E	353.00	18,470	USA, GFR, UK
- Crocodiles, snakes	Reptiles	1988	Nos.	E	1,036.00	42,350	Soviet Union, Saudi Arabia, Japan
- Termites, grasshoppers, millipedes	Insects and Anthropads	1988	Nos.	E	380.00	390	Netherlands, Italy
- Frogs	Frogs (Amphibians)	1988	Nos.	E	90.00	90	Japan, HongKong

Annex contd..

SPECIES	PRODUCT	YEAR OF REFERENCE	UNIT	SCOPE	QUANTITY	VALUE* US$	IMPORTING COUNTRIES (Where known)
Cinchona spp.	Cinchona barks	1988	T	E	94.4	163,100	UK, Belgium, Netherlands
A. Mearnsii	Wattle	1989	T	P	4,305.00	-	-
	mimosa extract			E	1,648.40	4,370,988	Thailand, USA Zambia, Canada
Julbernadia, Brachystegia, Isoberlinia Acacia, Combretum etc.	Honey	1989	T	E	62.00	14,565	UAE, UK, Sweden
	Bees wax	1989	T	E	221.10	510,231	GFR, France, UK, Japan
Animal Trophies:							
- Elephants	Ivory	1989	Kg	E	1,609.50	160,950	Australia, Belgium
- Crocodiles	Crocodile skins	1989	Nos.	E	142.00	131,928	France, UK, USA
- Zebras	Zebra skins	1989	Nos.	E	7.00	7,000	Canada, GFR, Spain
- Hippopotamus	Hippo teeth	1989	Kg.	E	65,860.00	34,983	Belgium, Spain, France
- Ostriches, parrots	Birds skins and Feathers	1989	Kg.	E	400.00	963	Norway, UK, Australia
- Tortoise	Tortoise shells	1989	Kg	E	22.00	1,219	UK, Italy, Pakistan
- Colubus & vervet monkeys, otter	Fur skins	1989	T	E	3,912.00	57,474	Hong Kong, India, Paskistan

Annex contd..

SPECIES	PRODUCT	YEAR OF REFERENCE	UNIT	SCOPE	QUANTITY	VALUE* US $	IMPORTING COUNTRIES (Where known)
Live Animals: - Ostriches, Love birds, parrots	Birds	1989	Nos.	E	9,000.00	983,865	Japan, Netherlands
- Vervet Monkeys, Serval cat, Impala	Mammals	1989	Nos.	E	1,361.00	33,540	USA, Belgium, UK
Crocodiles, snakes	Reptiles	1989	Nos.	E	2,084.00	39,165	UK, France, USA
- Termites, grasshoppers etc.	Insects	1989	Nos.	E	200.00	200	Portugal, Saudi Arabia
Cinchona spp.	Cinchona barks	1989	T	E	150.1	265,758	Belgium, UK, Netherlands
Acacia seyal, A. Senegal, A spirocarpa	Gum arabic	1989	T	E	503.3	262,646	Australia, GFR, India, Sri Lanka
Hevea brasiliensis	Raw rubber	1989	T	E	2.7	368,733	Syria and Singapore
Quercus spp,, Erythrina excelsa	Cork	1989	T	E	70.8	21,368	Italy, Zimbabwe
Zanthoxylum gilletti, Pinus spp. etc.	Essential oils, Resinoids	1989	T	E	40.0	15,645	UAE
Areca catechu	Betel Nuts	1989	T	E	1.0	2,520	Zambia

Annex contd...

SPECIES	PRODUCT	YEAR OF REFERENCE	UNIT	SCOPE	QUANTITY	VALUE* US $	IMPORTING COUNTRIES (Where known)
Mpingo, muhuhu, Combretum spp. Acacia mearnsii mangroves	Wood carvings	1989	T	E	184.7	728,302	USA, Sweden, Uganda
	Dyeing, Tanning & colouring materials	1989	T	E	18.0	12,969	Pakistan, USA
Miombo woodland spp.	Honey	1990	T	E	36.0	78,100	UAE, UK
	Bees wax	1990	T	E	234.0	565,540	UK, GFR, Japan
Animal Trophies:							
- Elephants	Ivory	1990	Kg.	E	4,929.25	492,925	Belgium, GFR, India
- Zebras	Zebra skins	1990	Nos.	E	10.00	10,000	Canada, Spain
Live Animals:							
- Ostrich, Flamingo, Love birds, Guinea fowl, Parrots	Birds	1990	Nos.	E	91,200.00	3,803,475	UK, Australia
- Vervet monkeys, Impala, Gazelle	Mammals	1990	Nos.	E	779.00	104,495	UK, France, USA, Japan
- Crocodiles, snakes	Reptiles	1990	Nos.	E	1,272.00	49,715	UK, France, USA
- Termites, grass-hoppers,	Insects and Anthropad	1990	Nos.	E	904.00	5,504	-

Annex contd....

SPECIES	PRODUCT	YEAR OF REFERENCE	UNIT	SCOPE	QUANTITY	VALUE* US $	IMPORTING COUNTRIES (Where known)
- Cinchona spp.	Cinchona barks	1990	T	E	119.8	265,000	Netherlands, Belgium, UK
Acacia mearnsii	Wattle mimosa extract	1990	T	E	5,538.15	-	-
Acacia spp.	Gum arabic	1990	T	E	740.20	370,100	India, GFR, Austria
Acacia mollissima (A. mearnsii)	Wattle mimosa extract	1991	T	P	5,466.51	-	-
			T	E	4,282.67	2,854,260	Italy, Egypt, Pakistan, Kenya, Thailand, USA, Canada, Zambia, Bangladesh
Mpingo, muhuhu, combretum spp.	Wood carvings	1991	T	E	78.40	194,750	UK, USA, Japan, HongKong
Brachystegia, Julbernadia, Isoberlinia, Acacia, Terminalia, Dombeya and Parinari spp.	Honey	1991	T	E	140.60	116,790	UAE, Saudi Arabia

Annex contd...

SPECIES	PRODUCT	YEAR OF REFERENCE	UNIT	SCOPE	QUANTITY	VALUE* US$	IMPORTING COUNTRIES (Where known)
Cinchona spp.	Cinchona barks	1988	T	E	94.4	163,100	UK, Belgium, Netherlands
A. Mearnsii	Wattle	1989	T	P	4,305.00	-	-
	mimosa extract			E	1,648.40	4,370,988	Thailand, USA Zambia, Canada
Julbernadia, Brachystegia, Isoberlinia Acacia, Combretum etc.	Honey	1989	T	E	62.00	14,565	UAE, UK, Sweden
	Bees wax	1989	T	E	221.10	510,231	GFR, France, UK, Japan
Animal Trophies:							
- Elephants	Ivory	1989	Kg	E	1,609.50	160,950	Australia, Belgium
- Crocodiles	Crocodile skins	1989	Nos.	E	142.00	131,928	France, UK, USA
- Zebras	Zebra skins	1989	Nos.	E	7.00	7,000	Canada, GFR, Spain
- Hippopotamus	Hippo teeth	1989	Kg.	E	65,860.00	34,983	Belgium, Spain, France
- Ostriches, parrots	Birds skins and Feathers	1989	Kg.	E	400.00	963	Norway, UK, Australia
- Tortoise	Tortoise shells	1989	Kg	E	22.00	1,219	UK, Italy, Pakistan
- Colubus & vervet monkeys, otter	Fur skins	1989	T	E	3,912.00	57,474	Hong Kong, India, Pakistan

Annex contd..

SPECIES	PRODUCT	YEAR OF REFERENCE	UNIT	SCOPE	QUANTITY	VALUE* US $	IMPORTING COUNTRIES (Where known)
Dombeya, Parinari and other Miombo spp.	Beeswax	1991	T	E	473.87	2,450,450	GFR, Japan, UK
Animal Trophies: - Elephants, Zebras, Lions, Leopards, Pythons, Cheetah	Ivory and skins	1991	T	E	255.67	1,012,770	Australia, Belgium, GFR, Japan
Live Animals: - Ostrich, Parrots, Love birds	Birds	1991	Nos.	E	135,159.00	346,810	HongKong, Japan
Cinchona spp.	Cinchona barks	1991	T	E	755.92	258,000	Belgium, UK, Netherlands.
Acacia senegal, A. spirocarpa etc.	Gum arabic	1991	T	E	385.54	904,110	Austria, GFR, India
Hevea brasiliensis	Raw rubber	1991	T	E	10.453	913,820	Syria, Singapore
Acacia mearnsii	Wattle mimosa extract	Jan/June 1992	T	E	1,114.50	1,787,330	Thailand, USA, Cuba, Pakistan, India
Julbernadia, Bra. chistegia, Combretum,	Honey	Jan/June 1992	T	E	262.26	-	UAE, Kuwait, Saudi Arabia, UK, Sweden
	Beeswax		T	E	265.00	719,490	UK, GFR, Japan

Annex contd..

SPECIES	PRODUCT	YEAR OF REFERENCE	UNIT	SCOPE	QUANTITY	VALUE* US $	IMPORTING COUNTRIES (Where known)
Animal Trophies:	Various	Jan/June 1992	T	E	222.30	1,337,710	Japan, GFR, Belgium, Norway
Live Animals: -Ostrich, Guinea-fowl, Parrots, Flamingo, lovebird	Birds	Jan/June 1992	Nos.	E	22,108.00	47,550	HongKong, Japan
- Vervet monkeys Gorillas, Impala, Gazelles	Mammals	Jan/June 1992	Nos.	E	112.00	32,170	Japan, USA, GFR, UK
Cinchona spp.	Cinchona barks	Jan/June 1992	T	E	147.00	98,290	Netherlands, Belgium, UK
Mpingo, muhuhu, Combretum spp.	Wood carvings	Jan/June 1992	T	E	36.27	103,870	USA, Japan, Belgium, GFR.
Hevea brasiliensis	Raw rubber	Jan/June 1992	T	E	20.60	-	Singapore, Syria
Acacia seyal, A. senegal, A. spirocarpa	Gum arabic	Jan/June 1992	T	E	311.85	99,150	GFR, India, Austria

LEGEND:

T: Tonne Kg: Kilogramme Nos: Numbers P: Production figures E: Export figures; US$ United States dollar
* Indicative Export World Market values. For honey and bees wax February 1989 prices: Honey 1800 US$ per T. bees wax 2360 US$ per T respectively. Export values are in United States Dollars (US$). July/August 1992 prices: honey 1070 US$ per T f.o.b, bees wax (sorted/refined) 2800 US$ per T; gum arabic 500 US$ per T.

SOURCE: Honey and bees wax 1980 - 1988, Customs Department and Central Bank of Tanzania.

Alternative figures in brackets for bees wax are from Foreign Trade Statistics 1986, Bureau of Statistics, Dar es Salaam, December 1988. For 1989 - 1992 figures, are from Foreign Trade Statistics, DSM June 1992.

: Wattle mimosa extract 1985 - 1991 Production figures (P) from Bureau of Statistics, Dar es Salaam, December 1991. Export figures (E) 1980 - 1987, Customs and Sales Tax Department and Central Bank of Tanzania. Export figures 1988 - June 1992, Foreign Trade Statistics, Dar es Salaam.

: Animal Trophies and Live animals 1988 - 1990 figures, Wildlife Division, Ministry of Natural Resources and Tourism, Dar es Salaam, December 1990. Export figures 1991 - 1992, Foreign Trade Statistics, Dar es Salaam, June 1992.

: Other products - Cinchona bark, Wood carvings, gum arabic, raw rubber and essential oils 1986 - 1992 Export figures Foreign Trade Statistics, Dar es Salaam, and Customs & Sales Tax Department, Dar es Salaam, June 1992.

NB : - No figure available.

: World market prices for forestry and non-forestry products on international market as given by the BoT journal "Trade Current" are just indicative. There are no official/government controlled prices for export. However, the exact prices for export are fully negotiable, based on quality and other terms (e.g. handling, packaging, after packaging etc., time of delivery) and consideration.

ANNEX III

CONTRIBUTION OF INTERNATIONAL TOURISM TO TANZANIA ECONOMY

YEAR OF REFERENCE	NO. OF TOURISTS	FOREIGN CURRENCY EARNINGS US $ MILLIONS
1980	84,021	18.00
1981	92,000	20.00
1982	71,290	15.00
1983	54,000	16.00
1984	64,000	10.00
1985	81,821	10.00
1986	103,363	27.00
1987	130,851	31.05
1988	130,343	40.40
1989	137,889	60.00
1990	153,000	65.00
1991	186,800	94.73
1992	227,900*	138.30*

Key

* Projection figures

Source: Tourism Division, Ministry of Tourism, Natural Resources and Environment, Dar es Salaam, 1992; Central Bank of Tanzania, August 1992.

ANNEX IV

SELECTED MULTIPURPOSE TREE SPECIES FOR PLANTING IN TANZANIA

Name of Species	Agroforestry/Fuel soil conservation species	Medicinal/Aromatic species	[illegible] species
Acacia arabica	X		
Acacia farnesiana	X	X	
Acacia mellifera		X	
Acacia nilotica	X		X
Acacia mearnsii	X		
Acacia senegal	X		
Acacia saligna	X		
Acacia tortilis	X		
Adansonia digitata			X
Albizia lebbeck	X		
Alchornea cordifolia		X	
Allanblackia stuhlmanii			X
Annona senegalensis	X	X	X
Araucaria spp.			
Artocarpus communis (A. altilis)			X
Azadirachta indica	X	X	X
Bridelia micrantha		X	
Byrsocarpus orientalis		X	
Carica papaya	X	X	
Cedrela odorata			X
Cinchona ledgeriana		X	
Cinnamomum camphora		X	
Combretum molle		X	
Croton megalocarpus	X	X	
Cupressus sempervirens			X
Dalbergia melanoxylon	X		
Delonix regia			X
Entada abyssinica		X	
Erythrina abyssinica	X	X	
Eucalyptus globulus		X	
Eucalyptus maidenii		X	
Eucalyptus regnans		X	
Faidherbia albida	X	X	X
Ficus benjamina			X
Grevillea robusta	X		
Jacaranda mimosifolia			
Juniperus procera		X	
Leucaena diversifolia	X		
Leucaena leucocephala	X		X
Mangifera indica	X	X	X
Maytenus buchananii		X	
Melia azedarach	X	X	

Name of Species	Agroforestry/Fuel soil conservation species	Medicinal/Aromatic	Fruit and Nut species
Persea americana (Persea gratissima)	x		
Pithecelobium dulce	x		
Piper capense			
Prosopis chilensis	x		
Prosopis juliflora	x		
Pyrus communis	x		
Rauvolfia caffra	x		
Rauvolfia vomitaria	x	x	
Senna siamea	x	x	x
Sesbania sesban	x		
Syzigium cuminii	x		x
Tabernaemontana pachysiphone		x	
Tamarindus indica	x		x
Terminalia catappa			
Trema orientalis	x	x	
Trichilia emetica	x	x	
Xylopia aethiopica		x	

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PROJECT PROFILES

Profile No. 10*

Project Title: Research: Beekeeping in Miombo woodland.

Priority : High

Location : Beekeeping Training Institute (BTI) and/or Tanzania forestry research Centres based near Miombo woodland.

Duration : Two years

Objectives : Immediate: - Investigate the management of miombo with respect to beekeeping potential

- Evaluate the effect and extent of use of bark for hives and other domestic containers.

- Identify wood-efficient methods of hive manufacture

- Establish reliable figures for the current and potential extent and value of beekeeping within Miombo woodland

Development: - To encourage beekeeping as an economic sustainable source of income from miombo woodland, and thereby help to safeguard its conservation.

- Develop strong sectoral linkages between beekeeping, forestry and conservation.

Justification: Miombo woodland is being cleared at the rate of an estimated 300 000 ha. per annum. However, beekeeping can provide an economic reason for the retention of miombo.

Beneficiaries: Local people living in or near miombo benefit from a sustainable source of income for themselves and future generations. There is, and is likely to continue to be a strong market for the products of beekeeping.

Tanzania through stimulation of the economy and export earnings (particularly of beeswax).

Tanzania and the whole region through conservation of the environment.

Activities:- Experiment on hive manufacture and production of bark hives with least damage to trees.

- Establish a team to gather reliable data.

- Investigate management practises within miombo with regard to beekeeping.

Institutional framework: BIT, Tabora
Tanzania Forestry Research Institute
Njiro Wildlife Research Centre, Arusha
Forestry and Beekeeping Division
International Bee Research Association, UK.
Funding agency.

Special considerations: Information on miombo tree species valuable for beekeeping already exists, but all discussion of the value of beekeeping is hindered by lack of reliable data (statistics)

Cost estimate: Foreign input 300 000 US $ (1989 Estimates).
350 000 US $ (1992 Estimates).

State of preparation: Profile.

* From the Sector Review Mission Report No. 15 of Tanzania TFAP by Kihwele, D. and Bradbear, N.

Project Proposal

Project Title: Comparative studies on grass/tree fodder crops utilization in three ecological zones of Tanzania - semi arid, Savannah woodlands and Humid highlands.

Priority : High

Location : Semi arid zone (Shinyanga, Dodoma); Savannah woodlands (Tabora) and Humid highlands (Arusha, Kilimanjaro Mts.)

Duration : 2 years

Objectives : Immediate: - To investigate the management of these 3 ecological zones - semi arid, miombo and montane with respect to livestock forage cultivation potential.

- Establish reliable figures for the current and potential extent and value of fodder cultivation within the 3 zones.

- Identify economical fodder cultivation methods.

Development: - To encourage fodder crop cultivation as a socio-economic sustainable source of income of the rural people in livestock keeping areas in Tanzania; and help overcome overgrazing and bush encroachment for fodder.

- To meet food scarcity for livestock especially during the dry season.

- Develop strong sectoral linkages between forestry, agriculture and animal husbandry.

Justification: To a greater extent, the forage needs for communal domesticated animals (cattle, goats, sheep) still is afforded from the wild sources, which it entails overgrazing of grasslands and forest encroachment close to their habitats in the high stocked-livestock farming areas. However, forage management can halt the rate of bush encroachment, for instance.

Beneficiaries: Local people living in rural areas where cattle grazing is a preoccupation as a source of income, food for themselves.

The Nation, through environmental conservation by planting of multiple tree fodder crops.

Activities :
- Investigate management practises within the 3 ecological zones with regard to forage cultivation.
- Establish a team to gather reliable statistics so as to overcome the paucity of information.

Institutional framework: Tanzania Forestry Research Institute, Morogoro; Ministry of Agriculture Training Institutes located in these three zones;

Funding agency.

Special considerations: Information of good fodder trees and grasses within each ecological zone already exists, but the paucity of information on the value of the fodder crops, their contribution to the economy of rural people in those areas where livestock keeping is an important activity; is due to lack of reliable data.

Cost estimate: Foreign input 25,000 US $ (1992 Estimates)
National input 2,500 US $

State of Preparation: Profile (proposal).

PILOT COUNTRY STUDY - UGANDA

A REPORT ON A PILOT COUNTRY STUDY

OF NON-WOOD FOREST PRODUCTS (NWFP)

IN

UGANDA

BY

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AUGUST 1993

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Finally I am grateful for the financial support rendered by the Commonwealth Science Council to enable me prepare the report.

EXECUTIVE SUMMARY

The pilot country study of non-wood forest products (NWTP) in Uganda was initiated by the Commonwealth Science Council, based in the Commonwealth Secretariat, London when I was invited to prepare a report within a period of two and half months.

The invitation was received at the end of July 1993, work started immediately and this is a result of the finding.

The objective of the pilot country study is to provide a brief, concise and realistic overview of the importance of NWFP of Uganda and prospects for further promotion and development.

The main topics to be investigated during this study reads as follows:

1 Brief definition as well as a classification of NWFP which are mainly used for subsistence as well as trade purposes i.e. locally, domestically and internationally.

2 Assessment of the importance of NWFP at the community, district and national levels.

3 Description of different institutional aspects in order to demonstrate the organizational responsibilities of NWFP, human resources involved, technical responsibilities of the appropriate organisation, sources of funds.

4 Identification of NWFP which have relevant role in local communities in terms of food security nutrition, health, job opportunities, income, cultural aspects, religous ceremonies, etc.

5 Technical description concerning cultural practices, harvesting, transportation processing, storage, marketing and trade of the most relevant NWFP.

6 Statistical data on NWFP.

7 Overview of the main problems and constraints which halt the promotion and further development of NWFP.

8 Formulation of recommendation which should be implemented in order to further promote NWFP.

Following the assignment an extensive study of literature and consultation with concerned people and institutions was carried out.

This report focuses on resource use and management issues related with plants, bee-keeping and honey collection,

basketry, traditional medicines and traditional medical practioners and birth attendants, bamboos, natural gum and resins, forest birds, mammals new natural products with commercial potential, biological diversity in Uganda.

There are specialist user groups within rural communities surrounding the forests. They represent groups of resource users with a common interest and good knowledge of plant resources.

Many are already members of organizations established either on community initiative or through their interests of the community, Uganda government and international organisations.

Recommendations for forest products by specialist group within multiple-use were made with emphasis on:

- carrying out taxonomic studies, inventories and surveys of the Uganda's biological diversity in order to fill the gap in about it;

- involve the local people and their communities in all relevant aspects of biological diversity uses and conservation including use of indigenous knowledge, compensation and equitable share of the benefits;

- the development of sustainable and appropriate methods of techniques of land use and natural resource management;

- institutionalising biological diversity conservation through policy and legislation so that it is reflected in the national plans and their implementation in all relevant sectors;

- train and educate the nationals in the relevant subjects to create the necessary personnel e.g. taxonomists, ecologists, biochemists, environmental economists etc.;

- the equitable partnerships about an additional new category of plant resources is almost ideal, as they can be extracted with low impact and some which have potentially high commercial value e.g. chemical structures and genetic materials from the forest;

- the exploratory efforts of the natural products should be pursued by a partnership of developing and developed nations, in such a way that the benefits are shared in a fair measure to all participants.

TABLE OF CONTENTS

1 INTRODUCTION

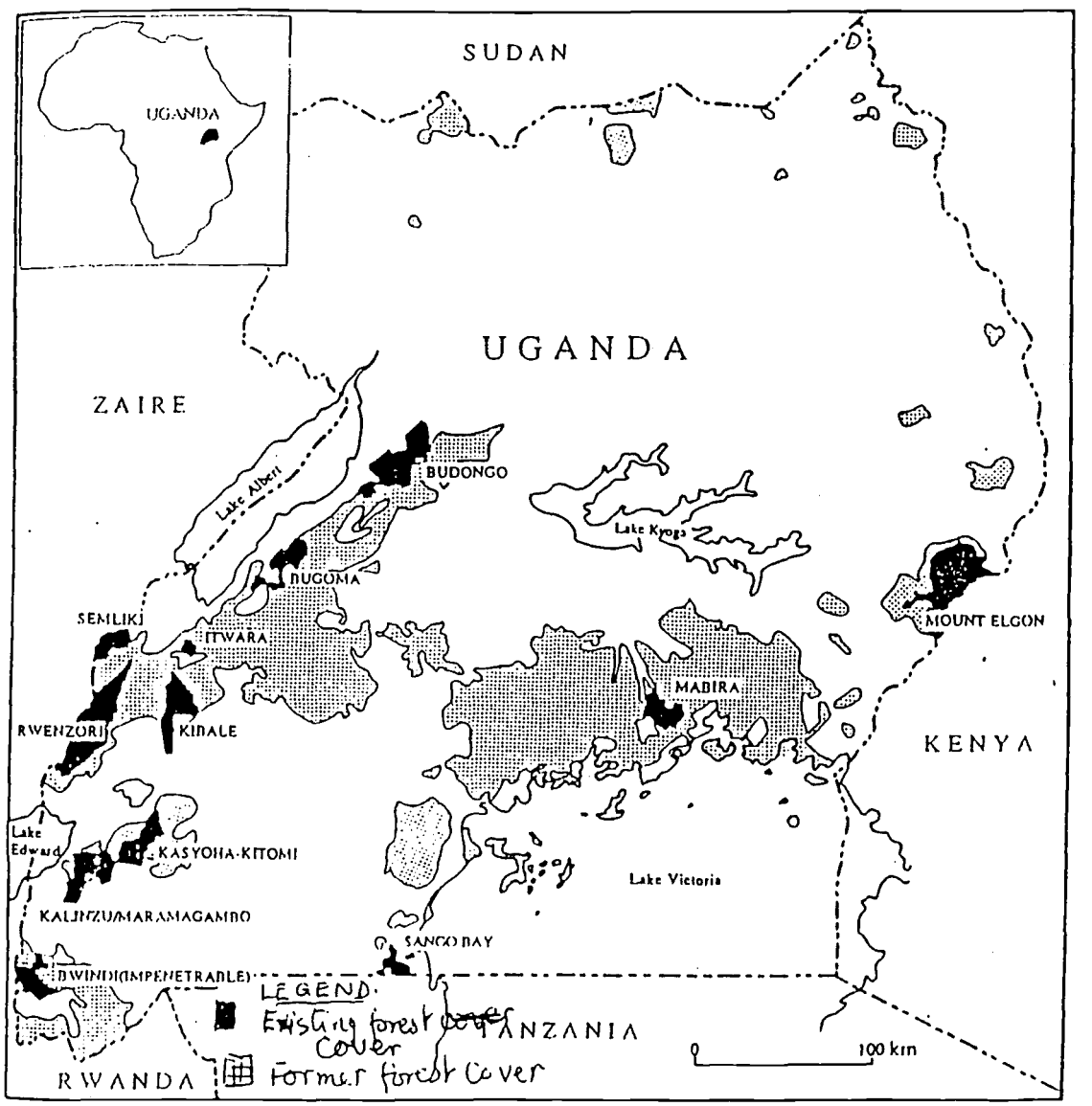
The pilot country report of the NON-WOOD FOREST PRODUCTS in Uganda is based on research carried out in Bwindi-Impenetrable National, the Rwenzori and Semliki Forest Reserves in Western Uganda which carry natural forests and were managed by the Forest Department until recently when Bwindi has been proclaimed a National Park (Figure 1).

The area is recognised internationally as a forest rich with flora and fauna peculiar to Africa. It is the highest biodiversity site in East Africa for birds plants butterflies and primate and contains half of the world's endangered mountain gorilla (*Gorilla beringei*) population.

The report also is based on multi disciplinary field mission and ethno-botanical and floristic research undertaken in Uganda in 1991. It was the second specific mission on the use of medicinal plants and other products of traditional african medicine.

A study also has been carried out on the edible plants of Uganda and the Natural Gum and Resins in Karamoja.

Finally the study took into consideration the report of preliminary survey of Uganda's biological based natural resources carried out by the National Biodiversity Unit of the Department of Environment Protection in October 1991 under the auspices of the United Nations Environment Programme (UNEP).



Rwenzori & Semliki

Figure 1. Showing the locality of Bwindi-Impenetrable National Park, Uganda in relation to other forest in Uganda, showing the former extent of forest cover (from Howard, 1991).

The report concerns itself with some of the Non-Wood Forest Products (NWFP) including all biological material (other than industrial round wood and derived sawn timber, wood chips, wood based panels and pulp) that may be extracted from natural ecosystems, and be utilised in household be marketed or have social, cultural or religious significance. The main objective of the pilot country study is to provide the Commonwealth Science Council (CSC) and the Food and Agriculture Organisation (FAO) a brief, concise and realistic overview of the importance of NWFP of Uganda and prospects for further promotion and development. The report will be utilized for the Africa Regional Expert Consultation on NWFP.

2 EDIBLE PLANTS IN UGANDA

The people use the leaves, stems,' roots and fruits which are often eaten raw and a variety of mushrooms (Table 1).

Most rural people know local plant species of their areas but not always familiar with plants in other parts of the country. Local species are valuable in the diet especially where green leaves are required to provide adequate vitamin A or where protein supply is low.

In rural areas most people possesses land near their home, where they grow crops and keep a few animals. In general it is the women who look after the home gardens and it usually comprises food, crops, fruits and vegetables and possibly with a few medicinal plants or herbs.

Women are usually responsible for planting fruits and vegetables as part of domestic food production and for feeding the family with an adequate diet.

Vegetables are gathered randomly from either the bush or cultivated land nearby. In northern Uganda species of *Hibiscus* are grown this way whereas in the eastern and Buganda solanum species and *Gynandropsis gyandra* are commonly planted.

Many local plants have uses other than food. They may have medicinal properties or they may be used for production of homestead articles. Some leaves impart a mucilaginous consistency to the sauce, others, add a bitter flavour.

Several types of leaves and fruits are sun dried and stored for use in dry season. Children eat a variety of fruits on their way to school or herding livestocks supplementing the vitamin A intake needed for the bodies.

Vitamin B is abundant in tropical foods, in cereals, grains, leafy vegetables, fish, meat, milk and fruits.

Vitamin C is mainly got from vegetables and fruits. Green leaves are either steamed with the staple food, boiled and served on their own. In some cases green leaves are boiled and added to a sauce just before serving.

Purseglove (1943) described forty three herbs and plants with edible roots and seeds used as vegetables by Ugandans. He commented that while these plants may form part of the normal diet of the people, some are eaten only in time of food shortage.

Information about species of mushrooms is very little. Indigenous edible fruits are widely distributed in all regions of Uganda and constitute 37 families and 75 species.

TABLE 1 SOME EDIBLE PLANTS AND FRUITS EATEN IN UGANDA

Scientific name	Common name	Part used
VEGETABLES		
Amaranthus dubius	Amaranthus spinach	Leaves
Phaseolus lunatus	Lima beans	Seed
Phaseolus vulgaris	French beans	Leaves and seed
Amaranthus lybridus	Amaranthus spinach	Leaves
Vigna unguiculata	Cow peas	Leaves
Gynandropsis gynandra	African spinderherb	Leaves
Lagenovia siceraria	Calabash gourd	Leaves
Solanum gito	Bitter berries	Leaves
Solanum nigrum		Leaves
Cucurbita maxima	Pumpkin	Leaves and fruit
Zingiiber officinalis	Ginger	Stem
Capsisum frutescens	Chillis	Fruit
Solanum indicum	Bitter berries	Fruit
Vigna unquiculata	Cow peas	Fruit
Colocasia schimperi	Cocoyam	Leaves
Oxylenanthera abyssinica	Bamboo shoots	Stem
FRUITS		
Carica papaya	Pawpaw	Fruit
Psidium quajara	Guava	Fruit
Aframomum sanguineum	Ginger lily	Fruit
Musa spp	Sweet banana	Fruit
Saccharum officinarum	Sugar cane	Stem
Artocarpus integer	Jack fruit	Fruit
Citrus sinensis	Orange	Fruit
Mangifera indica	Mango	Fruit
Ananas comosus	Pineapple	Fruit
Citrus limon	Lemon	Fruit
Persea americana	Avocado pear	Fruit
Annona reticulata	Custard apple	Fruit
Citrus retuculata	Tangerine	Fruit
Canarium schweinfurthii	Incense tree	Fruit
Physalis peruviana	Cape gooseberry	Fruit
Citrus aurantiifolia	Lime	Fruit
Passiflora edulis	Passion fruit	Fruit
EDIBLE FUNGI		
Lentinus proliferi	Fungus (whole)	Whole Fungi
Small white mushrooms		Whole Fungi
Fairy big white mushrooms		Whole Fungi
Very big brown and tall stem	Amakangago	Whole Fungi
Found in forest area		Whole Fungi
Medium dark cream cap		Whole Fungi
Fawnish cream		Whole Fungi
GRASSES EATEN		
Dactylocterium aegyptium		
Setaria pallidefussa		
Sorghum verticilliflorum		
Sorghum pellucidus		
Sorghum panicoides		

Table adapted from Goode P M FAO/42/1

People are conversant with a number of wild plants that can be eaten raw and cooked. Women use a variety of plants in preparing sauce for use with stable food. They know where to find the plants, when to collect them and how they are prepared.

2.1 Cultural Aspects to some local plant species (Goode 1989)

In many cases the vegetable plant is in some way connected with childbirth. There may be little on no truth in some of these stories but they illustrate that local plants found in the country. feature considerably in the lives of the people.

2.1.1 The fatal "Bisunsa" incident (*cucurbita maxima*)

In Toro traditionally a woman should not eat "bisunsa" after giving birth because it may cause scouring "Biteera munda" in Rutoro.

2.1.2 Ekicuraganyi (Urtica massaica)

It is believed that women who are picking the young tender shoots and leaves of this plant remain very quiet except if greeted by someone passing by. If in the process of greeting the name of the plant is mentioned then the plant will never be cooked properly and the leaves will remain hard and tough.

2.1.3 Enderema (Basella alba)

In Buganda this vegetable is eaten by women because it is believed that any man who dares eat it will lose his sexual potential for ever. The superstition may have grown up because women wanted the vegetable for themselves. Some men will not even eat food cooked in the same pot as enderema.

2.1.4 Ensugga (Solanum nigrum)

The pregnant women are forbidden to eat "ensugga" because it is believed that to eat ensugga has an effect on unborn child. The effects reveals when the baby begins to crawl and it seems that the child produces large quantities of saliva so that the baby's clothes are always wet.

2.1.5 Katunkuma (Solanum indicum)

This vegetable (katunkuma) is used by women after birth because they believe it increases milk production.

3 BEE-KEEPING AND HONEY COLLECTION

Bee-keeping is an important seasonal activity in almost of all the parts of Uganda where traditionally bee hives are constructed either from timber, bamboo boruss palms or woven from forest climbers. Honey is usually taken from hives twice a year.

The most favourite honey bees are *Apis mellifera adansonii* with two recognised varieties - the aggressive brown and darker. These low produce honey. Six types of Trigonid bees are recognised all of which nest in the hollow of trees stems or branches.

3.1 Wild Plants and Bee-keeping

People have a good knowledge of bees, plants and hills favoured for bees hence placing of productive hives. Forest plants are 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 (Cunningham 1992). The bee hunters know which plants have toxic pollen, producing honey causing diarrhoea, e.g. pollen from *Lobelia gibberoa* and forest climber *Urera hippsellodendron*.

Trigonid stingless bees are known to be pollinators of certain tree species. The knowledge about this aspect of tree biology has not been studied and unrecorded but is with honey-bee hunters.

There is also an observation of many bee-keepers in Bwindi forest that where there are tea plantations near the forest, bee production drops. This is attributed by bee-keepers to the insecticides used to spray the tea bushes. It needs further investigation (Cunningham 1992).

Bee hunters prefer placing of bee hives in forests compared to the open field because of three reasons. Hives hidden in forests are away from the smoke which is often made in the fields due to burning cleared vegetation. The hives are protected from wind in forest but not in the fields facilitating the bees to move from hive to hive. Hives in the forest are hidden away from scrupulous public who might either steal them or jealousy spoil them because of high productivity of certain hives. Hives kept away from homestead prevents family members from being stung.

3.2 Sustainability: Bee-keeping and Honey-hunting

It is noted that wooden hives from *Faurea* can last for over 20 years and those poorly protected from rain are said to last 5-8 years. Woven hives from bamboo, papyrus

or some climbers if well constructed can last 5-6 years and 1-2 year when not protected from rain. (Cunningham 1992).

Large trees are felled to construct hives and some smaller trees also felled to clear each hive (Butynski 1984). These are concerns which must be studied.

Bee-keeping has two dangers in the forest. Fires started in the forest when bee-hunting causes runaway fires and felling of trees for construction of wooden hives. Mwesigye(1991) recorded 63 bee-keepers with a total of 469 hives around southern sector of Bwindi-Impenetrable National Park.

Large trees are felled (> 30 cm at DBH) for hive construction. The majority of hives (106) - 93.5%) were made) from *Faurea saligna* and the remainder (5) -45% from *Polyscias fulva wood*

4 WILD PLANTS AND BASKETRY

Baskets area household utensil in Uganda. They are used for harvesting, drying, winnowing, grinding and storing agricultural produce. Basketry combines traditional skills and local materials to produce a range woven baskets and mats used in homes.

Plant materials used vary from fast growing, productive wetland species (*Cyprus papyrus* to scarce, slow growing climbers that are found at low density in forest - *Loesneriella apocynoides* (Table II).

Basketry techniques and plant materials are also used to weave granaries, fish traps, stools and tables. Skilled basket makers are relatively few in number.

TABLE II MAIN PLANT MATERIAL USED FOR BASKETRY

Family	Plant species	Life form	Part used
Araceae	Raphia farinifera	palm	leaf
Araceae	Phoenix reclinata	palm	leaf, stem
Calastraceae	Cyperus papyrus	climbers	stem
Cyperaceae	Cyperus papyrus	edge	leaf cuticle
Plantaginaceae	Plantago palmata	herb	flower stalk

Source: Cunningham 1992

Types of baskets widely used are the flat, circular basket placed adjacent to the grinding stone to collect ground flour, the deep bowel-shaped millet basket, a larger and shallower bowl shaped basket for grain, larger basket or carrying head-loads of crops and the winnowing. Women make mats for sitting on or sleeping mats as well as for drying food stuffs (Figure 2).

There are baskets made for tea leaves collection, baskets for putting in dirty laundry and baby cots.

4.1 Granaries

Food security is a fundamental world problem today. Post-harvest losses of cereal crops is between 10-20% in developing countries (FAO 1981). These loses are attributed to insects, and fungi;

Granaries are the major means of storing crops in rural areas in Uganda. (Figure 3)

4.2 Sustainability: Basketry Resources

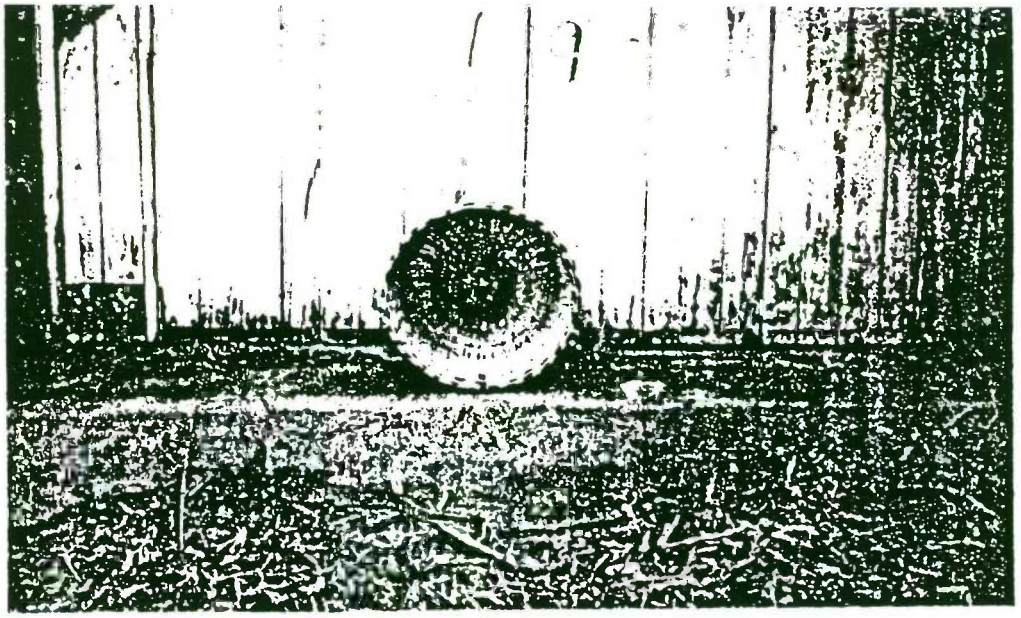
Basketry materials could be divided into five categories for resource management purposes.

- Species common in disturbed sites and old fields (*Eleusine indica*)
- Species found in wetland (*Cyperus papyrus*)
- Bamboo, climber and scandent scrub of disturbed scrub and forest, with (*Smillax kraussiana*, *Arundinaria alpina*) and the scandent shrub *Grevia* sp.
- Species restricted to moist valleys and gulleys in the forest (*Marantochloa leucantha*, *Raphia farinifera*).
- Climbers found in older secondary forest and mature forest (*Loesnerialla apocynoides*). The first two categories are common widespread and use would be sustainable.

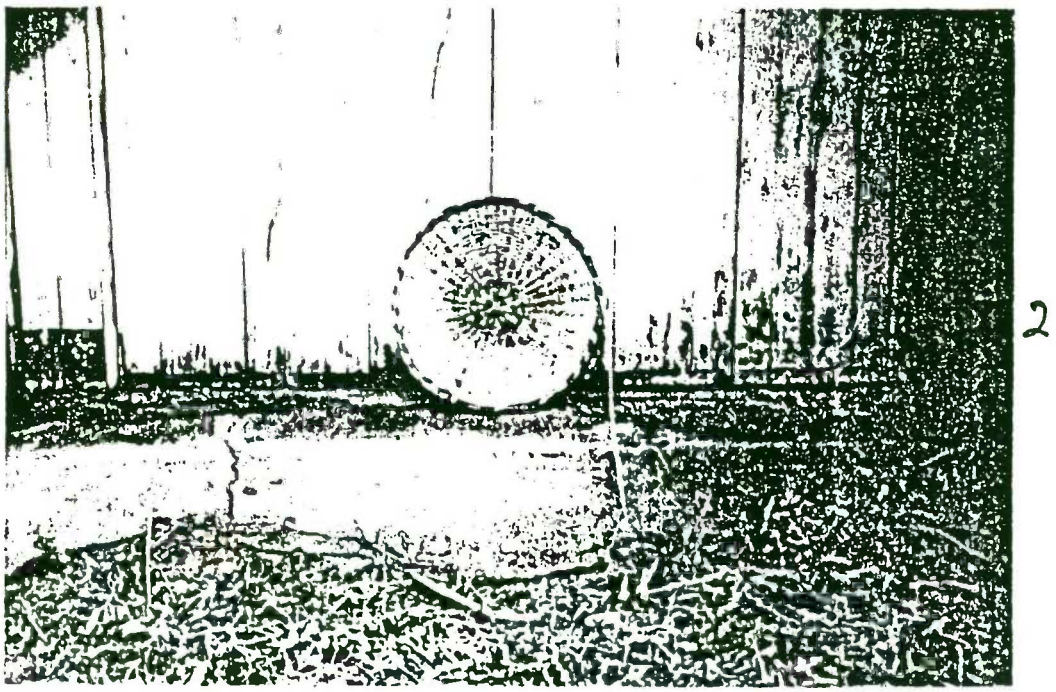
5 BAMBOO

Bamboo (*Arundinaria alpina*) is a widely used forest product to rural communities in Afro-montane forest in East African between 2400-3000 m.

In Uganda bamboo is cut in the Mt Elgon, Rwenzori, Mgahinga, Bwindi Impenetrable Forest, and Echuya (Howard 1991).



1 BASIN SHAPED BASKET FOR CARRYING AND STORING FOOD



2 THE FLAT (LUGALI) BASKET USED TO COLLECT GROUND FOOD AND WINNOWING

FIGURE 2:
THREE TYPES OF BASKETS COMMONLY USED IN FOOD PROCESSING

3. BASKET FOR STORING FOOD AND COLLECTING TEA LEAVES

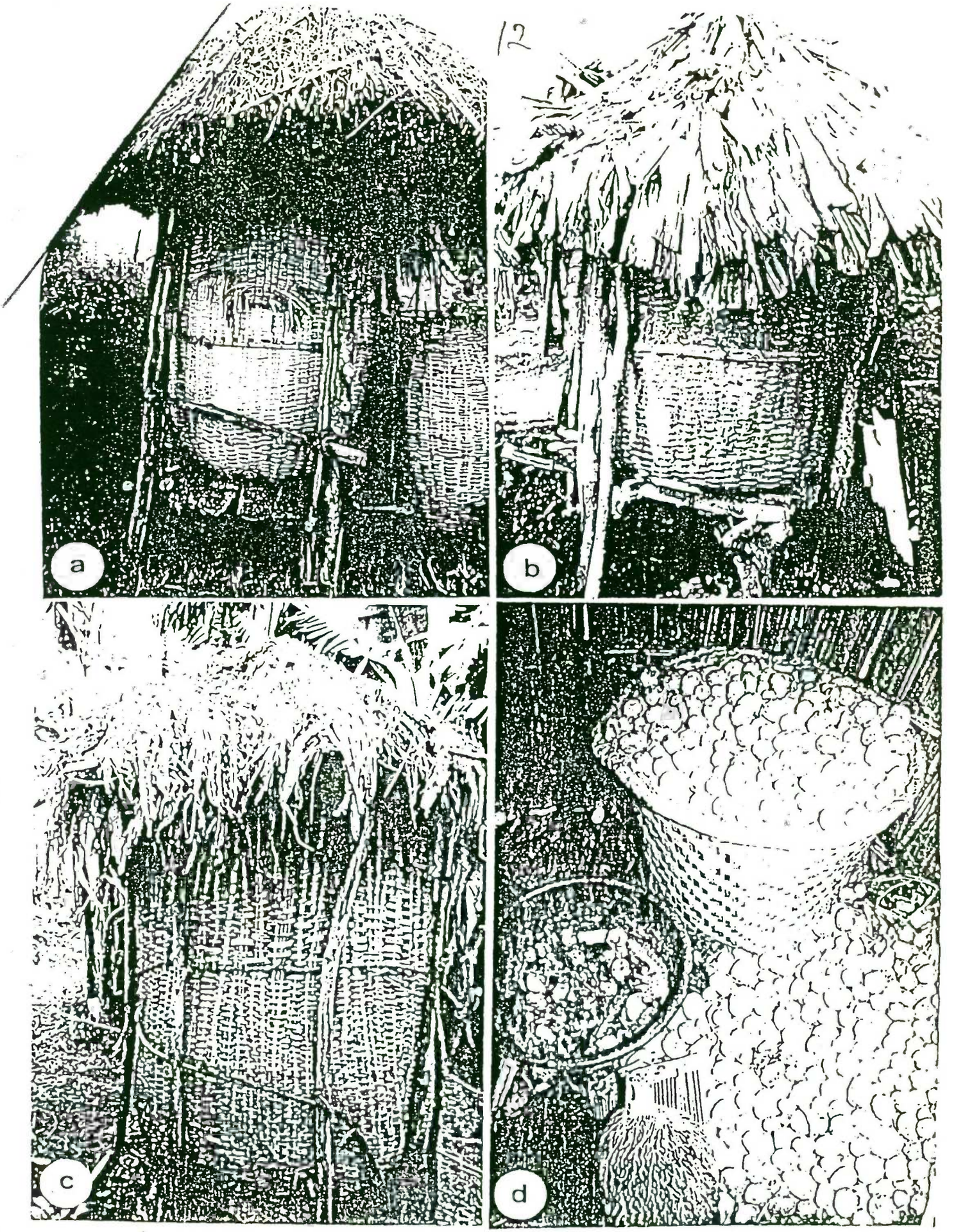


Figure 3. Granaries ... A. Bamboo (Arundinaria alpina), thatched with sorghum stalks ... ; B. Elephant grass (Pennisetum purpureum), thatched with banana fibre ...); C. the forest climber Loesneriella apocynoides (omijega), thatched with Imperata cylindrica (Bujengwe parish, adjacent to Kitahurira); and D. Papyrus (Cyperus papyrus). (with stored Irish potatoes)

SOURCE: (CUNNINGHAM 1992)

Bamboo was one of the important "minor forest products" sold by the Forest Department in former Central and Local Forest Reserves (almost 500,000 bamboos annually) between 1961/62 -1963/64.

In 1961/62 - 515,000 bamboos were sold;
1962/63 - 450,000 bamboos were sold;
1963-64 - 459,882 bamboos were sold (Forest Department 1964).

Young bamboo culm provide a valuable material for basketry for commercial sale and home use.
On Mt Elgon bamboo shoots are eaten by people. Bamboos are also useful in house construction, making fences, granaries and baskets. In other parts it is used as firewood. Young shoots are also eaten by animals (mainly primates).

The previous system of selling licences to people as a means of controlling and monitoring the harvesting of forest produce (including bamboo) failed because of declining purchasing power of salaries, Forest Officers laxed their supervision and unofficial sale of forest produce to supplement income became the order of the day (Howard 1991). It would be important to avoid this problem by paying living wages to employees if sustained use of forest produce is to be implemented.

6 TRADITIONAL MEDICINE AND PHARMACOPOEIA IN UGANDA

A multidisciplinary field mission and ethno-botanical and floristic research was undertaken in Uganda from 20th September to October 20th 1991, the area covered were Tororo, Lira, Bushenyi and Kabarole (represented the Uganda region Figure 4). It was the second specific mission on the use of medicinal plants and other products of traditional African and Research Commission of the Organization of African Unity (OAU/STRC). 302 species were identified and remarkably well drawn. The particular habitat of each medicinal plant is described as is its African or Tropical biogeographic distribution. Some of its medical uses are mentioned and a detailed account of phytontherapeutic uses. The number of diseases treated is 200; the therapeutic indications mentioned are covered by a total of 500 recipes and the data were gathered from 90 traditional healers and suppliers of information (Adjanohaun 1993).

Main diseases and the plants used to treat them has been given. Certain number of diseases and symptoms have been grouped together as

- Disease and conditions according to the systems
- Infectious disease
- Parasitic diseases (not of the digestive system)
- Specific diseases and conditions (miscellaneous)

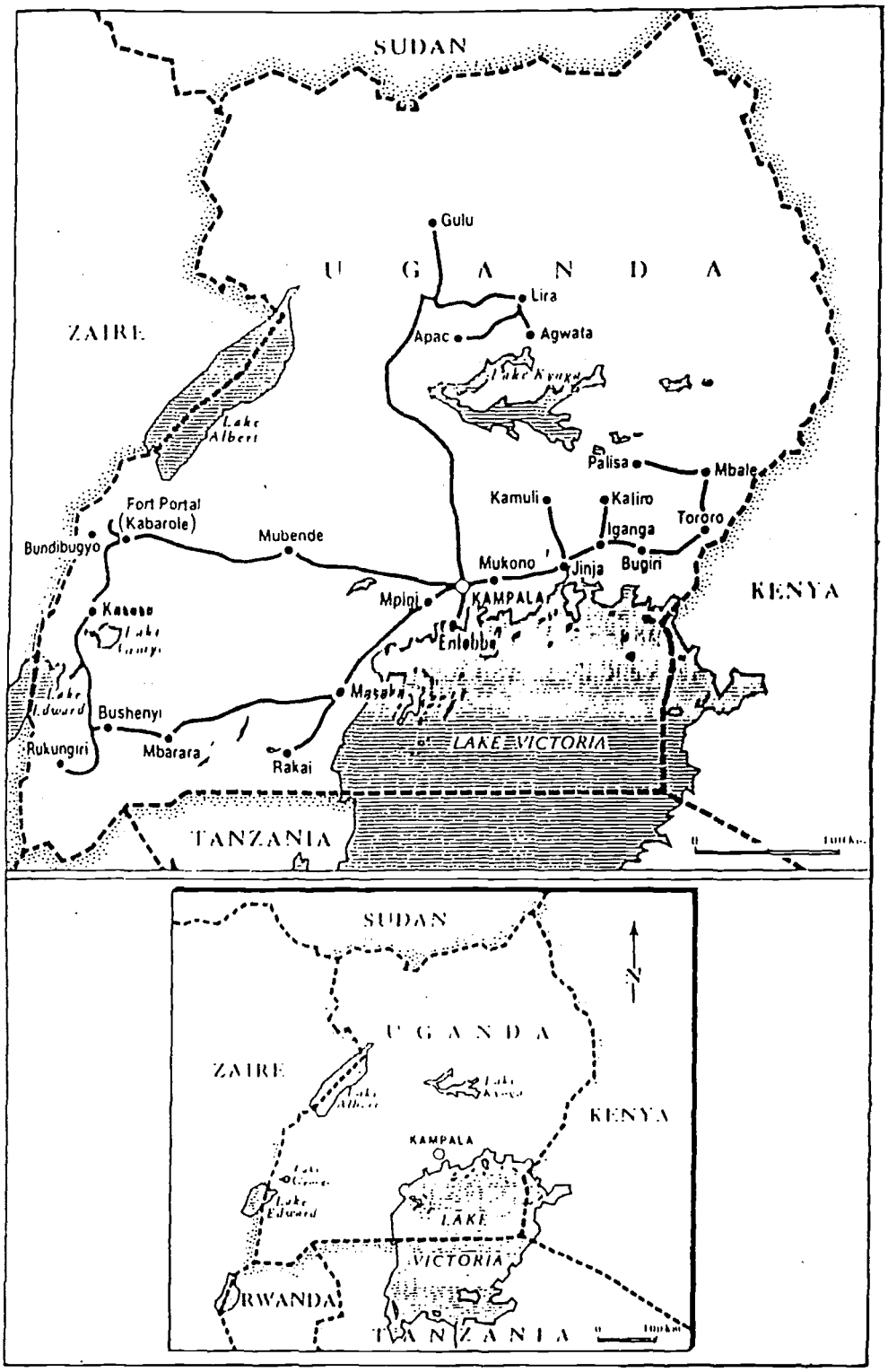


FIGURE MAP OF UGANDA SHOWING PLACES VISITED BY THE MISSION

Source: [illegible]

- Specific symptoms not mentioned elsewhere
- Childhood disease and conditions
- Directions for medico-magical use.

An overview of these recipes reveals certain pathological or symptomic tendencies primarily, female genital pathology, particularly the treatment of fertility and secondary sterility. The approach to various type of digestive, skin and nervous diseases are also dealt with.

Some recipes for rare cases are also dealt with such as asthma, epilepsy, parasitoses, childhood and eye disease, sexual asthenia in male, sickle cell anaemia, fractures, snake bites, anasarca, fever, headache, jaundice, asthenia - malaise, functional psychosis etc. (Table III).

TABLE III INDEX OF SOME OF MEDICINAL PLANTS COLLECTED INSIDE OR AT PERIFERRY OF FORESTS IN UGANDA (Adjjinohoun et al J.E 1993)

Species Names	Family	Location	Medical Use
Adenia rumicifolia	*Passifloraceae*	Forest edge	plant used to treat neuroticilla
Adhatoda engleriana	*Acanthaceae*	closed high Forest	Leaves treat abnormal pains
Alchornea corclifolia	*Euphorbiaceae*	Fringing forest	Root treats snake bite
Aristolochia elegans	*Aristolochiaceae*	Eucalyptus plantation	Root treats snake bite
Brillantaisia Kirungae	*Acanthaceae*	Forest edge	Leaves treat urethritis
Brillantaisia mahonii	*Acanthaceae*	Forest edge	Leaves treat psychotic excitement
Cardamine trichocarpa	*Brassicaceae*	In Forest	Tops treat Kwashiokor
Cardiospermum grandiflorum	*Sapindaceae*	Forest edge	Shoots treat fever
Chasmanthera dependent	*Menispermaceae*	Forest	Rhizome treat gonorrhoea
Chlorophytum sp.	*Liliaceae*	Forest edge	Tubercules treat infertility
Clerodendrum cordifolium	*Verbenaceaae*	Forest edge	Roots treat pelvic disease
Clerodendrum discolor	*Verbenaceaae*	Forest edge	Roots treat ulcers
Clerodendrum myricoides	*Verbenaceaae*	Forest edge	Leave treat dizziness
Clutraabyssinicca	*Euphorbiaceae*	Forest edge	Leaf treats shock
Coffea canephora Rubiaceae	*Rubiaceae*	In Forest	Leaf treats diarrhoe
Conbretum paniculatum	*combretaceae*	Forest edge	Leaf treats cough
Commelina benghalensis	*Commelinaceae*	In Forest	Root treats excitement
Crassocephalum mannic	*Asteraceae*	In Forest	Root treats polio
Cryptolepsis sanguinolenta	*Asclepiadaceae*	In Forest	Root treats malaria
Cyathula prostrata	*Amaranthaceae*	Forest edge	Whole plan treat leucorrhoe

Analysis of the table show the richness of Uganda forests with regard to medicinal plants. It also indicates that rural people who are far from medical services can be treated in a variety of diseases using medicinal plants.

The use of *Rytigynia kigezinsis* (Rubiaceae) bark to treat intestinal parasites (worms) in Bwindi is high. An examination of stool samples from 35 people 89% (31) were infested with round worm (Ascaris) and 34% (11) with whipworm (Trichuris) mematodes in addition to ten other types of intestinal parasites (Ashford et el, 1990). The bark is used by TMP's as a household remedy hence the local people look at it as a great saviour of their lives.

7 TRADITIONAL MEDICAL PRACTIONERS (TMP'S AND TRADITIONAL BIRTH ATTENDANTS (TBA's) MIDWIVES)

No data is available on the ratio of TMP's or TBA's to total population in Uganda. No doubt there are more numerous TMP's and TBA's than medical doctors. A ratio of a medical doctor to total population 1:20,000 is cited from the Ministry of Health (M.O.H) (Kakuru 1991). Although clinics are mushrooming in the city, towns and counties these are difficult to get to for many people and the exorbitant fee charged is prohibitive. In most cases drugs are non-existent.

Uganda government has recognised the need and services of the TMP's and TBA's. The government has registered members of TMP's and TBA's associations using cards connected with UNICEF. The government has undertaken a comprehensive long-term health development strategy in maternal and child health, primary health care, health strategy in diarrhoeal control, education network, and assistance of women needs.

Traditional medicinal plants are mainly gathered from the wild. Traditional birth attendants (TBA's or traditional midwives) play an important role in assisting home births in Uganda.

7.1 Sustainability: Traditional medicines

Forests outside Forest Reserves which were a source of traditional medicines in the past has been cleared for agriculture. With the low level of urbanisation in Uganda (6% of total population) there is a corresponding low level commercial trade in traditional medicines (IUCN 1991). In Owino market in Kampala only 10-12 men sell traditional medicines in small quantities (Cunningham 1992) (Figure 5).

Leaf material is the most common part of the plant used by TMP's, TBA's and cattle owners.

Data for medicinal plants gathered by TMP's in Bwindi are given leaves 38.9% [59 species], roots (21.7% [33 species] bark 29.6% [45 species] stems (1.3% [2 species) fruits 4.6% [7 species] whole plant 2.6% (4 species] flowers (1.3% [2 species] (Cunningham 1992).

The three most important categories of uses of medicinal plants by TBAs were for symbolic or magical purposes (as protective charms against bad omens to ensure safe journey or assist in love affairs and court cases) [22% [34 species] to assist women either prior to or shortly after child birth, preventing premature labour, assisting labour, removal of placenta, treat swollen breasts or improved lactation [18% (29 species)] treatment of internal parasites (de-worming) [7%, [11 species]. Although the data are incomplete, they show that of the plant parts used, at least 62% (96) is leaf material, the majority from herbs growing outside the forest.

7.2 Dental care: chewing sticks

In many rural areas in Africa, traditional tooth brush or chewing sticks from thin branches or roots of local plants are in common use because tooth brush and tooth paste are expensive. Chewing sticks particularly those which have anti-bacterial properties is important as a primary health care.

8 TRADITIONAL VETERINARY MEDICINES

Cattle has important economic and social significance in parts of Uganda e.g. Ankole and Karamoja. Veterinary medicines and formally trained veterinary doctors are scarce and expensive. Wild plants are commonly used to treat a wide variety of livestock diseases in cattle and goats. Over 20 different types of ailments affecting cattle are recognised. Leaf material forms the bulk of plant parts used (64% (16). There is no commercial trade in plants for veterinary medicines.

More detailed work is required on traditional veterinary medicines before firm conclusion can be drawn on major ailments treated in livestock.

The most commonly used remedies are diarrhoea disease, swelling on the legs, ears or groins, mastitis and swelling of the udder.

9 FOREST BIRDS OF UGANDA

The Uganda Forests are recorded the richest areas in Africa for forest birds and this is due to a number of factors (Penford & Francis 1991).

The forests provide a great diversity of food and habitat for the birds. Many food resources are available at different levels throughout the forest.

- Swifts, swallows, rollers and bee-eaters are seen hawking through the air above the canopy catching insects, returning to the branches to eat them.

- Flowers in the canopy attract a number of sun birds with thin down curved beaks which reach into the flowers and reach nectar hence help to pollinate the flowers.

- Fruits in the canopy support birds such as pigeons, hornbills and the turacos. These birds help in seed dispersal in the forest.

- Forests provide other features necessary for bird community such as song perches from where birds can proclaim territory. Holes in trees are useful for hole nesting birds such as hornbills and dead trees support woodpeckers that depend on insects in dead wood.

- Greenballs, robins and thrushes live mainly in the shrub layer of the forest and are mainly insect eaters.

- The forest floor with termites, fallen fruits and seeds, support ground living birds such as guinea fowl and francolins.

- Rivers and streams provide habitats for black duck and several species of king fisher.

- Birds of prey occur at different levels in the forest. Sparrow hawks catch small birds at the shrub layer while the crowned eagle catches monkeys at the canopy.

Eco-tourism is increasingly being based on bird watching and photographic safaris. Birds are beautiful and conspicuous creatures and many people find it interesting to learn their names and habits and this is the basis for ornithological safaris. Uganda has a great potential for this kind of tourism.

- Eight families, 345 genera and over 1000 species have been listed for Uganda.

10 MAMMALS

Mammals have attracted the attention of a variety of people ranging from the amateur naturalists to the professional zoologist. This has been to the large and conspicuous nature of some members of the group (Table IV).

In the early mid 1960s there were studies on elephants and other mammals. Later studies on large mammals continued such as those on the waterbuck, buffalo and the Uganda Kob.

According to the International Union for Conservation of nature (IUCN) there are currently five mammalian species on the "endangered" list in Uganda. These include the Mountain Gorilla - *Gorilla beringei*, Northern White Rhinoceros - *Ceratotherisus semum cottoni*, Black Rhinoceros - *Diceros bicornis*, African Wild Dog - *Lycaon pictus*, as well as Rwenzori Black fronted Duiker - *Cephalophaus nigrifrons rubidus*.

In addition to those there are three other species that are definitely extinct in Uganda. The Bongo - *Tragelaphus cepahlophus leucogaster* is believed to have been present in forests of south western Uganda such as Semliki but has since been exterminated.

The Yellow backed Duiker - *Cephalophus silvicultor* and the mountain Red buck - *Redunca fulvarufula* are endangered. The former occurs in the forest of western Uganda and was originally common but illegal hunting has reduced the population. The creation of Mgahinga and Bwindi National Parks may perhaps allow the species to recover.

Eight species that occur in Uganda are designated as "vulnerable" by the IUCN. These include five primates; the chimpanzee-*Pan troglodytes*, Crested Mangabey - *Cercocebus galeritus*, L'Hoest's quenon - *Cercopithecus l'hoestii*, Owl faced quenon - *Cercopithecus haralyni* and the Red Colobus *Procolubus badius*.

The primate as well as mountain squirrel are threatened by forest destruction. Elephant numbers in Uganda declined due to unprecedented poaching during the 1970s but such poaching now appears to be on the wane. De Brazza's Monkey - *Cercopithecus neglectus* occurs in a few forest patches in the eastern and western Uganda which are under intense human pressure. If such habitats are lost to human beings, that will probably exterminate *Cercopithecus neglectus*.

The Black fronted Duicker - Cephalophus nigrifrona is a montane forest specie occurring in the Rwenzoris, Mt Elgon, Bufumbira volcanoes and Bwindi. Its population has declined markedly due to intense hunting pressure.

The conversion of Mgahinga, Bwindi and Rwenzori forest reserves to national parks status is likely to limit hunting and allow the population to recover.

Bates' pygmy Antelope is a very scarce antelope occurring in lowland rain forests of South western Uganda such as Maramagambo - Kalinzu, Kasyoha-Kitomi, Kibale and Semliki. There is need to survey these forest to establish the current status of this species.

There are several rodent species that are of conservation concern in the "indeterminate" category. The herbivorous, forest dwellings *Otomys denti*, the march dwelling *Delanymys brooksi*, the high altitude *Praomys denniae* and *Thamnomys verustus* as well as two relented wetland species, *Pelomys hopkinea* and *Pelomys isseli*.

The Mill rat Mytomys dybowskii is also in this category in addition to a montane species *Rousetus lanosus* (*ternonycteria lanosus*). There is little or no information on the population and in some cases precise habitat requirements for all of the "vulnerable" species. There is need for research in the ecology of all these species on a country wide basis.

With the recent proclaimation of Bwindi forest as a National Park, the mountain gorilla peculiar to Uganda has started to attract many tourist hence boosting the foreign currency to the country.

TABLE IV: MAMMALS OF UGANDA

Family	Genera	Species	Remarks
Tenrecidae	2	2	
Chrysochloridae	1	1	
Erinaceidae	1	1	
Soricidae	5	32	
Macroscelidae	2	4	
Pteropodidae	10	12	
Emballonuridae	2	5	
Nycteridae	1	7	
Megadermatidae	2	2	Insufficiently known
Rhinolophidae	1	10	Insufficiently known
Hipposideridae	2	6	Insufficiently known
Vespertilionidae	10	32	Insufficiently known
Molossidae	3	20	Insufficiently known
Galagidae	1	4	Insufficiently known
Lorisidae	1	1	Insufficiently known
Cercopithecidae	5	14	not known
Pongidae	2	2	Extinct, venerable
Leporidae	2	3	
Sciuridae	4	10	
Anomaluridae	2	4	
Bathyergidae	1	1	
Rhizomyidae	1	1	
Cricetidae	11	17	
Muridae	20	39	
Muscardinidae	1	1	Insufficiently known
Histricidae	2	3	Insufficiently known
Thryonomyidae	1	2	Insufficiently known
Canidae	3	4	Not known, extinct, insufficiently known
Mustelidae	5	6	Insufficiently known
Viverridae	11	14	Rare
Hyaenidae	3	3	NT Insufficiently known
Felidae	3	7	Insufficiently known
Elephantidae	1	1	
Equidae	1	1	
Rhinocerotidae	2	2	Extinct
Hippopotamidae	1	1	
Suidae	3	3	Insufficiently known
Tragulidae	1	1	Insufficiently known
Giraffidae	2	2	Extinct
Bovidae	17	31	Rare, Extinct
Procovidae	3	5	Insufficiently known
Manidae	1	3	Insufficiently known
Orycteropodidae	1	1	Insufficiently known
TOTAL	154	321	

Source: Uganda Country Study on Costs, Benefits, and Unmet Needs of Biodiversity Conservation - January 1992

11 NATURAL GUM AND RESINS IN UGANDA

A research project funded by IDRC and implemented by Nakawa Forest Research Centre of the then Minister of Environment Protection looked into the possibilities of reviving gun arabic industry which had collapsed due to the civil unrest in the country.

The research also looked into the extent, type and quality of the gum resource and to evaluate the current utilization and market potential of the local gums. The project area was in Karamoja north-east of Uganda. The extent of this resource has largely been unknown (Kityo 1993). The utilization and marketing of gum arabic was embarked on in 1960s and showed some promise as an important export earner, source of rural employment and an alternative to costly import. The gum arabic industry was completely abandoned by the early 1980s.

The Forest Department has for sometime been developing the effective utilization of gum arabic for rural development in Karamoja region where it occurs naturally in dry sandy thorn scrub areas, valley depressions and rock hills. The species include *Acacia senegal*, *Acacia seyal*, *Acacia polyacantha* and *Commiphora abyssinica* etc. The actual extent and composition of these species is little known nor the types, qualities of the exudate (Kityo 1993).

11.1 Physical and Chemical Properties of Local Gums

Gum arabic has a variety of uses which are in printing and book binding. Some potential users of the local gum are eminent if the chemical properties, purity, viscosity, absorption and solubility are established.

11.2 Market Evaluation

The Forest Department organized the handling and marketing of gum arabic in late 1960 purposely to offset costly imports. Government departments, institutions and private industries which had depended on this gum arabic wound up due the civil strife while others resorted to using inferior gum and others imported it (Kityo 1993).

Now that there is peace in the country these industries are being revived and are keen to use local gum arabic (Table V).

It is not known how much gum arabic can be produced in the country and where it can be utilised.

TABLE V: MAIN CONSUMER OF GUM ARABIC IN UGANDA IN 1970s.

Institution	Yearly consumption
Government Printer	1 - 2 tons
Mugonza & Co Ltd	2 - 3 tons
Lands and Survey Dept	0.2 tons
Kampala Textile Crafts School	0.1 tons
Associated Match Company	0.3 tons
Total	3.4 tons

Basing on the past consumptions and population growth, the current domestic requirements of gum is estimated to be between 5-8 metric tonnes annually. This is likely to increase with improved awareness of the potential users. (Kityo 1993)

11.3 Production of gum arabic

There is no tapping of trees for gum collection in Karamoja, all that is collected exudes naturally. The gum exudation process is not very clear since gummosis is known to follow bark damage by some kind of pathogen. There are variations on yield depending on tree, within the tree, area and season.

Information of yields in Uganda is still lacking. Gum collection is done once in an area with no follow up. Most of the gum is collected by herdsmen who wonder about while grazing cattle. There is a general agreement that 200 gm may be collected from each tree every season (Kityo 1993). Assuming a stocking of 425 tree per ha, then between 85-127.5 kg gum arabic per ha could be collected (Table VI).

A man may collect between 0.5 - 1.5 kg a day depending on the stocking of the area. Some gum is however, eaten by the herdsmen as they go along. Whatever remains is sold to the buyers - who is mainly the Forest Department. The cost of a kilogramme of gum arabic is paid USh. 300 = (June 1991 figures)

TABLE VI GUM ARABIC PRODUCTION FROM KARAMOJA IN THE EARLY 1970S

Season	Quantities (in Kg)
1969/70	400
1970/71	986
1971/72	1936
1972/73	3970
1973/74	3952
1974/75	1084
1975/76	

Source: Forest Department

The Forest Department in 1973/74 and 1974/75 collected 3953 and 1084 kgs respectively from an area four km apart in Bokoro County. There was a steady increase of the gum collected from 1969/70 up to 1973/74 which declined from 1974/75.

It is reported that collection of gum arabic was limited to Bokoro County because it was easily accessible by vehicles. It is therefore assumed that if all the productive areas in the region are involved an estimated amount of between 15-20,000 kg of gum arabic could be collected every season (Nov-March). This could increase with the improvement of stocking and tapping methods.

The cost of collecting 1 kg of gum is UShs. 300=
Hence cost of 1 ton of gum is USh. 300,000=
Basing on transportation costs a tonne FOB Kampala is 39,714 or US$ 377.

The present stocking is quite variable with some scattered stands of *Acacia senegal* often entangled with the other species, making gum tapping difficult. Most of the areas of high intensity are on public land.

12 NEW NATIONAL PRODUCTS WITH COMMERCIAL POTENTIAL

Tropical forests are a source of potential medicines or other natural products or wild relatives of crops plants.

Conserving tropical forests for potential new natural products e.g. pharmaceutical drugs has had a wide publicity by international conservation agencies (Cunningham 1992).

There is also a need to conserve wild relatives of new crop plants. If these new products are discovered in an area they add to means of improving income to rural people living in or near forests as a means of earning income from forest without destroying it.

Bwindi impenetrable forest contains a number of wild plants falling in this category (Cunningham 1992). For example *Allanblackia kinbillensis* seeds are potential source of fat which might be used in cosmetics. *Allanblackia stuhimannii* seeds contains an edible fat which is harvested and sold to Gapex (General Agricultural Products Export Company) by local people in Usambara mountains, Tanzania for extraction of fat (FAO 1983a).

Local people in Bwindi extract an oil from *Carapa grandiflora* seeds and use it as a substitute for vaseline (Cunningham 1992) *Myrianthus arboreus* and *Myrianthus holstii* have high prospects as new crop plants and have been proposed for planting and fruit production (FAO 1983a).

Bwindi Impenetrable Forest contains many representative plant families of interest as potential sources of new drugs, such as the Rubiaceae and Apcocynaceae both of which are rich in alkaloids. Edible fungi which may have potential for cultivation e.g. Lentinus prolifer exists.

Bwindi Impenetrable forest is a rich source of soil micro-organisms such as actinomycetes which are a source in new antibiotics.

Western Uganda is rich in plants with horticultural potential in the genus *Impatiens*.

Vigna luteolus (the cow pea relative) *Coceinia mildbraeddii*, (cucumber and pumpkin relatives) and *coffee* (wild coffee) have international interest for their value in breeding programmes for forage plants. Local farmers have a greater knowledge of these new natural products.

A mechanism is needed to link the recognition of the origin and value of these resources as one of the incentives for habitat conservation in developing countries, so that they are seen as a regional resources rather than global common property.

Those who benefit from biological resources should pay more of the costs of ensuring that such resources are used sustainably (Mac Neely et al, 1990).

Consideration should be taken to develop these products locally to a greater degree. Prices paid for raw materials at source are low, leading to a low returns to local harvesters and over-exploitation of medicinal plants in the wild.

The commercialization of new wild plant for new products (e.g. seeds, bark) and harvesting them on large scale can have major effect on forest.

13 BIOLOGICAL DIVERSITY (BIODIVERSITY) IN UGANDA

Biodiversity is a term used to describe the total variety of living organisms (plants, animals, fungi and microbes) that exist on this earth.

Biological diversity exists virtually everywhere in a wide range of habitats capable of supporting some form of life. Species diversity within habitats varies widely and correlates well with the annual rainfall, with wetter areas tending to be richer in species.

In Uganda the highest number of species identified are plants and the great proportion of these is found in forests.

Tropical deforestation is a continuing process. Rapid population growth both by natural increase as well as by immigration has resulted in broad-scale clearing and degradation of forest habitats causing species extinction (Etoori 1991).

In Uganda, the tropical high forest which used to cover 12.7% of total land in 1900 covered only 3.0% in 1987 (UNEP 1988). A major problem has been encroached in the gazetted forest reserves. Since then, this problem has been addressed to and some encouraging signs of regeneration can be seen in forests. However, the problem of rapid degradation of tree resources by pitsawyers and charcoal burners still exists and need further to be addressed.

13.1 Biodiversity Conservation in Uganda

The recently revised Forest Policy (1988) has gone a long way to strengthen the conservation of biodiversity. The European Economic Community (EEC) financed Natural Forest Management and Conservation Project is emphasizing on this aspect of forest management and setting aside at least 20% of the reserved forest as strictly protected nature reserve and 30% as buffer zone.

Human activities have accelerated the rate of extinction of species to an alarming level, hence the need to strengthen conservation measures. Conservation here meaning both protection and management for sustainable

- Government should carry out an inventory of the weaving material in the forest reserves so as to know the amount available in the country.

- Ecological research is needed on the biology of climbers and their biomass production and spacing in relation to canopy gap dynamics.

15.4 BAMBOO

- Cultivation of bamboo should be considered as an important component of Agro-forestry programme.

- Research needs to be done to find out the biomass production and effects of harvesting on *Arundinaria alpina*.

- Research should be carried out on the population biology and gap dynamics of *Arundinaria alpina* with regard to resource use and maintenance of the vegetation type.

- Stock taking and mapping of available bamboo thicket need to be taken.

- How the bamboo is establish must be researched - fire induced, elephant or canopy gaps.

15.5 MEDICINAL PLANTS

- Planting of popular medicinal plants (trees and scrubs) should be included in the afforestation programmes.

- To produce scarce and popular medicinal plant species from cuttings for distribution at costs to herbalists and interested farmers.

- Investigations probably by medical schools, to find out the efficacy of popular herbal remedies the desirability of producing medical plants of known taxicity.

15.6 BIRDS

- Monitoring of bird population as indicators of environmental change.

- Promotion of bird related tourism and promotion of sustainable utilization of e.g. the guinea fowl.

15.7 MAMMALS

- Research should be undertaken to determine the population and habit requirements for all "vulnerable" species of mammals.

- Research should be done into the ecology of all the species on a country wide basis.

- Ecological studies should be done to resolve the status of "not known" and "indeterminate" categories of mammals.

15.7 NATURAL GUM AND RESINS

- Forest Department should gazette some areas with high intensities of Acacia senegal.

- The government should solicit funds for development of gum industry in Uganda.

- The government to create public awareness of the availability and utilisation of gum arabic in the country and encourage investments in its production by potential users.

- Training in gum production technique be instituted.

- Gum collection could help the idle Karamoja population and boost their financial out look and living standards. It would increase the country's export diversification.

15.8 NEW NATURAL PRODUCTS WITH COMMERCIAL POTENTIAL

- Profits arising, if a new natural product is developed, to be returned to the region of that product (oil, resin, organic chemical genetic material).

- Prices for raw materials at source are low, leading to low returns to local harvesters and over-exploitation of medical plants in the wild.

- Steps should be taken to cultivate the material in short supply in a region in order to offset the over exploitation of the wild stock.

- National infrastructure to develop these products locally need to be looked into.

- Assistance be provided to develop and strengthen local expertise in screening of extracts.

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PILOT COUNTRY STUDY - ZAMBIA

NON-WOOD FOREST PRODUCTS
ZAMBIA

A Country pilot study for the expert consultation for English Speaking African Countries.

by

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Consultant

May, 1993

ACRONYMS AND ABBREVIATIONS

FAO	-	Food and Agriculture Organization of the United Nations
GRZ	-	Government of the Republic of Zambia
GTZ	-	Gesellschaft fuer Technische Zusammenarbeit
NGO	-	Non - governmental Organization
NWFP	-	Non Wood Forest Products
TFAP	-	Tropical Forest Action Plan
ZFAP	-	Zambia Forestry Action Plan

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EXECUTIVE SUMMARY

In assessing the role that forests play in the daily lives of the people who live in and around forests we often overlook the importance of Non-wood forest products (NWFP). This is often the result of a biased ideas that the major benefits derived from forests is wood and environmental protection.

Rural populations depend on the forests for a number of other products. Forests provide food in form of fruits, leaves, roots and mushrooms. They also provide building and construction materials in form of fibre, bamboo, rattan and so on. For most rural people, medicinal plants from the forest provide about the only form of medicines throughout their lives. The collection of these items provide people with employment and their sale supplements their income. With about 60% of Zambia's population residing in rural areas, it is not difficult to realise the importance of forests.

Over 55% of Zambians's total land area of 752,600 square kilometres is covered by forest type comprises species of the Brachystegia, Isoberlinia and Julbernadia genera.

The government has overall responsibility over NWFP through four government departments, namely:-

- Forest Department
- Natural Resources Department
- Wildlife Department
- Fisheries Department

These institutions have assumed the responsibility because of the nature of their main operations. These and other organizations are involved in conducting research in NWFP. Other organizations are:

- The University of Zambia
- The National Council for Scientific research
- Public and Private Companies
- Associations and other interested groups

These conduct research in those NWFP in which they have vested interests.

Funding for research for government institutions is provided by the government. Donor agencies and other interest groups also provide funding for special purposes.

Of all NWFP in Zambia, the ones that are highly promoted and developed are those connected with beekeeping activities and basket/mat making.

Traditional beekeeping is widely practiced in Zambia. The activity depends on forest resources for all inputs and outputs. The hives in which the bees are kept are made from tree bark. The bees are found in any forest especially where rainfall is over 1000mm per annum. The bees collect nectar and pollen from the forest to produce honey. The beekeepers harvest honey for consumption and trade. The combs are processed into beeswax which is marketed. The income from these products goes a long way to assist the rural populations.

Baskets and mats are made from bamboo, reeds or rattan and other plants that produce similar materials.

The importance of identified NWFP and classification according to use have been tabulated with statistical information on selected products. Statistical information on NWFP is not available because the harvesting, processing and marketing of these products is done by individuals who keep no records or on small-scale basis.

A number of constraints that hinder the development of NWFP have been identified and these are:

- Shortage of man-power
- Inadequate funding
- Poor infrastructure
- Poor economic environment
- Under developed economic structure

Recommendation have accordingly been made that if implemented would alleviate some of the problems in this sector. Based on these recommendations, a field project has been recommended to address the problem of lack of information on NWFP in Zambia. The project is nation - wide survey and it falls within the framework of the Tropical Forestry Action Plan which Zambia is in the process of formulating. In addition the survey would augment the efforts of other surveys that have been conducted in the country.

PILOT COUNTRY STUDY FOR ZAMBIA ON NON-WOOD FOREST PRODUCTS

1.0. INTRODUCTION

1.1. GENERAL

The importance of forests as a source of livelihood and sustenance for the rural population in Zambia dates back to the time before people begun to cultivate the land on which to grow food. During this time people gathered fruits, roots and leaves and also hunted birds and animals for food. In addition the forests provided shelter against adverse weather conditions and possible predators. To date forests continue to play a major role in the provision of wood and non-wood forest products and services to the population living in and around the forest areas for their subsistence.

For most rural people forest foods add variety to diets, improve palatability and provide essential vitamins, protein and calories. Medicines from forest species are usually the main medicines for rural populations. Many people rely on sale of rattan and bamboo products, grass medicines wild fruits and others to supplement their income.

The objectives of the pilot study is to "provide a brief, concise and realistic overview of the importance of non-wood forest products to the country and prospects for further development".

This paper presents the results of a pilot study carried out to gather and collect information on "non-wood forest products" in Zambia. It gives information and statistical data on the use and importance of non-wood forest goods and services that are derived from the forests and their biomass for commercial, industrial and subsistence use.

1.2 GEOGRAPHICAL DESCRIPTION

Zambia is entirely landlocked and lies between latitudes 8 and 18 degrees south and longitudes 22 and 34 degrees east. It is bordered by Zaire, Tanzania, Angola, Mozambique, Zimbabwe, Malawi, Botswana and Namibia.

The total area of Zambia is 752, 600 square kilometres. The population of the country currently stands at nearly 8 million inhabitants with a very high growth rate of 13.2% per annum. With over 42% of the total population residing in areas designated as urban Zambia is one of the highly urbanised countries in Africa.

The main part of the country is a plateau which ranges from 1000 to 1300 metres above sea level. A range of mountains on the north eastern border rises to move than 1800 metres. The major river is the Zambezi from which the country derive its name. Its

small tributaries dry the western part of the country. the Kafue and Luangwa rivers are the main tributaries of the Zambezi and these drain the central and eastern parts of the country. The Luapula river drains the northern part of the country and pours its water into the river Zaire. In addition to these rivers there are a number of lakes which are shared with neighbouring countries. In the north is the southern tip of Lake Tanganyika and Lake Mweru which are shared with Tanzania and Zaire respectively. In the south is found the man-made lake Kariba which is shared with Zimbabwe. Lake Bangweulu lies wholly in Zambia.

The climate of Zambia is sub - tropical with three identifiable seasons. The warm wet season, the cool/dry and warm/dry seasons. The unimodal rain season stretches from November to April. The rainfall varies from 700mm in south to about 1400mm per annum in the north. The cool/dry season runs from May to August while the warm and dry season is from September to November. Temperature vary from 17 to 32 degrees just before the rains and between 15 and 27 degrees during May to September.

As a result of varying elevation and rainfall distribution, the country is divided into four major agro - ecological zones and there are :

1. The Northern high rainfall zone covering the Copperbelt, Luapula, Northern and North-western provinces. In these areas soils are highly leached sand velds of low fertility.

2. The medium rainfall Central, Southern and Eastern plateau which also has the most fertile soils with the highest population density. Rainfall in this zone averages 800 - 1200mmm per year

3. The low rainfall Luangwa - Zambezi rift valley with an average of about 700mm of rainfall per annum. The soils are mainly shallow chestnut sands.

4. The western semi-arid plains which cover the western part of the country. The area is covered by infertile Karahari sands. Average rainfall varies between 700 and 1000mm per annum.

1.3. FORESTRY SECTOR

It is estimated that about 55% of Zambia's total land area is covered by indigenous forests. In land tenure terms land in Zambia is basically classified as

Statelands	6%
Reserves	36%
Trustland	50%
National Parks	8%

Specific areas in Statelands, Reserves and Trustland are declared as either National forests or Local forests. National and Local forests constitute slightly under 10% of the total area.

The distribution of vegetation and forest types follow altitude and rainfall patterns. The more important forest types include:

The dry forests particularly in the west where the highly valuable Baikiaea plurijuga is found.

The Mopane woodland comprising Colophospermum mopane in almost pure stands

The acacia woodland which is more savanna like and characterised by species of Acacia, Combretum and Terminalia genera.

The miombo woodlands characterised by Brachystegia , Julbernadia and Isorberlina species and covering almost 60% of the forested area. The miombo woodland is found in the high and medium rainfall areas of the northern and central Zambia.

In addition to the above forest types there are grassland vegetation types associated with flood plains of major rivers and lake basins while evergreen forest are found in high rainfall highland areas occurs. The dry forests are found either as dry evergreen or dry decidious such as the Zambezi Teak Forests. Table 1 below shows the percentage distribution of these forest types.

Table 1 : Distribution of Forest Types

Forest Type	% of total forested area	
Closed forests		
Dry (evergreen and deciduous)	7.7	
Swamp and riparian	0.5	8.2
Open forests		
Miombo	58.3	
Kalahari	15.8	
Mopane	7.2	
Munga (Acacia)	6.1	87.4
Other		
Termitaria etc	4.4	4.4
	100	100

2.0 DEFINITION AND CLASSIFICATION

Non-wood forest products are defined as all biological material (other than industrial roundwood and its derivatives) that may be extracted from natural ecosystems and managed plantations and utilized within the household, be marketed or have a social, cultural or religious significance. NWFP include flora and fauna.

NWFP play an important role in the Zambian household. They provide the people living in or around forests with a variety of products that are employed in their day to day life. Examples of activities where NWFP are important are:-

2.1 Food Security

This is in farm of nutritional supplements. Leaves of forest trees provide a welcome additional source of nutrition especially during the dry months when fresh vegetables become scarce. Forest fruits ripen at different times of the year thereby supply a continuous source of vitamins especially for children. Fruits from trees such as Uapaca kirkian, Parinari curatellifolia, Strychnos spp, Syzygium spp, Anisophyllea etc are very popular when they are in season.

Wildroots have saved many a life in the remote parts of the country especially during drought, examples are Colocasia edulis, Dolichos elipticus and Eriosema buchananii, wild animals, birds and fish provide an important source of protein to all Zambians.

Although there are restrictions on the harvesting of wild animals, fish is widely available and is a major source of cheap animal protein. Lymnophyton obtusifolium and Nidorella welwitschii are burnt to made cooking soda and salt respectively.

2.2 Traditional Medicines

People living in rural areas and to a large extent those in towns, depend on traditional medicines to maintain their physical or mental health. Some traditional medicines are largely based on NWFP. Although these medicines and charms may not be scientifically proven, people believe in them and in some cases they are the only available medicines.

Leaves. bark, fruits etc are used for medicinal purposes, Parts of some animals are also utilised in the preparation of traditional medicines

2.3 Construction Materials

Traditional dwellings and other structures such as granaries are constructed of locally available materials. The frame of the roof of such structures is made of pieces of bamboo (Oxytenanthera abyssinica) or reeds tied together with bark rope and thatched over with grass. Blandering in the walls of pole and dagga huts may be of bamboo tied with bark rope. The best bark rope is obtained from the Brachystegia spp and Julbernadia spp. Triumfetta is also used for tying where trees are not available.

2.4 Manufacture of other items

Baskets and similar items are made from materials derived from forest plants. Bamboo, reeds and papyrus are some of the plants that are used. Bark and leaves of Phoenix reclinata are used to make temporary containers. The mid-rib of the leaves of Borassus aethiopum makes good sweeping brooms while the other part of the leaf is used for basket, hats and mats. Rope from the fibres of Sesamum angustifolium is used for stitching reed mats and making fish nets and animal traps.

2.5 Income generation

All items mentioned in the preceding paragraphs may actually be traded for cash to generate income for other uses. People engage in such activities particularly during the slack periods when agricultural activities are reduced.

During the years in which caterpillars occur, caterpillar collection becomes a lucrative activity as the larvae are favourite delicacy of people living on the copperbelt and in Lusaka.

The classification of Zambia NWFP according to whether they are used for subsistence or trade purposes at local, national or international levels as well as the assessment of their importance at community, district and national levels is given in Annex 1. The assessment is based on the observation of use of a particular product vis a vis its natural availability in the area. For instance if a particular NWFP such as bamboo or mushroom is readily available in the area, it is expected that the product will be widely used and residents in that locality will depend on its use to some extent. And if almost every household is actually utilizing these products in their every day life, then products are classified as very important at community level. The same assessment applies at district and national level.

It has been possible to show volumes or values because such information does not exist and the collection of such data is beyond the scope of this pilot study. The indicator used in the identification of products is the popularity of usage of a particular product. In fact it is this aspect that the proposed project is supposed to tackle. So the products that have been rated as very important are those whose use in widely spread to such an extent that almost every household uses them.

The classification into traded or mainly subsistence use is based on whether the product is actually offered for exchange at a relatively reasonable scale.

3.0 IDENTIFICATION

In line with the criteria for the identification and selection of non-wood forest products that play a relevant role in local communities, the products listed in Annex II have been identified. Annex III show the analysis of the opportunities that exist to further promote and develop NWFP in Zambia. These are the Socio-economic activities that would expand and benefit from further promotion and development of the identified products.

4.0 INSTITUTIONAL ASPECTS

Whereas there is no particular institution responsible for all non-wood forest products in the country, there are four government departments that have overall responsibility over national forests and wildlife. These are :

The Forest department
Natural Resources department
Fisheries department
Department of Wildlife.

These four institutions are responsible for policy formulation, data collection, taxation control of exploitation and resource protection. There is hardly any overlapping or

duplication of responsibilities as their different roles are cleared defined. However, close cooperation does exist between the four institutions.

The Forest department has its headquarters in Ndola while the other three departments have theirs in Lusaka. All the four departments are represented at Provincial, district and sub district levels where they have personnel to man the offices.

Popular participation is assured through traditional ruler and local authorities who represent the people. Before the four departments can issue a licence for exploiting any of the products (especially on commercial basis) authority must be sought from the traditional ruler and the local authority.

Based on the available knowledge, the government can take measures to restrict the production of, processing and trade of any Non-wood forest products at any time. However, the enterprises can influence government policy and practice by making presentations to the minister responsible.

4.1 INSTITUTIONAL RESPONSIBILITY

Organizations and institutions that are involved in research and development of some non-wood forest products in Zambia are described below.

4.1.1 Forest Department

The Forest department has three divisions that deal with research and utilization of non-wood forest products based in Kitwe and these are :

Forest Products Research Division
Forest Research (Biological) Division
Beekeeping Division.

The Forest Products Research division has a section that conducts research in minor forest products; the aspect of collection (extraction), processing and utilization and preservation are dealt with. The area of emphasis in this section has been on products that are derived from wood (trees) especially extractives. Investigations have been carried out on dyes, essential oils, gums, resins and tanins.

The Forest research (biological) division conducts research on various biological aspects of forest plants of interest. The emphasis is on the identification and raising of these plants to improve production. Investigations are carried out on medicinal plants, fibres, food plants (fungi, fruits etc) and extractives (dyes, tanins and gums).

The Beekeeping Division conducts research in beekeeping methods and products, marketing and extension. The main area of interest is in forest flowers (Bee forage), fibres for hive production, honey, beeswax and propolis.

All these divisions are manned by university post graduates with Masters of Science in forestry related fields. They are assisted by Bachelor of Science degree holders , diploma and certificate technicians. To some extent these institutions are capable of conducting their business. Where they are not able to do so, there is always a possibility of seeking assistance from local and international institutions.

The major source of funding for the Forest department is the government which provides funds to run these organizations. International agencies (FAO and FINNIDA) have been assisting with the provision of equipment and manpower training. In addition, local organizations and companies have been helping to fund research and development of those non-wood forest products of particular interest to them, such as research on latex producing trees, raising of mushroom in green houses and rattan production.

4.1.2 National Council For Scientific Research

This is an autonomous organization created to, among other objectives carry out research on the possibilities of commercial utilization of local raw materials. The council has been involved in research and development and utilization of non-wood forest products. So far research is being conducted in Fibre, Vegetal, Medicinal and Extractive categories.

The human resources at the council is highly qualified some of them being Phd holders in their field of specialization. The technical capability (Laboratories and other facilities) is there as this council was established specifically for the purpose of conducting research.

The funding of this organization is in form of grants from the Zambian government. Other funds are obtained from sponsorships by organizations and companies that are interested in particular non-wood products and sale of formulae or patents to commercial entities.

4.1.3 The University of Zambia

The university through its many faculties and schools has been involved in various aspects of non-wood forest products. The involvement depends on the interest of the faculty or school in question such that the department of chemistry is involved in extractives, agriculture department is responsible for non-wood forest products that are of interest to farmers and so on.

4.1.4 Public and private companies

Various private and public companies do conduct research in those NWFP of their interest especially where they can detect a commercial possibility.

4.1.5 Associations and interest groups

These organization service various sectors of the community and represent varying interest groups. Groups such as the Traditional Healers Association and the Zambia Council for the Handicapped conduct research in non-wood forest products from which their members benefit. This is done either by the associations themselves or through sponsoring relevant research programmes in other institutions.

4.1.6 Other support institutions

Since the harvesting, processing and marketing of non-wood forest products falls in the category small scale (forest) enterprises, these activities are also catered for by institutions established to provide small scale industries.

1 - Village Industry Service (VIS) was established in 1978. VIS is a voluntary NGO whose object is to promote industries and crafts on the basis of small scale labour intense unity with the objective of maximizing village employment and generating additional village income. VIS provides technical and financial support.

2 - Small Scale Industries Organization (SIDO) was established by an act of parliament of 1981 with a primary objective of promoting small scale industrial enterprise in Zambia.

3 - Small Scale Enterprise Promotion Limited (SEP) was set up as a joint venture of the Development Bank of Zambia and the Frederick - Ebert Foundation of West Germany. The company provided requisite services such as financial and training of small scale entrepreneurs. The company has since been transformed into a financial institution exclusively interested in small scale entrepreneurs.

4.2 LEGISLATION

The Forest Act Chapter 311 of 1973 with subsequent amendments is the main law that govern forestry in Zambia. Relevant sections of the law prohibit entry into the protected forest areas for any purpose without authorization to do so. The law empowers the minister to set fees and make any regulations concerning the harvest, removal and processing of forest products

and also empowers the forest officers to collect fees and taxes and to authorize the collection, removal and utilization of forest products. There are no guidelines or standards regarding product quality or testing requirements on non-wood forest products. However, since most forests or woodland in the country lies outside the protected areas, the Land Act and it's subsidiary legislation is also relevant.

The legislation in itself is adequate and not overly restricted although non-wood forest products are not individually named. The deficiency lies in the enforcement of the law.

4.3 POLICY

The policy of the Zambian government as regards non-wood forest products is derived from the main policy and law on natural resources. The law states that the ownership of all land is vested in the President on behalf of the people of the country. The policy is that the government should manage these resources for sustainability and for the benefit of the Zambians.

4.4 TRAINING RESEARCH AND DEVELOPMENT

Scientific training at degree level in non-wood forest products is conducted outside the country due to lack of adequate training facilities locally. Below this level, training can be done either locally or abroad. Consequently links at various levels do exist with other research on educational institutions in other nations.

Technical support and infrastructure on sub-national basis is on the whole not well distributed for reasons to be discussed later. The same applies to the dissemination of information on relevant advances in their fields.

Whereas the number and hierarchy at nation, regional and district levels are defined in the establishment for each institution, together with the quality of staff training in relation to responsibilities and whereas the government has trained and facilitated the training of a number of personnel to fill these posts, the staffing is far below required levels. This is mainly due to government failure to retain trained staff who leave after training for better conditions. The incentive for career advancement is there but there are no incentives to keep trained staff from leaving.

5.0 PROBLEMS AND CONSTRAINTS

The importance of non-wood forest products to the local communities cannot be over emphasized. Some of the non-wood products are not only important to the local communities but also to the nation. Exploitation of NWFP helps to create job opportunities and helps the country earn the much needed foreign exchange. However the promotion and further development of these products is hindered by a number of problems. These constraints mainly stem from the institutional framework in which the NWFP are managed. The government has overall responsibility for NWFP. This has resulted in the following constraints.

5.1 LACK OF INFORMATION

Information on NWFP in Zambia is not readily available. Even where research has been conducted, the results are rarely publicised. Most of the research in academic statistical information is lacking mostly because of the unorganized nature of utilizing the NWFP.

5.2 SHORTAGE OF MANPOWER

The difficulty with the arrangement of having the government as the sole institution responsible for non-wood forest products is that the responsibility becomes too much. More attention is paid to pressing matters as well as activities that appear to generate more tangible results. This is illustrated in the terminology used to refer to NWFP. In Zambia these are referred to as "Minor Forest Products" even in the legislation. Consequently trained manpower in this field are very few. Since specialised training is required for this category of personnel, the government has failed to retain trained personnel due very low salaries and poor conditions of service.

Human resources are essential to conduct research in NWFP as well as to disseminate research findings train and educate the producers and users of these products.

5.3 INADEQUATE FUNDING

Even in instances where human resources are available, it has not always been possible to carry out their job because facilities are lacking. In order to conduct meaningful research, properly equipped laboratories should be in place. Other facilities such as transport to visit the areas for either sample collection or to provide extension services are a prerequisite for successful promotion and further development of non-wood products

5.4 INFRASTRUCTURE

The development of NWFP is also hindered by lack of well developed infrastructure in the country such as a good road network and staff housing. Forests by their very nature are found away from centres of large populations were market for these products exist. If the road system is well developed NWFP that are either bulky and heavy or highly perishable (e.g honey, bushmeat and mushroom) can easily find access to the market. Additionally if extension expertise is available on site and able to offer advice when needed, interest in these products would be maintained. This would in turn encourage more production of the product in question.

5.5 POOR ECONOMIC ENVIRONMENT

Due the poor economic environment prevailing in the country, individuals and companies have been reluctant to invest in ventures that would result in the promotion and development of NWFP. Even where the willingness is present, the high interest rates and availability of loans discourages investment in those activities that have narrow profit margins or are unfamiliar to financiers.

The same situation exists when it comes to short-term (seasonal) loans to enable individuals to enter into production and processing of non-wood forest products.

5.6 UNDER DEVELOPED MARKETING STRUCTURE

The availability of a well developed marketing structure is an essential element in the promotion and further development of any commodity. For any individual or organization to enter the production, processing or marketing of non-wood forest products, there must be assurance of the possibility of selling their products locally or internationally.

6.0 TECHNICAL DESCRIPTION

Four activities that involve production and processing of NWFP are discussed. These activities are widely practiced. They are beekeeping and basket making which are described in detail and two ways of beverage making which are briefly discussed. There are a number of other products of local and national importance. The problem is that of data availability. Since as mentioned earlier, there is no particular institution that has conducted a detailed research in the use of these products it is not possible to show figures in a study such as this one. In addition, the NWFP is this country are mostly dealt with by the informal sector.

6.1 BEEKEEPING

Beekeeping is well suited to those who live in rural areas as there is plenty of space in which to scatter hives. In Zambia honey and beeswax production depends on the natural forest.

6.1.1 Production

Zambia has many thousand of hectares of Brachystegia woodland which provides excellent source of nectar for bees. The availability of bee forage varies greatly depending on the proportions of the various tree species in the woodland and on the rainfall. In general however any wooded area with more than 1000mm of rainfall may be considered a possible beekeeping area.

Although efforts have been made to introduce frame hive beekeeping for more than 30 years, this has not been successful mainly because of the price of the frame hives which rural people cannot afford. Consequently, traditional beekeeping by the rural people is the major source of honey products in the country. Traditionally making of hives, baiting and harvesting (Cropping) are male roles. Women can only participate in transporting and processing.

Bark hives are made by stripping bark off a live tree. The cylindrical lives are about 120 cm long and about 30cm in diameter. The joint along the length of the hive is secured with seasoned hardwood pegs, the ends are then closed either by circular plaited grass doors made of fine thatching grass, or by another piece of bark.The hives are then left to dry for two months before being hung in trees.

6.1.2 Harvesting

Harvesting is done when the flowering of trees from which the nectar is obtained is over. There are two flowering seasons. The main flowering period is September to November usually just before the rains. This is when the Brachystegia species flower. In addition over considerable areas Julbernadia paniculata and J. globiflora occur, and these flower from February to May producing a second flow.

It must be stressed that the major source of nectar are the Brachystegia and Julbernadia species. However any species which flower out of the main season are important because they enable the bees to keep up their stores of pollen and honey. The most important species in this group are Marquesia macroura, M. acuminata, Syyzygium and Parinari species.

Even in area where Brachystegia woodland does not occur, good yields may be obtained from species such as Acacia and other shrubs.

Once the honey is removed from the hives, it is packed in any suitable containers and transported to the villages where the honey can be used for beer brewing, as a sweetener or prepared for sale.

6.1.3 Processing

Honey for sale is traded either semi processed or unprocessed. In the country there are both government and private agencies involved in the honey trade. The would-be buyers distributes containers to the beekeeper before harvesting. After harvesting the unprocessed honey is bought by the many buyers who process it further. The honey that is semi processed is first processed at village level.Some beekeepers have been supplied with honey presses which are used to squeeze the honey from the combs. The liquid honey is sold as semi processed honey. The combs from the honey press together with those from honey where the bees have absconded are processed into beeswax.

The procedure is that the combs are melted in boiling water once everything has boiled the liquid is strained through sack cloth and left to cool. The beeswax will solidify on top of the dirty water. This is then marketed through the normal channels, processed honey and beeswax fetched more income for the village beekeeper. Processing is a family activity.

6.1.4 Renewability of the resource base

Beekeeping makes use of the high natural potential of the areas where it has been practiced for generations. Investigations into the most appropriate technologies (concerning ecological, economical and social relevance) have been carried out.

According to a recent study done on the impact of beekeeping on the natural resources a negative impact by bark-hive beekeeping has been identified. Ironically the same tree species that are good bee forage producers also have the best bark for hive making. In recognition of this fact, a number of measures have been taken to ensure sustainable utilization of the trees. Beekeepers do appreciate the value of forests (trees) and they are aware that the sustainability of their livelihood depends on the availability of forests. To this end, beekeepers are encouraged to make three to five hives from a single tree. Other measures include the introduction of alternative hive making material such as grass, calabashes and planks. In fact it is not all trees of a given species are suitable for back hive manufacture, so there is selection during the process of hive making. The procedure is likened to the silvicultural practice of selective cutting employed by logging companies in the same miombo forests. But this is at a reduced scale. The damage caused by beekeeping to the environment is therefore not as severe as that caused by other activities such as logging, shifting

cultivation, charcoal burning and clearing for agriculture and settlements.

Currently research is underway to try and find suitable alternative materials for hive making that would be accepted to the local beekeepers.

6.2 BASKET MAKING

Another NWFP based activity the is widely practiced in Zambia is basket/mat making. Material used for making baskets vary but the most common is bamboo (Oxytenanthera abyssinica). In Zambia bamboos are closely related with termite mounds.

The popularity of this activity is proven by the fact that it is the most important activity in the forest based small scale industries sector. Fisseha and Milimo (1986) found that of the 80, 000 full time workers in this sector, 94% were in manufacturing and of these 5%% were basket and/or makers.

Basket making is a very lucrative business entered into specifically for income generation. The products are sold in urban centres and along major road routes.

6.2.1 Harvesting and processing

Fresh bamboo is used. Good canes with few branches are chosen and cut in lengths of more than 2m each. These are the split in the forest into strips before transporting to the village or roadside then the strips are smoothed.

Larger strips are used for the skeleton of the basket and handles. The thin strips (about 5cm in diameter) are used for weaving the basket body. Since basket are bulky, it is usually these bamboo strips that are transported from the place of production (mostly Copperbelt) to other marketing areas.

6.2.2 Manufacture and Marketing

Basket manufacture is usually done at or close to the selling point. Various shaped basket are made. The same raw material is also used for baby cribs, wicket chairs, flower baskets and similar products. The activity is done by individuals with family members or one or two friends. Selling is done at the market , at road sides and by vending.

6.2.3 Renewability of the resources base

Bamboos grow from rhizomes, harvesting does not kill the clamp unless it is dug up. So bamboo bushes keep sprouting until they flower at which time the whole clamp dies. this phenomenon is however very rare. The growth rate of bamboos is high such

that there is replacement on an annual basis. No efforts are made to replant or regenerate bamboos in Zambia.

6.3 MUNKOYO (SWEET BEER)

Great potential for developing non-wood forest products exist in Zambia.The roots of a sub shrub Rhynchosia insignis are used in the brewing of a sweet beer locally known as Munkoyo.

6.3.1 Production and processing

Rhynchosia insignis is a sub shrub found as an under storey plant in the Miombo Woodland. Its roots are tuber-like and fibrous. Collectors dig the roots up and either offer them for sale directly or are beaten up into fibrous strands that are dried and then sold.

The process of brewing Munkoyo involves the preparation of maize meal porridge which is then left to cool. Once the porridge has cooled, beaten roots of Rhynchosia are added to it and stirred until the colour changes to yellow. The liquid is then strained and left overnight.

6.3.2 Marketing

The Munkoyo is the marketed by women to workers in industry and offices and is very popular especially as cheap lunch. It is also taken as a beverage at home and where ever there is a gathering of people such as at weddings, funerals or meetings.

6.4 MASUKU

The fruits of Uapaca kirkiana are very popular with Zambians. They ripen between September and November when they are offered for sale at markets and along roads.

The National Scientific Council has come up with formula for making Masuku wine which a local company is using. The fruits are collected during the period when they are in abundance and processed into a sweet wine.

Apart from wine, the fruits can also be used in making jam.

7.0. STATISTICAL DATA

Statistical data on non-wood forest products is not easy to come by. These products are collected and utilised by local communities, The only figures that are available are for those item that are licenced by the government department. Even then, the accuracy of such figures is questionable since the government does not have adequate facilities to monitor the licenses. Furthermore, people are reluctant to give accurate production figures of whatever activity that they are involved in for various reasons. The figures given in the table below relate to the part of production that goes through the government established channels of trade such as cooperatives. It has been estimated that the bulk of the production is handled by the informal sector.

Table II Statistical Data Sheet

Year	Product	Scope	Quantity	Unit	Value US$
1988	**Honey**	**M**	180780	**Kg**	180780
1989	"	**M**	95000	**Kg**	95000
1990	"	**M**	205300	**Kg**	203300
1991	"	**M**	10014	**Kg**	10014
1991	"	**E**	18000	**Kg**	18000
1992	"	**M**	20.000 ~~171850~~	**Kg**	171850
1988	**Beeswax**	**M**	14765	**Kg**	38390
1989	"	**M**	19895	**Kg**	51730
1990	"	**M**	56395	**Kg**	146630
1991	"	**M**	24635	**Kg**	64050
1992	"	**M**	28515	**Kg**	74140

Note: Information obtained from official figures. It has been estimated that 50% of total production of honey is recorded and only 25% of the beeswax.

8.0. RECOMMENDATION

The further promotion and development of non-wood forest products requires a deliberate government policy directed specifically at this sector. Zambia's economic performance has been on the decline since the mid 1970s. The high rate of population growth and the lack of new investments has resulted in falling standards of living and reduced employment opportunities. Non-wood forest products have high potential in terms of employment creation and improvement of the standard of living of the people involved in such activities. Many people rely on sale of honey, beeswax bamboo furniture and baskets, medicine, wild fruits and mushrooms to supplement their income. Others engage in hunting and gathering for sale seasonally either to exploit raw materials or markets available only at particular periods or the labour available at certain times when agricultural activities slack. NWFP are heavily depended upon in emergencies as was evident in some remote parts of the country during the recent drought.

As the new government which came into power in 1991 tries to put the economy of the country back on track, attention should be paid to what should be done to the forest sector (especially NWFP) in order to bring the optional utilization and to derive maximum benefits for the local communities and the nation as a whole.

According to the governments economic recovery programme, the primary goal is "to reduce unemployment, expand resources to improve health, education and other basic social services and meet the income and other needs of the most vulnerable members of society". The government policy focus on "promoting small holder production by redirecting and augmenting research and extension services and improving rural infrastructures especially roads, storage and processing facilities".

Efforts along this line are already in progress. At present the government is seriously looking into the question of retaining the already trained manpower by improving the conditions of service. But the progress is slow due to limited financial resources as other sectors of the economy such as improvement of infrastructure also urgently require attention. The following are general recommendations.

8.1 INFRASTRUCTURE

The improvement of infrastructure such as roads would facilitate easy movement of the forest products especially from the remote rural areas. This will automatically result in more product utilization and thus development.

8.2 MANPOWER

Although the government with the help of various donor countries has trained a lot of people, adequate manning levels are far from being achieved because those with relevant expertise leave the government and/or the country. Thus efforts and resources are wasted. Measures should be taken to improve conditions of service in the country and also provide facilities to promote efficient performance. Skilled workers are required to conduct research and extension.

8.3 FINANCIAL ASSISTANCE

The harvesting of NWFP in Zambia starts with the local populations. In some instances, it is not easy for these rural people to do so in an efficient way due to lack of facilities. Rural populations have no access to loans from ordinary financial institution because they lack security and collateral. Financial assistance in form of small seasonal loans can go a long way in assisting the rural people to develop NWFP. These loans can be used to acquire transport (bicycles), storage facilities, simple processing equipment and other materials that may be necessary. These loans can be repaid after the loanee has marketed his produce.

8.4 INFORMATION DISTRIBUTION SYSTEM

The first step in this direction is to reorganise the existing institutions so as to establish a system whereby research findings can easily be made available to interested parties so that those who wish to venture into developing NWFP can have the information that they need.

9.0 CONCLUSION

The paper has highlighted some of the aspects of NWFP in Zambia. Like in most countries little attention is paid to NWFP except for those that produce high returns. This is evident from the fact that there is no specific institution responsible for these products. However, a number of organizations have responsibility over some NWFP this responsibility come as a by-product of the institution's main activity.

The value of NWFP to the people who live in and around the forests is quite immense and is often underestimated. Availability of information and data on consumption and trade is seriously lacking due to the fact that most of the trade is not recorded except in cases where large organizations are involved. It is hoped that this problem will be addressed by the survey that has been proposed within this paper.

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Annex I: Main use and importance

Product	Subsistence			Traded		
	a	b	c	a	b	c
Fibre						
Bamboo	1	1	-	2	2	3
Bark	1	1	-	3	3	-
Grass	1	1	-	1	2	-
Leaves	3	-	-	-	-	-
Rattan	3	-	-	-	3	3
Stem	3	-	-	-	-	-
Vines	3	-	-	-	-	-
Vegetal						
Flowers	3	-	-	3	-	-
Fruit	1	1	-	2	1	-
Fungi	1	1	-	2	1	3
Leaves	3			3		
Nuts	2			-	3	
Roots	2			2	2	
Seed	3			3		
Stem	3			3		
Tuber	2			3		
Faunal (Food)						
Bush meat	1	1	-	2	2	
Eggs	3			3		
Fish	1	1		1	1	
invertebrates	1	1		2	1	
Faunal (Non food)						
Hides	3			3		
Horns	3			3		
Skins	3	3		3	2	3
Tusks	3	3		3		
Cosmetic & Medicinal						
Bark	2	2	-	2	3	-
Fruit	2	3		3		
Fungi	3			3		
Leaves	2			3		
Roots	2	3		3		
Nuts	3			3		
Stem	3			3		
Hides & Skins	3			3		
Horns	3			3		

Product	Subsistence			Traded		
	a	b	c	a	b	c
Extractives						
Dyes	3	-	-	3	-	-
Tanins	3			3		
Miscellanous						
Honey	1			1	1	2
Beeswax	1			3	2	3
Propolis	3			3		

Legend
- a: Community
- b: National
- c: International
- 1: Very important
- 2: Moderately important
- 3: Less important

ANNEX II IDENTIFICATION OF RELEVANT ROLES

Category	Product	Importance
Food security and Nutrition		
	Vegetal Condiments	3
	Fruits	1
	Fungi	1
	Leaves	3
	Nuts	1
	Roots	2
	Seed	1
	Tubers	2
Faunal (Food)		
	Bush meat	1
	Bird	2
	Eggs	3
	Fish	1
	Honey	1
	Invertebrates	2
Health/ Cosmetic & Medicinal		
	Bark	1
	Fruits	3
	Fungi	3
	Leaves	1
	Roots	1
	Stems	3
	Hides & Skins	3
	Horns	3
Miscellaneous		
	Propolis	3
Job opportunities/Fibre		
	Bamboo	1
	Leaves	3
	Rattan Stem	3
Faunal (Non-food)		
	Hides	3
	Horns	3
	Sericulture	3
	Skins	3
	Tusks	3
Extractive		
	Dyes	3
	Essential oils	3
	Gums	3
	Resins	3
	Tanins	2
Miscellaneous		
	Beeswax	1

Income generation/Fibre		
	Bamboo	1
	Bark	3
	Grass	1
	Stem	3
Vegetal		
	Flowers	3
	Fruits	1
	Fungi	1
	Leaves	3
	Nuts	3
Faunal (food)		
	Bush meat	1
	Fish	1
	Honey	1
	Invertebrates	2
Faunal (Non-food)		
	Hides	2
	Sericulture	3
	Skins	2
	Tusks	3
Extractives		
	Dyes	3
	Resins	3
Miscellaneous		
	Beeswax	1
Cultural aspects/Faunal (non-food)		
	Hides	2
	Horns	2
	Feathers	2
	Furs	3
	Skins	1
	Tusks	2
Miscellaneous		
	Propolis	3
Religious ceremonies/Fibre		
	Leaves	2
Miscellaneous		
	Beeswax	2

Legend:

1: Very important
2: Moderately important
3: Less important

Annex III PROMOTION AND DEVELOPMENT OPPORTUNITIES FOR IMPORTANT PRODUCTS

1.0 Food Security and Nutrition

1.1 Fruits - good opportunities especially if preservation and processing can be improved

1.2 Fungi - good opportunities especially if well preserved.

1.3 Bush meat - good opportunities especially if harvesting can be controlled to ensure sustainability

1.4 Fish - immense opportunities

1.5 Honey - immense opportunities particularly if a less wasteful method of beekeeping is successfully introduced to increase productivity.

1.6 Nuts and seed - As for fruits

1.7 Tubers - good opportunities

2.0 Health

2.1 Bark - relatively good opportunities especially if the claims and beliefs can be scientifically proved.

2.2 Leaves - good opportunities as for bark

2.3 Roots - good opportunity as for bark.

3.0 Employment creation - Most products have a potential for job creation provided that the source is tamed or cultivated.

3.1 Bamboo - excellent opportunities especially at international level there is no need of cultivation.

3.2 Beeswax - good opportunities if a better way of keeping bees are introduced.

4.0 Income generation - the possibility of income generation does exist for all traded NWFP but for some of the products, the opportunities are exceptional.

4.1 Bamboo - excellent opportunities

4.2 Grass - good opportunities especially in areas that are close to fast growing urban centres.

4.3 Fruits - good opportunities although fruit occurrence is seasonal.

4.4 Fungi - good opportunities as for fruits.

4.5 Bush meat - good opportunities provided that the killing is controlled

4.6 Fish - immense opportunities

4.7 Honey - great opportunities provided a more sustainable way of keeping bees is successfully introduced.

4.8 Beeswax - as for honey.

5.0 Export - These are the products that have a potential as export products or as raw materials in exported products.

5.1 Fungi - good if storage and transport is improved.

5.2 Honey - great opportunities

5.3 Fish - good if preservation is improved.

5.4 Bamboo - good opportunities as semi processed raw material or finished products

5.5 Beeswax - excellent opportunities

5.6 Faunal (non food) - excellent opportunities if the ban on trade of such products was lifted.

6.0 Import substitution - All NWFP can be used for import substitution to same extent. Only a few are given below

6.1 Fibre - all products under this heading have good potential of substituting imported materials.

6.2 Cosmetic and medicinal - Products in this group have potential which can be greatly improved it the claims were to be proved scientifically.

6.3 Dyes and Tanins - good opportunities if the sources can be cultivated in order to produce sufficient quantities.

6.4 Beeswax - great potential.

Annex IV

1.0 PROPOSED FIELD PROJECT

The following field project is being proposed to facilitate the acquisition of more detailed information on NWFP.

1.1 INTRODUCTION

The tackling of the issues raised in this paper would require wide and far reaching measures to be undertaken by government. It is not within the power of the author to commit the government to undertake policy measures but recommendations have been made. Further it is not possible to come up with a project that would address all the issues that have been covered in this paper, for this reason only one aspect will be covered in the project.

Recognising the need for more comprehensive information in the field on NWFP, a field project is being proposed to look into ways and means to promote and further develop these products in Zambia.

1.2 OBJECTIVES

The objectives of the project will be to conduct a detailed survey into the extent of usage of NWFP in the country. The survey will also look at research activities and findings in this field and assess the usefulness of the results of research.

1.3 SCOPE

This national wide survey should concentrate on the northern part of the country where wide distribution and diversity of the forests is found. In addition, this is where more activities are found. The survey is expected to come up with information on the type of product, method of harvesting or processing, present marketing possibilities, the importance of these products at the community and national level and the constraints that hinder promotion and further development. The contribution of NWFP to domestic and national income and generation of employment opportunities will also be assessed.

It is also hoped that the survey will throw some light on the effects of extracting NWFP on the forests and also consider ways of ensuring sustainable utilization.

1.4 DURATION

The NWFP survey is expected to take 24 months. The first three to four months will be used to organize the project in order to put everything in place.

1.5 PROJECT REQUIREMENT

In order to successfully conduct such a survey, a number of inputs are needed. Similar surveys have not be conducted in the past due to shortage of resources.

The NWFP survey project can easily be accommodated by the Forest Department of the Zambian government. However, there is need to provide resources such as financial, equipment and personnel.

1.5.1. Equipment

The following equipment will be required

- 1x4 wheel drive twin- cab vanette
- 2 office tables
- 4 office chairs
- 1 filling cabinet
- 1 book shelf
- 1 computer (PC with 40 - 60 megabytes with WP-5.0 and spread software preferably window excel)
- stationery
- camping equipment

1.5.2. Financial

Funding will be required to pay the drivers and staff salaries and subsistence allowances in addition to meeting vehicle maintenance and running costs.

1.5.3. Personnel

The following personnel will be required as part time and full time for the project duration. The project manager and the two assistants will be seconded from the Forest Department while the driver and secretary will be employed by the project.

- 1 Project Manager - Msc degree holder (Part time)
- 2 Assistants - diploma holders (full time)
- 1 Driver
- 1 Secretary

1.6. PROJECT BUDGET

The total project budget for the 24 months will be $55, 660 broken down as shown in table 3 below:

ITEM	COST US$	
1. Equipment		
1x4 wheel drive vanette	15,000	
1 Computer with software and printer	4,000	
2 Office tables	600	
4 Office chairs	600	
1 Filling cabinet	500	
1 Book shelf	300	
Stationery	1,000	
		22,000
2. Camping Equipment	1,000	1,000
3. Salaries and Allowances		
Project Manager (100x24 man months)	2,400	
2 assistants (2x80x24 man months)	3,800	
1 driver (50x24 man months)	1,200	
1 secretary (50x24 man months)	1,200	
Allowances (4x15x150 man days)	9,000	
		17,600
4. Operating expenses	10,000	10,000
5. Contingencies (10%)	5,060	5,060
TOTAL	55,660	55.660

1.7 RELEVANCY OF PROJECT

This project will supplement other surveys that have been conducted in connection with the utilization of the local forest resources. These are The Wood Resources and Consumption Survey which was sponsored by FAO and conducted from 1984 - 86, the Beekeeping survey on North-western province conducted by Bernhard Clauss between 1987 -91 with sponsorship from GTZ and the Rural Small-scale Forest Based processing enterprises in Zambia conducted by Dr. Y. Fisseha and Dr. J.T. Millimo in 1985.

This survey is within the scope of the Tropical Forestry Action Plan. TFAP is a global framework for action to promote sustainable use and conservation of tropical forests through proper management of forested areas. The Zambia Forestry Action Plan (ZFAP) which is in the process of being formulated sets out the programme of sustainable use and conservation of forest

resources in Zambia. The local experience gained during this NWFP survey will be extremely useful in the formulation of ZFAP programmes and other integrated projects in other fields. It is on this basis that this project is strongly recommended.

PILOT COUNTRY STUDY - ZIMBABWE

NON-WOOD FOREST PRODUCTS IN ZIMBABWE

Bruce Campbell and Tim Brigham

April, 1993

Paper prepared for the FAO expert consultation on non-wood forest products (anglophone Africa).

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1 INTRODUCTION

Attention on non-wood forest products in the forestry discipline is relatively recent, mostly limited to the last decade (FAO, 1983, 1991; Rao, 1991; Poulsen, 1982), though the interest in such products from botanists and anthropologists goes back many years, as evidenced by the journals Economic Botany, Journal of Natural Products, formerly Lloydia, and Journal d'Agriculture Traditionelle et de Botanique Appliquee (and its predecessor), which began publication in the 1930s and 1940s - see also Wickens, 1990). The recent attention is a result of many influences (FAO, 1991), including deteriorating economies (and the need for generating and saving foreign currency), the realisation by foresters that local people are dependent on forests and woodlands for products other than wood (Poulsen, 1982; Bradley and McNamara, 1980; Bradley and Dewees, 1993), the concerns of developing countries about conservation of tropical forests and biodiversity (Groombridge, 1992; Juma and Cable, 1992), and the development of new markets for 'environmentally-friendly' products (May, 1990; Jenner, 1989).

The aim of the present paper is to examine the non-wood forest products of Zimbabwe, to identify their importance at local, national and international levels and to investigate the institutional and other constraints on their development.

2 ENVIRONMENTAL AND SOCIO-ECONOMIC BACKGROUND

Zimbabwe, covering some 390,000 km^2, consists of four main physiographic regions. One of these, the eastern mountains, forms a narrow band along the Mozambique boundary. The rest of the country is characterised by a north-east to south-west watershed, the highveld (above 1,200 m); this descends to the Zambezi river in the north-west and the Limpopo in the south-east, in a series of plateaux, with the middleveld (900 - 1200 m) giving way to the lowveld (below 900 m). Approximately two-thirds of the country lies above 900 m.

Five main vegetation types cover Zimbabwe: Afromontane forest and grassland in parts of the eastern highlands; Zambezian miombo woodland covering the high and middleveld; mopane woodland and scrubland dominating the lowveld; large areas of Acacia scrubland in the southwest; and dry forest and scrubland on the Kalahari sands in the west.

Rainfall is the greatest physical constraint to agricultural production in Zimbabwe, and falls in a single season (November to March) annually. Altitude and relief greatly affect temperature as well as rainfall. Some two-thirds of the country receives on average less than 750 mm of rainfall per year and only 5%, the eastern mountains, receives on average more than 1000 mm (Ministry of Natural Resources and Tourism, 1987). The soils of Zimbabwe, derived largely from granite and basement complexes, are inherently infertile. The combined constraints of rainfall and land capability reduce the area of land suitable for intensive dryland cropping to about 17% of the national area.

An overriding feature of land use, and therefore of environmental development and conservation, has been the apportionment of land and the duality of the agricultural sector (Gore et al., 1992). At independence in 1980, there were four major land use categories: communal farming areas, commercial farm land, parks and wildlife estate (comprising mostly national parks and safari areas), and forestry land. These apportionments left farming land divided more or less evenly between black and white farmers, although whites constituted less than 6% of the population.

The magnitude of the social and environmental problem is exacerbated by the distribution of commercial and communal farm land in relation to agricultural potential. The communal farming area covers some 16.5 million hectares, the greater proportion of which falls within the areas of low potential. Much of the land in communal areas is under threat due to severe population-resource imbalances. Many communal areas have population densities exceeding 50 persons/km^2 (Ashworth, 1990). The Zimbabwe population is presently about 10.4 million, with an annual growth rate of over 3% (CSO, 1992). Over half the population is under the age of 15. Of the total population, some 20% live in urban areas, mostly in Harare and Bulawayo.

In order to redress the unequal distribution of land, the government initiated a resettlement programme in 1981, by which land is acquired from the commercial sector for resettlement of families from communal land. The aim was to resettle around 160 000 families on over half of the former white commercial land. To date less than half the number of families have been resettled on some 2.7 million hectares, and the programme contributes little to relieving land pressure in communal areas, given the magnitude of the population-resource imbalance.

Communal Areas and Resettlement Areas are characterised by small-scale, low-input, agro-pastoral systems. They occupy just over half of Zimbabwe's land area and accommodate 57% of Zimbabwe's population. Communal Areas tend to be densely populated and relatively deforested (Whitlow, 1980; Whitsun Foundation, 1981; du Toit and Campbell, 1988) and Resettlement Areas also appear to be undergoing rapid deforestation (Grundy et al., 1992).

Households in Communal Areas have small arable fields, typically about 3 ha in total area (Bratton, 1987; Reh et al., 1988). Maize is the staple crop. Other important crops are finger millet, bulrush millet, groundnuts, sunflowers and cotton. Croplands are in close proximity to grazing areas, which are used communally. The savanna in most of these grazing areas has been opened by tree cutting for timber and fuelwood or was previously cleared of trees for purposes of cultivation (Campbell et al., 1991). Cattle, goats and chickens are the chief livestock. They are usually kept for home use rather than commercial slaughter. Cattle are used for milk, manure and draught purposes and also have an important exchange value, especially in the payment of lobola (bride price) (Scoones, 1992). In grazing areas, trees and their products are used communally and control of their use varies from region to region.

The Zimbabwe economy is dominated by the agricultural sector, with good rainfall seasons producing favourable economic performances in most other sectors (CSO, 1987). The agricultural sector is the largest employer of labour (25%) in the formal economy and contributes around 15% to GDP and 35% to export earnings. The large-scale sector contributes most to output, but by 1986 communal farm production had increased to 32% of total agricultural output (with 61% of communal production being retained for own consumption) (Ashworth, 1990).

The forestry sector is comparatively small, mostly based on intensively managed pine and eucalypt plantations covering only 110 000 ha. It is largely located in the eastern highlands on state land under the control of Forestry Commission or on land owned by large companies (Forestry Commission, 1991). The country is self-sufficient in wood and has an expanding panel and pulp industry. The value of primary processing alone is valued at US$40 million per year (World Bank, 1992). Indigenous forest resources presently only account for 5% of industrial wood output and their contribution will continue to decline (World Bank, 1992).

3 NON-WOOD FOREST PRODUCTS AND THEIR IMPORTANCE

3.1 INTRODUCTION AND DEFINITIONS

The term 'non-wood forest products' is one of the many terms used to describe the products under discussion, others being the dismissive epithet 'minor forest products', 'lesser-known forest products', 'wild resources' and 'non-traditional forest products' (e.g. de Beer and Mcdermott, 1989; Rao, 1991). 'Non-wood forest products' is used in the present report, but is also taken to include some products that would not strictly be encompassed by the term, these being: i) wood for the production of handicrafts (including household utensils and agricultural tools), and (ii) service functions of forest lands, including climate amelioration and maintenance of aesthetic and cultural values. A note is necessary on the inclusion of livestock products as non-wood forest products. In the FAO (1991) publication wild animal products are regarded as non-wood forest products and range products (graze, browse, shade) are also included as non-wood forest products (under service functions of forest land). The exclusion of livestock products is somewhat peculiar, as the range products are of importance to both wild animals and domestic livestock. In Zimbabwe forage for the production of livestock and wildlife is largely derived from free-range movement in the woodlands and savannas. If the argument is that wild animals are not managed and that livestock are managed, then this argument is weak as

numerous forest goods that are included under the term 'non-wood forest products' are managed, as evidenced by the considerable body of indigenous technical knowledge and practice (reviewed by Campbell et al., 1993). For these reasons, we include livestock products as non-wood forest products.

In Zimbabwe the term 'forest' is rather inappropriate, as most of the landscape from which non-wood forest products are collected is covered by woodland, savannas and scrubland. Non-wood forest products can be collected from 'natural' systems, the remnants of 'natural' systems (e.g. indigenous trees left scattered in cultivated land) or managed systems, mostly plantations. Horticultural domesticated tree crops, mostly fruit trees, are not covered by the present report. There is a diverse horticultural industry within the commercial sector, and small-scale farmers usually have a few fruit trees around there homesites, from which they derive produce for local trade and home consumption.

The beneficiaries of non-wood forest products are many, including households in the small-scale sector, land-managers/owners in the large-scale sector and the national treasury. In the next sections, the importance of these products for both the small and large-scale sectors, and the importance of trade at three scales (local, national and inter-national) is assessed. Local trade covers trade of products within communities at the district level (trade at local business centres and growth points). National trade applies to products that reach the main centres in Zimbabwe and which are often traded through national marketing institutions. International trade refers to trade beyond the borders of Zimbabwe. This latter type of trade is, of course, particularly important as it improves the foreign currency reserves of the country.

There is very little data on the value of non-wood forest products, and what data exist can seldom be used for comparative purposes. After developing a list of the products and preparing the matrix shown in Table 1, the relative importance of products to two different sectors was assessed on a 5-point scale as follows. For the formal economy, data on some products for domestic and export production are available (Table 2), and the volume and value of these products can be gauged for each of the sectors from production data (livestock) or estimates of relative land devoted to production (wildlife). For the small-scale sector, there are now some data on livestock-based non-wood forest products (e.g. Scoones, 1992) and on tree-based non-wood forest products (e.g. Campbell et al., 1991), and such studies have formed the basis of the ranking for subsistence products. The ranks are taken to be roughly proportional to gross benefit per hectare.

3.2 IMPORTANCE OF PRODUCTS IN THE LARGE-SCALE SECTOR

3.2.1 Introduction

The benefits of non-wood forest products to the large scale sector are largely derived through trade, not subsistence. The beneficiaries within this category include:

a) companies, individuals or the state (Agricultural Development Authority) owning commercial farmland (covering over 12 million hectares);

b) the Forestry Commission, a parastatal, having control of nearly 1 million hectares of State Forest, these being indigenous woodlands and forests, initially established as timber reserves;

c) the Department of National Parks and Wildlife Management, which controls nearly 5 million hectares of National Parks and Safari Areas.

It is evident that a very limited range of products are of value to the large-scale sector, the most important being products from livestock and wildlife (Table 1).

Table 1. Classification of non-wood forest products, their importance for various sectors and for trade at various scales. Key: blank cells = no value; **** = very valuable.

Category of non-wood forest product	Product	Importance of non-wood forest products					
		Importance to sectors			Importance of trade		
		Large-scale sector	Small-scale sector		Local	National	International
			Subsistence	Trade			
ANIMAL (domestic): FOOD	Meat	****	***	***	*	****	**
	Milk		***				
ANIMAL (wild): FOOD	Bush meat	*	*			*	*
	Insects		**	*	*	*	
	Fish		**	*	*		
	Honey	*	*	*	*	**	
ANIMAL (domestic): NON-FOOD	Hides, leather	***	**	*		*	**
	Traction		****				
	Fertilizer		***				
ANIMAL (wild): NON-FOOD	Tourism	****		**		*	****
	Hunting	***		**			***
	Live animals	**				**	
	Tusks,hides etc	**		*			*
PLANT: FOOD	Fruits		***	**	*	*	
	Fungi	*	**	**	*	*	*
	Leaves		*	?			
	Nuts		*	*		*	
	Roots, tubers		*	?			
	Flowers		*				
	Bark, sap		*				
PLANT: FIBRE AND MATERIALS	Bark		***	*	*		
	Thatch	*	***	*	*		
	Reeds, wood		**	**	**	*	*
	Fertilizer		**				
	Live plants	*				*	
COSMETIC & MEDICINAL	Medicines		***	**	*	*	
	Toxins		*				
PLANTS: EXTRACTIVE	Dyes		*				
	Gums			*		*	

3.2.2 Livestock

In the large-scale sector, livestock production is carried out by individual farmers, large companies and the state Agricultural Development Authority on commercial farmland, with the chief product being meat, mostly for the domestic market (Table 2). The export value of meat has fluctuated widely in the last decade (Fig. 1), with severe curtailment of exports related to outbreaks of foot and mouth disease (Jansen et al., 1992). Hides and leather in the piece are also relatively important export products (Table 2, Fig. 1). Milk is not regarded as a non-wood forest product in the large-scale sector, as most milk is produced under intensive management rather than from free-range cattle.

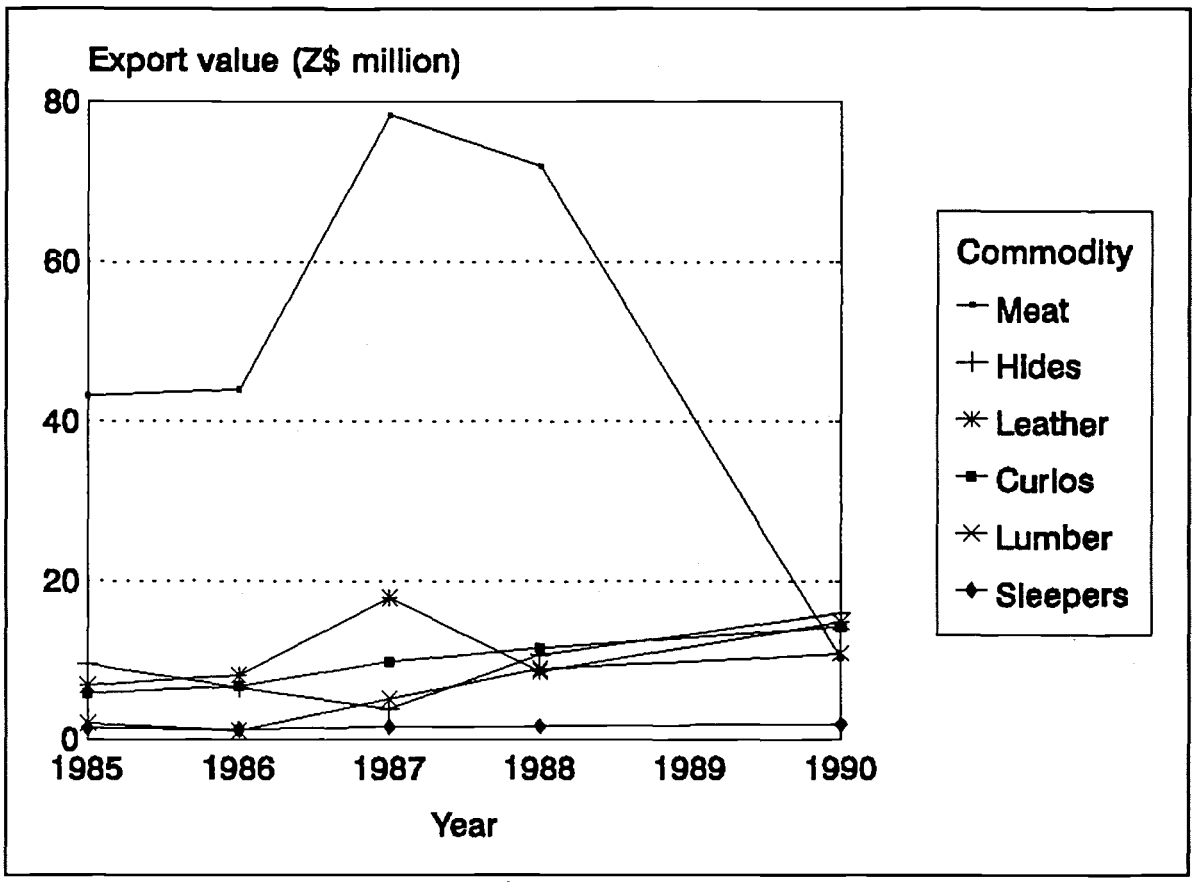

Figure 1 Value of exports from Zimbabwe: livestock products, curios and lumber (data from CSO, 1989, and CSO, 1991). 1989 data missing because of change in reporting year.

Table 2. The quantity and value of wildlife and livestock products and timber.

Product	Quantity (t=tonnes, #=numbers m = million)		Value (Zim$ million[2] yr^{-1})		Year	Source
	Total	Export	Total	Export		
Cattle (large-scale sector)	1.7 m#				1990	Herd size: Jansen et al. (1992)
			353		1990	Offtake sales (milk & meat): CSO (1991)[3]
Cattle (small-scale sector)	4.0 m#				1990	Herd size: Jansen et al. (1992)
			800[1]		1990	Sales + subsistence: Cumming and Bond (1991)
			81		1990	Offtake sales (milk & meat): CSO (1991)
Beef (all sectors)	63300 t	3100 t	226	19	1990	Sales (net realized): Jansen et al. (1992)
Hides (all sectors)		2186 t		16	1990	Export value: CSO (1991)
Leather (all sectors)		2848 t		15	1990	Export value: CSO (1991)
Wildlife (all gross revenue, both sectors, data regarded as rough estimates)						
Hunting			45	45	1991	Jansen et al. (1992)
Tourism			500	300	1991	Jansen et al. (1992)
Live animals			6.2	small	1991	Jansen et al. (1992)
Meat, hides			1	?	1991	Jansen et al. (1992)
Ostrich			20	20	1991	Jansen et al. (1992)
Timber (both sectors)	43400 m^3		3.3		1990	timber output (data from Bradley and Dewees, 1993)

1 This value is based on the valuation of cattle functions by Barrett (1991); if the valuation by Scoones (1992) was used, the value would be roughly three times as high.

2 Zimbabwe dollar has performed against the US dollar as follows: US$ per Zim$: 1978: 1.47; 1979: 1.47; 1980: 1.56; 1981: 1.45; 1982: 1.31; 1983: 0.99; 1984: 0.79; 1985: 0.62; 1986: 0.60; 1987: 0.60; 1988: 0.55; 1989: 0.47; 1990: 0.40; 1991: 0.29; 1992: 0.20.

3 Reduces to about Z$220 million if milk production excluded (CSO, 1991).

3.2.3 Wildlife

Wildlife producers in the large scale sector include individual farmers, large companies, Forestry Commission and the Department of National Parks and Wildlife Management, with 22% of the country now devoted to wildlife production (Fig. 2). 2.7 million hectares of commercial farmland, roughly 20 % of the total is being managed for wildlife production (sometimes in conjunction with livestock) (Cumming, 1990). More than half of the state forest land is managed for wildlife, and Forestry Commission has its own safari company.

Considerable revenue, mostly as foreign currency, is derived from tourism and safari hunting, with some also from the sale of live animals and wildlife trophies and by-products (Table 2). The tourist industry is generally considered to be the third highest generator of foreign currency behind mining and agriculture (dominated by tobacco and cotton) (Jansen et al., 1992; CSO, 1987). The industry is estimated to be 95% 'nature-based' (Jansen et al., 1992), with wildlife and scenic attractions forming the basis. Thus tourism can be regarded as one of the most important non-wood forest products.

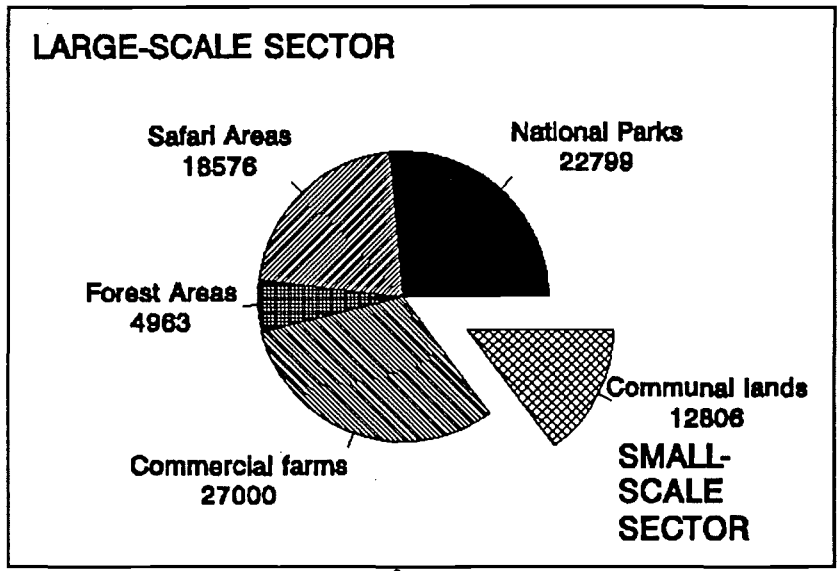

Figure 2 Land areas (km^2) used for wildlife conservation in Zimbabwe in 1990 (Cumming, 1990).

Gross income from sport hunting has risen steadily from just over US$2 million in 1984 to US$ 9.3 million in 1990 (Jansen et al., 1992). Elephant, especially before the international embargo on trade in ivory, constitute a large proportion of this value, estimated to be US$4.7 million in 1989, a return of US$75 km^2 yr^{-1} in prime elephant habitat (Department of National Parks and Wildlife Management, 1989). The demand for live animals, from the expanding safari industry on commercial farmland, cannot be met, mostly because of strict veterinary controls in the face of recent foot and mouth disease and the lack of game capture units (Cumming, 1990). In the six years 1982 to 1987, ivory sales realised Z$500 000/annum (CSO, 1989). At current prices it is estimated that Zimbabwe could earn US$4 million per annum, but the international ban on trade in ivory has precluded trade (Child, B., quoted in Zimbabwe Wildlife Apr, 1992). Ostrich are farmed intensively, mostly for hides, and earn substantial foreign currency (Table 2). Crocodiles are also farmed intensively, but are not included here as most of their feed is not from the wild.

3.2.4 Other products

Other non-wood forest products that are utilised by the large-scale sector are of minor importance to the sector. From the indigenous woodlands, they include thatching grass (sold to households in the small-scale sector by Forestry Commission and large-scale farmers), honey and live indigenous plants or seeds. From the plantations, the chief non-wood forest products are honey and mushrooms, with an export market for the latter having been recently initiated. Forestry Commission has a section involved in seed sales, with a proportion of this being based on indigenous resources (Table 3). Seed for the commercial forestry sector, based on eucalyptus and pine, dominate the sales figures. The Commission and a number of private companies are also involved in the marketing of indigenous plants for the ornamental market, but no data are available.

Table 3. Value of seed sales by Forestry Commission in 1990 and 1991, broken down by Pine, Eucalyptus and Other. The latter category mostly includes indigenous species except for exported seed in 1991 which is mostly Acacia melanoxylon.

	To other sections within Forestry Commission (Z$)			To other institutions within Zimbabwe (Z$)			Exported (US$)		
Year	Euc.	Pine	Other	Euc.	Pine	Other	Euc.	Pine	Other
1990	10057	5931	1308	6412	9487	1142	1111	90527	107
1991	4419	6308	1781	10471	10233	2321	5707	109727	8637

3.3 IMPORTANCE OF PRODUCTS IN THE SMALL-SCALE SECTOR

3.3.1 Introduction

In this section the importance of non-wood forest products is assessed for the small-scale sector (covering some 20 million hectares). Importance is assessed both for subsistence needs and cash income. Cash income may be based on sales either by individuals (e.g. local trade) or by the community (e.g. sales of hunting rights to safari companies).

3.3.2 Livestock

As in the large-scale sector, some of the most important non-wood forest products in the small-scale sector are derived from livestock and wildlife (Table 1). In the case of livestock, the value of cattle production is immense (Table 2), even though offtake and sales are small and do not contribute much to the national economy or international trade, which is dominated by the large-scale sector (Table 2). Data from valuation exercises for cattle in the small-scale sector, indicate that only 12% of total value are derived from sales (Fig. 3), a figure which is comparable to the 10% derived from estimates of the herd size in small-scale areas and national sales from the sector (Table 2). A further small proportion of sales occur locally, and do not enter national statistics.

The dominant end product of subsistence cattle production is draught power (for ploughing) followed by, with roughly equal value, transport, cattle sales, milk (largely for home consumption) and manure (for fertilization of the cultivated land) (Fig. 3). Of much smaller significance are meat for home consumption and investment (cattle are kept as an investment against risks and as sources of funds for occasional large expenses, such as school fees - Scoones, 1992).

The data presented in Table 2 relate to cattle, but goats are another important component of small-scale farming systems, with goat numbers being roughly 40% of cattle (Cumming and Bond, 1991). Using the valuation of subsistence and commercial goat products by Scoones (1992) and the numbers of goats in communal areas, the total value of goat production is roughly Z$55 million yr^{-1}, some 20% of cattle value in this sector. Goats are particularly important for meat and milk (Scoones, 1992).

Another way of illustrating value of woodlands for livestock is shown in Fig. 5, where range production accounts for roughly 25 to 30% of the total value of non-wood forest goods (excluding wood and service functions of forest lands).

3.3.3 Wildlife

The large-scale sector also dominates wildlife production, with only 14% of the total wildlife production area being based in communal lands (Fig. 2). None the less, wildlife production in communal areas is significant, with 1.2 million ha (roughly 5%) of communal land being managed for

wildlife production (Murphree and Cumming, 1991). No detailed data are available at a national level for the small-scale sector, so the relative importance of wildlife products for Table 1 is assumed to be roughly 10% of that in the large-scale sector (i.e. in proportion to land devoted to wildlife production). Communal land safari concessions had a potential to earn about US$3.8 million in 1990 (Jansen, pers. comm., in Cumming, 1990). A proportion of these wildlife revenues are returned to the community, either to community institutions or as dividends for individual households (Cumming, 1990). In addition, households receive meat from culling operations.

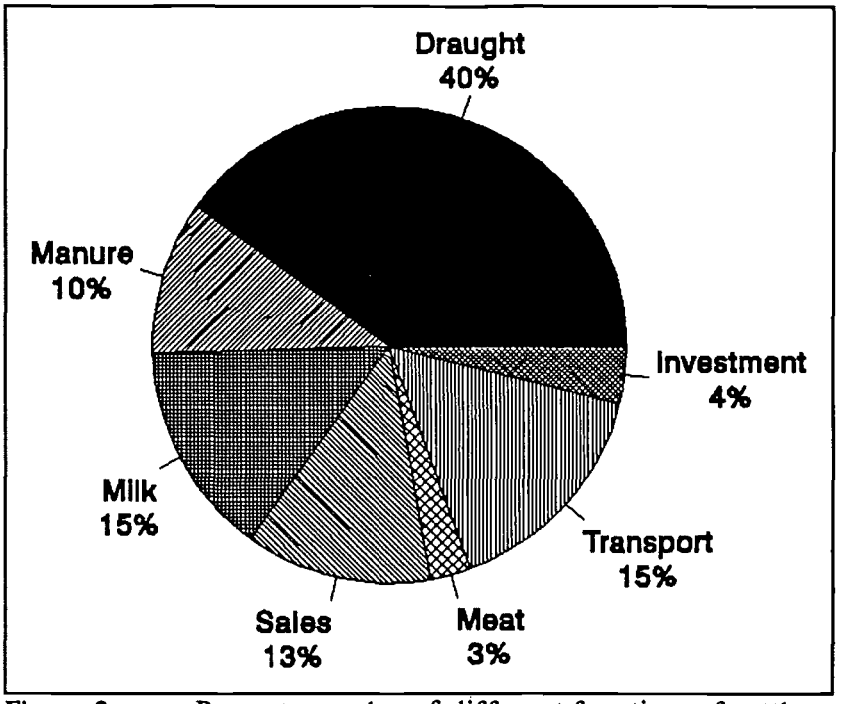

Figure 3 Percentage value of different functions of cattle (from data presented by Cumming and Bond, 1991, ARDA, 1987, Barrett, 1991, Danckwerts, 1974, GFA, 1987, and Scoones, 1992).

Apart from the above formalized arrangements for wildlife utilization, there are also poaching activities, which in Zimbabwe are either for international trade (ivory and rhino horn) or for domestic meat consumption. Murindagomo (1988) estimated that subsistence hunting in one area of Zimbabwe, Dande, gave five times greater returns per hectare than did dividends paid by commercial safari hunting. Apart from the illegal hunting of large mammals in those communal areas where wildlife populations are still abundant, there is extensive use of rodents and birds throughout the small-scale farming areas (see Wilson, 1990, and McGregor, 1991, for much detail). These authors present data which show the importance of bushmeat for household food security. Vibrant markets for bushmeat, as found in West Africa (Scoones et al., 1992), are not found in Zimbabwe, partly because trade in most species is illegal.

3.3.4 Other animal-based food products

Other animal-based products include honey, insects and fish, all of which are mostly used for domestic consumption, with a minor amount of local trade. Honey and insects are collected and eaten by almost all households, but seasonally and in low amounts (Campbell et al., 1991; McGregor, 1991; Wilson, 1990). Important edible insects include termites, caterpillars and some orthoptera, while honey is obtained from honey bees, mostly from the wild, or stingless bees (McGregor, 1991; Wilson, 1990). Trade in these products is conducted by less than 10% of households and is mostly local (Campbell et al., 1991), but in recent years caterpillars begun to be marketed in very small quantities in supermarkets. Fish consumption is probably higher than that of the above products, with Wilson (1990) recording fish as part of the relish in 12% of meals. However, it is unclear what proportion of the fish is obtained from woodland streams and rivers in the area and what proportion is obtained by trade from outside the community. McGregor's (1991) data indicate that only 1% of meals are from local fish.

3.3.5 Plant-based food products

Of the range of food products derived from woodlands, by the far the most important are wild fruits (Campbell, 1987; McGregor, 1991; Campbell et al., 1991; Wilson, 1990). All households use wild fruit, mostly as snacks, but in some areas up to 25% of meals of poor households in the dry season may include a fruit component (Wilson, 1990). This percentage may be much lower in other areas (e.g. less than 3% of meals at any of three sampling periods - McGregor, 1991). Much use of wild fruits is by primary school children (Campbell, 1987). Of all tree-based forest products, wild fruits are probably the most frequently marketed (by around 10% of households)(Campbell et al., 1991). Most of this sale is localised, but many types of fruit also reach the main towns of Zimbabwe (Brigham, in prep.). Although market size is uncertain, stallholders in the main Harare market reported significant profits from the sale of masowe (Ziziphus mauritiana) fruits both direct to the public and to sidewalk vendors. The major wild fruit species are listed in Appendix 1.

As with domestic fruits, most sales of wild fruit do not involve processing. One exception is the small market for Parinari curatellifolia fruits which had been processed into sweet cakes for local sale, mainly to school children (Brigham, in prep.). Another exception, is the juice or wine made from Sclerocarya birrea, which is largely used for home consumption and for agricultural work parties (Gumbo et al., 1990).

Other food products include fungi, leafy vegetables (from woodland herbs and a few woody plants), roots and tubers, flowers from a few woody plants, bark and sap (for chewing and drinking) and nuts (Tredgold, 1986; McGregor, 1991; Sharp, 1988; Wilson, 1990). Most household will consume these products, but as with other forest foods such as honey and insects, the quantities are small and seasonal and 5% or fewer household are involved in trading in these products (Campbell et al., 1991). McGregor (1991) recorded mushrooms in 1.5% to 4% of meals at three different times of the year, indicating that they may be as important as wild fruits in main meals (with wild fruits having overall more importance because of widespread use as a snack). Informal sector trade at a national level is evident for mushrooms, many of which are obtainable at roadside markets during the wet season, for prices around Z$0.70/kg (Sharpe, 1988). McGregor (1991) recorded collection by the sackful. Limited trade (50 kg/yr) in nuts from the marula, Sclerocarya birrea, has been taking place for many years, with small-scale producers in one area supplying a health shop in Harare. The retailer indicated that sales were limited by the small volumes sent by the suppliers.

Gathered wild foods are used mainly as relishes, but can also be a basic energy source, especially during times of seasonal hunger or drought (Wilson, 1990). The importance of non-wood forest products in the diet may not be in the quantity consumed but rather in: (i) contributing minerals and vitamins, and thus to balancing the diet (Campbell, 1987; Bradley and Dewees, 1993; Poulsen, 1982; McGregor, 1991; Wilson, 1990); (ii) contributing to the diet in times of stress (Campbell, 1987; Wilson, 1990), and (iii) contributing to the diets of poorer households (Wilson, 1990). Using very preliminary production data, it is estimated that wild fruits have about five times greater value, as measured by replacement cost, to households than the total value of honey, mushrooms, insects and wild vegetables (Campbell et al., 1991), and that wild foods as a group provide a considerable proportion of the total value of woodland goods (Fig. 5).

3.3.6 Fibre, materials, fertilizer

Households use forest products for a range of essential household and agricultural equipment, including cooking sticks, mortars, plates, baskets, mats, implement handles and yokes (Campbell et al., 1991; see Ellert, 1984, for detailed documentation on the material culture of Zimbabwe). Although many households will themselves make some of the above goods, there are members of communities who specialise in the production of these items, and thus there is a small local trade in these goods. Table 4 illustrates that the number of households involved in production and trade is limited: only 16 households out of 443 surveyed (around 4%) (Brigham, in prep.). The small number of households participating in craft production seems to suggest a limited role for this sector; however, the extensive market for these products indicates their importance within the local economy. A total of 349, or nearly 79% of the households surveyed, reported they had purchased at least one of the products listed (Table 4). One-third of purchasing households stated they had purchased five out of the six products.

Given the number of local people purchasing craftwork, there is clearly a significant local trade in these products. Data from craft-making households also indicate most production is intended for local consumption. However, informal interviews with craftsmen regarding their marketing channels suggest a somewhat different picture (Brigham, in prep.). A number of the craftsmen, while acknowledging the importance of local sales, reported frequent sales to communities up to one hundred kilometres away; some also travelled several times per month to Harare to sell their wares. Market outlets depend to some degree on the nature of the product involved. For example, tool handles and yokes tend to be sold locally whereas kitchen utensils such as wooden spoons, plates and bowls have a market in both rural and urban areas. One carver interviewed, working out of his home with assistance from relatives, supplies a total of a thousand or more spoons per month to buyers within the commercial sector. An unexpected finding was the degree to which mortars are marketed outside the rural areas. A craft maker stated he had no difficulty selling 25 mortars over a period of two days in Harare. Another craftsman, through a local middle-man, sold two orders totalling 46 mortars to South Africa; a craft worker from the same area supplied mortars for sale within Botswana.

The marketing practices described by Brigham (in prep.) challenge the perception that craftwork is exclusively a localised, limited and somewhat passive activity. Instead, as indicated by the sales and income data summarized in Table 4, the craft sector is made up of a range of enterprises that operate at widely varying levels of activity. A significant proportion of craft sellers in fact rely largely on the income earned through these sales and, as Mhone (1991) suggests, display considerable enterprise and ingenuity in their activities. Several craftsmen were acting on perceived market opportunities in the hopes of expanding their business or addressing some of their business problems. These options included new products which provided higher cash returns to labour or focused on expanding into different markets to reduce time and travel expenses.

Apart from the above craftwork for household products, there is production of crafts for the tourist industry. The crafts include baskets, mats, wooden and stone carvings and pots (some products are not truly forest products). Overall, as much as 10-15% of households may be involved in craft making for cash income (Campbell et al., 1991), and this percentage may be much higher in areas close to tourist centres. Craft workers in Mangwende earned an average of Z$53 yr^{-1}, while in Binga District producer households received roughly $130 yr^{-1} (Campbell et al., 1991). Helmsing (1987) in a survey of over 17000 households in the communal areas recorded 15 % as being involved in non agricultural enterprises, with a major proportion of these being based on non-wood forest products, with craft activities dominating this proportion (Fig. 4). Crafts (and works of art) produce not unsubstantial foreign currency earnings through formal sector marketing (Fig. 1). However, it is unclear to what extend these earnings are based on non-wood forest products, as they also include pottery and stone carving.

Table 4. The marketing of tree-based craft products in Mangwende, Mutoko and Uzumba Communal Areas (from Brigham, in prep.[1]). The sales and income data refer to amounts per selling household.

Product	Buyers	Sellers	Yearly sales per household	Yearly income per household	Average price
Mortars	312 (70.4%)	4 (0.9%)	mean: 15.75 med.: 4.5 s.d.: 24.9	mean: 196.5 med.: 67.5 s.d.: 294.2	12.50
Kitchen Utensils	284 (64.1%)	5 (1.1%)	mean: 159.0 med.: 20.0 s.d.: 226.3	mean: 102.2 med.: 10.0 s.d.: 130.3	0.65
Yokes	230 (51.9%)	3 (0.7%)	mean: 21.0 med.: 12.0 s.d.: 21.0	mean: 390.0 med.: 150.0 s.d.: 441.9	18.55

Furniture	216 (48.8%)	4 (0.9%)	mean: 5.0 med.: 5.0 s.d.: 2.95	mean: 64.75 med.: 22.5 s.d.: 90.5	12.95[2]
Tool Handles	214 (48.3%)	6 (1.4%)	mean: 16.5 med.: 13.5 s.d.: 7.5	mean: 36.0 med.: 37.5 s.d.: 26.3	2.20
Bark Products[3]	61 (13.7%)	4 (0.9%)	mean: 3.75 med.: 2.0 s.d.: 4.2	mean: 39.0 med.: 35.5 s.d.: 36.8	10.40[2]
TOTALS[4]	349 (78.8%)	16 (3.6%)	____[5]	mean:193.65 med.: 60.00 s.d.:440.00	____[5]

1 Sample size is 443 households from 20 randomly selected sites.

2 Both these figures are derived from a range of products rather than a single product line.

3 Products containing either bark alone (such as a bag) or having bark as part of its construction (such as a reed mat with bark twine).

4 Craft-selling and craft-buying households may sell and buy a number of products, therefore figures may not add up to expected totals.

5 Sales and prices are not comparable across a range of products.

Fibres are required for many household tasks (Poulsen, 1982) and most households collect the bark of trees for their fibre needs, with a limited amount of trading also taking place (Campbell et al., 1991). Vendors selling green leafy vegetables at local markets use bark fibre to tie the bundles, and McGregor (1991) recorded bark rope being sold to vegetable vendors in Shurugwi. Some households also generate income through the sale of handbags or reed mats utilising bark twine in their construction (Table 4) (Brigham, in prep.). Important species for bark collection are noted in Appendix 1.

Thatching grass is used by almost all households but because of shortage of grass, much grass is derived from areas outside the communal lands (Hawkes, 1992). Certain members of the community may specialise in thatching roofs (Fig. 4, Helmsing, 1987).

Large volumes of leaf litter are collected from woodland by between 20 and 70% of households, depending on area (Campbell et al., 1991; McGregor, 1991). The quantities involved may be quite large, Nyathi and Campbell (1993) recording around 0.4 tonnes per household per annum in communal areas. The litter is either applied directly to fields and gardens or added to the cattle pen (and then eventually returned to the fields with the manure) (Nyathi and Campbell, 1993). The litter may be particularly important as a fertilizer source for poorer households without access to other fertilizer sources (McGregor, 1991). The contingent valuation indicated that woodland inputs to crop production, i.e. litter, were regarded by householders as substantial, but a replacement cost calculated on the basis of nitrogen provided by litter suggested a much lower value (Fig. 5).

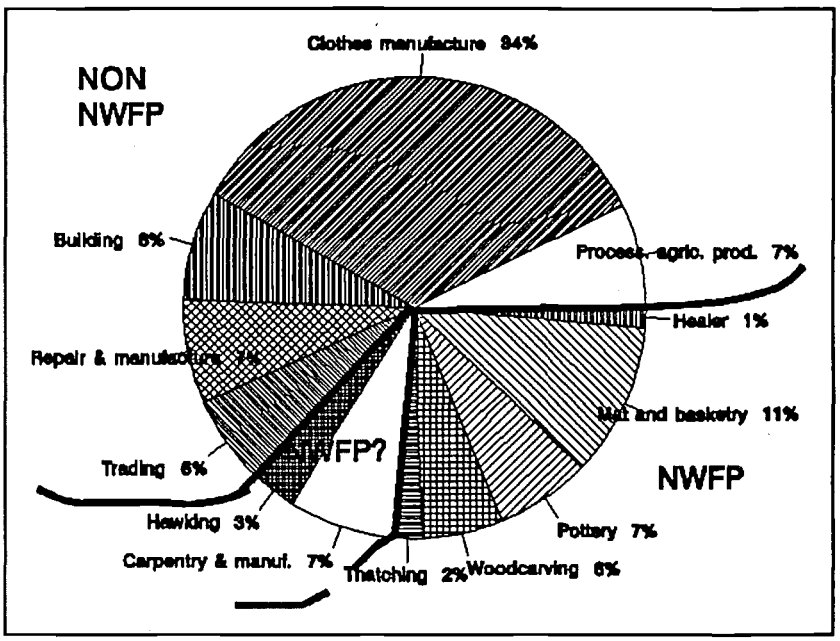

Figure 4 The non-agricultural enterprises in communal areas (Helmsing, 1987), showing which are based on non-wood forest products.

3.3.7 Medicines and pharmaceuticals

Approximately 500 species, 10% of Zimbabwe's flora, including many tree species, are used medicinally by traditional healers (Gelfand et al., 1985). Traditional healers have an important role in both rural and urban communities, providing advice, divination and herbal prescriptions for physical and psychological complaints. Traditional healers in relation to population figures in Zimbabwe are estimated to be 1:234 in urban areas and 1:956 in rural areas (Gelfand et al., 1985; Cunningham, 1990), ratios much lower than those for medical doctors.

Unfortunately, there are no quantitative data on volumes or value of trade and consumption. Cunningham (1990) provides some data indicating the importance of medicinal plant products, e.g. some medicinal plants are moved to distances over 200 km. In local markets, the section for medicinal plants is usually larger than those for any other non-wood forest product (pers. obs.). Campbell et al. (1991) record just under 10% of households as being involved in marketing of medicinal products. Another study (Brigham, in prep.) conducted in the Murewa, Mutoko and Uzumba Communal Areas, found less than 1% of households were involved in the marketing of medicines derived from the woodland; approximately 11% reported purchasing these products. A traditional healer encountered

during the research suggested that the use of medicinal herbs had declined over the past two decades in large part due to the preference of younger people for western medicine (Brigham, in prep.). The contingent valuation of woodlands suggested a relatively low value for tree-based products as a source of health as compared to other functions of trees and woodlands (Fig. 5).

Toxins used for bird lime and catching fish (Wilson, 1990) may be considered as potential pharmaceuticals.

3.3.8 Plant extractive products

Plant extractive products are not very important in the household economies in Zimbabwe. Some dyes derived from woodland sources are used in various crafts, and small quantities of gum from Acacia are collected and sold to a company in Buluwayo. Oil extracted from the seeds of Trichilia spp. was once used for soap production, and there appears to be some potential to develop a small industry around the oil from this species (Grundy and Campbell, 1993).

3.4 IMPORTANCE OF SERVICE FUNCTIONS OF FOREST LANDS

One service function of forest land is the provision of range: graze, browse, shade and shelter for domestic livestock and wildlife (FAO, 1991). This has been taken care of by considering livestock and wildlife products as non-wood forest products. Soil improvement and protection is a service function of forest land. There are many studies showing the value of trees for soil improvement (reviewed by Campbell et al., 1991, and further reported on in Campbell et al., in prep.). Biodiversity maintenance is another service function, but little attempt has been made to value this service function for Zimbabwean woodlands (Campbell, 1993). In the formal market, it is reflected in the tourism potential of the country, which is sizeable (Table 2). One ecological service function concerns the importance of trees and woodlands in influencing the hydrological cycle, but few studies are available to document the influences (du Toit, 1985, presents data on river flow patterns, and Wilson, 1990, and McGregor, 1991, present data on people's perceptions about changes in the hydrological cycle). Other service functions include the maintenance of aesthetic and cultural values. Some trees are sacred, some are linked to ancestral spirits and some are used as landmarks, play facilities and meeting places (Wilson, 1990: Campbell et al. 1991).

One attempt at placing a value on service functions for Zimbabwean conditions is the contingent valuation of Campbell et al. (1991) (Fig. 5). From the data it appears that roughly 25% of the total value of woodlands is considered to be related to service functions, with ecological service functions rated highly.

3.5 GENERAL DISCUSSION AND RELATIVE IMPORTANCE IN RELATION TO WOOD PRODUCTS

The value of some of the above-mentioned non-wood forest products, some with figures running into the hundred millions, should be contrasted with more conventional forestry activity, where total output of industrial timber in 1991 was 961 000 m^3 (Forestry Commission, 1991). Of this figure, only 5% was derived from indigenous forests and woodlands, this being largely mukwa (about 70%) and teak. Much of the mukwa is exported as finished furniture, while much teak is exported as railway sleepers (Bradley and Dewees, 1993; Forestry Commission, 1991). The total production value of industrial timber is very small by comparison to that of livestock and wildlife (Table 2). Export data show the same pattern, with railway sleepers being a minor export in comparison to livestock products (Fig. 1), and especially to wildlife products.

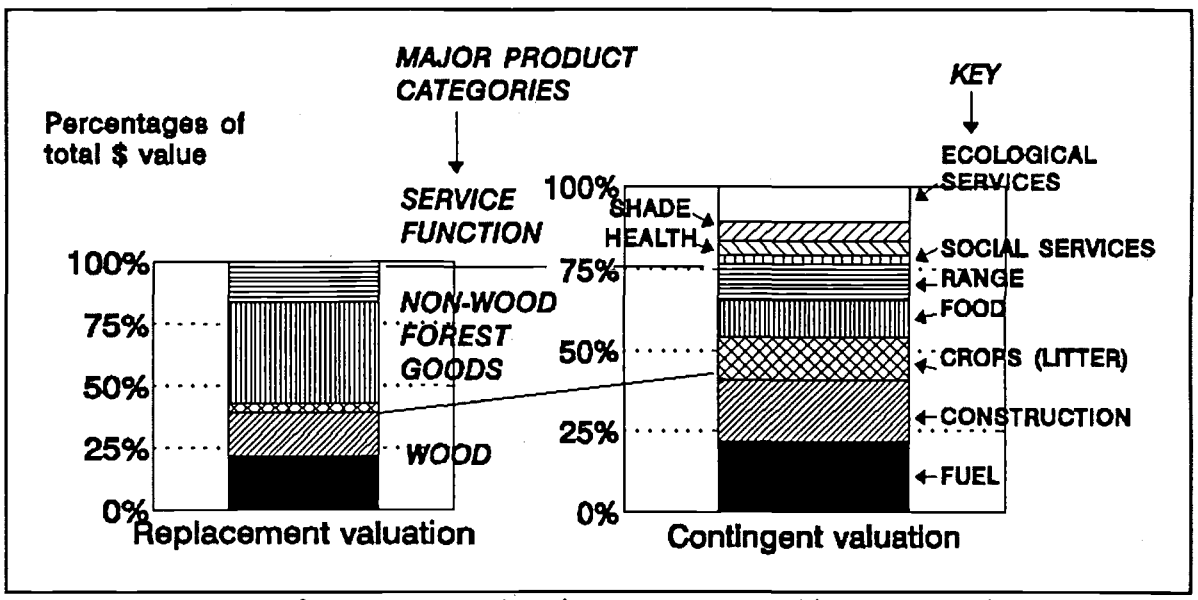

Figure 5 Value of tree resources (contingent method: rankings expressed by householders; replacement method: gross replacement cost of goods) (Campbell et al., 1991).

The valuation exercises (Fig. 5) show slightly different results because they focus on subsistence and large quantities of wood are used for construction and fuel (Fig. 5). The valuations indicate around 40% of total value is due to wood.

The results support the general contention that non-wood forest products are an important source of cash income for the rural poor (Scoones et al., 1992). This is evident by, for example, the local trade in household utensils. However, the importance of the non-wood forest products in the commercial sector, namely livestock and wildlife, for cash income far exceeds income from non-wood forest products in the small-scale sector. Of much greater significance in the small-scale sector is the value of non-wood forest products as subsistence products.

4 INSTITUTIONAL RESPONSIBILITY FOR NON-WOOD FOREST PRODUCTS

4.1 INTRODUCTION

This section provides a brief outline of the structure and key responsibilities of those institutions most directly involved in the management, development and exploitation of non-wood forest products in Zimbabwe. It covers government institutions, the Universities and non-governmental agencies.

4.2 MINISTRY OF LANDS, AGRICULTURE AND RURAL RESETTLEMENT

The ministry is responsible for the agricultural industry of Zimbabwe and for implementing the government's agricultural policy. The ministry includes three executive departments that cover some aspects of non-wood forest products:

- Agricultural and Technical Services (Agritex);
- Research and Specialist Services, and
- Veterinary Services.

In addition there is a training branch, which oversees the activities in the Agricultural Colleges at Chibero, Esigodini, Gwebi and Mlezu. These colleges together produce about 700 graduates. Under the ministry, there is a statutory body, the Agricultural Development Authority (ADA).

4.2.1 Department of Agricultural and Technical Services

The aim of Agritex is to stimulate the adoption of proven agricultural practices for sustained and profitable production. The target population is all farmers in Zimbabwe, with particular emphasis placed on the small-scale sector. The Field Services Division is responsible for providing advice on all aspects of agricultural production and conservation. In regards non-wood forest products, Agritex is important in providing information about livestock production, and the extension service has expanded its tree-based activities in the small-scale farming sectors, and now includes an agroforestry section which collaborates closely with Forestry Commission (Agritex, 1982). There is a total establishment of approximately 4000 in the department, of which over 2000 have diplomas and 250 have degrees in agriculture.

4.2.2 Department of Research and Specialist Services (R&SS)

The key functions of R&SS are to further the welfare and technical progress of agriculture in Zimbabwe through agricultural research, and by providing specialist services. The department is also entrusted with the administration of certain regulatory services under various acts, including the implementation of phytosanitary regulations.

As regards non-wood forest products, R&SS includes a small agroforestry section, undertakes research and development programmes on livestock production, undertakes vegetation surveys of the communal lands and has a small section involved with apiculture. The National Herbarium falls under R&SS; it is able to provide considerable information on the plant species of Zimbabwe.

4.2.3 Department of Veterinary Services

The Department of Veterinary Services is responsible for the prevention and control of animal disease in Zimbabwe, thus they are important in sustaining livestock production. The department's activities include the following:

- extension advice on health of livestock for the communal areas and responsibility for dipping services (involving over 2000 dip tanks) within such areas;
- foot-and-mouth disease control measures, to protect the beef export industry, and
- tsetse fly control and eradication programmes.

4.2.4 Agricultural Development Authority (ADA)

ADA came into existence in its present format in 1982. The major objectives of ADA are:

- to engage in the production of strategic agricultural commodities on state farms;
- to carry out research and planning on the agricultural and rural development potential of the country and to lead, coordinate and monitor the planning and implementation of rural development throughout Zimbabwe, and
- to generate employment in the rural areas through its estates and by promoting agro-industries, either in its own right or in association with other bodies.

Planning of agricultural and rural development is being carried out by ADA planning teams in communal areas of most provinces of the country. These teams identify small- and medium-sized projects in which the rural people can participate. As to non-wood forest products, ADA presently undertakes livestock production, but ADA could be the agency charged with the development of these products.

4.3 MINISTRY OF ENVIRONMENT AND TOURISM

Professional expertise is located within the two departments and two parastatal commissions which fall within the ministry. These are:

- Zimbabwe Tourist Development Commission
- Forestry Commission
- Department of National Parks and Wildlife Management
- Department of Natural Resources

4.3.1 Forestry Commission

The Forestry Commission is a parastatal body with responsibility for forest resources and the forestry industry. The commission's duties include the following:

- promote the development of the country's natural resources for the benefit of the people and to ensure that forestry is integrated into the fabric of social life;
- introduce additional forms of land-use, including recreation and non-consumptive game safaris, to optimise the benefits from land under its control;
- carry out and promote research to improve the efficiency of forestry;
- promote the socio-economic benefits of natural resource management and ensure adequate funding for environmental programmes, and
- develop appropriate models that will integrate the indigenous woodlands into the entire production process of rural communities.

The Forestry Commission is involved with non-wood forest products through its participation in the wildlife industry and its social forestry programme. In the early 1980s the Forestry Commission began a social forestry programme, but initially this was concentrated on eucalyptus woodlots and nurseries. By the mid-1980s the focus had broadened to the provision of wider set of species, some of which yielded non-wood forest products. In recent years, the emphasis has again shifted to include the management of indigenous woodland resources. Thus the full range of non-wood forest products could be within the brief of the Commission. However, it should be emphasised that the social forestry component of the research section only comprises two professional officers.

4.3.2 Department of National Parks and Wildlife Management

The main responsibilities of the Department of National Parks and Wildlife Management are to:

- protect and manage all national parks, botanical reserves, botanical gardens, sanctuaries, safari areas and recreational parks;
- undertake research and develop appropriate land management practices inside and outside the parks and wildlife estate for the benefit of fauna and flora and to enhance rural productivity;
- promote appropriate use of the parks and wildlife estate and of wildlife-oriented outdoor recreational activities generally;
- promote the sensible long-term use of the nation's indigenous fauna and flora in the interests of the resource and of sustainable rural productivity, and
- promote, support and regulate appropriate secondary industries based on indigenous flora and fauna of the parks and wildlife estate.

This department is central as regards wildlife production. Major current programmes include:

- provision of services to the game ranching industry;
- the development of a nationalised marketing structure for wildlife products in Zimbabwe;
- the Communal Areas Management Programme for Indigenous Resources (CAMPFIRE), which has been initiated in a number of communal areas, and
- anti-poaching activities in the Zambezi valley and elsewhere, as well as translocation of rhino populations.

4.3.3 Department of Natural Resources

The principal responsibilities of the Department of Natural Resources are to:

- promote and secure the implementation of policies designed to conserve and improve the natural resources and environment, and
- ensure that the provisions of the Natural Resources Act and other relevant legislation are observed.

To meet these responsibilities, the department:

- advises government on the formulation and implementation of conservation policy;
- maintains an effective surveillance through its lands inspectorate and other appropriate organisations and bodies to ensure observance of the provisions of the Natural Resources Act;
- promotes, advises, and assists in the work of all conservation committees established under the Act, and
- assists in promoting and coordinating the activities of government agencies involved in conserving and improving natural resources and the environment of Zimbabwe.

The major natural resources extension effort is conducted through a range of conservation committees which are serviced by regional secretaries and a national secretariat.

4.4 MINISTRY OF FINANCE, ECONOMIC PLANNING AND DEVELOPMENT

Broad economic planning, public sector investment programmes, recurrent expenditure and donor aid programmes are controlled, coordinated and planned by the Ministry of Finance, Economic Planning and Development. Within this Ministry a planning unit, headed by the chief economist, has been closely involved in environmental development and land reform programmes.

The Central Statistical Office is located within the Ministry and produces the Zimbabwe quarterly and annual 'Digests of Statistics' on a wide range of economic, industrial, commercial and development-related matters.

4.5 UNIVERSITIES

The medium term objective of national development is to develop and strengthen indigenous scientific and technical capability in terms of human resources and training institutions. To mediate this development, there are three universities in Zimbabwe, the long-established University of Zimbabwe, and two recently established universities, the Africa University and the National University of Science and Technology.

The University of Zimbabwe contains all the major faculties of concern to the education, research and development of non-wood forest products, although there is no single department covering forestry. Faculties and some relevant departments and activities include:

- Faculty of Agriculture

  The Department of Agricultural Economics and Extension is currently involved in valuation of tree-based resources and wildlife and livestock production. The Departments of Animal Science and Crop Science are involved with livestock production. The latter is also undertaking work in Agroforestry.

- Faculty of Arts

  The Department of Geography is undertaking work on human coping strategies in impoverished rural areas and on tourism.

- Faculty of Science

  The Department of Biological Sciences conducts research on both animal and plant non-wood forest products. The department offers an MSc in Tropical Resource Ecology (MTRE), together with the Centre for Applied Social Studies. These two departments have been selected by UNEP as one of eight centres of excellence for environmental education. The Department of Chemistry is conducting work on medicinal plants.

- Faculty of Social Studies

  The Institute of Development Studies conducts research on policy issues relevant to the development of non-wood forest products. To date, research has included that carried out on rural and community development, the informal sector, land reform, wildlife management, agricultural finance and extension. The Centre for Applied Social Studies conducts a wide range of research on resource management.

- Faculty of Veterinary Science

  The Faculty teaches and conducts research on both livestock and wildlife management.

- Faculty of Medicine

  There are a number of researchers in the Faculty looking at traditional medicines.

The other two universities are too recent to allow for a detailed description, but both are relevant to research, training and development as regards non-wood forest products. The Africa University is going to be a university of agriculture and natural resources, while the National University will focus on science and technology.

4.6 NON-GOVERNMENTAL AGENCIES (NGOs) AND VOLUNTARY ORGANISATIONS

There are many institutions involved in development of non-wood forest products. They include the following:

- ENDA (Environmental Development Action) - Zimbabwe

  The objective of ENDA Zimbabwe is to promote the development of Zimbabwe's rural communities in the environmental, social, educational and technological spheres. The organisation undertakes research, initiates development projects and conducts training courses. In the past it has undertaken work on several non-wood forest products.

- UNDP Africa 2000 Network

  The Africa 2000 Network is a new initiative intended to mobilise and support African-based NGOs in a continent-wide effort to address the growing problems of environmental degradation.

- World Wide Fund for Nature (WWF)

  There are a number of WWF projects in Zimbabwe; the largest in terms of human resources is the WWF Multispecies Project. This project is examining the ecological and economic basis

for single (usually cattle) and multispecies (usually wildlife and livestock) systems of animal production in southern central Africa.

- Zimbabwe National Conservation Trust

  The Zimbabwe National Conservation Trust is tasked with the promotion of projects relating to the environment and to the utilisation and conservation of natural resources.

- The Zimbabwe Trust

  One of the major aims of the Zimbabwe Trust is to provide the supportive services required by communities in the Communal Areas to secure the 'Appropriate Authority' over their wildlife and other resources.

- ZERO (Zimbabwe Energy and Environmental Research Organization)

  ZERO is a regional network of environmental experts that promotes and coordinates indigenous research and expertise on environmental issues.

- Producer associations

  For the most important non-wood forest products, there are strong producer associations. In the large-scale sector, there is the Wildlife Producer's Association and the Livestock Producer's Association. Newly established in the small-scale sector is the CAMPFIRE association, which aims to coordinate the activities of those districts where CAMPFIRE programmes are in progress. In each district where wildlife management is being practised, there are local institutions which manage the programmes.

4.7 INSTITUTIONAL GAPS

There is no single institution which covers non-wood forest products, but the diversity of products is such that this could hardly be expected. Livestock receives much attention, especially in the large-scale sector; but even in the small-scale sector, livestock receive more attention than any other non-wood forest product. In recent years wildlife has received considerable focus with the CAMPFIRE scheme. In government the central organization is the Department of National Parks and Wildlife Management, but the real expansion has taken place outside government, with the establishment of WWF Multispecies project and ZIMTRUST, and the initiation of research by the Centre for Applied Social Sciences (UZ) on natural resource issues. Funding for wildlife development is now secure in comparison to other non-wood forest products, as all the major donors are presently involved in the wildlife sector.

The remaining non-wood forest products, including all the forest foods, the barks and materials, the medicinal plants and the gums and dyes, receive almost no attention. The only research to look at the full spectrum of products has taken place in the Department of Biological Sciences (UZ), while product development has been limited and scattered in many different organizations. There is no organization that coordinates activities. Extension activities regarding non-wood forest products are also limited and the responsibility of no single organisation. Expanded extension activities would probably have to be directed through Agritex, but this agency is dominated by extension on the major crop and domestic livestock.

For activities to be effective, there is need for strong coordination among the different agencies involved. Communication and coordination are not at present very strong. Funding for research and development is increasingly dependent on external donor funds. For instance, within government institutions, budgets have been static in the last decade despite widespread inflation. Research officers have security of a job but no funds, in the absence of donor support, to undertake in-depth studies (e.g. see Piearce, 1992, with respect to the Forestry Commission). Turnover rates for staff are also unsatisfactory, because of poor conditions of service. The average length of service of less than three years for research professionals in Forestry Commission (Piearce, 1992) is typical of most government and parastatal institutions, and precludes any long-term continuity in research and development.

5 LEGISLATION RELEVANT TO NON-WOOD FOREST PRODUCTS

In this section a brief overview of the relevant legislation is given.

- CITES (Convention in Trade in Endangered Species)

  The most important piece of legislation affecting wildlife trade is Appendix One of CITES, which prohibits international trade in a listed species and its products between the signatories of the convention, one of which is Zimbabwe. Elephant were recently shifted to Appendix one and this has made the wildlife industry much less profitable (Cumming and Bond, 1991; Child, B., quoted in Zimbabwe Wildlife Apr, 1992). Industries based on ivory and elephant hide have had to close down, rural communities have foregone wildlife earnings of several million dollars and livestock production has become more economically competitive with wildlife.

- Natural Resources Act

  This act provides for the conservation and improvement of natural resources at the national level. The implementing agency is the Department of Natural Resources, and the act allows for the ordering of inhabitants to carry out or refrain from certain activities.

- Forest Act

This act deals primarily with forests and woodlands on lands in the large-scale sector and in state land, with the implementing agency being Forestry Commission. Small-scale householders using resources on adjacent State Forest would be governed by this act. The act allows for the creation of forest officers who have power of seizure and arrest.

- Communal Land Forest Product Act

  This act pertains to the communal lands, is implemented by Forestry Commission, and governs the exploitation of forest products. The act provides for the exploitation of forest products for subsistence and lays down the mechanism whereby products can be exploited on a commercial basis through a system of permits, licences and agreements.

- Parks and Wildlife Act

  This act governs the exploitation and conservation of natural resources on state land administered by the Department of National Parks and Wildlife Management. In addition the act applies to the exploitation of protected animal and plant species on private land. The act is important as regards wildlife management is concerned, as it allows for the use of wildlife on private property for the benefit of the landowner. Recently, wildlife on communal lands has also been incorporated into this aspect of the act, with 'appropriate authority' over wildlife now being given to District Councils.

The legislation, especially in regards non-wood forest products on communal lands, has been overly restrictive to the exploitation of these products and has not promoted development of trade. The primary strategy embodied in the acts is criminilisation (Gore et al., 1992). In addition, the legislation has not prevented commercial interests from exploiting the resources unsustainably. In recent years, some aspects have changed, with greater authority being given to more local structures (District Councils). For instance, the use of wildlife for the benefit of local residents is now possible, but this needs to be expanded to the full range of products. There is much more than can be done to liberalise and promote sustainable exploitation. At present it is easier for outsiders rather than local residents to exploit non-wood forest products through the permit system. Local residents should have easier access, and local residents should have greater say in the exploitation of the resources.

6 KEY NON-WOOD FOREST PRODUCTS AND THEIR EXPLOITATION

6.1 INTRODUCTION

Of the many non-wood forest products used in Zimbabwe, it is necessary to select a few for further research and development. In this section, the most important non-wood forest products, and further research and development objectives are identified.

Livestock play a central role in household security in Zimbabwe, and must be a priority for research and development. However, the livestock sector is covered by numerous research and development institutions, and receives a considerable subsidy from central government (Food Studies Group, 1990). Thus livestock is not regarded as being key for any new focus on non-wood forest products. The same can be said for wildlife, though here the network of institutions undertaking research and development is rather recent. Nevertheless, wildlife are also not regarded as being a key focus for any new programme.

6.2 WILD FRUITS

Although wood for construction and fuel make up a high percentage of the goods derived from trees, as important, are wild fruits from the woodland. Wild fruits need much more attention; there is a need to document present levels of trade and to investigate means of developing the market potential of selected wild fruits. Fruits which are currently marketed and probably have potential for

development include Uapaca kirkiana, Ziziphus mauritania, Strychnos spp. and Sclerocarya birrea. These mostly have at least two end-products, fresh fruit and fruit drinks (either alcoholic or non-alcoholic). S. birrea also has the possibility of providing high-quality nuts for confectionary, and in South Africa it is already used to produce a high-quality liquor, for domestic and export consumption. Zimbabwe is very poor in nut production, so a Sclerocarya nut market would result in import substitution. This tree is a very heavy producer (see e.g. Peters, 1988), so there are unlikely to be supply constraints, although research is needed into improving nut extraction methods.

Technical data on fruit yield and storage are lacking. It would be important to utilise indigenous technical knowledge in order to rapidly gain insight into production potentials of specific species and specific individuals, and of how stable the production is in relation to the rainfall variability that is characteristic of the region.

6.3 MUSHROOMS AND INSECTS

Two other woodland foods need attention: mushrooms and insects. The former probably have export potential, while the latter have potential on domestic markets. Technical data on these potential products are extremely limited, and the degree to which sustainable and economic harvesting practices can be implemented is unknown. Mushrooms production is unknown, with estimates of production ranging from 2 kg/ha to 50 kg/ha (C. Sharpe, pers. comm.). Production is very seasonal and dependent on the rainfall regime. Basic production data need to be collected, but assuming production is at the top end of the range, then at current prices the woodland can fetch Z$300/ha for mushrooms, which would represent the highest gross benefit per hectare of any land use, including crop production. Once again, it would be important to harness indigenous technical knowledge in obtaining rapid insights into the productive potential of these products.

6.4 CRAFTWORK

Within the range of non-food forest products, that with the most potential for development concerns craftwork. Experiences of the Binga Craft Centre run by the Danish Volunteer Service need to be documented with the view to replicating this marketing mechanism in other areas of Zimbabwe. Present levels of marketing are more or less unknown and the potential for exportation of crafts is unclear.

Although craft workers generally displayed optimism in the future of their enterprises, they did acknowledge a number of difficulties (Brigham, in prep.). The most frequent complaints centred on the marketing infrastructure, or lack thereof, available to craftsmen. For those looking to sell goods outside of the immediate area, problems are encountered with the availability and cost of transport. Where buses are relied upon for getting to market, if a conductor discovers goods for sale are being transported, he will often sharply increase the fare. Another difficulty is finding an outlet which provides a fair return for the product; many complained of the 'makoronyera' (cheats) of Mbare market in Harare who coerce craft makers into surrendering their products for low prices. Some of the 'European' (tourist) shops in the city are also known for their high mark-ups, in one case up to 750%.

Scarcity of raw materials is also of some concern to craft makers (Brigham, in prep.). Most now travel long distances - on average approximately 5 or 6 kilometres - to obtain the specific wood they require. Shortages of certain species are often quite localised and craftsmen respond by shifting their collecting sites. Chidari et al. (1992) point out that statements regarding tree shortages may refer more to the rarity of a specific form of that tree rather than to an overall rarity of that species. Nevertheless, many craft makers expressed a concern that in the future, perhaps within a few years in some areas, certain species would no longer be available. Even under the current situation, conflicts were arising where craftsmen attempted to access wood resources considered to belong to neighbouring communities (Brigham, in prep.).

Little research has been undertaken on the environmental consequences of craft enterprises (Mhone, 1991). The craftsmen offering information on their tree-cutting practices indicated a rough felling rate of 25 to 60 trees per year (Brigham, in prep.). Currently, craft workers prefer to collect further afield rather than substitute with species they consider inferior, one of which is eucalyptus, the mainstay of Zimbabwe's afforestation programmes to date. Craftsmen demonstrate considerable knowledge of the characteristics of the trees they use, both in terms of utilisation suitability and their ecology. Such knowledge could be used to evaluate the practicality of any interventions in the craft sector, including those involving species substitution or enhancement.

Whether expanding current levels of craftwork should be encouraged or not will depend on local conditions; prior to beginning a programme, site specific research will be required to assess the sustainability of current exploitation rates of craft species. Questions regarding the benefits and costs for various interest groups and the community at large will also have to be addressed. What is clear is that local communities, as those most affected by alterations to the forest resource, should be at the

centre of any planning activities, and their concerns and priorities should be of paramount importance.

6.5 MEDICINES

There is also probably plenty of potential for the development of medicinal products from the woodlands of Zimbabwe. The development potential would only be realised if the ethnobotanical survey expertise and the pharmaceutical research establishment were strengthened. Zimbabwe has an excellent overview of medicinal plants (Gelfand et al., 1985); what is required is more detailed information about specific plants.

6.6 INSTITUTIONAL ARRANGEMENTS FOR THE EXPLOITATION OF NEW FOREST PRODUCTS

The success of any programme is partly dependent on providing an enabling institutional framework. Because of the CAMPFIRE programme, which was largely established for the exploitation of communally-held wildlife resources, Zimbabwe has the potential to establish institutional structures which could be used to exploit the full potential of indigenous woodlands. There are now established mechanisms for returning profits to the community, for establishing natural resource committees and for ensuring communication between government and local institutions. The local institutions could ensure that there is a degree of participatory planning and that local indigenous knowledge is channelled into the programme.

7 PROBLEMS AND CONSTRAINTS

Prejudices against certain non-wood forest products are evident amongst rural dwellers (McGregor, 1991, and Wilson, 1990). These prejudices may be entrenched at higher institutional levels (Sene, 1985; FAO, 1991), but no data on this for Zimbabwe are available.

Legislation on non-wood forest products is too restrictive. The international ban on trade in ivory is preventing further development of the wildlife industry in communal areas and is likely to result in the collapse of some of the wildlife schemes that were initiated, as the considerable value of ivory formed the basis of the economic justification for the schemes. In Zimbabwe, the CITES regulation will have the opposite of its intended effect: in the absence of elephant economic value, elephant numbers (and other wildlife) will be reduced and domestic livestock will become more common. Local legislation is also overly restrictive to the exploitation of these products and has not promoted development of trade.

There is often a lack of data on the importance or otherwise of non-wood forest products. To some extent, this is due to methodological obstacles to the valuation of nonmarket products (Scoones et al., 1992; Campbell et al., 1991; Campbell, 1993), but it is also due to the lack of collection of the appropriate statistics, often due to the absence of a single institute responsible for non-wood forest products and due to monetary and personnel constraints in the current institutions.

Perhaps more important than the above, is the lack of data on how the value of non-wood forest products varies in time and space (Campbell, 1993; de Beer and Mcdermott, 1989; Scoones et al., 1992). How does value vary with such factors as year, season, gender, age, wealth status and ecological conditions?

The products are often collected from common property resource areas (Nhira and Fortmann, 1993; Scoones et al., 1992). How is access changing with time and how are access rules changing? Evidence suggests that as pressures on the commons increase, there is increased privatisation of land and forest products (Campbell et al., 1993; Wilson, 1990). In view of the dependence of the poorer sections of rural populations on non-wood forest products (e.g. Wilson, 1990), securing access to the products is important for maintaining livelihoods of the poor (Scoones et al., 1992).

Commercialisation of non-wood forest products cannot be seen as a panacea for development, as various studies have shown that commercialisation often results in the breakdown of indigenous management techniques leading to unsustainable extraction levels (Campbell et al., 1993; Cunningham, 1990). Furthermore, commercialization often benefits the wealthier sector of the rural population (de Beer and Mcdermott, 1989).

There is, as always, a lack of consultation with people in devising development plans. Any new programmes should be fully participatory, with programme development starting at the village level. Development of markets for non-wood forest products should benefit the rural poor, and the rural poor should be empowered to control access and management of the resource.

There is insufficient information exchange between countries. Exchange is important as much of the data on non-wood forest products are in the 'grey' literature. For instance, researchers in South Africa, Botswana and Zimbabwe have expressed interests in Sclerocarya, but there has been no or very little exchange of ideas. A related problem is that there is insufficient knowledge and awareness about non-wood forest products in the main government institutions. There is a need to conduct short courses for personnel from such institutions.

8 RECOMMENDATIONS

The following recommendation encompasses a broad vision, both for the short and long terms, for the development of the potential of non-wood forest products. However, should severe funding restrictions be encountered then individual components of the programme would have to be selected.

An institution either at the university or in the non-governmental sector should be identified to establish a programme on non-wood forest products. It would be best if the personnel of the institution work out of a government institute, perhaps Forestry Commission or Agricultural Development Authority, so that once the programme has been established it can be continued by the government institute. The selected institute would, in a 3-5 year programme, undertake the following:

a) run short courses on non-wood forest products to raise the policy profile of non-wood forest products;

b) devise and implement simple methods to improve and widen the collection of statistical data on the production, consumption and trade in non-wood forest products;

c) make a study of the experiences of the Binga Craft Centre in marketing craftwork;

d) undertake a research project on the sustainability of the exploitation of products for craftwork (case study in the Binga area);

e) set up two development projects, as follows:

   i) Set up a craftwork marketing development project, building on the experiences of the Binga Craft Centre;

   ii) Establish a non-wood forest products exploitation centre based on wild foods. The establishment would be carefully monitored so that the approach could be improved on and replicated in other areas in the future. This activity would have the following elements:
   - select a site where the exploitation of a number of products is possible and where there is already some experience in institutional arrangements for the exploitation of communal resources (e.g. Mvurodonna Wilderness Area, where, over a short distance, one could imagine the exploitation of mushrooms, insects and wild fruits, particularly Sclerocarya).
   - employ participatory methods to harness indigenous knowledge and to establish exact institutional arrangements for exploitation, and
   - device and implement simple monitoring arrangements for investigating the production of the resource base.

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Appendix 1: Lists of key plant species of importance for different functions

Wild fruits (data from Campbell, 1987, McGregor, 1991, and Wilson, 1990)

All species are important for the nutrition of children, those that are important for other purposes as well are noted accordingly.

Azanza garkeana
Berchemia spp. (e.g. B. discolor and B. zeyheri)
Diospyros mespiliformis
Ficus spp. (e.g. F. soldanella)
Grewia spp. (e.g. G. flavescens)
Parinari curatellifolia
Sclerocarya birrea (also used for nuts and making fruit drinks and wine)
Strychnos cocculoides (and other Strychnos species)
Uapaca kirkiana
Vangueria infausta
Ziziphus mauritiana (important for cash income)

Fibre (data from McGregor, 1991)

Brachystegia spiciformis
B. boehmii
B. glaucescens
Colophospermum mopane
Julbernardia globiflora

5 Monetary Valuation of Tree-Based Resources in Zimbabwe: Experience and Outlook, by B Campbell, University of Zimbabwe.

The monetary valuation of tree-based resources in Zimbabwe: experience and outlook

B.M. Campbell

May, 1993

Paper prepared for the FAO expert consultation on non-wood forest products (anglophone Africa).

1 INTRODUCTION

In the last two decades, debates on development and resource exploitation have increasingly centred on sustainability issues (e.g. Barbier, 1987; Beets, 1990; Katerere et al., 1991; World Commission for Environment and Development, 1987). Often the debates have lacked an economic component or, where the debates included economic arguments, these were oversimplistic and incorporated little more than marketed output, and the capital and labour invested for this output. Generally, no economic value was assigned to changes in natural resource stocks (Repetto, 1992). Furthermore, the economic analyses in developing countries paid scant attention to subsistence production and to labour (the latter was 'surplus') (Repetto, 1992).

With such poor analytical tools, it is not surprising that policy decisions regarding development options have often had no positive impact on society and, in extreme cases, have resulted in wholesale disruption of natural systems (e.g. Browder, 1988; Mahar, 1988; Sinclair and Fryxhall, 1985). One example in Zimbabwe from the early 1980s is the US$7.3 million investment in the rural afforestation programme, which was made in the context of a fuelwood crisis without almost any analysis of the value of natural woodlands and trees to rural households (World Bank, 1990). The outputs from this programme have probably had little positive impact (World Bank, 1990). In addition, one small component of the programme saw the replacement of indigenous woodland of arguably high value with eucalyptus plantations of arguably no value (pers. obs.; World Bank, 1990).

In the last few years, there has been a massive increase in awareness that analyses for decision-makers about development and resource exploitation have to incorporate accounting for environmental assets (Repetto, 1992; Scoones et al., 1992; Swanson and Barbier, 1991). In this paper, I look at the efforts to value tree-based resources in Zimbabwe. Other data from the region are reviewed, but these are mostly non-existent. Most of the work on tree-based economics in the region has focused on alley cropping systems (see Swinkels and Scherr, 1991), which are not at present common in the region (Campbell et al., 1991a). Resource economics in the tropics has centred on moist tropical forest (e.g. Hecht et al., 1988; Rasoanaivo, 1990; Peters et al., 1989). In this paper, the focus is on dry tropical savanna-woodlands (miombo, mopane, teak and Acacia woodlands - White, 1983). In these woodlands, only wildlife values have received much attention and here the focus has been on direct use values (e.g. Barbier et al., 1990; Jansen et al., 1992; Swanson and Barbier, 1991).

The essential question that requires answering is how much is the woodland worth, and to whom? The results of the few studies are reviewed and a research agenda for future work is outlined. To place the Zimbabwean work in context, the first sections deal briefly with why valuation is necessary and methodological approaches to valuation.

2 WHY VALUE NATURAL RESOURCES?

Numerous fora have identified the need to value natural resources and to develop appropriate valuation methodologies. For instance, one of the recognised priorities for forestry and agroforestry policy research is the development of mechanisms for: (i) a balanced valuation of environmental benefits in national accounts and (ii) valuing trees and forests from a local perspective to complement national valuations (Gregersen et al., 1992). One of the four programme areas that make up Chapter 11 of Agenda 21 deals with 'capturing forest values' (Ayling, 1993). Within the body of literature devoted to non-wood forest products, it is recognised that there is a need to improve the valuation of the social and economic benefits derived from these products (de Beer and Mcdermott, 1989; FAO, 1991; Scoones et al., 1992).

In the Zimbabwean context, attention has been drawn to the fact that the valuation of natural resources has been inadequately dealt with (Bojo, 1993; Campbell et al., 1991b; Moyo et al., 1992).

There are a number of reasons why tree-based resource valuation is necessary in Zimbabwe and most other developing and tropical countries. At the global scale, the following question remains unanswered: What is the value of woodlands in terms of recreational values, biodiversity conservation and impact on climate? (Bojo, 1993). At the national level, valuation is required as a key input to decisions about land allocation and land use (Bojo, 1993; Moyo et al., 1992; Scoones et al., 1992), for instance:

(i) Given the proposed land reform programme to address the gross inequities in land distribution (Katerere et al., 1991), how can woodlands be appropriately valued? What are the costs and benefits associated with the loss of woodlands (Grundy et al., 1992) that will occur in the resettlement areas? If land taxation is used as an instrument to increase the supply of commercial farmland for the land reform programme (Murphree and Cumming, 1991), on the basis of what value should the large tracts of indigenous woodland on this farmland be taxed? (Bojo, 1993; Moyo et al., 1992).

(ii) Roughly 10% of Zimbabwe's woodlands are managed by the parastatal, Forestry Commission. Conservation of these State Forests is often justified on the basis of protection of watersheds and conservation of biodiversity. However, what are the costs and benefits of conservation? (Bojo, 1993; Moyo et al., 1992).

(iii) In tree-based development programmes, where should the emphasis lie? Do rural households need investment in woodlots, fruit tree orchards or fodder trees? How valuable are non-wood forest products? Conventional resource planning is biased in the favour of commercial harvest and has undervalued other goods and services (de Beer and Mcdermott, 1989; Scoones et al., 1992).

(iv) Much has been written about resource degradation (e.g. Katerere et al., 1991; Campbell et al., 1988). What are the costs associated with woodland degradation? In particular, what are the off-site downstream impacts of degradation? How can the costs of negative externalities be internalized to enhance efficient and sustainable use of resources (Moyo et al., 1992).

(v) Ultimately, one must ask whether it is possible to have an amended system of national accounts incorporating information about changes in natural resources? (Bojo, 1993).

3 POTENTIAL VALUATION METHODOLOGIES

From the outset, it should be stressed that the present paper deals with monetary valuation, but that there are a wide range of non-monetary indicators of value that can be used (de Beer and Mcdermott, 1989), such as frequency of consumption of forest products, frequency of collection, and percent of household time-budgets devoted to forest-related activities. Many of the indicators need to be collected for certain approaches to monetary valuation.

Values of tree-based resources can be classified into three classes: values associated with use (use value); values related to potential use (option value) and values associated with mere existence, for instance the benefit associated with knowing that some woodland type exists (existence value) (Bojo, 1993; Krutilla, 1967; Scoones et al., 1992; Weisbrod, 1964). What

goods and services of trees and woodlands should be considered? Traditional economic analyses of forestry activities have concentrated on the use values of wood. The full range of non-wood forest products have to be considered. Furthermore, analyses have focused on marketed goods. Most woodland products are in fact used for subsistence (Campbell and Brigham, 1993), and hence there is a need to incorporate nonmarket use values. In addition, it is necessary to include option and existence values in valuation exercises. Finally, how can woodland service functions (indirect use values), such as climate modification, soil fertility improvement and biodiversity maintenance, be valued?

In the absence of organized markets, an intuitively appealing approach to revealing the preferences of individuals is the use of contingent valuation methods (CVM) (Davis, 1963; Mitchell and Carson, 1989). These techniques use a hypothetical market situation to obtain bids from individuals indicating their willingness to pay (WTP) for a commodity. Despite the widespread use of these methods, the reliability of values obtained using CVM is vigorously debated (e.g. Bishop and Heberlein, 1979; Brookshire and Coursey, 1987; Knetsch and Sinden, 1984).

Many tree-based goods and services are closely linked with conventional markets, e.g. tree litter for fertility maintenance can be replaced (at least, partially) by inorganic fertilizers, off-site impacts of woodland clearing in terms of downstream siltation can affect crop output through reduced irrigated production. Hence, it is possible to value tree-based resources by tracing their link with organized markets. Bojo et al. (1990) identify a number of major classes of techniques in this group, two of which are relevant here: that based on production values, in which the losses or gains to production are estimated and valued, and that based on replacement costs, i.e. the cost of replacing tree-based goods and services with those from organized markets.

4 RESULTS FROM RESOURCE VALUATION EXERCISES IN ZIMBABWE

Contingent valuation of tree-based resources

The most comprehensive attempt to date to value woodland resources in Zimbabwe is that of Campbell et al. (1991b), in which two approaches were used, one based on CVM (Lynam et al., in prep.) and one based on a mixture of production values and replacement costs, to value goods and services derived from miombo woodland by residents in communal areas.

In the CVM approach, ten cards representing commodity categories of trees and two cards representing commodities not related to trees were explained to respondents, and respondents ranked and distributed 50 matches among the cards to reflect the relative importance of each category of commodities. The two extra cards showed a hand pump and a well-known design of latrine. The CVM was based on the willingness of respondents to pay for a fifth share in a borehole with a hand pump. Values were derived for all tree commodity categories by standardizing the points allocated to the categories against the points allocated to the borehole and then multiplying by the expressed willingness to pay (WTP). Direct questions of value about tree resources were considered inappropriate because of the 'inexperience of most respondents in dealing with monetary valuations of tree resources' (Lynam et al., in prep.), and hence a borehole was selected for valuation.

To check the validity of the WTP estimate, (i) actual costs of building and installing a borehole with hand pump were compared with the WTP estimate; (ii) respondents were asked what compensation they would be willing to accept if the hypothetical borehole were

to be destroyed, and this was compared to the WTP estimate; (iii) respondents were asked, in a set of dichotomous questions, to choose between a shared borehole and five common commodities decreasing in value from about Z$35000 (a tractor) to Z$90 (in mid 1991, at the time of the analysis, Z$1.00 = US$0.32); (iv) the calculated value of the latrine derived from the points allocation was compared to actual costs of building and installation, and (iv) hypothesised trends in WTP with mean annual rainfall and with present kind of access to water were compared with stated WTP. In general, the validity checks supported the use of the WTP estimate, but sharing of a borehole was based on five sharing households and a linear demand curve was assumed. It would have been preferable to have investigated the nature of the demand function.

The mean values elicited by the CVM for different tree commodities are shown in Table 1. Direct material inputs to major productive practices are the most valuable categories of commodities that households obtain from tree resources (Lynam et al., in prep.). These include wood for fuel and wood for construction, inputs to crop production (woodland litter, scattered trees in cropping areas) and animal feed (dry season browse). It is somewhat surprising that fuelwood is regarded as so important, and that food products from trees (e.g. fruits) are not placed in this top grouping, considering that many other studies have indicated that tree planting by households is based on fruit trees, with planting of trees for fuel being a very low priority (Grundy et al., 1992; Campbell et al., 1993; Bradley and Dewees, 1993). One must ask the question as to whether it is present utility that householders are basing their valuation, and whether it would be more desirable to value the potential utility of trees? (Bradley and Dewees, 1993).

CVM is an important technique because it can be used to obtain values for various service functions of forests. Respondents valued 'ecological services' of trees relatively highly (Table 1), these being regarded as soil fertility maintenance, soil erosion control, climate control and maintenance of stream flow. Other such intangibles are much less important commodities (Table 1). These include shade, health (medicinal plants) and social services (embracing cultural and spiritual values). Cash income from tree products is also relatively unimportant.

The values derived from the CVM are regarded as capital values, and can be converted to annual benefits using an appropriate discount rate. Using rates between 5 and 20 %, annual benefits derived from tree resources amount to between Z$84 and Z$336 per household per year. Lynam et al. (in prep.) suggest that the benefits derived from tree resources could be equivalent to between 12 and 160 % of off-farm and agricultural production incomes in the different study areas.

Table 1. Values derived for various categories of tree-based goods and services using a contingent valuation method (Lynam et al., in prep.). The categories are arranged in order of importance. Mean values which differ significantly at p = 0.05 are shown by different alphabetic superscripts. The ranking of the categories by the replacement-production method (Table 3) are also shown (see text, data from Campbell et al., 1991b).

	Contingent valuation		Ranking of categories by replacement-production valuation
	mean value Z$ HH^{-1}	median value Z$ HH^{-1}	
Fuel	373[a]	500	2
Farm/house materials	290[b]	400	3
Crop production	222[c]	333	5
Animal feed	181[c]	144	4
Ecological services	175[c]	257	not assessed
Food	136[c]	200	1
Shade	102[d]	150	not assessed
Cash income	82[d]	125	6
Health	71[d]	100	not assessed
Social services	46[e]	47	not assessed
Total	1678	2256	

Z$1.00 = US$0.32 in mid 1991, at the time of the survey.

Lynam et al. (in prep.) argue that the values can be used to gain insight into behaviour as regards resource use and technology adoption. Using the example of fuelwood, they show that with annual benefits of only Z$37 per household (assuming a 10 % discount rate) and with eucalyptus wood for a year costing roughly five times this value, it is not surprising that farmers seem reluctant to invest in eucalyptus woodlots. However, the same conclusion may be reached for fruit trees, which is not the case, as householders are interested in planting fruit trees. Such calculations need to be carefully interpreted as they clearly depend on the discount rate chosen and the meaning attached to value by the respondents (Bradley and Dewees, 1993).

In the other approach of Campbell et al. (1991b) to value tree-based products, a mixture of replacement cost and production value methods was used (Table 2). The economic valuation is crude by necessity: the available data do not allow for accurate economic accounting (Campbell et al., 1991b). In most cases the estimated value is calculated simply from a knowledge of the quantity of goods derived from trees multiplied by the 'farm gate prices' of these goods or the 'replacement cost'.

Table 2. Methods used to estimate value for different tree-based goods and services in the replacement-production valuation (Campbell et al., 1991b).

Fruit	Production data for fruit trees, market values of replacements, indigenous fruits on a per hectare basis, exotics on household plantings
Other wild foods	Consumption data for households, market values of replacements
Fuelwood	Consumption data for households, market values of replacements
Construction wood	Consumption data for households, market values of replacements
Craft wood	Household output of marketed products
Livestock production	Value of livestock, extra benefit provided by trees compared to absence of trees, on a per hectare basis
Crop production	Litter from woodlands - consumption data for households, market value of inorganic nitrogen Fertility improvement from scattered trees - nitrogen improvement using simulation model, market value of inorganic nitrogen, per hectare basis

By using farm gate price of a subsistence product, they assigned value on the basis of exchange value. Replacement cost is the cost a producer would have to pay to replace the subsistence product. Because of the use of farm gate price or replacement cost for goods which, in fact, are mostly not bought and sold, there is an overestimate of local use value (Campbell et al., 1991b; Bojo, 1993), as: (i) in most cases, the financial constraints facing small-scale farmers do not permit them to switch to a marketed product; (ii) small-scale farmers would probably not choose to buy the marketed replacements if the necessary financing were made available to them unconditionally; and (iii) the prices used do not take into account 'diminishing marginal utility' (if all the fruits were taken to the market place, the price per fruit would drop dramatically).

That the data base is limited is evident by a recalculation that has been done for the present paper for the value of leaf litter to crop production. On the basis of new litter consumption data (Nyathi and Campbell, 1993), the new estimate of value is 20 % of the estimate in Campbell et al. (1991b) (Table 3). On the other hand, recalculation of income from craft work from data from Brigham (in prep.) support the previous estimates. The

model SCUAF (Young and Muraya, 1990) was used to simulate fertility improvements by scattered trees. Since then, testing of that version of SCUAF demonstrated serious flaws (Vermeulen et al., 1993), but this is unlikely to make large differences because of the small number of trees in fields.

Another problem related to data limitations, is that some categories of value were estimated on a per hectare basis while others were estimated on a household basis (Table 2). For instance, value of wood was based on household consumption, whereas value of fruit from indigenous trees was estimated on the basis of per hectare production from woodland and from scattered trees in cropping land. In order to express value on common scales, it was assumed that the average area of woodland available to each household (HH) ranged from about 3.5 ha HH^{-1} to 5.6 ha HH^{-1} in the three study areas covered by the work (calculated on the basis of areas of communal woodland and 1991 projected population figures) and that the area of cropping land averaged 3 ha HH^{-1}. Using these conversion factors, value can be expressed either on a per hectare basis or a per household basis, but an additional source of error is introduced.

The point to be made is that the figures produced have to be used with caution because of the poor data base. Some sceptics would probably discount the method entirely for the reason of poor data. One partial solution is to ensure reporting of statistical variability, but this itself is not simple, as the estimates for different categories are based on different kinds of data. In the present paper, ranges are reported where possible (Table 3).

Woodland produces goods to the value of about Z$200 ha^{-1} yr^{-1}, while scattered trees in fields value at about Z$10 ha^{-1} yr^{-1}. In total, trees produce goods to a value of nearly Z$1000 HH^{-1} yr^{-1}. Our valuation is mostly based on household consumption data. If current consumption is in excess of sustainable levels of production, the values we obtain, especially for fuelwood and construction wood, do not account for environmental degradation as a result of non-sustainable use. Generally, if progressive decline of the woodlands is occurring, the key issue is likely to be the future effects rather than current value as determined here.

There is a major difference in the ranking of categories derived from the two valuation techniques in regards the placing of food from trees (Table 1). Firstly, the differences in the rankings could be due to the poor data used in the replacement-production valuation to calculate the value derived from indigenous fruits. The valuation was based on very poor production data. It would be simpler to obtain household consumption data and base the valuation on this. Secondly, it should be noted that some differences are expected, as the two techniques estimate different components of value. The CVM estimates capital values, which then have to be converted to annualized benefits using a selected discount rate, which could vary among different categories. The replacement-production valuation estimates annual gross benefits. Net benefits could be calculated if the costs of using the different resources could be quantified. This mostly relates to labour and transport costs.

Table 3. Gross values of tree-based goods and services, expressed as value to a household (HH) and woodland value. Data derived from Campbell et al. (1991b). Cash income for households and value of woodland for cash income are shown separately, as this component of value is included where appropriate in the product categories.

		Value to a household (Z$ HH^{-1} yr^{-1})	Value of woodlands[1] (Z$ ha^{-1} yr^{-1})
Fruit	indigenous fruits in woodland	230-360	65
	indigenous trees in cropland	10-44	
	planted exotics	12	
Other wild foods		63	11-18
Fuelwood		183	33-52
Construction wood	buildings	114	20-33
	implements, utensils for own use	16	3-5
	craft wood income	7-18	1-5
Livestock production		100-168	30
Crop production	litter from woodlands[2]	17	3-5
	fertility from scattered trees	15	
TOTAL		767-1010	166-213
Cash income	exotic fruits	17	
	wild fruits	2	<1
	craft wood[3]	7-18	1-5

[1] Only those products obtained from woodland are included in this column, thus excluding products from planted exotics and indigenous trees scattered in cropping land and homesites.

[2] Recalculated on the basis of 0.38 tonnes per user household per annum of litter used (Nyathi and Campbell, 1993, for Masvingo communal areas).

[3] Data from Campbell et al. (1991b). Using recent estimates of craft trade and income from Brigham (in prep.) would result in similar overall figure.

The same methodology to the above was conducted to value Acacia savanna in South Africa (Milton and Bond, 1986). These authors arrived at a similar total value, but the relative value of various commodities was different. Gumbo et al. (1989) looked at the value of Sclerocarya birrea trees in Southern Zimbabwe. They used a replacement cost method to derive a value for the trees. The direct value of the products (fruit, wine, wood products, nutrient inputs) over time far exceeds the value realised by chopping the tree down, hence they provided an economic rationale for maintaining the trees.

There are very few other studies of relevance, and most of these have concentrated on marketed products. Brigham (in prep.) investigated the marketed output of all woodland products in one communal area in Zimbabwe, while Cunningham (1990a, 1990b) measured incomes derived from palm wine production in South Africa and described the trade in medicinal plants in southern Africa. The study of Campbell et al. (1991b) also recorded income levels from tree-based resources. As can be seen, these are relatively insignificant by comparison to the total value of tree-based resources (Table 3).

Although livestock and wildlife are not strictly tree-based resources, they rely heavily on trees for the provision of browse, and the value of cattle calculated by Scoones (1992a) was used as an input to the calculation of the overall value of woodlands by Campbell et al. (1991b).

There are a number of examples of the economic valuation of cattle in communal areas, all based on calculating value using replacement costs, because most commodities derived from cattle are not marketed. These valuations have been reviewed by Jackson (1989) who highlights the assumptions that have been used and states that it is unclear as to whether the different valuation results are due to different farming systems or different assumptions. He concludes that valuing the economic benefits of livestock within communal areas is at a very rudimentary stage. The different results have different policy implications, and therefore there is a need to resolve the differences. For instance, in one of the valuations manure production is seen as five times more valuable than milk production whereas in another valuation, the opposite is recorded.

Perhaps the most detailed valuation is that of Scoones (1992a). Data on biological productivity, milk production, sales and slaughters, manure production and work rates are presented for cattle and goats. The economic valuation is more complete than that for tree-based resources described above, as it includes the costs of production (veterinary support and stock herding), and thus gross and net benefits can be calculated. Furthermore, the data on which the entire analysis is based are more reliable than those available for valuation of tree-based resources. Lacking from the valuation is the social value of cattle, in particular for bridewealth. It would be of interest to pursue contingent valuation for such intangibles, as farmers rank the bridewealth function third after transport and draught (Scoones, 1992a).

The gross value for cattle is around Z$800 yr^{-1} $adult^{-1}$ (Z$1.00 = US$0.66 in 1987), and the net economic value of communal area cattle and goat systems is Z$104.50 ha^{-1} yr^{-1} (Scoones, 1992a). Patterns of investment in livestock are discussed in relation to the valuations made. In communal lands the rate of return on investment is high for cattle and goats and returns to grazing land are considerably higher than in conventional beef ranching, as long as the full range of livestock products and services are accounted for. Perhaps one flaw in the analysis relates to the use of actual stocking rates rather than officially recommended stocking rates (which are two to three times lower), in the absence of any calculation of the environmental costs of maintaining such high stocking rates, a subject of hot debate (e.g. Sandford, 1982; Scoones, 1992b; du Toit and Campbell, 1989; Child 1988, 1990; Taylor and Child, 1991). Using more conservative stocking rates, reduces the net economic value to about Z$30-Z$40 ha^{-1} yr^{-1} (see for example Barrett, 1991). Jansen et al. (1992) provide an estimation of the cost of overstocking (see next section), but there estimate is for commercial livestock systems.

Jansen et al. (1992) provide the most detailed account of the value of commercial production of wildlife and livestock. In a survey of 89 commercial farms in the drier regions of Zimbabwe, they compare the financial and economic profitability of cattle ranches, wildlife ranches and mixed system ranches. They include in their analysis all sources of income and all costs (including labour, capital, cost of degradation). It appears that wildlife only ranches are the most financially viable and have an average return on investment of 10.5 % compared to only 3.6 % for mixed enterprise systems and only 1.8% for cattle only ranches. Similar conclusions are arrived at for economic profitability.

In comparison to this very detailed valuation of wildlife on commercial farmland, there has almost been no work on wildlife values on communal land. Murindagomo (1988) showed that for a remote community, the value of subsistence hunting was Z$8.2 ha^{-1} yr^{-1}, while

commercial safari hunting yielded Z$1.54 ha^{-1} yr^{-1}. There is also scattered data available on the amounts of income realised by wildlife schemes in communal areas (e.g. Cumming and Bond, 1991), but very little detailed valuation work has been undertaken.

Costs of environmental degradation

There are only two studies in Zimbabwe which have explored the costs of environmental degradation, that of Elwell and Stocking (1988) which investigated the regional effects of soil erosion in relation to the cost of replacement of the lost nutrients, and that of Jansen et al. (1992) which estimated the cost of overstocking by livestock and wildlife. In both studies, the influence of trees on the degradation dynamics was not investigated.

The valuation by Elwell and Stocking (1988) is limited to the extend that it is based on erosion simulation models, which are most applicable to cropped land and not grazing land and woodlands. They calculated that the annual cost of soil erosion to Zimbabwe was Z$2.5 billion (1985 prices).

Our understanding of the degradation process by livestock and wildlife is incomplete and hence any attempt at valuation is problematic. Jansen et al. (1992) base their estimate on the work of Child and Taylor on a commercial range (Child, 1988; Taylor and Child, 1991), thus the estimate is of little value for communal systems. Using long-term data, they have calculated the loss in productivity due to overstocking as an average annual productivity loss of 0.32 kg livemass ha^{-1} yr^{-1}. Using carrying capacity estimates and actual stocking rates, they were able to calculate the productivity loss per overstocked livemass. With estimates for livemass prices, they then converted productivity losses to costs, which amounted to Z$0.113 per kg of overstocked livemass per hectare per annum. This cost and an estimate of the degree of overstocking (calculated from known stocking rates and carrying capacity estimated from relationships between rainfall and biomass), were used to estimate the cost of overstocking on the 89 ranches they studied. The estimates are crude but the methodology is innovative and would be worth further investigation.

Avoidance cost valuation of carbon sequestration

Bojo (1993) made a preliminary valuation of the carbon sequestration function of woodlands in Zimbabwe. Valuation is regarded as hypothetical as there are at present no binding international agreements to limit CO_2, and actual monetary transfers will have to take place from developed countries to underdeveloped countries, as it is unlikely that decision makers in Zimbabwe will be much impressed by the fact that somewhere in the industrialized world costs are being saved by the decision to preserve indigenous Zimbabwean woodland.

Bojo (1993) bases his calculation on the data in Nordhaus (1991) which gives costs of reducing emissions per quantity of carbon. Given an average of 42 t ha^{-1} of wood in the remaining woodland (from Bradley and McNamara, 1990), the value of woodland from a carbon sequestration point of view would be about US$200 ha^{-1}, which would could be paid as a lump sum or as an annual, infinite payment of US$20 ha^{-1} (assuming an interest rate of 10%) (about Z$140 ha^{-1} in mid-1993).

Value of tourism

Tourism in the region is said to be based on the wildlife resource (Buetzler, 1990), which in turn is centred on the woodlands of the region. However, in Zimbabwe the outstanding tourist attraction, Victoria Falls, also accounts for considerable tourism revenue. There have been no detailed analyses of the value of tourism, and the data available are scattered (e.g. Cumming and Bond, 1991; Jansen et al., 1992). The tourism industry is considered the third most important source of foreign currency behind mining and agriculture (Jansen et al., 1992), and thus detailed analyses of it are particularly needed.

Comparative valuation of different land-uses

There is now a growing literature on the comparative economics of different land uses. Previous analyses have compared communal livestock systems with commercial livestock systems (e.g. Scoones, 1992a) and compared livestock and wildlife systems (e.g. Jansen et al., 1992), but the only attempt to place trees in the centre of such an analysis is that of Bojo (1993), who has used much of the data presented above. Because of the data limitations, it is perhaps premature to make many strong conclusions, but it does appear that indigenous woodlands, particularly in the drier regions, compete well with other land uses (Bojo, 1993). One of the chief limitations restricting comparison is that the estimates for tree-based resources represent gross incomes, not gross margins, because no costs of production have as yet been included in the valuation.

5 OUTLOOK

The review indicates that a modest start on resource valuation has begun, but that research on many topics is required before resource valuation is going to contribute meaningfully to decision making. The questions posed in the earlier sections remain unanswered: How much is the woodland worth, and to whom? What is the value of woodlands in terms of recreational values, biodiversity conservation and impact on climate? What are the costs and benefits of catchment conservation? How can resource valuation be incorporated in an amended system of national accounts?

Some of the major lines of research that are required are outlined below:

(1) Contingent valuation methods

CVM needs further methodological development and use. How can option and existence values, social services (e.g. bridewealth, conservation of sacred groves) and woodland service functions be incorporated in such analyses? Is it possible to obtain WTP bids directly about tree commodities, rather than using proxy commodities such as boreholes (as used by Lynam et al., in prep.). The actual meaning of the values solicited need investigation (Adamowicz, 1988; Adamowicz and Phillips, 1983; Bradley and Dewees, 1992) -- What are the appropriate forms of questioning? What does the value reflect: present utility or potential interventions?

Moyo et al. (1992) argue that willingness to pay may be better based on such questions as what monetary wage a communal area individual would be willing to accept in formal employment, or what income the individual would accept from his agricultural enterprises in order to forego reliance on tree cutting in preference for purchased formal sector substitutes. In this way, Moyo et al. (1992) argue, CVM will allow for consideration of entitlement and consumption patterns, not in situ, but in a dynamic long-term context.

(2) Willingness to pay

Valuation is based on willingness to pay (WTP), either as expressed in consumer's own preferences in conventional markets, or in hypothetical markets (as in CVM) (Bojo, 1993). Using the WTP concept raises four major problems: imperfect knowledge, externalities, skewed income distribution and market imperfections (Bojo, 1993; de Beer and Mcdermott, 1989).

While householders in the small-scale sector undoubtably have a wealth of 'indigenous technical knowledge' about trees and tree utilization, and act rationally in making resource use choices (Shepherd, 1992; Campbell et al., 1993), they are likely to be poorly informed about certain natural resource processes and are likely to undervalue off-site downstream impacts (externalities). To take an extreme example, they are unlikely to value woodland destruction in terms of its impact on global climate change.

It has been argued that WTP data are not only an expression of preference, but also reflect wealth and income distribution (Bojo, 1993). This is especially a problem in such countries as Zimbabwe, where income distribution is highly skewed. Even within the small-scale sector, there are wide differentials and skewed income distribution (Jackson 1989; Jackson and Collier, 1988; Moyo et al., 1992). There is a need to investigate the relationship between WTP and wealth, and a need to develop a system of weighting to ensure that the WTP of the wealthier sectors do not dominate any analysis (Bojo, 1993).

Markets do not necessarily reflect the true preferences or values of society where the property rights governing access to the resource are non-exclusive (Lynam et al., in prep.; Randall, 1983). In the smallholder sector in Zimbabwe, access to tree-based resources is a mixture of private and communal (Wilson, 1989; Nhira and Fortmann, 1993). Behnke (1985) has explored the shortcomings of valuation exercises in that they fail adequately to reflect the real value of some goods. Bradley and Dewees (1993) note that farm-gate prices and willingness to pay exercises may tend to over-value some commodities and undervalue others. Whether one is using actual or hypothetical markets there is a need to investigate the nature of willingness to pay estimates. What is the nature of demand functions? To what extent do market prices overestimate the value of products not commonly marketed or replacement products not frequently purchased? The relationship between WTP data and access rules also need investigation.

(3) Replacement-production methodologies

Firstly, it is obvious that the major need is for better, more site-specific data to allow for detailed differentiated analyses (Scoones et al., 1992). The previous valuation was based on scattered bits of information from many systems throughout the country (Campbell et al., 1991b).

Production costs need to be incorporated in such analyses, particularly the labour costs. There is almost no data on labour required to exploit tree-based resources. The valuation of labour is problematic. For some activities, for instance craftwork, the net benefits would be negative if labour was given much value. On the other hand, labour inputs in the small-scale sector have often been underplayed or even ignored (de Beer and Mcdermott, 1989; Moyo et al., 1992; Southgate, 1988). Labour availability varies throughout the year, with severe bottlenecks in certain periods (Gumbo et al., 1989; Zinyama, 1988). Labour requirements for resource management need to be quantified, valued and incorporated into resource valuation.

The current examples of replacement-production methodologies have largely based the valuation on household consumption; the long term costs of changes in resource stocks have not been incorporated into the analyses (Moyo et al., 1992).

(4) From individuals to society

How can values assigned by individuals be weighed together to obtain an aggregate value which can guide social choice? (Blackorby, 1990; Bojo, 1993). In the first instance, research should compare how individuals assign value to commodity categories in comparison to the assignments of community groups and outside 'experts'. In this direction, the CVM described earlier included a comparison between the rankings of householders and experts (Campbell et al., 1991b). In general, there is a problem of scale, the wider the group of beneficiaries, the more difficult it is to obtain a valuation (Bojo, 1993).

In moving from the valuations of individuals to policy making, Moyo et al. (1992) argue for two approaches to be taken, termed the 'positivist' and 'normative' valuation approaches. They argue that the current valuation exercises have concentrated on the positivist approach, with valuation being based on current use patterns and the assumption that patterns of ownership, access and use of land and labour resources remain substantially unchanged. They argue that what is missing are any examples of valuation using a normative approach, in which policy makers are informed of the relative merits of different options of resource use entailing fundamental structural changes in the historical legacy of the present ownership and use. The two approaches involve different shadow pricing assumptions and a normative approach may preclude some methodologies such as CVM, which Moyo et al. (1992) argue rely on revealed preferences based on existing resource use, precluding valuation under alternative economic arrangements.

(5) Values in time and space

Generalised estimates of value and aggregate analyses are now available, but what is sorely needed is information that clarifies how value changes in time and space, in relation to such variables as season, year, environment, tenure, gender, wealth and age (Scoones et al., 1992; de Beer and Mcdermott, 1989). Valuation should tell us about changing uses of woodlands over time and about differential values amongst users. Most studies treat the rural population as an undifferentiated homogenous population: there are few studies of a micro-economic nature (Bradley and Dewees, 1993; Moyo et al., 1992).

(6) The cost of environmental change

Despite widespread concern about environmental degradation, it is clear that there is almost no valuation of environmental change in the region (see Southgate, 1988). The valuation of communal livestock systems by Scoones (1992a) did not take into account any potential degradation in the resource base and the replacement-production valuation of tree-based resources by Campbell et al. (1991b) did not incorporate any cost of the change in the resource base, as the estimates were mostly based on household consumption data: consume more and hence higher value! Hosier (1988) has provided a review of studies on the economics of deforestation in eastern Africa, but finds that only two studies have sufficient data to investigate the subject. He concludes that more information is needed about the resiliency of ecosystems to tree removal and more work is necessary to clarify the proper techniques to evaluate the economic implications of environmental change in developing countries. In the context of Zimbabwe, the cost of degradation is particularly important as

the cost relates to the cost of not undertaking land reform and of not investing in the development of communal lands (Sam Moyo, pers. comm.; Katerere et al., 1991).

(7) Regional value of woodlands for service functions

There are almost no data on the ecological value of woodlands, apart from the CVM described above, which is based on a localized survey. What are the regional consequences of changes in tree cover? What is the value of the state forests in catchment conservation? Bojo (1993) argues that the changes in water flow patterns and/or changes in soil erosion and siltation should form the basis of such a valuation. For instance, as regards water the following techniques would be appropriate: (i) production valuation associated with changed water yields; (ii) contingent valuation on the consumers of water from rivers and dams, and (iii) valuation based on flood damage estimates. There is a vast source of largely unanalyzed hydrological data in Zimbabwe, on which to base valuation, but simulation models would probably also have to be used. As regards soil erosion and siltation, the following techniques need investigation: (i) loss of dam services due to siltation could be valued; (ii) soil loss and the resulting change in production could be investigated using simulation models such as SCUAF, though more empirical data are needed on the influence of trees on soil erosion.

(8) Global value of woodlands for biodiversity

There has been no attempts to value biodiversity in Zimbabwe or the region (Bojo, 1993). There is at least a need to make a preliminary valuation, but I concur with Bojo (1993) that biodiversity values are likely to be minor in comparison with other values. Some preliminary papers have discussed the methodological obstacles associated with the valuation of biodiversity (e.g. Bojo, 1993; Evenson, 1990; Haneman, 1988).

(9) Tourism

There is a need to make a more detailed analysis of the tourism industry, especially in regards the contribution of woodland systems to the benefits accrued.

(10) National accounting

It is clear from the above review of valuation that there has been no attempt to include changes in natural resource stocks in national accounts. There is recognition that the deficiencies in the national accounting system needs rectifying (Bojo 1993; Forestry Commission, 1990, p. 11; Katerere et al., 1991), but little attempt has been made to overhaul the present system. A fairly sophisticated example in which natural resources have been included in the national accounting system is that for Costa Rica (Tropical Science Center, 1991).

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6 Pines and Eucalyptus - Sources of Non-Wood Forest Products in Africa, by J J W Coppen, Natural Resources Institute of the Overseas Development Administration, UK.

FAO/Commonwealth Science Council Regional Expert Consultation Meeting on Non-Wood Forest Products, Arusha, Tanzania, 17-22 October, 1993

PINES AND EUCALYPTS - SOURCES OF NON-WOOD FOREST PRODUCTS IN AFRICA

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Abstract

The production of pine resin (as a source of turpentine and rosin) and eucalyptus oil in different parts of the world is described with the aid of overheads and slides. The social and economic benefits that derive from such activities are noted. Focus is given to their present production in Africa: in Zimbabwe, Kenya, South Africa and Swaziland. In conclusion, the need for research in certain areas - if production is to be improved and extended successfully to other African countries - is discussed.

FAO/Commonwealth Science Council Regional Expert Consultation Meeting on Non-Wood Forest Products, Arusha, Tanzania, 17-22 October, 1993

PINES AND EUCALYPTS - SOURCES OF NON-WOOD FOREST PRODUCTS IN AFRICA

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Introduction

The term 'Non-Wood Forest Products' embraces a wide range of plant and animal products that may be obtained in one way or another from the flora and fauna growing or living in the forest. It distinguishes non-wood products, or minor forest products as they used to be called, from those such as timber and pulp in which the log of the felled tree is the primary product. The term is often used in connection with traditionally collected products from the natural forest but may be applied equally to those derived from forest plantations or smaller, community or family based plantings.

Two groups of trees that are very widely planted throughout the world, pines and eucalypts, yield products that most certainly fall in the category of 'non-wood forest products': resin obtained by tapping pine trees, which on distillation yields turpentine and rosin, and oil obtained by distilling the leaves of certain *Eucalyptus* species. The manner in which these products are obtained from the trees, particularly in Africa, the social and economic benefits to be gained from undertaking such activities, problems or gaps in knowledge that exist in meeting the demands of the market or in raising productivity, and the ways in which research needs to be directed in order to provide some answers, are discussed below [and with the use of slides].

Gum naval stores - the production of turpentine and rosin from pine resin

Any country with a standing resource of pine trees - whether natural or plantation - has the potential to tap them and obtain a resin which yields, after a process of distillation, turpentine and rosin. These two products enter international trade for eventual use in a wide range of applications, but may also meet important needs of the producing country.

Around 850,000 tonnes of turpentine and rosin are produced annually from tapping pine trees and of this, China accounts for over half. As increasing labour costs have led to a decline in production in countries such as the USA, Portugal, Spain and France, others, such as Brazil and Indonesia, have increased production markedly in recent years to take advantage of the demand for these products.

There are now three producers of turpentine and rosin in Africa, all of relatively recent origin: Zimbabwe (which began tapping about 1976), Kenya (1986) and South Africa (1986). Between them they produce about 4,000 tonnes of crude resin a year. The tapping operation itself is a labour-intensive activity and the employment opportunities thus offered are a major incentive to exploring the potential for naval stores production in a country where none exists. Women can undertake several of the tasks involved. At the national level, gains or savings in foreign exchange can be made through import substitution or exports.

In most countries, older methods of tapping which involve cutting deeply into the wood have been replaced by those which entail simply removing small, horizontal strips of bark at regular intervals and applying a liquid or paste formulation. In this way, the tree is not damaged and the stem, if it is to be felled eventually for timber or pulp, does not suffer any significant reduction in volume or quality. Royalties payable to the Forestry Department or

owner of the trees - usually based on the amount of resin collected - provides a valuable source of extra income.

While most pines yield resin of some sort upon tapping, the question of whether it is economic to do so depends on its quality and the quantities that may be obtained. Some generalisations can be made in terms of those species of pine which are most suitable in this regard, although other factors such as provenance origin of the trees and local climatic conditions can have an important influence. *Pinus elliottii, P.caribaea* and *P.radiata* are the three species of pine tapped in Zimbabwe, Kenya and South Africa. Countries such as Tanzania, Zambia and Malawi have large areas of *P.kesiya, P.oocarpa* and *P.patula* planted. NRI experience is that the first two species are not high yielding in resin, but the good quality of *P.kesiya* resin and the fact that *P.oocarpa* is utilised in Honduras and Mexico make them species that are worth investigating in more detail. *P.patula*, however, is not a species that is ever likely to be exploited for naval stores purposes.

NRI maintains good contacts with the trade and there is no doubt that international demand for turpentine and rosin will remain high for the foreseeable future. Importers and end-users are keen to find new sources, providing price and quality are good. In the first instance, however, new producers will want to meet local demand: turpentine for use by the paint industry as a solvent for paints and varnishes, and rosin for use by the paper industry or for making soap.

The major constraint to increasing production to meet this demand is the shortage of resin. This may be due to the fact that existing production utilises trees that are intrinsically of limited yielding capacity (ie they are not the optimum species, variety or provenance), or environmental conditions are not well suited to high resin flow, or the tapping methods used are not optimal. Or there may simply be a shortage of trees, perhaps because

replanting is not taking place as fast as trees are felled. Solutions exist for most of these problems, though some are longer term and require investment in research, both by forestry organisations and institutions, and by agencies that have expertise in these areas. Current work in South Africa on *Pinus* hybrids holds particular promise for the region.

Better education can also play an important role: heightened awareness amongst foresters and decision makers of the benefits that accrue from gum naval stores production may enable untapped resources to be utilised, whilst the pooling of knowledge among existing and potential producers is to the advantage of both and is to be encouraged. The case for doing this in Africa is no less strong than elsewhere and, indeed, has already been voiced by producers in the region.

It would not necessary for a new African producer of pine resin to be committed to the installation of a processing plant. Although this may be desirable eventually, crude resin could, in the first instance, be an item of cross-border trade, going some way towards making up the shortfall experienced by existing producers. Kenya, for example, has a requirement of about 1,000 tonnes of rosin for use by the paper industry, but only produces about half of this from its own resources. Countries such as Tanzania, Zambia and Malawi could step in to provide the remainder if the pines were shown to be capable of supporting a tapping operation.

Eucalyptus oil - its production from Eucalyptus leaf

The fast-growing nature of eucalypts makes them ideally suited to the production of wood for pulp, timber (including poles) and fuelwood. They are also, however, an important source of essential oil.

World production of eucalyptus oil is around 3,500 tonnes per year, of which about 2,500 tonnes is the medicinal type

of oil. Most of the balance of production is of perfumery-type of oils. China accounts for about 70% of world production of medicinal oil (and the bulk of the perfumery type).

African production of medicinal oil amounts to approximately 250 tonnes and is split between South Africa, Swaziland and Zimbabwe, although the latter provides less than 10 tonnes of this. It is possible that Tanzania will commence production in the near future.

Eucalyptus may be utilised for oil production in one of two ways: it may be grown specifically for oil on a short-rotation coppice system, harvesting the regrowth at intervals of between 6 and 16 months after the first cut; or the 'waste' leaf available after trimming the felled tree destined for the pulp or sawmill may be collected and distilled.

Most of the social and economic benefits that derive from the production of pine resin apply equally to the production of eucalyptus oil. In the case of estate-led production specifically for oil, harvesting of the leaf and loading it on to trailers for dispatch to the distillery is, like pine tapping, labour-intensive. The distillery probably requires rather more people to maintain production (to load and unload the stills) than does a resin distillation plant. In contrast to pine resin, the distillation of eucalyptus oil is something that can be undertaken on a relatively small scale. Stills of 50kg capacity and less are easily fabricated for village-scale use.

The leaves of most species of eucalypt yield an oil when distilled, but only a few species produce it in sufficient amounts and of a quality to make its distillation practicable and economic. Utilisation of 'waste' leaf, therefore, depends on the species being grown for its wood also being suitable for oil. *E.globulus* (grown for pulp in

Spain and Portugal) and *E.citriodora* (grown for charcoal production in Brazil) are two such species. In Africa, *E.smithii* is a particularly fast producer of leaf biomass and is by far the major source of medicinal eucalyptus oil. *E.radiata*, however, holds much promise as a significant supplementary source of oil in the region.

To date, most African production of oil has been from trees planted specifically for that purpose. *E.camaldulensis* (Petford provenance), however, which is suited to more drier areas than *E.smithii* and *E.radiata*, has high potential for use as a source of both oil and wood for pole or fuel purposes.

Utilisation of *Eucalyptus* as a multipurpose tree, as well as meeting a number of different needs, means that the risks associated with low prices or demand for one or other of the products are spread and the effects minimised. Research is needed, however, to define the best harvesting schedule for the species grown so that the returns are maximised. As with pines, other long-term research remains to be done. As well as seeking to increase oil quality and productivity through selection of elite germplasm, improved field management will unboubtedly pay dividends.

7 Gum Arabic Report from Sudan, by O El Wasila.

Gum Arabic - An essential non-wood based products in Sudan

By

* Omer A/El Karim El Wasila

Paper presented in Regional expert Consultation on non-wood Forest Products (NWFP) for English-Speaking African Countries

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Introduction

Sudan account for nearly 80% of the world production of gum arabic. It is the third largest export item from Sudan, after Cotton and Sorghum. The total production and its distribution between different producing areas have undergone changes (There is a notice declination in Kordofan, Darfur and Eastern State while the Central State is promising). The Gum Arabic company purchased all the quantities produced in the country. However, this is not the actual production. Some of the production is smuggled outside the country especially through Chad and Ethiopia due to the high international; prices in comparison to what is paid to the merchants,hence smuggling is extremely profitable.

Another type of gum produced from **Acacia seyal** is closely linked to the production of hashab gum (Acacia senegal) when production of hashab gum is high neither the producer nor the gum arabic company are interested in the collection of Talh gum when there is a short fall in production, farmers are started to collect Talh to substitute the loss in hashab although its prices are cheap.

The species which are commercially tapped are Acacia senegal (Hashab), Acacia seyal (Talh) and **Boswellia papyrifera** (gafal) or Tarag Tarag. 90% of the gum exported from Sudan is hashab. Also there is potential for **Sterculia setigera** (Tartar or Karaya) in world markets.

Gum Arabic is also a significant source of cash income for the peasant communities occupying the gum belt. Population estimates are highly uncertain, but table 1.1 shows that the areas of Kordofan, Dafur, Eastern and Central States accounts for some 10 million people, with perhaps 2.8 million people living in the gum belt.

Table 1.1

Sudan population estimates 1983 (millions)

State	Urban	Rural	Nomads	Total
Eastern	0.64	1.01	0.56	2.21
Central	0.83	2.96	0.24	4.01
Kordofan	0.39	1.92	0.78	3.09
Darfur	0.32	2.31	0.47	3.09
Others	1.97	6.04	0.14	8.15
Total	4.15	14.22	2.19	20.56

Source: Sudan Department of Statistics (1983) third population census.

Gum Arabic is an essential commercial crop to the people of these states beside the tree has a multi-functional purposes, providing a number of products of direct use and benefits to the farming communities and, most significantly acting as an environmental stabilizer, within the gum belt which lie between 10 and 14 degree latitude.

(a) **Production**

In the last 5 years (1988/89 - 1992/93) the production showed a significant reduce as depicts in table 1.2 below:

Season	Quantity in Tonnes
1988/89	38948
1989/90	25733
1990/91	12061
1991/92	7330
1992/93	10870

* **Source: Gum Arabic Company - Khartoum**

The Production declination is due to the following reasons:

1. Drought and desertification problems in 1983/84 especially in Northern and Eastern Kordofan and Northern Darfur which followed by interregional migration to the gum producers.

2. Locust infestation, which covered all the gum belt areas extending from the Eastern to the Western border for many seasons.

3. Rainfall fluctuation in some areas, in addition to the extend of rainy season till October in others.

4. Rising cost of living in rural areas and the lack of cash in the hands of the farmers/gum producers after 1983/84 drought.

(b) Gum Arabic Export Value

Table 1.3 gives the value of exports since 1989. There is a clear fluctuation from year to another which reflect the fluctuation in production as shown in Table 1.2.

Table 1.3

Value of Gum Arabic exports (in U.S.$ 000)

Year	Value
1989	46788.99
1990	54594.74
1991	50818.66
1992	23496.65

* **Source: Gum Arabic Company - Khartoum**

(c) Role of Gum Arabic Company: (Solving problems)

1. Producers

(a) Participation in policies concerning production marketing and the future of Gum Arabic trade (4 seats were reserved in the administrative council).

(b) Contribution in the capital of Gum Arabic Company.

(c) The company purchase the excess in production.

(d) Execution of the minimum price policy announced by the government.

(e) Non exploitation insurance.

(f) Execution of emergency programmes to combat locust, best and diseases, water availability at production sites, execution of development programmes, development of production, and protection of Hashab Trees.

2. **Merchant**

(a) Existing of definite price in addition to excellent revenue.

(b) Availability of inputs and requirements.

(c) Solving Transportation problems.

(d) Combat smuggling.

(e) Organizing internal markets and open new one.

(f) organizing cleaning operations in addition to selection and quality.

3. **Production**

(a) Protection of hashab Trees from locust by subsidizing protection department.

(b) Protection of Hashab Trees from fires by coordination between the agricultural departments (Forestry, ranges and pasture).

(c) Promotion of production and development of other gums e.g. Talh and Tartar.

(d) Role of FNC Corporation

1. Participation in development, planting, protection and conservation.

2. Future planning for production continuity and production of new types of gums.

3. Conservation of natural resources (trees) plus the environment.

4. Control funds provided for Gum Arabic afforestation by the Gum Arabic Company and GOS development budget. Also provides advisory services (Table 1.4).

5. Provide extension activities arising from research in establishment and tapping also product promotion for fruits, medicine and fodder.

Table 1.4

Talh and Hashab Afforestation programme in Feddans for 93/94 in the country

State	Hashab	Talh	Total
Central	25275	8540	33815
Eastern	14000	5100	19100
Kordofan	18200	-	18200
Darfur	3000	-	3000
Khartoum	_	100	100
Total	60475	13740	74215

* **Source: FNC Corporation Khartoum**

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8 Information Notes on Statistical Information, by F Padovani, Forestry Officer, Planning and Statistics Branch, Forestry Policy and Planning Division, Forestry Department of FAO.

Statistical Information on Non-Wood Forest Producs

N o t e s

by: F. Padovani

Statistics are about quantities and magnitudes. They are used in communicating information, keeping records and making comparisons. Forestry Sector Statistics cover all aspects of the activities of the sector. The information they carry may be needed for many different purposes, both by people within the sector and by people looking at the sector from outside.

When people use statistics, they very often use them to make comparisons the following examples are depicted from the section NON-WOOD FOREST PRODUCTS in the FAO Publication "Statistics Today for Tomorrow 1961-1991,2010". The comparisons may be between different things:

Natural Rubber Production Value of Brazil compared with Palm Hearts Production Value of Brazil.

The comparison may be between the same thing in different places:

Rattan Export Value of Indonesia compared with Rattan Export Value of Philippines.

Or the comparison may be between the same thing in the same place at different times:

Cork Export Values of Portugal Compared for Each 5 Year since 1948

If a comparison is to be usefull, we must know **WHAT** the things are that are being compared, **WHERE** they come from, **HOW** they are measured and **WHEN**.

You will notice that the graph on Gum Arabic says:

The product and the activity have been named:
- What? Gum Arabic Exports

The place has been named:
- Where? Sudan

The units are stated:
- How Measured? metric Tons, US Dollars

The time for which the export statistic is recorded:
- When? 1980, 1981, 1982, 1983 1990

In the first part of this presentation, these four characteristics of the definition will be discussed in a little more detail.

What - The definition of the product

What is a product?
When we speak of a product we are talking about an "object" a "thing" which has been produced, has been harvested, has been processed, has been manufactured, has been delivered to a household enterprice or market.
In the example above we considered very few NWFP Naval Stores, Natural Rubber, Palm Hearts, Cork, Rattan, Gum Arabic. Each of these are large collections of products. For example Natural Rubber exports may include Natural rubber latex, whether or not prevulcanized and Natural rubber (other than latex). Naval Stores may include CTO/DTO, Rosins, Salts/Esters, Other Rosin Derived, Turps, Pine Oil, Other Terpenes, Terpene Resins, etc..

When we are involved in the sale of "a product, much more detailed specifications have to be considered giving the species and quality of the material. The total volume of Gum Arabic exports includes the volume of all species and all qualities.

Different systems of statistics show different degrees of detail. The important thing to recognize is that any statistic must be accompanied by a definition if it is to be useful for comparison with other statistics.

Hopefully, we shall look at the major classifications and their definitions in more detail during this Expert Consultation in order to start to sistematize Non-Wood Forest Products (Forest Products Other Than Wood) statistics and to define a framework, structure and definition.

WHERE - The Spacial Coverage of a Statistic

Statistics may be collected at paricular location in a country for example for provinces or regions, the total for the country is the sum of data for provinces producing the product in the country.

The FAO international statistics gathered attempts to obtain estimates of the total of each class in any country. In the examples, the statistics were stated as the exports of a country: Sudan, Brazil, Philippines, Indonesia, etc.. The assumption is that they include all exports of the product from the country. The question may be asked do they include all the exports of that product? Are exports of all companies - large, small, government and private - included? are the exports from all ports included? is the cross border trade with neighbouring countries included? There is very little recorded trade in forest products between neighbouring African countries.

This question of coverage may be very significant in the case of domestic production, for example honey production.

Last question - are there accurate records or estimates for all of these?

How Measured - Units of Measurement of the products

The FAO international statistics use the metric system. National statistics may have their own measurement units and measurement conventions. As long as these are accurately known, they may be converted to FAO standard units. Trade statistics are recorded in many countries in weight units: kilogrammes or tonnes. These may be converted approximately to cubic metres using standard conversion factors. The FAO standard for value is the United States dollar. National currency units are converted to US dollars, using current exchange rates published by the International Monetary Fund (IMF).

WHEN - The Time Period to Which Statistics Relate

For example the FAO Yearbook of Forest Producs presents statistics for the calendar year January-December. Some countries or companies maintain their statistics on fiscal, or financial years or according to different calendars. Where monthly data is available, the calendar year data can be calculated. Where countries supply data for a different time span, it may be necessary to accept this as a best estimate of calendar year data. For such purposes as marketing and trade, monthly data are important.

A sample of NWFP classifications

UN Standard International Trade Classification Rev. 2 and 3.
This classification has been the basis for many national trade classification. With the introduction of by the Customs Cooperation Council of the Harmonised System in 1988, the UN introduced SITC rev.3 with a precize correspondence between the items of the harmonised system and these of SITC rev.3.

NWFP consultation held in Bangkok 5-8 November, 1991.
The Consultation reviewed the range of NWFP produced in different countries and establisched a classification as applicable to the Asia-Pacific region.

The NWFP reporting in Brazil.

The major significance of "minor" forest product.

Until now we have spoken about

What, Where, When, How;

but what about

WHO? and WHY?

The replay is that before is important to discuss the first series of queries, and after, in the second presentation, if there is time, we can describe the functions of a Forestry Statistical Office, the Organization of Statistical Information, how to built support for the statistical work, the importance of statistics in the decision-making process, and the role of Forestry Statistitian in promoting NWFP. The experience of FAO Forestry Department in collecting and disseminating International Forestry Statistics will be presented.

9 Dependency on Forest and Trees for Food Security, by the Tanzania Food and Nutrition Centre, Tanzania.

TANZANIA FOOD AND NUTRITION CENTRE

DEPENDENCY ON FORESTS AND TREES FOR FOOD SECURITY

A PILOT STUDY: NANGURUWE AND MBAMBAKOFI VILLAGES MTWARA - REGION, TANZANIA

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1.0 INTRODUCTION

Forests and woodlands are assumed to occupy about 50 percent of Tanzania's land area (TFAP 1989). In these regions/areas forests and forest products continue to be central to the household economy, as well as to household food security and health through numerous traditional practices. Forests and tree products form a significant part of household food security in most communities in the rural areas.

The entire rural population as well as the majority of the urban households rely on forest resources for their energy needs. In the rural areas mostly firewood is used while in the urban areas about half of the population use charcoal as their main source of energy. Subsistence farmers also need the forest lands for their agricultural production.

In Mtwara, the region selected for this study, farmers practice a forest-fallow system of shifting agriculture and continue to expand into remaining forest areas in their search for more fertile land.

In addition forest resources are being used to supply building materials as well as various forest foods and medicines. It is a major concern of the forestry department that forest resources in many parts of the region are now being rapidly depleted.

1.1 Justification

Historical background indicate that frequent food crisis caused by natural calamities like drought floods, outbreak of crop diseases and pests is normally associated with increased us of forest and tree products for food. Usually the intensity of utilization is higher in those areas where forest and tree products are easily accessible.

However, not only direct consumable food is obtained from forests and tree products but they sometimes provide indirect support to household food security (see fig.1). Such supports comes in different forms like provision of materials for business such as firewood, charcoal, timber, crafts etc, which in turn provide cash for use in purchasing food items. Firewood is in most rural communities the only source of cooking fuel.

Forest and tree products have also been and are still being used for prevention and cure of diseases. This is indirectly related to household food security in the sense that it provides good health to both people and livestock as well as crops. It is also associated with normalizing or increasing the productivity and food availability.
Maintenance and improvement of ecology, is also achieved by the presence of forest and tree products. Good soil conservation and fertility with improved conditions of rainfall availability is partly a function of forests and tree products.

In areas which face shortage of domesticated animals (livestock), forests and tree products play a major role as good sources of animal protein. People go for animal hunting to supplement the little available source of animal protein.

1.2 Description of the region

Mtwara region is located in the extreme South East of Tanzania covering an area of 16 726 sq.km. It is bordered by the Indian Ocean in the East, the Ruvuma river and Mocambique in the South, the Ruvuma region in the West and Lindi region in the North.

Administratively, Mtwara region is divided into four districts; Mtwara Urban (163 sq.km.), Mtwara Rural (3 597 sq.km.), Masasi 8,940 sq.km.) and Newala (4,020 sq.km.). According to the 1988 population census there were 894,000 people in the region and the population has been growing at an average rate of 1.4%, well below that of the national average of 2.8% for the last ten years.

Mtwara region has 132,192 hectares of planted forest and about 542,000 hectares of natural forests. Hence about 30% of the region is covered by forest but the requirements of wood for different uses is also high and increasing with population pressure.

Mtwara rural district has about 284,857 ha of natural forests including several forest reserves. It also has 1,073 ha of planted forest and 14,237 ha of mangrove forest reserves. Hence, about 76% of the total land area of the district is covered by forests. The district lies within the eastern zone of the Makonde plateau and has an altitude ranging from sea level to approximately 350 metres.

The district has a population of 169,436 people, mostly *Makonde*. Other major ethnic groups of people living in the area include, *Makonde* from Mozambique, *Yao*, *Makua* and *Swahili*.

Major health problems in the area include malaria, upper respiratory tract diseases, and diarrhoea. The district has a relatively high rate of malnutrition as compared to the other two districts in the CSD programme. According to the Tanzania Nutrition Trends report (TNT, 1992) about 9.5% of the total children underfive years of age during the year 1990 were severely malnourished.

The major source of income is subsistance agriculture with cassava and cashewnuts as predominant cash crops. Other cash crops include coconut, oil seeds and legumes. Major food crops include sorghum, cassava, rice, maize and legumes. Livestock plays a minor role but there are some cattle, goats and poultry.

1.1.2 Background to the pilot study

During the early phase of the Forest, Trees and People programme, TFNC carried out a nutrition study in the Forest and Tree Programme (TFP) project area of Babati. This study was the first activity TFNC undertook in collaboration with the community forestry department. Although the study was small it was important in making both nutritionists and foresters aware of the many and complex ways in which the two fields interrelate. It also raised the interest in participating in further FTP activities aiming at finding more practical methods of collecting information on forestry and nutrition.

Thus,TFNC participated in the planning seminar in Uppsala in 1991. This was when the plans for conducting pilot surveys on dependency on forests and farm trees for food security were drawn up. Further preparatory discussions were held between the department of Community Forestry of the Ministry of Tourism National Resource and Environment and TFNC, and a one day workshop involving TFNC, ministries of Tourism Natural Resources and Enviroment, Agriculture and Community Development Children and Women affairs and Institute of Resource Assessment was held in Dar es Salaam. The meeting introduced and discussed several issues relating to forestry, food security and nutrition and served as a sensitization seminar for professionals from all the participating institutions. The plans for the pilot

study in Mtwara were discussed and agreed on. The meeting formed a multisectorial taskforce to review existing documentation, identify ongoing efforts and prepare a 5-year programme (Ref.).

1.3 Objectives

1.3.1. General objectives

1. This, study in *Mbambakofi* and *Nanguruwe* villages in Mtwara rural district, aims at exploring the degree of dependency by the community, and identifying way through which the forest staff can use this opportunity to integrate nutrition aspects on their programme so that Household food security can be assured.

2. To provide preliminary information on the role of forests and trees in food security, people's dependence on forest and trees, changes and trends in the nature of this dependency.

3. To develop and test informal methods of collecting information on dependency on forests and trees which could be useful for planning of support activities by institutions involved in community forestry and nutrition.

1.3.2 **Specific objectives**

1. Describe and analyse the current role of forests and tree products in household food security, especially in the food insecure households.

2. Document the perceived changes in access to and dependency on forests and tree products for food security and describe strategies people use to cope with these.

3. Identify priority issues expressed by the communities and relate to dependency on forests and trees for food security for community forestry to consider in their planning.

1.4 Methodology:

1.4.1 **Selection of Study area.**

During a preliminary visit to Mtwara in August 1992, staff from TFNC and Ministry of Tourism Natural Resources and Enviroment (Department of Community Forestry) selected two villages for the pilot study. The criteria used for the selection was that one village should be close to the proposed forest reserve of ***Mnivata/Mtiniko*** and the other further away from a forest but still using forest produces. The villages selected were Mnivata/Mbambakofi and Nanguruwe/**Namahyakata.**

1.4.2 **Teamwork and Field Implementation.**

A multi disciplinary team carried out the pilot study. TFNC and the Ministry of Tourism Natural Resources and Enviroment (Department of Community Forestry) jointly selected a team with the following composition:

TFNC staff (including 2 nutritionists and 1 agricultural economist)

3 forest officers (from regional, district and community level)

2 community development officers (from district and community level)

1 Nutritionist/Ministry of Agriculture (district level)

The team members are listed in appendix.

Preliminary information was collected through use of rapid assessment methods. The research team was given a three day training in this techniques in connection with the joint planning of the study. The team collected and reviewed secondary data from regional and community levels, Discussed and agreed on issues of importance for investigations of dependency on forests and farm trees for food security and together prepared checklists to be used in collection of primary data.

Following that the team made a one day initial visit to the communities for consultation with village leaders on topics of importance and practical arrangements. In accomplishing this work the team divided into two groups of about five people. Each group went to different sublocation of the selected villages.

Then the team spent two days in each village collecting information. The information was gathered through village meetings, village walks, semi-structured interviews and conversations with key informants and knowledgeable people individually and in groups. Interviews were made with different categories of community members eg leaders, elders, women, youth, and children. The information from interviews and conversations was complemented with observations. During field work, the team split into smaller sub groups of 2-3 people using different combinations of professions depending on the topic to be investigated.

The data collected included general village set up, history, economic development, current issues, production systems, sources of income, food procurement, food security, use of forest and tree products in meeting food security needs, trends and changes in utilisation, extent and nature of food

problems, coping strategies, current and emerging problems.

.....Insert -> PRA training & data collected in connection with 3rd visit.....

1.4.2.1 **Analysis and reporting**

Each evening day the team met and reviewed the information gathered during the day. In those meetings, summaries from the interviews were prepared for the report, and illustrations and diagrams of the findings were made. The team discussed and compared notes and took notice of conflicting and missing information for further investigation the following day. Each day the team also agreed on topics to investigate the next day, revised the checklists and decided on key respondents or groups to interview the following day. Differences and similarities between the two study villages were also discussed before leaving the study area and preliminary conclusions drawn.

.....Need to add from 2nd & 3rd visit.....

2.0. CHARACTERISTICS AND HISTORICAL BACKGROUND OF THE STUDY VILLAGES.

Mnivata/Mbambakofi

Mnivata/Mbambakofi village is located 56 km south west of Mtwara on the road to Newala district. The village is divided into two sub-locations, ***Mnivata and Mbambakofi***, each with houses on both sides of the road and separated by a stretch of forest (see map 2). The ***Mnivata*** forest reserve lies partly within the village boundaries. Including the crop fields and natural forest the area belonging to the village stretch approximately 4 km towards the north and 5 km to the south.

Mnivata sublocation is a traditional village said to have originated under Chief ***Mzee Chamtula*** during the 19th century when Sultan Bin Said ruled Zanzibar. The original settlers came from Newala district and settled near the river valley and at the edge of the forest. The village remained small until in the 1950's when the new road was constructed. People then moved towards the roadside and in the early 1960's the first families settled in the area which was to become ***Mbambakofi*** (Figure 2).

Figure 2: TIMELINE- MNIVATA/MBAMBAKOFI VILLAGE.

1880s----------	First settlers
1952----------	Proposed forest reserve
1953----------	Construction of Mtwara-Newala road people started moving from valley
1959----------	Food shortage
1961----------	Few families settled in Mbambakofi
1967----------	Mbambakofi registered as village
1968-9----------	Food shortage
1974----------	Villagization act-people moved from valley and other areas to Mnivata/Mbambakofi
1980----------	Primary School opened in Mbambakofi
1989----------	Food shortage
1989-90----------	Kuchakumi farm introduced
1990----------	Floods in valley area
1991----------	Food shortage

The ***Mbambakofi*** sublocation was registered as a village in 1968. It received it's name from the ***Mbambakofi*** tree (Afzelia quanzensis) which was planted on the road side and became a popular resting place.

With villagization in 1974 more people moved in from areas nearby. According to the village register, the total population of the two clusters today is 1726 persons consisting of 341 households.The majority of the people are of upcountry ***Makonde*** origin and most of them are moslems.

Behind the houses and further away from the road is a mixture of old and new fields in the natural, regenerated forest areas. Access to land in terms of acreage is not yet a problem in the ***Mnivata/Mbambakofi*** area but people complain that the fertility of the land is decreasing and that there is no more thick forest available for opening up new fields. Some therefore question the proposed forest reserve.

The Mtiniko/Mnivata forest Shamba la Bibi (Grandmothers forest) was proposed a reserve in 1952. It is a catchment rather than a productive forest and it was considered of special interest beneficial because potential springs were developing. The forest border was cleared regularly until the 1970's but has since been left unattended for financial reasons. In general both villagers and government have respected the boundaries and regulations of the reserve despite it not yet being a gazetted forest. The forest is now said to harbour wild animals such as lions, leopards, bushpigs and monkeys and the villagers complain that these wild animals are destroying their field crops.

2.1 Social Services

Mnivata/Mbambakofi has got limited basic social facilities. A primary school was established in 1980. It was constructed by the villagers themselves and the government gave a support of corrugated iron sheets. The school is surrounded by trees from the seedlings distributed by the forestry department in the early 1980's.

The village has a serious problem of water shortage. There is no permanent river near ***Mbambakofi*** and the sub-merged surface water storage troughs have been constructed all over the village area. People have also dug several deep water holes in the dry river valley to utilize the little amount of water available. The river valley is located on the north side of the village and collects water from Newala in the ***Makonde plateau*** to the Indian Ocean. In the dry season, people walk about 4 km searching for water, and spend long hours (6-12) queing to collect water from the river valleys.

There is no clinic and the basic health service is provided by a first aid assistant who has a first aid kit. There are also three traditional birth attendants in the village. For other services villagers utilize health centres in ***Mtimbwilimbi, Ntiniko*** and ***Namasangi*** which are about 5-7 km away. There is also a catholic missionary hospital which is located in ***Nanyamba,*** about 20 km away.

There is no centralized market place in the village but small informal markets are found in several places near the road. Mostly youths are involved in the selling of foods, cigarettes, both forest and domesticated fruits and other forest products, e.g ***Ming'oko.***

Last year a group of elders also decided to start a small shop in one of the houses and this group now sells items mostly needed in emergencies such as funerals.

There is one mosque in each cluster/street, (i.e ***Mbambakofi*** and ***Mnivata)*** and the village also owns one godown which is mainly used for storing crops collected by the primary cooperative union. Major crops collected by the union are cassava (dried) and cashewnuts.

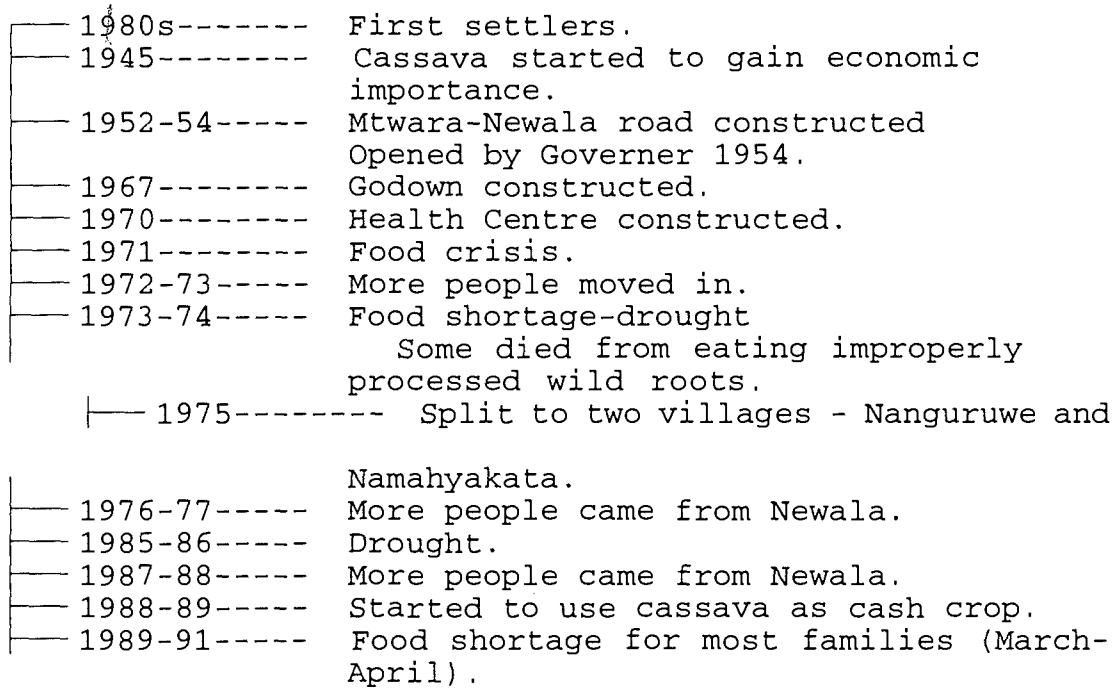
Nanguruwe/Namahyakata

Nanguruwe/Namahyakata villages are located about 45 km south west of Mtwara on the way to Newala District. People started to settle at ***Nanguruwe/Namahyakata*** in 1950s when the road was constructed as they wanted to live along the road.

In 1974 as villagezation took place more people came from nearby villages, and to date, people are still imigrating in especially from Newala. It is said that they are attracted by availability of social services, mainly water, health centre, school & transport.

Previously, these two villages had one common name ***(Nanguruwe)***. In 1975 the ***Nanguruwe*** split into two (see fig.3).

Figure 3: TIMELINE - NANGURUWE/NAMAHYAKATA.



One side retained the name while the other was named ***Namahyakata*** and these two are separated by the road. The split of the village was due to increased number of households.

As more people moved in from various areas including Kitondo village, Kitondo primary school which was about 5 km distance had to shift to ***Nanguruwe/Namahyakata*** from where it was previously located (i.e 1975). The school was built by villagers themselves and Government supplied corrugated iron sheets and cement.

According to village register, the population of ***Nanguruwe/Namahyakata*** is 2,977 (data December, 1991) with 733 households and the household size is between 6-10. This include:

Women	722
Men	633
Children (under 13 years)	1404
Elders	140
Handicapped	78

The dominant ethnic group in Nanguruwe/Namahyakata are also ***Makonde***, most of them are moslems. Only few are christians and most of these are from Mozambique.

Nanguruwe/Namahyakata has a health centre established in 1970 and currently serving more than 10 villages. Only one traditional birth attendant was identified.

Unlike ***Mnivata/Mbambakofi,*** water is not a problem in this village. There is a water dam which supplies water throughout the year.

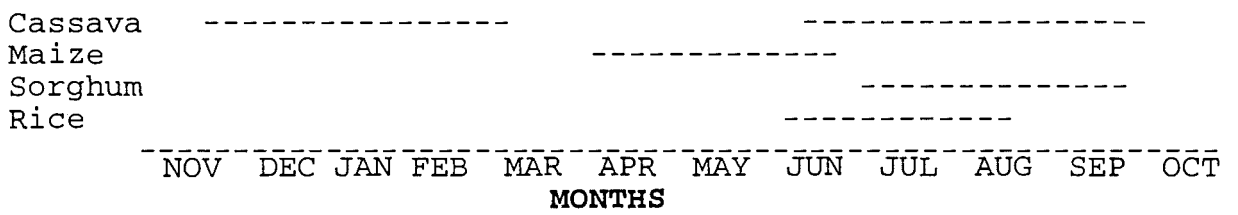
3.0. AGRICULTURAL PRODUCTION AND SOURCES OF INCOME

3.1 Main Staples.

The main economic activity in both study areas is agriculture. Nearly all households are subsistence farmers who practice shifting cultivation or forest-fallow system.

Cassava is a basic dependable staple crop through out the year (Fig. 4)

Figure 4: HOME GROWN MAJOR STAPLES.



Cassava is also treated as a major cash crop. It is intercropped with a number of other food crops such as sorghum, bulrush millet, maize, and rice. Thus, the definition of food shortage in these villages implies low cassava harvests. Other crops grown are cowpeas, sweet potatoes and several varieties of yams. The second major cash crop is cashewnuts, but smaller amounts of rice, sorghum and maize are also sold on the local market.

The number of crops intercropped in a single field depends on the size of the field. Normally people prefer to grow more than four crops (ie cassava, maize, sorghum and rice) in one field when the size of the field is as larger as two acres or more. This system of intercropping is preferred to monocropping because it is believed to take care of risks of crop output failure due to droughts, crop disease and pests outbreaks!

The local cultivation system is rather complex with a large variety of crops intercropped without tilling the land in the same field. Planting time for the individual crop varies and rarely or no kind of fertilizer is applied. In both areas planting seasons and sequence of crops is lamost

the same. During the first year after the forest has been cleared and burnt, cassava is planted first followed by rice, maize, and then cashewnut. The cassava is planted in rows but more widely spaced than the government recommendations, with grain crops interspaced in the rows. Cowpeas, sweet potatoes, pumpkins and a number of local yam varieties can also be intercropped in the same field during the first year.

In the second and sometimes up to the fourth year, the plot will only be planted with cassava and cashewnut. New areas are used for the cereals and legumes. Cassava may be planted in the same field for a third and even fourth year but people complained that yields decrease with the years.

A number of different varieties of cassava are used. They vary in maturing periods (table: 1) but also in other characteristics, eg texture, taste and storage.

Table 1: **Common Cassava varieties.**

Variety	Maturing time(Months)
Albert	8
Nanchinyanya (New farm)	8
(Old farm)	18
Ntukane	8
Limbaga	12
Kigoma	8
Super	8

After the third (or fourth-fifth) year, the land is left fallow for 10-13 years with only cashew remaining. The cashew tree indicates that the land is occupied. This will ensure that the plot is left to regenerate until the farmer decides to start another cycle of production.
The average farm size is said to be 6-10 acres in Mbambakofi and 4-5 acres in ***Nanguruwe/Namahyakata***. The biggest farm in ***Nanguruwe*** is about 15 acres.

Depending on the labour available access to cash or food to hire labour, households can continue to expand their farms. Some people feel that currently there is a trend of farm expansion. Some are complaining that much of the better farmland near the road is already occupied by the elders (but not used) and new farms have to be opened far away. Several people commented that land fertility was declining, there was no longer good farming land available closer to the villages. Thus, they wanted to get permission to clear part of the forest reserve.

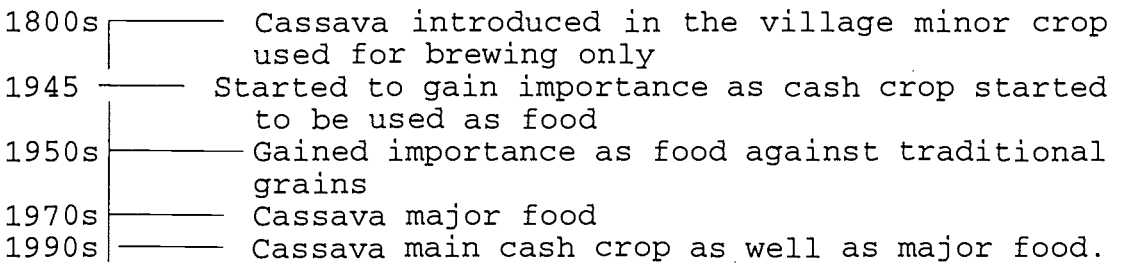
The yields of cassava are better during the first year of cultivation but declining thereafter (See table:2). All agreed however, that the yields were better in their system of intercropping than what would be possible with a monocropping system. People said that they would get 6 bags of rice if monocropped but could get 2 bags of rice plus 2 bags of maize, 1 bag of sorghum and 4 of cassava if they applied their intercropping system.

Table:2 Average Crop Yield for Main Staples.

Crop	**Yield/acre**	
	Mbambakofi	***Nanguruwe***
Cassava	5 - 7 bags	up to 10 bags
Maize	1 bag	2 - 3 bags
Sorghum	1 1/2 bags	1/2 - 1 bag
Rice	2 - 4 bags	1/4-1/2

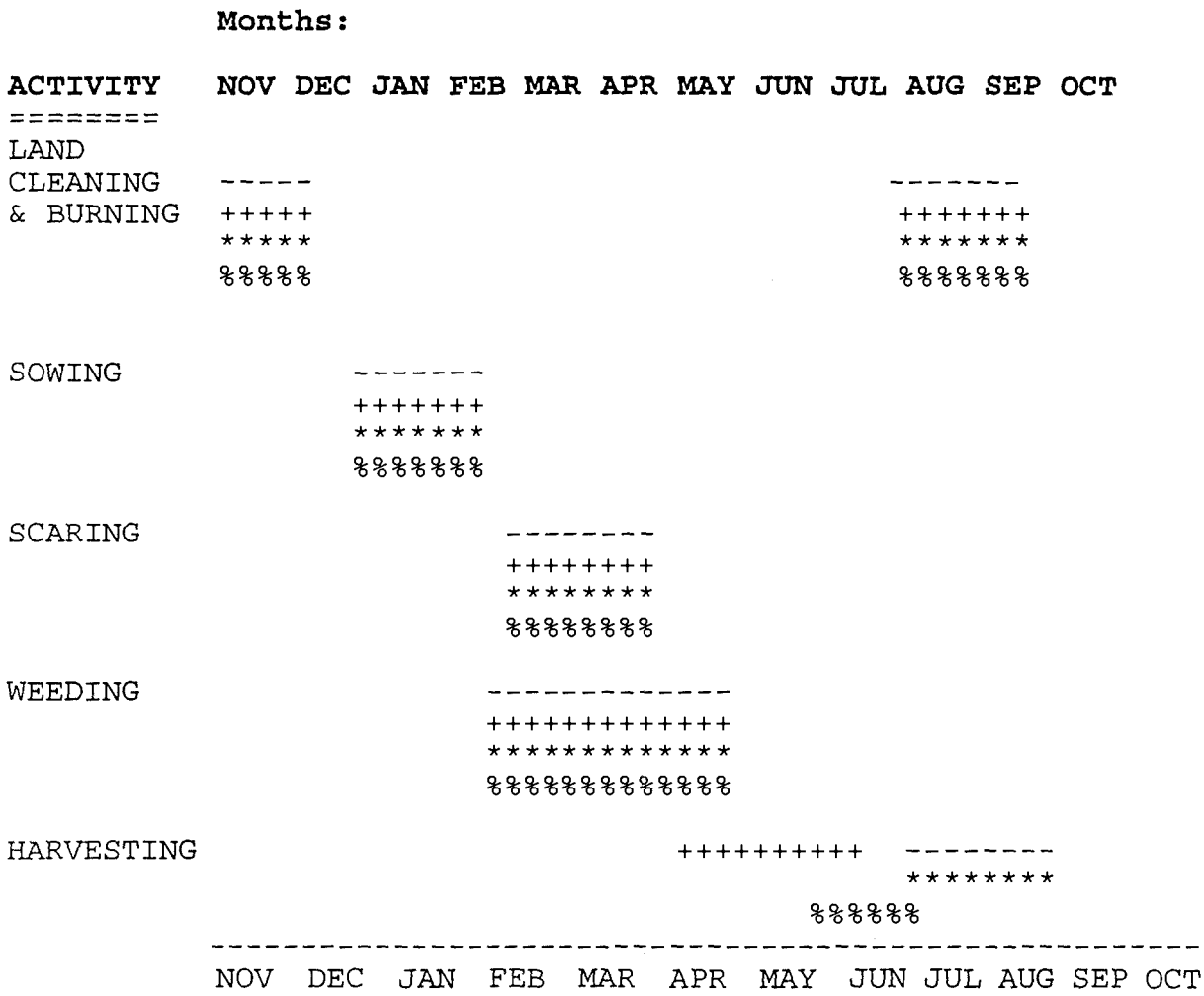
Many people commented that cassava production was expanding. Cassava has just become the priority cash crop with an assured market through agreements made with private dealers. Farmers have seen that those who sold enough cassava last year, all made enough profit to buy bicycles and other useful consumer goods. Others were planning to expand their fields this season. Up to the 1950's people relied on their traditional staples millet and sorghum sufficiently to neglect cassava as a food. In fact during that time cassava played only a minor role as cash crop and was used for local brewing beer that had to be mixed with tobacco (Figure 5).

Figure 5: TIMELINE FOR CASSAVA USES IN NANGURUWE.



Gradually cassava has gained popularity against the traditional grains as a staple. Cassava became the main staple in 1970s and was until 1989 mainly grown for food. With the current lucrative market prices for cassava, people in ***Nanguruwe*** have even stopped using it for the local brew and changed to coconut sap (***mnazi***). Cassava beer is only brewed for festivals. Harvesting of the new crops normally starts as early as April starting with maize, followed by other annuals during the months of May and June (fig.6).

Figure 6: AGRICULTURAL CROP PRODUCTION ACTIVITIES (SEASONALITY):



KEY:

--------- Cassava
+++++++++ Maize
********* Sorghum
%%%%%%%%% Rice

During the dry and sunny months of July to October, cassava harvesting and sundrying takes place. Enough cassava has to be processed to ensure sufficient supplies over the rainy seasons. Drying is difficult during the rainy months and some people do soak the thin cassava roots to speed up the drying at such times.

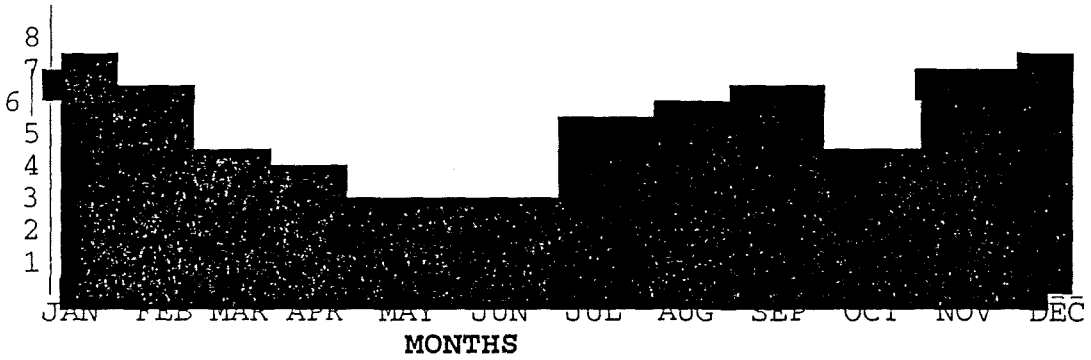
The local varieties of cashew may start producing after the third year. For better cashewnut harvests, the crop requires a substantial pesticide input and good management.

Farmers complained that it was no longer worthwhile. Production has been declining since 1970s and producer prices last season were 127/= per kg which is considerably lower than anticipated.

3.2 Labour Demand

The seasonal pattern of labour and the gender division of labour for agricultural work in the two areas follows a similar pattern to other regions in Tanzania. The busiest period, when women feel that they are overworked is during the early part of the agricultural season. This is when preparation of the fields, planting and weeding is done (Fig. 7).

Figure 7: SEASONAL CALENDAR OF WOMEN LABOUR SUPPLY.



Normally men are concerned with clearing and preparing the new fields while women often work on the old ***shamba***. In ***Nanguruwe*** both men and women were said to take part in planting of cassava and the annual crops. But in ***Mbambakofi*** this was said to be the responsibility of the women. In both study areas, the weeding of crops were all done by women.

The period of relaxation, rest and visiting friends and relatives is during May-June. At that time most of the annual crops would be harvested and people could afford to take a break before July when the harvesting and drying of cassava begins.

3.3 **Livestock**

Livestock play only a minor role in the economy of both study areas. Apart from chickens which are common in most households, only very few families are engaged in livestock keeping. In ***Mnivata/Mbambakofi*** only 10 households had goats and 2 households had sheep. It was said that there was a declining trend of number of livestock keepers and that of livestock kept.

In ***Mbambakofi***, cattle was introduced by government in the 1970's but failed to prosper. The serious water shortages and the lack of grazing land together with poor or absence of veterinary services had all contributed to the failure. To day people are not very much interested in keeping small livestock either. Only few households kept their goats tethered near their houses.

Some people expressed their willingness to use the open range livestock keeping system. But, their fear was that, if livestock were left roaming around the forest, they would cause crop damage in the forest fields or get killed by leopards or lions. This has happened sometimes within the village itself where some livestock were killed by wild animals.

In ***Nanguruwe*** however, a relatively big number of people keep livestock like goat, sheep, chicken and doves. Very few people (about 2) have cattle. Like in ***Mbambakofi***, in ***Nanguruwe*** cattle were introduced by the Government but, only few of them were surviving. Same reasons as those applied to ***Mbambakofi,*** except water shortage accounted for the failure of the programme in ***Nanguruwe*** as well.
In the nearby village of ***Namahyakata,*** cattle keeping is both done privately and communally. There are two cows communally owned under the village leadership management, while some few individual also have their own cattle.

The few domesticated animals are supplemented by wild animals which are used in large amount. The presence of ***Makonde*** from Mozambique who are good hunters has contributed to consumption of more wild animal species in the area.

3.4 Domesticated Fruits

Coconut, palms and one or two fruit trees are grown near houses. Common tree fruits include oranges, mangoes, pawpaw and bananas.

A wild plant locally known as "***Mlangilangi***" whose fruits produce a dye used in food preparations, dying of materials for making baskets and mats has also been domesticated. The plant has become more popular around many homes especially at ***Nanguruwe,*** *and it* is also sold for cash.

intensely in periods of food shortage. Many were of the opinion that it was becoming more common. People would eat ***ming'oko*** while waiting for the main meal to be prepared, or mix ***ming'oko*** with cassava for diet variations. "It's the first food we eat in a meal" (village elder's statement in group interview).

Collecting ***ming'oko*** is the work of women. It could be done throughout the year, but the peak season could be dry seasons especially during the period of transit food shortages. During the rainy season it is more difficult to find the vines as the bush grew generally thick and lush. Thus, the thin vines were more difficult to be seen.

Ming'oko is also the forest food which is most significant from an economic point of view, and which seems to have an assured growing market outside the village. In ***Nanguruwe Ming'oko*** is used extensively to complement the traditional staple, despite the fact that ***Ming'oko*** is not available within the village.

Women travel long distances ranging from 8-16 km to the nearby villages of ***Mkomo Chavi, Mtiniko*** and ***Malanje*** where ***Ming'oko*** are available in a reasonably large quantities. Normally women spend a night away and come back the next day.

Though ***Ming'oko*** are regarded as not an important commodity for sale (business) in the village, but observations indicated that ***Ming'oko*** are sold both when raw and boiled. Most people involved in this business are youths who do it on behalf of their mothers. One piece of boiled ***Ming'oko*** measuring about 10 cm long sells at 2/=. While a bundle of ***ming'oko*** with about 10-15 pieces (see picture) was sold at 10-20/=. Occasionally, cassava is sold in a fresh form. Normally it is sold in a dried form, with one kg fetching up to 25/=.

Despite this central role no significant interest has been given so far to carryout research or investigation of this wild yam variety. Only one priest in a nearby community was said to have tried to domesticate and cultivate ***ming'oko***. But, in general no one could see any advantage of doing that as the production of ***ming'oko*** was more than sufficient.

At the local ***Naliendele*** agricultural research station only minor interest has been shown to the crop. Some scientific studies on the crop has been attempted by the research station. The studies involved collecting germ plasm from the forest. First the growth was tested in a pot, but it failed to germinate well and later died.

Thereafter, another test was carried out in the farm (in normal soils) but also the crop failed to thrive. However, these tests made researchers to come up with thoughts that the crop requires soils with higher fertility for better growth. So far, no botanical name has been named though it was said that the crop belongs to the **Dioscorea spicies.** Currently it is generally called a wild yam. It was also claimed that, plans are underway to carryout studies on the nutritional value of the crop. This is going to be done in collaboration between the research centre and TFNC.

Several other wild roots and tubers were also mentioned but each was of lesser significance. Several of the local yams varieties which were domesticated were said to be found also in the wild but this was not fully verified. There was one tuber said to resemble Irish potatoes (***"Mandale", Mailu)***.

Apart from ***Ming'oko,*** and other forest fruits, ***Mbunga*** is another forest product highly preferred for its sweet taste for consumption. It is a wild grain from bamboo trees resembling rice.

Though the crop is highly appreciated but its supply occurs in long cycles. The bamboo grain ***"Mbunga"*** is produced when the bamboo tree reaches its maximum growth and after producing the grains, the tree dies. It takes about 30 years to reach its maximum growth & produce grains.

Its occurrence is traditionally associated with poor crop harvests leading to famine for that particular year. This type of wild grain is used by the people especially during food shortage.

4.1.3 Vegetables

A limited number of vegetables were also gathered from the forest, mostly during the rainy season. In the initial field visit no attempt was made to investigate the use of such foods in depth and some of the villagers thought that they were not very important.

The varieties which were commonly used included leaves from the cassava plant, wild '***mchicha***' and mucilagenous leaves like '***mlenda***' (See Appendix (iii). In ***Nanguruwe*** there were leaves from at least three species mentioned as vegetables and several water plants growing in the pond.

4.1.4 Animal Products

Wild animals are considered as a nuisance in Mbambakofi, because they destroy crops. This is due partly to its being part of the reserve forest which harbours a lot of vermins. However, in ***Nanguruwe*** the wild animals are hunted for food. Hunting is done mostly by the Mozambican ***Makondes*** who are traditionally hunters. The animals which are widely hunted include wild pigs, hogs, birds, gazelle, rabbits, dikdick. A list of animals and birds that are hunted could be seen on appendix (v) . During hunting the Mozambican ***Makonde*** team up with the upland ***Makondes*** who are moslems and who

actually do the slaughtering of the animals, so that they can be used by the rest of the community. The use of wild animals for food could be of great importance to the community, as there are very few domesticated ones.

4.1.5 Honey

Use of honey in this communities is very minimal. There is only one beekeeper at ***Mbambakofi.*** This person was initially a traditional beekeeper and has now been supplied with modern beehives.

4.2 Medicinal use.

A number of forest plant products were also mentioned as home-remedies both in prevention and treatment of common health problems. An initial list from the first visit is given in appendix (i).

Knowledge and use of plant medicines was not limited to traditional healers only. On the contrary, most people would mention or show the common plant medicines and describe how they would be applied as a first "home cure" for different ailments.

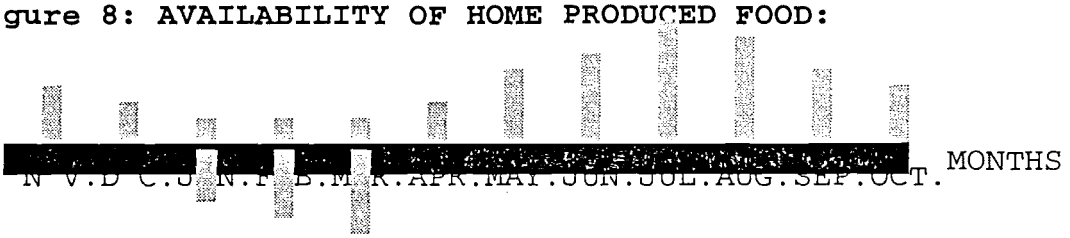
4.3 Preferences and trends.

Most of the food items mentioned could be used mostly for diversity of the diet, however ***Ming'oko*** seems to be playing a crucial role in food security. It has been shown to be used for complimenting the usual diet and also as a supplementary food in lean months. The degree of dependency on forest products will be explored during the second visit.

4.4 **Food shortages and crisis.**

For people in ***Mbambakofi***, food security is basically perceived as sufficient stores of cassava up to the time when the new crops are harvested. Shortages and bad years were described as situations where people have to resort to harvesting thinner cassava roots. This has normally been occurring during the December-March a period of transit food shortage (hunger seasons - see fig. 8).

Figure 8: AVAILABILITY OF HOME PRODUCED FOOD:



During this period people rely heavily on the ***Ming'oko*** roots as a coping strategy.

With the new role of cassava as a cash crop, women were fearing worse food shortages in future as their husbands would sell off too much of the food stock.

The views of men and women were clearly different on the issue of whether food shortages were common or not. Men generally did not consider food insecurity as a major issue, at least not in ***Mbambakofi.*** On the contrary most women rated food shortage was a problem and that this was compounded by the fact that cassava functioned as both major staple and cash crop.

Serious food crisis for the entire community did not seem to be a major issue. But, most villagers would recall some years when food shortages were more severe because of drought, or would agree that some households had problems in meeting the food needs. They all described various strategies through which food insecure households coped with during hunger periods.

Besides increased use of immature cassava and ***Ming'oko,*** other coping strategies to overcome the hunger season include food for work or rely on relatives for food assistance or use cash to purchase.

In years of more severe crisis people would resort to famine foods. Several types of toxic roots were mentioned including ***Malondolo*** and ***Hyangadi***. The process of detoxification was described to be labourious.

5.0. Current and emerging issues:

A number of concerns issues related to food security and the future were brought up in conversations with both men and women in the two study areas.

The overwhelming problem in the ***Mnivata/Mbambakofi*** area is water. Water collected from the storage tanks or the hand dug holes and wells in the dry river valley would only last for 9-10 months.

After that women have to walk several kilometres to get water from other distant sources. This goes on up to the time when the tanks begun to fill again. Over forty of the 53 storage tanks were in need of repair and no cement was available even in the Mtwara town. The problem was acute at the time of the preliminary review. However, the local, district and the region authorities were aware of this touchy problem.

The declining productivity and deterioration of forests and forest lands is a central concern in both study areas and linked to several of the listed problems. The forest-fallow system of shifting agriculture is under increasing stress for reasons of population pressure (natural and immigration) and desire to expand cassava cultivation. Over time farmers have had to clear for new fields further away from the village. Many now complain of time consuming and

tiresome long walk distances to the fields. Farmers in both study areas try to increase farm production through expansion of the cultivated area. In some cases they try to meet their increased need through longer use of the same fields or shortening the fallow periods. Still many complain of continued declining yields. The dependency on forests to sustain agricultural production and as a supplementary source of non-agricultural income is gradually becoming more difficult as most of these are also forest based. The collection of forest products for cash income is becoming more difficult and the availability of forest foods is also declining.

People in both ***Mbambakofi*** and ***Nanguruwe*** complain for declining fertility of land and "Land-shortage" (ie no more dense, virgin forest for their new fields). In ***Mbambakofi,*** forest foods seem still available in abundance while in ***Nanguruwe*** people already have to walk long distances to find these products.

6.0 COMPARISONS BETWEEN THE TWO VILLAGES:

(i) BASED ON: (1) AVAILABILITY OF RESOURCES.

MBAMBAKOFI	***NANGURUWE***
*1. Kuchakuni	*1. Kuchakuni
2. No Mfumaki	2. Mfumaki
3. Sufficient land with relatively low fertility	3. Sufficient land with high fertility
4. Farms near home	4. Distant farms from home
5. More area with thick forest	5. Less area with thick forest
6. Water shortage	6. Have adequate water supply
7. Low population	7. Density populated with high influx of people from other areas particularly Newala.
*8. Have School	8. Have School
9. Have less Social facilities	9. More Social facilities

NB: * - Indicate Common to all villages.

(ii) BASED ON 2: USE OF RESOURCES

MBAMBAKOFI	***MANGURUWE***
1. No forest based small business	*1. More forest based small business.*
**2.High use of forest food products*	**2. High use of forest food products.*
3. Less use of animal products	*3. More use of animal products*
4. Walk less distance to collect forest products.	*4. Walk long distance*

5. Less cassava production	*5. More Cassava products*
6. Less variety of crops grown	*6. Wide variety of crops grown.*
**7. Livestock keeping is minimal*	**7.Livestock keeping is minimal*
8. More complains about wild life destroying	*8. Less Complains*
9. Less urbanized	*9. More urbanized*
**10. Lean months hunger seasons common to both*	
**11. Share the same rainfall patterns and crisis periods are the same*	
**12. Same coping strategies during hunger/food shortage periods.*	
13. Long fallow periods	*13. Shorter fallow periods*
14. Gets most of the forest fruits	*14. Only some of the forest fruits*
15. Mostly Makonde moslems from Makonde Mainland	*15. Mixed with other tribes few Christians and majority muslims.*

<u>NB:</u> Indicate common to all villages

7.0 COMMENTS FROM THE PARTICIPANTS ON THE RAP METHOD

1.(a) It is an easy method, but, possibilities for repeating the same respondents is high especially if you have a large team in small village.

(b) Solution to the above (a) is:-

- to have a better preliminary arrangements at village level.

- the size of the survey team should be proportionate to the size of the village.

2. The method can be adjusted according to the community needs. It is also seems to be approximately right or precisely wrong.
3. It is faster and cheaper
4. The investigator need to be able to interview and need be interested in the subject.

5. Can be useful for community forest activities in Mtwara for TFAP and RFAP at both National and Regional respectively.

8.0 PRELIMINARY CONCLUSIONS:

1. Community dependency on forest for farm land (Shifting Cultivation) presently the community feel that there is a decline in land fertility.

2. There has been an intensive use of forest products for food particularly ***Ming'oko.***

   The use is more pronounced during food shortages. In some cases forest food are used in the case of changing diet and sometimes as a source of income.

3. Fuelwood is not a problem, but choice of suitable wood could be a problem because most suitable woods has been depleted and they are found deeper into the forests.

4. There is a seasonal food shortages and some houses could be severely food insecure.

5. Cassava production could expand with time as it becomes a cash crop. This as it becomes a cash crop. This can have a considerable consequences on forest deterioration. Because farm land expansion goes concomitantly with deforestation.

Appendix (i)

List of trees used for medical purposes

Tree (Makonde) Name	Scientific name	Part of a tree used	Diseases it treats
Mpera (guava)		Leaves	Stomach pains
Papaya		Leaves	Constipation
Mnyangagambi		Roots	Constipation bilharzia
Mnyangagambi		Leaves	ear pain
Mtumbati		Leaves	Coughing, chest pain
Mhuhwe		Roots	Hernia
Msimbarure		Roots	Hernia
Mkatoha		Roots	Hernia
Mtoromanga		Roots	Convulsion
Msonobari		Leaves	Diarrhoea
Mnungo		Leaves	Diarrhoea
Ntalu		Leaves	Diarrhoea
Msofu		Roots	Bilharzia
Mkatika		Leaves	Stomach pain
Namalale		Leaves (leaves)	Malaria
Mwarobaini			Many diseases

Appendix (ii):

List of forest roots used as food

Makonde Name	Swahili	English/ Elab.	Scientific Name	Season Available
Ming'oko*		Wild yam		**Whole year**
Vinjamilwa		Yams		**Aug-Dec**
Vitundu		Yams		Aug-Dec
Matu			**Dioscorea bulbifera**	**Aug-Dec**
Luvale				**Aug-Dec**
Mandale, Mailu		Potatoes		Aug-Dec
Vihambo				
Malondelo				
Lyamna				
Lyangadi				
Cereals				
Mbunga		Bamboo grains		

***Most Pentful**

Appendix (iii):

Forest Vegetables

Makonde Name	Swahili	English/ Elab.	Scientific Name	Season
Kisamfo	Kisamvu	**Cassava leaves**	**Manihot gravii**	**Nov - May**
Mchicha	Mchicha	**Amaranthus**		"
Lilende	Mlenda	**wild onion**		"
Chinyanje				"
Litetedi				"
Lihakwe		**Amaranthus**		"
Nandimu				"
Natolo				"
Mushrooms (fungi)				**Highland valley**
Utoko				Dec - Jan
Mbohu				"
Ujenga				"
Livanga				"
Utuga				"
Ubulna				"
Hukundulekele				"
Litembo				"
Ubulva				"
Ukundubekate				"
Kiungolo				"
Vehivehi				"
Msinda				"
Upambai				"
Mwikambo				"
Myenja				"

Appendix (iv):

Forest Fruits

Makonde Name	Swahili	English / Elab.	Scientific Name	Season
Muembe	Mwembe	**Mango**	**Mangifera indica**	**Nov-mar**
Matili, Maungo	Mabungo	**Climber**		**Dec-Apr**
Usofu				Dec-Apr
Mpwipwi			**Lannea Stuhlmanni**	Dec-Apr
Mahama				Dec-Apr
Jiminji	Zambarau			Dec-Apr
Vitolo		**Climber**		Jan-Feb
Makuyu			**Sterarlia appendiculata**	Jan-Feb
Mongo				Jan-Feb
Ukwaju	Ukwaju		**Tamarindus indica**	Jan-Mar
Uheu, Usegevu				Jan-Feb
Uhuhwe				Jan-Feb
Mwambo, Kwambo				Jan-Mar
Jinjunju, Vingolongondo				Jan-Mar
Umbendu				Jan-Mar
Vidunguli				Jan-Mar
Ukudimwali				Feb-Mar
Utahu				Mar-Apr
Jihulu	Fulu			May-Aug
Mambila, Mambilu				May-Sept
Matope			**Annona Senegalensis**	May-Sept

Unjuchu				May-Aug
Likonda				July-Aug
Ubabede		Pulp as spice		July-Oct
Mapera	Pera	Guava	Psidium guajara	a whole year
Mangongwa				"
Matengo				Jan- Feb
Jangadi				
Malondolo				
Uhangu				
Maolwa				
Vitele				
Jihyokela				
Mangare				
Ndelelele				

Appendix (v):

Wild animals

Makonde name	Swahili name	English name	Scientific name	Season of availability
Mbutuka				
Nungu	Nungunungu	**Porcupine**		
Ng'onde	Paa	**Gazelle**		
Mbavala	Mbawala	**Rabit/hare**		
Sungula	Sungura	**Wild pig**		
Nenje				
Nguruwe	Nguruwe			
Fungo	Fungo			
Ntavala				
Ntoda				
Ng'ube				
Nkuli				

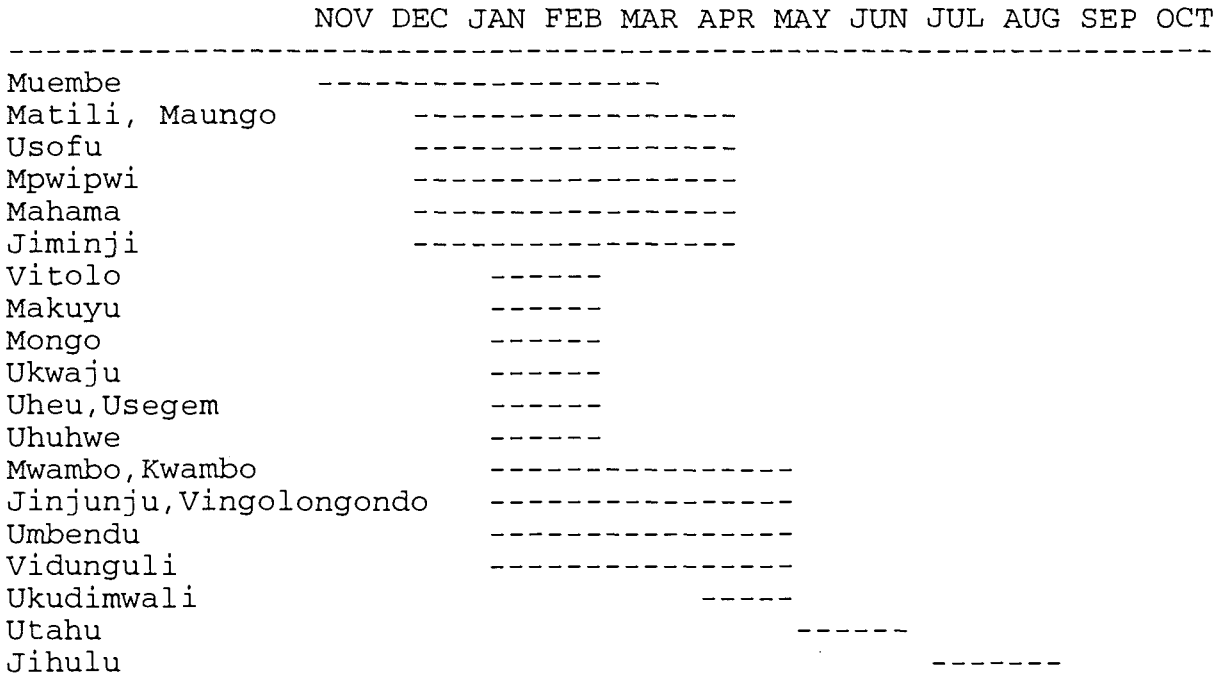
Appendix (vi):

Wild Birds

Makonde Name	Swahili Name	English elaboration	Scientific Name	Season of availability
Nantindi				
Nantipitila	**Dudumizi**			
Ndinya				
Makatavala				
Likwili				
Chilanga				
Mdela				
Machende				
Ndandili	**Kanga**			
Vangolongolo				
Chimbutu				
Nanjalahu	**Mlasiafu**			
Chiviti				
Namanje				
Chididi				
Nswisi				
Kereng'ende				
Kororo				

Figure 9(a): SEASONAL CALENDER: AVAILABILITY OF FOREST FOODS.

1. **FRUITS**



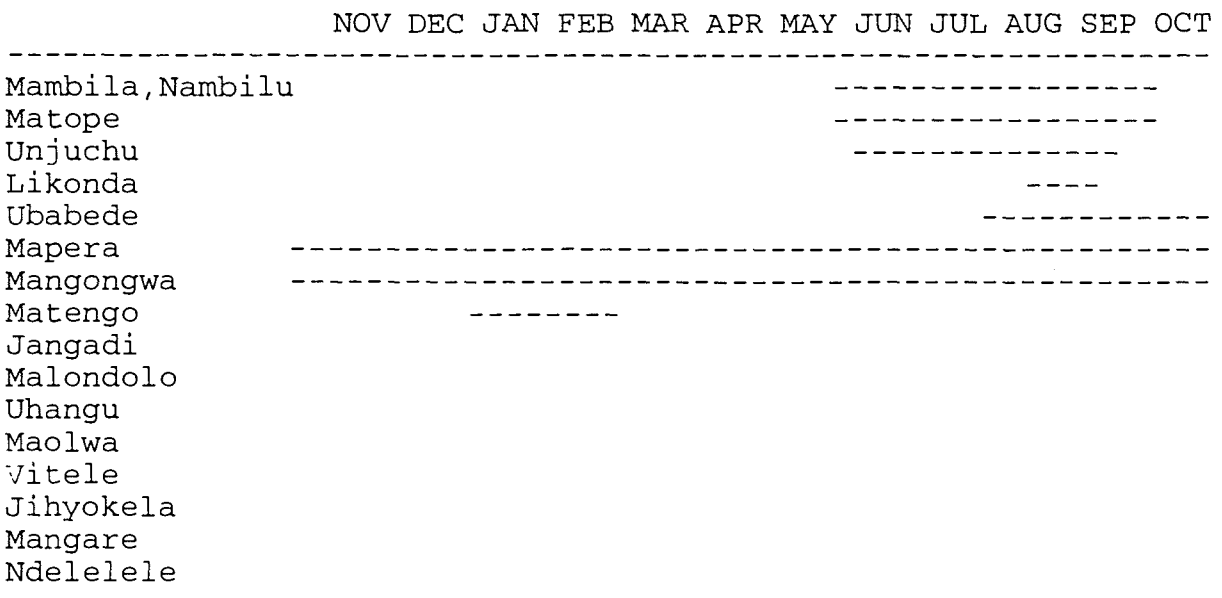


Figure 9(b): AVAILABILITY OF DOMESTIC FRUITS (MBAMBAKOFI)

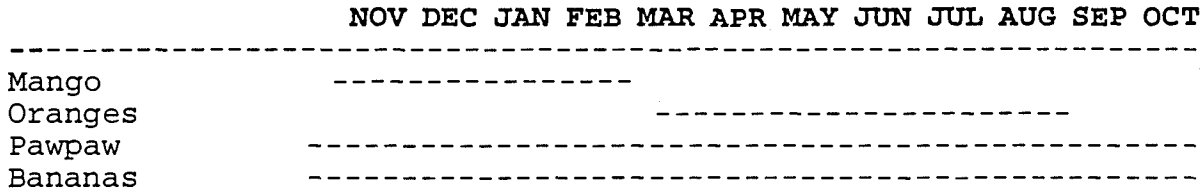


Figure 9(c): VEGETABLES

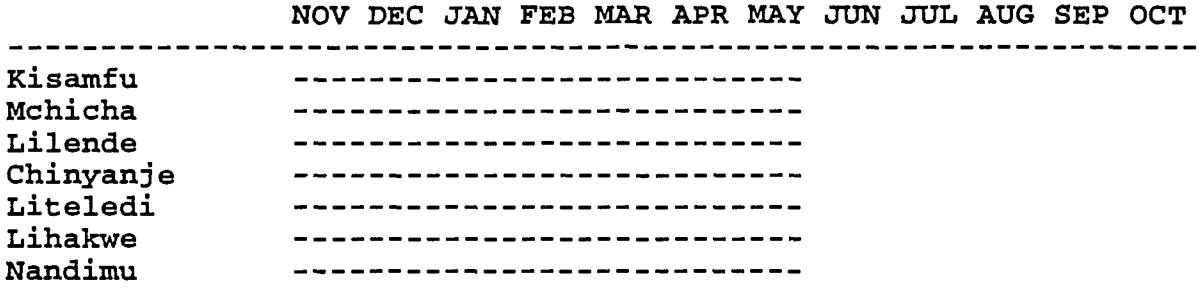
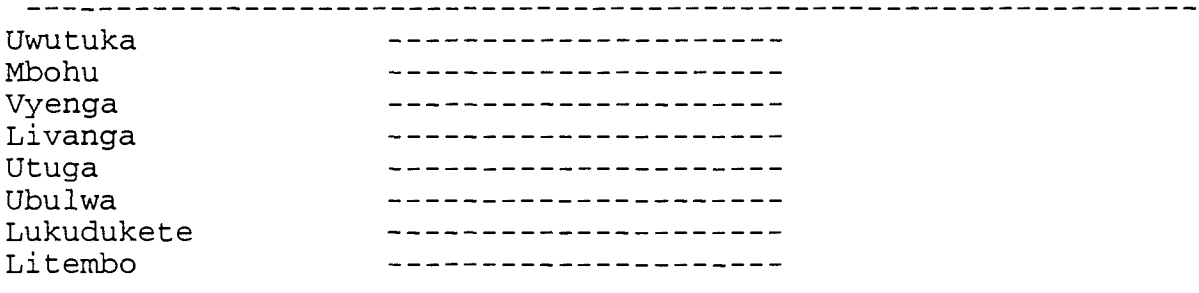


Figure 9(d): Mushrooms

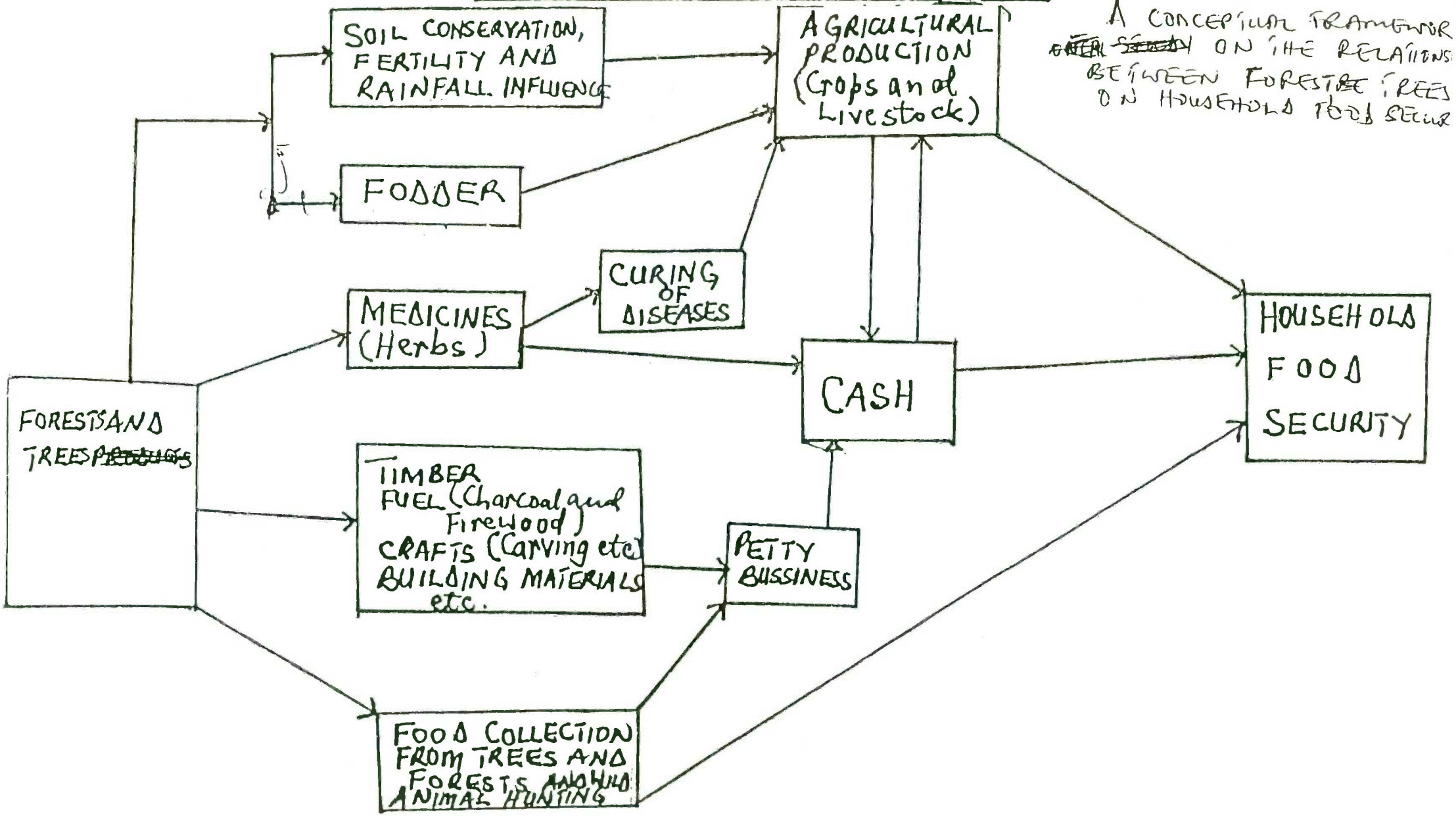


PLANNED ACTIVITIES FOR THE 2*nd* PHASE
(MAY / JUNE 1993)

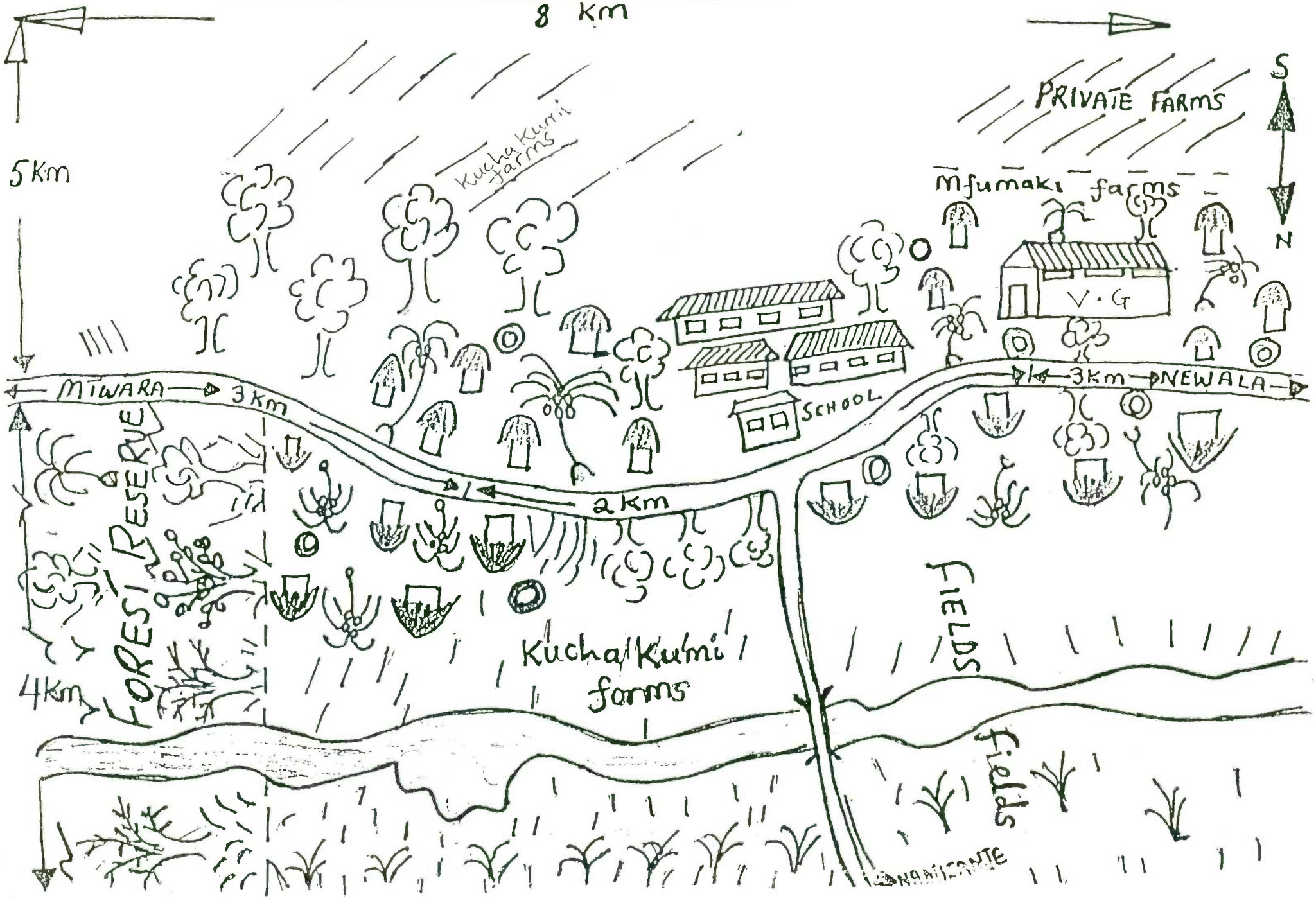
1. Compare food insecure households (Who, Why and how many).
2. Role of different formal and nonformal institutions eg. research center's)
3. Case examples on:-
   (a)
   (b) Progressive farmers
4. Role of forest and tree products in infant and young child feeding and health questionnaire.
5. Firewood: Accessibility of preferred tree spices
6. Present and planned community forest activities
7. Check on the domesticated forest food crops
8. Check on the degree of dependency of forest and tree products on household food security.

Figure 1: A CONCEPTUAL FRAMEWORK OF FOREST AND TREE PRODUCTS DEPENDENCE ON HOUSEHOLD SECURITY.

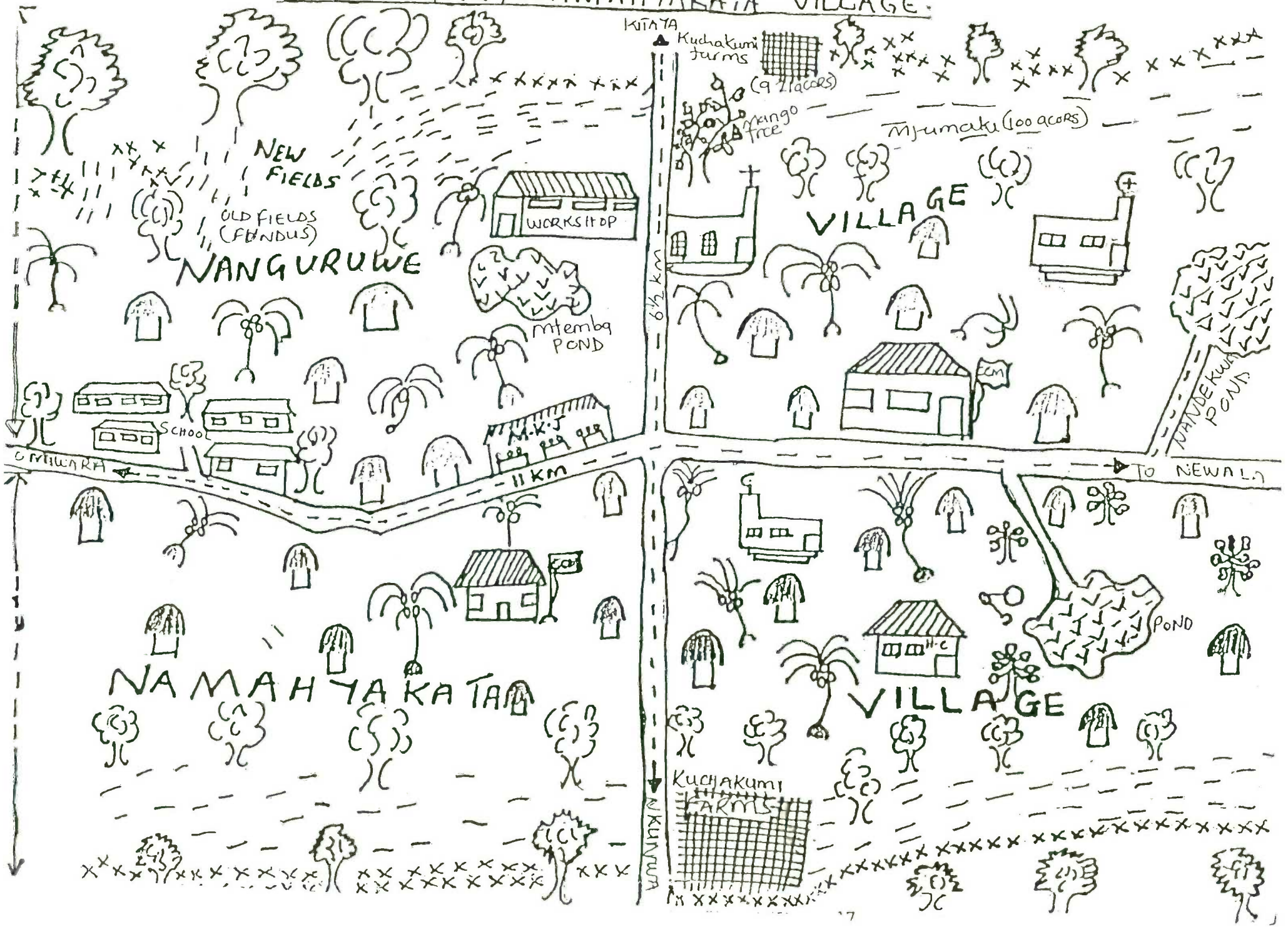
A CONCEPTUAL FRAMEWORK ON THE RELATIONS BETWEEN FOREST TREES ON HOUSEHOLD FOOD SECUR



MAP 1: MBAMBAKOFI / MNIVATA VILLAGE.



MAP 2: NANGURUWE / NAMAHYAKATA VILLAGE.



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