

**Potentials of Non Wood Forest Products in
Household Food Security in Tanzania: The Role of Gender Based
Local Knowledge**

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REPORT

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SUMMARY

This study was undertaken to synthesize existing information on the role of gender-based local knowledge in utilization of wild foods and other non-wood forest products for household food security in Tanzania. The study aimed at generating useful knowledge for advocacy, policy making and training. The specific objectives of this study were firstly, to assess issues of accessibility and dependency on wild foods and other non-wood forest products for household food security in the country, secondly, to examine the difference between women's and men's local knowledge with regard to collection, processing and utilization of wild foods and other non-wood forest products, and thirdly, to identify potentials and problems/threats with regard to availability of non-wood forest products for household food security.

Literature from different authorities was critically synthesized to achieve the study objectives. The available information shows that there exists a wide range of wild foods and non-wood forest products, which are important for household food security. Non-wood forest products contribute through direct consumption of harvested wild foods and indirectly through income generation.

The study revealed that there exists ascribed local knowledge between men and women on selection, preparation, utilization, storage and even consumption of wild foods. Furthermore, the study has revealed that non-wood forest products are of vital importance as tools for coping with food shortage and famines. The nutritive value of most wild foods is good and sometimes better than domesticated expensive foods.

Despite of all the positive attributes of non-wood forest products, sustainable use of these resources is faced with problems of deforestation, lack of proper forest management regimes and non-homogeneity of non-wood forest products users. However, there exist some opportunities to improve the use of non-wood forest products for sustainable household food security; such as the diversification of forest management systems to incorporate locally valuable non-wood forest products, encouraging fruit trees growing in farms, providing market support and supporting small scale forest based enterprises.

From this study it can be concluded that gender based local knowledge is a central issue in the selection, collection and preparation of wild foods. While women are very much knowledgeable about direct food consumption activities, men are more knowledgeable and responsible with income generating non-wood forest products. Furthermore, it can be concluded that the nutritive value of wild foods is substantial and can be used as substitute to the expensive domesticated food items. It is further concluded that increasing pressure of modernization is a problem facing expansion of non-wood forest products for household food security.

From the findings of this study, it is recommended that the government, non- governmental organizations and individuals should target women when committing themselves to household food security. It is further recommended that there should be policy interventions to sensitize people on the use of wild foods as substitutes for the domestic ones. Nutritive values for different wild food items be assessed and used to improve food and nutrition security. It is also recommended that detailed study be conducted on local knowledge before it is lost through modernisation. Last but not least quantification of the contribution of non-wood forest products in food security equation should be done.

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LIST OF ABBREVIATIONS

CHAWATIATA	-	“Chama cha Waganga/Wakunga and Tiba Asili Tanzania”
FAO	-	Food and Agriculture Organization of the United Nations
MLNRT	-	Ministry of Lands, Natural Resources and Tourism
MNRT	-	Ministry of Natural Resources and Tourism
NTFP	-	Non- Timber Forest Products
NWFP	-	Non - Wood Forest Products
SUA	-	Sokoine University of Agriculture
TFNC	-	Tanzania Food and Nutrition Centre
TMPs	-	Traditional Medicine Practitioners
TShs	-	Tanzania shillings
UDSM	-	University of Dar es Salaam
UNICEF	-	United Nations Children Fund
URT	-	United Republic of Tanzania
USD	-	United States Dollar

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1. BACKGROUND

1.1 Introduction

Food security has been an important theme in the debate of rural development and poverty alleviation policies in many developing countries. Despite the substantial increase in food production in many countries, 790 Million people in developing world do not have enough to eat. Another 34 million people in the industrialized countries and countries in Transition also suffer from chronic food insecurity (FAO 1999a). If all the World's undernourished people were gathered together, the population of the continent of the hungry would dwarf that of every other continent except Asia (FAO 1999a).

It is argued that in aggregate terms, Tanzania has no food shortage (URT and UNICEF, 1990; Kavishe and Mushi, 1993). However, some parts of the country are prone to food shortages due to drought, flood, market and transport constraints that hinder smooth transfer of food from surplus areas to deficit ones. Thus availability of food at national level is not translated into household food security or equal access among all members of the household. At a household level food security entails having adequate supply of food. Adequate refers to quantity and quality; that is there should be enough food to meet daily requirements of all members of household (Mosha, 1990).

Causes of food insecurity have been identified as being crop failures, storage deficiencies and sale of food in higher proportions than food security would require (TFNC, 1992). It is clear that the problem of food insecurity has often been looked into in a narrower sense, with a bias on direct agricultural production. The problem of food insecurity is not simply one of agricultural output, but encompasses all factors affecting households access to an adequate year round supply of food. For example it is known that in Tanzania a widespread hunger prevailing particularly in semi arid areas is not due to inavailability of food in the market but due to inadequate purchasing power among the rural poor. Consumer purchasing power has been declining over the years in Tanzania. The hardest hit is the urban low wage earners and the rural poor who usually face food deficit and as such have to buy food.

Rural Tanzanians are relatively poorer than their urban counterparts. The average rural per capita is 63 percent of income in urban areas. About 85% of all poor people live in rural villages. Declining real farm income, increasing pressure on good land and opportunities for off farm earnings created by new economic policy of liberalization has caused expansion of rural - non farm sector. There is evidence that the process of de-agrarianization in rural Tanzania has been widening. De-agrarianization refers to the tendency that rural people show of shifting part of their efforts from agriculture to other non-farm activities. Rural wage labour is increasingly assuming importance in both agricultural and non-agricultural labour markets. The proportion of non - farm cash income in total cash income per household has been rising from 25 per cent in 1969 to 47 per cent in 1983 (Bagachwa, 1994). It is no wonder that part of this income is obtained from forest resources, thereby forest resources contributing indirectly to household food security.

Analyzing questions of food security in a broader sense allows us to capture the potential contribution of forest resources to household food security. It is a known fact that most rural poor are supplementing their food requirements from the forests. However, systematic studies and documentation of the potential of non-wood forest products are fragmented. This report

synthesizes the work done along the lines of the contribution of non-wood forest products to the household food security. It points out information gaps and suggests ways on how such gaps can be addressed.

1.2 Problem Statement and Justification

Trees and forests play important role in food security. For many foresters the issue of food security may seem to be a concern which goes far beyond the domain of their profession and yet in many areas, forests and trees provide critical support to food security (Kajembe, 1994).

Forests and trees do have an important role to play in food security, although it is clearly wrong to suggest that forests and trees can replace agriculture as a food production system to any significant extent (FAO, 1990). This role has been ignored in the past because many of these resource values have not been picked up in standard income consumption - expenditure surveys. This points to some flaws in standard estimates of rural welfare. Forests and trees have the potential benefits either as a regular dietary supplement, as a seasonal supplement or as a survival strategy, which are so far not well captured and explained.

Women and men's knowledge on drought resistant seeds, wild foods including fruits, tubers roots and vegetables and medicinal plants has assisted in ensuring rural - based - household food security. Studies in rural development indicate that both women and men are in good position to explain their local environment, strategies of ensuring maintenance of the ecosystem and many aspects of indigenous tree species such as timing for flowering, fruiting, growth, of such trees and their nutritional values (Kajembe, 1994).

However issues of accessibility and dependency on NWFPs are not well synthesised and documented . Moreover scarcity of NWFPs, that contribute to the household food security directly or indirectly, is already being experienced as a result of increase in population, non domestication of NWFP sources and dilution of indigenous knowledge in the wake of modernization. The indigenous knowledge should be documented to ensure its widespread use and build up an institutional memory.

Tanzania is a huge country with more than 120 ethnic groups. Each of those groups has different cultural norms, beliefs and practices and hence different food habits. A study that seeks to bring together information on potentials of wild foods and other non-wood forest products addressing problems related to food insecurity in rural Tanzania will go a long way towards enriching policies regarding food security. An understanding of the significance of forest products to the rural communities contributes substantially towards working out possible strategies for involving these communities in the management of forests. It is essential also to investigate the importance of forests to the daily life of local communities in their struggle to make ends meet, a struggle which can sometimes threaten the forests (Kessy, 1998).

1.3 Study Objectives

1.3.1 Overall objective

To synthesize useful information for advocacy, policy making and training on the role of gender based local knowledge in utilization of wild foods and other non-wood forest products for household food security in Tanzania.

1.3.2 Specific objectives

1. To assess issues of accessibility and dependency on non-wood forest products in relation to household food security in the country.
2. To examine the difference between women and men's local knowledge with regard to collection, processing, and utilization of wild foods and other non-wood forest products.
3. To identify potentials and problems/ threats with regard to availability of non-wood forest products for household food security.

1.4 Research questions

The study addresses the following research questions:

- What is the current importance of wild foods in household food security in Tanzania and what are the future potentials?
- Who (within the household) has a stronger dependency on wild foods between men and women and why?
- Who collects the wild foods, who knows how and where to collect and what to collect?
- Who is responsible for the management of wild foods, including storage of products and management of seeds?
- What are the problems/ threats facing utilization of wild foods and other non wood forest products and what need to be done to overcome the problems/threats?

1.5 Scope and Methodology of the Study

This is a desk study that synthesizes information on the actual and potential use of non-wood forest products for household food security in Tanzania. The literature cited is therefore mostly from Tanzania. Where necessary literature from elsewhere is used to illustrate some points or give examples that are not well covered by the existing literature from within the country.

This study has chosen one class of goods – Non Wood Forest Products (NWFP) because wood products have traditionally been conceived as the only important products from the forest and management was geared towards the production of only such products. This tendency undermined the role of NWFP in the livelihood systems of rural people. The study restricts itself to the role of NWFP in household food security in the rural areas in view of the urgent need to understand the problem of food insecurity in the broadest sense possible.

2. CONCEPTUAL FRAMEWORK

This section clarifies the conceptual framework within which pertinent issues to the study

will be analyzed. It also defines some key concepts in the study.

2.1 Definitions of Key Concepts

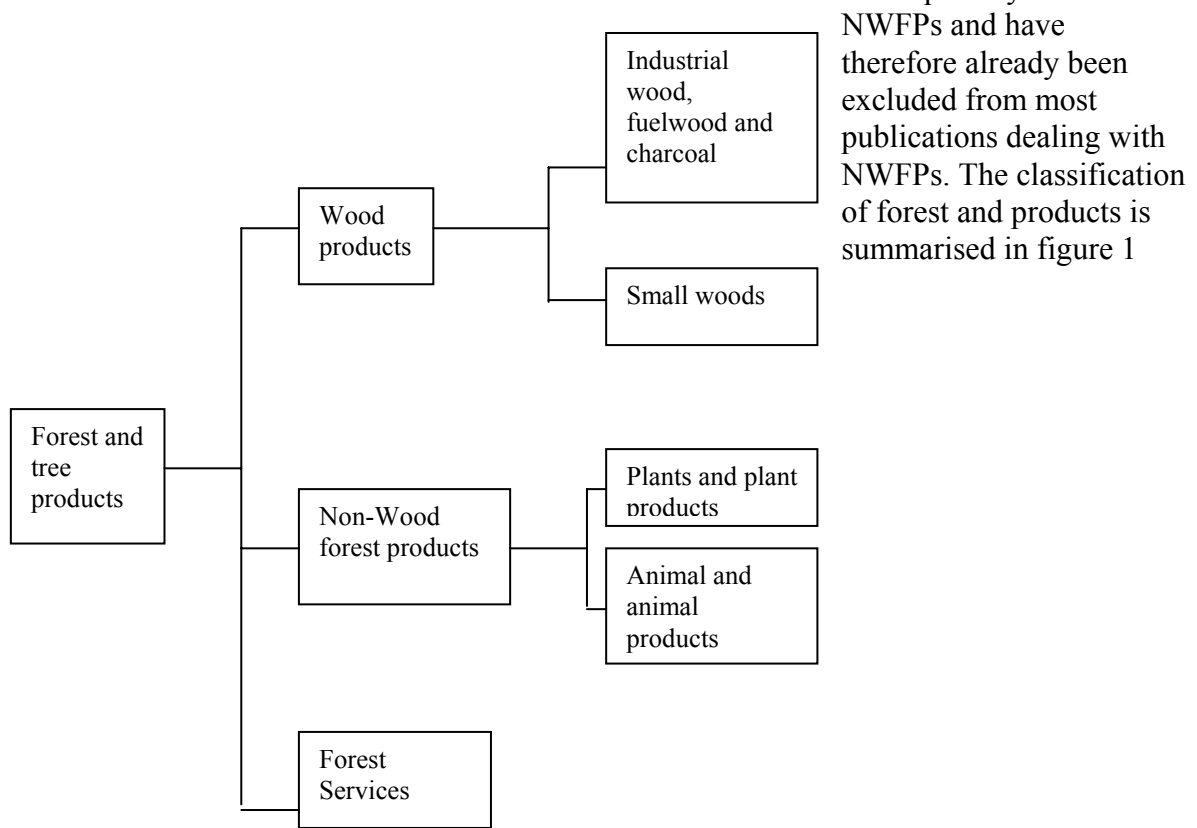
2.1.1 The Concept of Wild Resource and Non Wood Forest Products

It is important to distinguish between wild and non-wild resources. To qualify as a wild resource, the resource must be freely provided by natural processes (Cavendish, 1997). The main purpose of this emphasis on free provision is to rule out cases whereby the households expend labour on resource management and rule in cases where they do not. It follows that crops in fields are clearly not wild, as they are intensively managed, whereas certain leaf vegetables grow spontaneously in fields without planting or weeding, and are considered as wild. Likewise exotic fruit trees are usually planted in homesteads and tended carefully, whereas there may be indigenous fruit trees, also found at homesteads but not tended. These two resources are classified as non-wild and wild, respectively.

It is also important to clarify the term Non Wood Forest Product (NWFP); According to FAO (1999b) Non Wood forest products consist of goods of biological origin other than wood derived from the forests, other wooded land and trees outside the forests. Following this definition the term NWFP excludes all woody raw materials. Consequently timber, chips, charcoal and fuelwood, as well as small woods such as tools, household equipment and carvings are excluded. Non timber forest products (NTFPs) in contrast generally include fuelwood and small woods, this is the main difference between NWFPs and NTFPs.

NWFPs should be derived from forests and similar land uses. Since plantations are also included in the FAO definition of forest, NWFPs that are obtained from plantations, such as gum arabic (*Acacia senegal*) or rubber (*Hevea brasiliensis*), are thus included in the definition of NWFPs. NWFPs are therefore derived from both natural forests and plantations,

The term "product" corresponds to goods that are tangible and physical objects of biological origin such as plants, animals and their products. Forest services (e.g. ecotourism, grazing, bioprospecting) and forest benefits (e.g. soil conservation, soil fertility, watershed protection) are excluded. Services and benefits are even more difficult to assess and quantify than



Source FAO 1999b

Figure 1 Classification of forest products.

2.1.2 The concept of food security

Food security has been given different definitions and received varying interest in the past. The Committee on World Food Security defined food security as economic and physical access to food for all people at all times (FAO, 1989a). The World Bank defined food security as the access by all people at all times to enough food for a healthy and active life (Maxwell and Frankenberger, 1992). Conventionally, food security is defined as the balance of food supply (mainly cereal supply) and effective demand for food.

Ishengoma (1998) systematized food security concerns in Tanzania at different epochs. In the 1970's food security was mostly concerned with food supply, usually in the form of grain stocks and was being applied at regional or district levels. In the 1980's the focus shifted to questions beyond supply. It also included access to food at household and individual level (Maxwell and Frankenberger, 1992). Emphasis was also placed on food chain as a component of food security analysis to encompass production, marketing and consumption.

The World Bank definition of food security cited above has been widely accepted. It encompasses two elements:

- ◆ Food supply and
- ◆ The access or the ability of a household to acquire food, either through their own production or purchase.

Access to food can be seen as the process through which food reaches people. It also signifies that the level of analysis is no longer only the region or district. It must also encompass the household or the individual. Household food security prevails if the actual food intake of all household members required to fulfil their dietary requirements is secured in terms of both quantity and quality throughout the year (Mosha, 1990).

Household food security concerns the microeconomics of the household. In particular it

describes the use of food in the household, access to it by various members in the household, household survival strategies and the role of gender. In addition, household decisions concerning the use of

resources, output and cash income are some of the important critical variables in the overall household food security analysis (Ishengoma, 1998).

Therefore a household is said to be food insecure when it fails to meet its dietary food intake in terms of quantity and quality. There is evidence to suggest that household food insecurity is widespread and chronic in some areas of Tanzania, since there seems to be certain degree of food deficit at one time or another during the year. This is especially true prior to harvesting season.

2.1.3 The Concept of Gender–Based Local knowledge

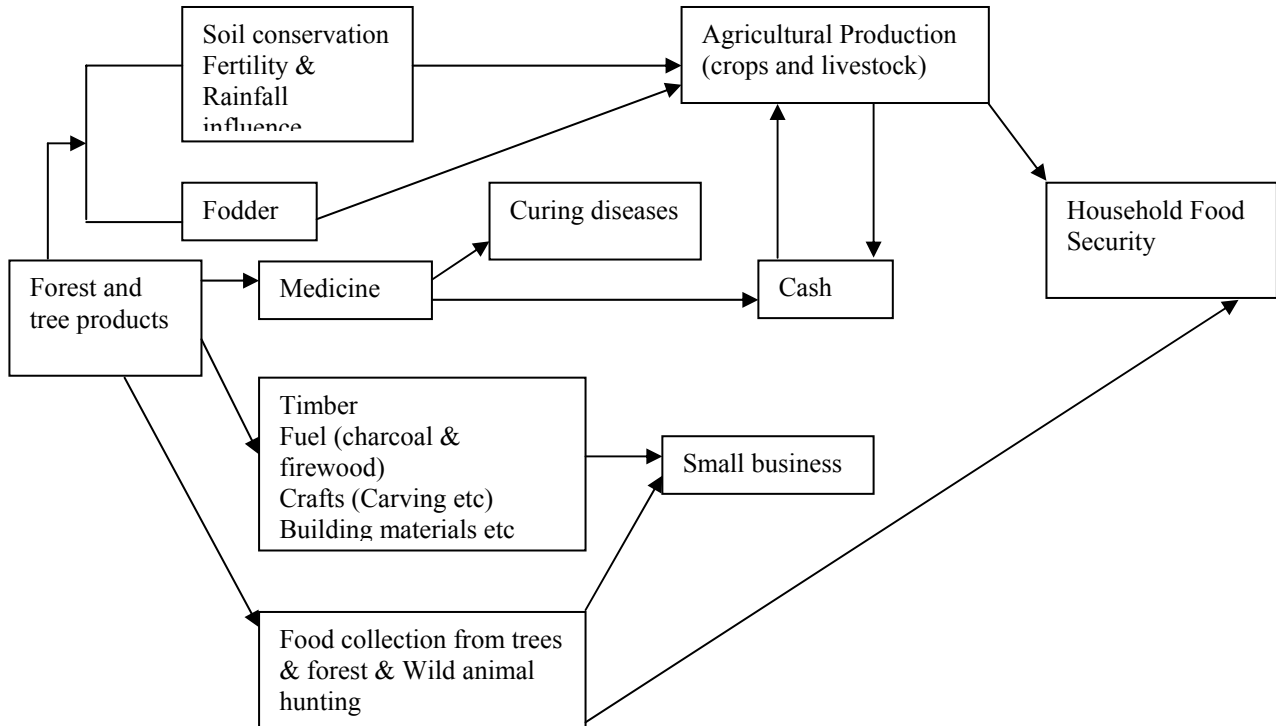
Until recently, local knowledge has been under attack for being backward, static and hindrance to modernization. This attitude has undermined the capacity of local knowledge to innovate and lower the status of grass-root innovators, especially women, whose contribution to technology development has traditionally been undervalued (Fernandez, 1994). Matose and Mukamuri (1994) reported that local people still have various ways of preserving and managing non – wood forest products for household food security. They also argued that knowledge articulation is directly linked to the positions individuals or groups occupy in the social strata. The modern scientific knowledge is a reductionist one, in which a single component is viewed as a unit and exploited ultimately leading to a crisis. For example, in the reductionist paradigm, a forest is reduced to wood for industrial purposes whereby its generative capacities are first undermined and then destroyed (Mishra, 1994).

Gender is cultural construct related to the behaviour learned by men and women; it affects what they do and how they do it within a specific social group. Gender differentiation comes about as a result of the specific experiences, knowledge and skills which women and men develop as they carry out the productive and reproductive responsibilities assigned to them. The degree of gender specificity attached to the knowledge and skills within a society depends not only on the way responsibilities are allocated among men and women, but also on the degree of flexibility men and women have to carry out the other's assignments.

As a result of gender specialization, the local knowledge and skills held by women often differ from those held by men. The kind of relationship which exists between these two sets of actors will affect hierarchies of access, use and control of resources, resulting in different perceptions and priorities for the innovation and use of technology by women and men (Appleton and Hill, 1994).

2.2 Relationship between Food security, forests and welfare

The relationship between forests, household food security and welfare has conceptually been illustrated by Ogle (1996) with special reference to Tanzania as shown in figure 2.



Source: Ogle (1996)

Figure 2: The relationship between forest and household food security

According to this conceptual framework the importance of forests to local livelihoods is explained in terms of agricultural production systems, forest products collection and income generation. Applying this conceptual framework in East Usambara, Kessy (1998) found that forests in the area are important to farmers as far as household food security is concerned. First of all a lot of farming activities are taking place under the forest canopy, showing an indirect role that forests have in the production of agricultural crops. Secondly, forests in East Usambara provide a range of edible non-timber forest products. These range from bush meat to a variety of vegetables and fruits. It is further pointed out that not only do these foodstuffs ensure food availability at household level but they also contribute to the nutritional status within families. Commercialization of forest products in East Usambara is the third way in which forests contribute to the household food security.

For the purpose of this report the conceptual framework is reduced in scope as shown in figure 3.

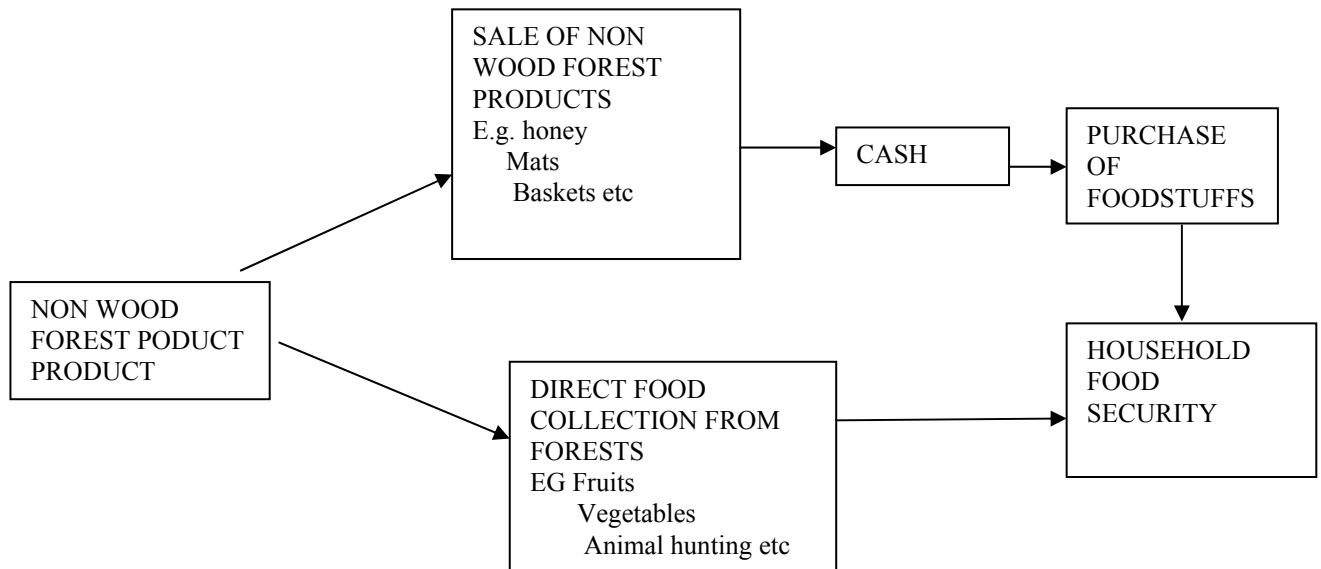


Figure 3: The relationship between non-wood forest products and household food security

3. WILD FOODS AND THEIR CONTRIBUTION TO HOUSEHOLD FOOD SECURITY

In general, people in Tanzania still rely on surrounding forests for both meeting their subsistence needs and as a source of income. In many areas people would have difficulty surviving if they had to depend only on cultivated land for food, fuel and cash income (Hines and Eckman 1993). Most rural people still depend on forests and bush lands for both economic and food security, and in many cases this dependency is increasing with improved living standards and increasing population (Hines and Eckman, 1993).

Some factors that influence consumption of indigenous tree products include:

- ◆ The type of forest cover and the percentage of forest cover remaining;
- ◆ The accessibility to tree areas both in terms of distance from the village and entry restrictions;
- ◆ The degree to which exotics have been introduced and accepted;
- ◆ Disposable income and the availability of substitute products; and
- ◆ The traditional importance of trees within a tribe.

The indigenous flora and fauna found in forests and bushland contribute to the local food systems in two ways (FAO, 1989b): Wild products might be collected for direct consumption or wild products might be sold to generate income for food purchase or other expenditures. In this way forests play direct and indirect roles in production and food security systems (Makonda,1997). For example women might rely on such forest products as raw materials for mats and baskets as the only available source of income generation. They may therefore use the proceeds from the sales of the items to buy foods. This is indirect contribution.

3.1 Direct food products from the forests

It has been reported that at global level, around 75,000 plant species are edible, out of which 12,000 have been used for food, but only 2,000 have been domesticated so far (Walters and Hamilton 1993). Food products from forests include both plant and animal. The plant food products encompass stems, shoots, tubers, roots, leaves, flowers, fruits, nuts, oil seeds, condiments, spices and mushrooms. A study carried out in Zimbabwe by Campbell *et al.* (1987) found that fruits are gathered mostly during the times of famine. Forests therefore provide important coping strategies for rural dwellers during times of food deficiency. Kajembe (1994) and Kessy (1998) pointed out the importance of wild foods and argued that wild foods are as important to the diets today as ever before. Animal food products include honey, bushmeat, fish shells, edible bird eggs and insects. These issues of accessibility and dependency on non-wood forest products in relation to household food security are discussed in the following sections on the basis of various products from the forests.

3.1.1 Wild Fruits

Many forest fruits are valued as food for children and are collected mostly by children while in the woods. In many cases adults eat these fruits when carrying out other activities in the forests. Hives and Eckman (1993) argued that where exotic fruits such as mango, papaya and banana are planted, little use is being made of forest fruits. Likewise where a large number of indigenous fruit trees have been retained or planted, the variety of exotic fruits is small.

FAO (1983) identified 40 food and fruit bearing forest species in Tanzania with the assistance of the then Lushoto Silvicultural Research Station. This publication details botanical and vernacular nomenclature, ecology, distribution, multiple uses, period of fruit collections, nutritional value, propagation, cultivation, economics and local marketing potential of the species covered.

The most common and preferred indigenous and naturalized fruit trees are indicated in table 1

Few studies have attempted to look into percentage contribution of wild fruits to the diets of local people. An example of a study that goes thus far is that of Uiso & Johns (1996) who assert that a total of 38 species of fruits are used in Tarime district, 21 of which are wild. Out of the wild species 14 were recorded in the food frequency data and it was found that on the average fruits contributed about 11% of all foods consumed. Fruits categorized as high in beta-carotene, which actually coincided with the cultivated fruits mainly mangoes, papaya and oranges contributed slightly less than 6%. By implication the remaining 5% is contributed by wild fruits. The edible wild fruits of Mara region generally, Tarime being one of the districts, have been documented by Johns *et al.* (1996). It suffices here to give some examples of the species of fruits registered. They include *Afromanum mala*, *Anona senegalensis*, *Balanites aegyptiaca*, *Carissa edulis*, *Ficus sur*, *Hibiscus acetosella* etc.

3.1.2 Wild Vegetables and edible mushrooms

A study carried out in East Usambara by Mattila *et al.* (1997) found that the majority of informants preferred wild vegetables to the cultivated ones. Wild vegetables are regarded as easily obtainable and palatable and their good taste is widely appreciated. It became clear in the study that a great variety of wild vegetable plants are utilized on a daily basis and most probably they make up an important source of vitamins in otherwise fairly poor staple food.

The most favoured and important wild leafy vegetables in East Usambara mountains are

ndeleva, *msangani* and *Pupalia Lappacea (mshunga)* the three species were most often mentioned and given the best ranking.

Table 1. Preferred Fruit trees

Botanical name	Local name**	Botanical name	Local name
<i>Adansonia digitata</i>	Mbuyu	<i>Phoenix reclinata</i>	Bukindu ⁵
<i>Annona senegalensis</i>	Mtopetope	<i>Rhus natalensis</i>	Mkumba
<i>Azanza garckeana</i>	Mtowa ¹	<i>Sclerocarya birrea</i>	Mng'ongo
<i>Balanites aegyptiaca</i>	Mwambangoma	<i>Strychnos cocculoides</i>	Mtonga
<i>Berchemia discolor</i>	Mnago	<i>Strychnos innocua</i>	Mkwakwa
<i>Borassus aethiopicum</i>	Mvumo	<i>Strychnos spinosa</i>	Mpapa
<i>Bridelia micrantha</i>	Mkarati	<i>Syzygium cordatum</i>	Mshwi ⁶
<i>Cordia sinensis</i>	Nyamate	<i>Syzygium guineense</i>	Mzambarau
<i>Cordyla africana</i>	Mgwata	<i>Syzygium owariense</i>	Mzambarau ziwa
<i>Diospyros mesipiliformis</i>	Mgiriti	<i>Tamarindus indica</i>	Mkwaju
<i>Eriobotria japonica</i>	Msambia	<i>Uapaca kirkiana</i>	Mkusu ⁴
<i>Ficus sycomorus</i>	Mkuyu	<i>Vangueria infausta</i>	Mviru
<i>Flacourtia indica</i>	Mgola ²	<i>Vangueria madagascariensis</i>	Mviru
<i>Grewia similis</i>	Mkole	<i>Vitex doniana</i>	Mfudu
<i>Grewia villosa</i>	Olmalungai ³	<i>Vitex keniensis</i>	Mfuu
<i>Lannea schweinfurthii</i>	Mtundu	<i>Vitex mombassae</i>	Mfudu maji
<i>Manilkara mochisa</i>	Msapa	<i>Ximenia americana</i>	Mpingi
<i>Parinari curatellifolia</i>	Maula ⁴	<i>Ziziphus mauritiana</i>	Mkunazi

Source: Hines & Eckman (1993), Mbuya et al (1994) FAO (1983)

Wild vegetables are mostly collected by women and girls, but young boys may also occasionally collect them. They are mostly picked in home gardens and farmland, where they grow as weeds or by forest trail sides on the way home from distant cultivation. The most used species in this part of Tanzania are available all the year round and therefore long collection trips are not necessary. However, some of the popular species thrive only in moist places or shady forest sites, which might make their collection more time demanding. Wild vegetables are used as spinach and eaten in a form of sauce, *mboga*, which is served as a side dish with staple food most commonly maize stiff porridge (*Ugali*) (Matilla et al., 1997). In this way the leafy vegetables contribute to the household food security. Fleuret (1979) who reported that wild green leafy vegetables are an essential part of every diet, which accounted for 81.2% of all side dishes in West Usambara, also supports this argument.

A Herb, *Sesuvium Portulacastrum*, known locally as *mboga pwani*, grows on sandy portions in the mangroves and is eaten as a vegetable in Pangani Mafia Rufiji Delta Mtwara and Lindi districts. Since this species is salt tolerant and is found throughout the year in many mangrove areas, it is an important food source in an environment otherwise hostile to the growth of plants more usually regarded as vegetables, such as spinach and cabbage (Semesi 1991).

* * The local names are in kiswahili except where a superscript number is indicated, it refers to tribal languages in Tanzania as follows; 1=Hehe, 2=Zigua, 3=Arusha, 4=Nyamwezi, 5= Sukuma, 6=Sambaa

Uiso and Johns (1996) documented the consumption of cultivated and wild species of leafy vegetables and species of fruits during June –July 1990, among the Luo in Tarime District. Leafy vegetables accounted for almost 23% of the total foods consumed during the months of June and July. This was found to be the highest contributor to the total overall frequency score in relation to the seven major categories of food used in the study. From a total of 31 different leafy vegetables documented, nineteen are collected in the wild whereas the rest are cultivated. Thirteen of the wild species appeared in the seven- day food frequency data indicating an important nutritional contribution of wild leafy vegetables to the diets of the population of Tarime District. Some examples of the edible wild leafy vegetables of Mara region include *Amaranthus spinosus*, *Asystasia schimperi*, *Cleome hirta*, *Corchorus trilocularis*, *Crotalaria brevidens* etc. (Johns *et al* 1996).

A survey of edible mushrooms in Tanzania has shown that wild mushrooms are a delicacy (Harkonen *et al.*, 1995), contributing immensely to rural households' food security. This comprehensive study of edible mushrooms in Tanzania described thirty-one most common edible mushroom species. This indicates widespread uses of forest mushrooms in Tanzania. It was revealed by the study that the best mushroom yields occur in miombo trees, which have mycorrhizal fungi in their root systems. Examples of miombo tree species include *Brachystegia*, *Combretum*, *Julbernadia*, and *Uapaca*. At the beginning of the rainy season a rich variety of fungal fruit bodies appear.

Most people in Tanzania take mushrooms as part of their diet and therefore do collect the mushroom from the forests. Exceptions are given for some tribes like the Chagga, Arusha, Meru and Maasai who do not eat mushrooms. In the rainy season most families eat mushrooms two to three times a week, with a higher frequency among some tribes like the Bena, Hehe, Makua, Nyamwezi, Nyiha and Sambaa who are reported to have a mushroom meal every day during the peak season (Harkonen, *et al.*, 1995). The diversity of mushrooms used for food is small in mountain areas and large in miombo woodlands on the high plateau. The study found that the largest diversity of edible mushrooms exists in the southern and western parts of the country. The longest lists of edible mushrooms (20 to 28 species) were obtained among the Bena, Hehe, Makonde, Nyamwezi, Sumbwa, Sukuma, and the Yao ethnic groups (Harkonen, *et al*, 1995).

In most tribes, all family members collect mushrooms. Men mostly pick them only when they see them by chance, but women and children go purposely mushroom hunting. That is why the best mushroom specialists in the villages are women. Mushrooms are prepared for eating in almost the same way in different parts of the country. Usually mushrooms are firstly washed, then cut into pieces and cooked in a pan. Different kinds of oil or oily seeds are used for cooking the mushrooms. Onions and tomatoes or some other vegetables are added together with salt, but seldom spices. The mushrooms are usually eaten as a stew with Ugali or cooked banana. In African societies, and Tanzania in particular, it is always the mother who makes the food. If other members of the family have picked the mushrooms the mother checks their identity before accepting them.

When people were asked to compare mushrooms with other foodstuffs like meat, fish and other vegetables, most people considered mushrooms being similar to meat, and in particular chicken (Harkonen, *et al.*, 1995). Drying is the only method of preservation widely used.

Mushrooms are cut into pieces and spread on a mat or iron sheet in the sunshine. Some species are boiled first before being dried. In mountain areas, where rains are more continuous, mushrooms can not be dried in the sun. Some people therefore dry small amounts in the smoke over the fireplace. Mushrooms are sold at market places and along roadsides mostly when fresh, but occasionally when dried. There are commercial mushroom pickers who regularly collect mushrooms for certain dealers in market places. Other mushrooms are used for medicinal purposes.

3.1.3 Wild roots and tubers

Missano *et al* (1994) found in their survey of forest foods dependency in two villages of Mtwara region that cassava-like wild starchy roots were being consumed widely by rural people and were being bought by town dwellers as snacks when travelling inland. The roots are known locally as *ming'oko*, which is a wild yam believed to belong to the *Dioscorea* species. The study further found that some forest and tree products were important and more popularly consumed than some of the domestic food crops. In a pair wise ranking of major food crops by women it was indicated that *ming'oko* was more important than most domesticated food crops with the exception of cassava.

Other crops which were compared with *ming'oko* included rice, maize, sorghum, bambara nuts, cow peas and pumpkin. *Ming'oko* is important because it is available and consumed throughout the year and particularly during periods of food shortages. It is believed that without *ming'oko*, the hunger incidences could have been more severe.

Collection and preparation of this product is gender based. All activities related to collection and preparation of *ming'oko* for home consumption is being done by women. Nowadays *ming'oko* has become a cash crop and is sold by children on behalf of their mothers.

3.1.4 Wild Grains

Apart from wild roots, tubers and vegetables some wild species of grains are also consumed in most tropical countries. In Tanzania for example, a study conducted by Missano *et al*, (1994) in Mtwara region found that household members were consuming a wild grain from bamboo locally known as "Mbuga". Consumption of this wild bamboo grain was associated with poor crop harvests in that particular year leading to critical food shortages. Although it is highly appreciated due to its sweet taste, bamboo take about 30 years to reach its maximum growth, a stage at which grains are produced. Harvesting of bamboo grains do not follow any gender arrangement although preparation for consumption is done by women as is the case for most foods. Consumption of wild grains in many rural areas of Tanzania has not been sufficiently explored, though it is said that many other tribes consume wild grains available during food shortages.

3.1.5 Wild animals and Honey

Wild animals are another group of important forest food products that provide household food security through direct consumption. The range of species consumed include birds and their eggs, insects, rodents and other larger animals. For people living in close proximity to forests, wild animals offer an important part of their diet, in some cases they supply the only source of animal protein.

In southern part of Tanzania, particularly in Mtwara and Lindi regions, consumption of some species of rodents is popular. In Bukoba, where people of the *Haya* ethnic group are dominant, there are high rates of prestigious consumption of some insect species known locally as "senene". Consumption of some wild birds is common in central parts of Tanzania, Singida and Dodoma region.

FAO (1989b) pointed out that of all game meat, small animals (e.g. rodents, birds and insects) are the most important due to their natural abundance and unrestricted hunting. Thus, small animals serve as popular source of protein for subsistence consumption in most rural areas of Tanzania and Africa at large.

Currently, there are arguments that game meat is losing its popularity due to changes in cultural values. This concept is contrary to findings by FAO (1989b) in West Africa, where high prices provided a good indicator for high demand for game meat. In some cases price of game meat exceeded price of domestic meat. While prices do not directly indicate the prevalence of bush meat consumption, they do suggest that consumption is limited by supply rather than changes in cultural values.

Forests provide an important source of meat in both rural and urban household diets. Forest and fallow field areas provide the habitat for many commonly consumed wildlife species. Wildlife can provide nutritionally important sources of animal proteins. The nutritional value of wild meat is comparable to that of domestic meat. Wild meat is good source of iron, vitamin A and vitamin B. In rural areas of West African forest zone, bushmeat has been a major food item contributing 20%-90% of the total protein consumed (FAO 1990). Besides of providing food, wildlife also represents an important source of income for many families. The Wildlife policy of Tanzania of 1998 encourages meat quota hunting for local communities. Meat quota hunting is allowed in community wildlife management areas of Selous and Serengeti (MNRT 1998c). This strategy provides access to wild meat so that the communities appreciate wildlife. In this type of hunting scheme, villages apply for a quota and hunt the meat-animals. The meat is sold in the villages and revenue accrued is used for managing wildlife area and for small village development programmes. The meat supply is often distributed over much of the year to match the demand patterns and the low purchasing power in the villages. A study carried out in some parts of East Usambara Protected Natural Forests by Katigula (1999) found out that there are 21 species of wild animals, 10 species of birds and 8 species of fish, forming an important source of animal proteins utilised by the local people.

Honey is another valued NWFP around the world. In Tanzania it is reported that honey is a very important food for the Sandawe agriculturalists in central part of the country, Dodoma and Singida Regions (Kihwele *et al.*, 1999). In this part of the country, honey is collected three times a year. Honey provides an important source of non-proteneous animal food product. Honey is nutritionally valuable, especially due to the energy it provides. It is estimated that 100g of honey has 280 Calories. It is normally consumed as a side dish of the main dish "*Ugali*". It is also used as jam and in many parts of Tanzania. Also honey is used for making local brew popularly known as *Wanzuki*. (Kihwele *et al.*, 1999).

Gender division of labour for activities associated with wild animals and their products are centered on harvesting and preparation. While hunting of large animals is done by men,

collection of insects and rodents is mainly done by women and sometimes children. Food preparation is done by women. Selection of the right variety or species for consumption is based on their indigenous knowledge.

3.2 Nutritional Values

The consumption of wild foods provides essential vitamins and minerals for the diet because of their variety. Forest foods such as fruits, stems, roots, mushrooms, leaves, honey and game meat can make a significant contribution to resolving specific nutritional deficiencies common in Tanzania.

Comparison of nutritional values of wild foods and non-wild food provides evidence as to the importance of such foods. FAO (1992) reported that while vitamin C content of an orange is 57mg/100g, the fruit of the Baobab tree, *Adansonia digitata* has 360mg/100g. The same source reports that iron, which is needed to produce blood hemoglobin, is abundant in many forest products. *Sclerocarya birrea* (Mng'ongo) is a wonder tree whose fruit juice is rich in vitamin C and the seed kernel contains 50% - 60% non drying oil and 28% protein. Fruit juice contains 2gm of vitamin C per milliliter a concentration that is 4 times that of an average orange (Forx 1938 quoted in Mtango and Mahunnah 1998).

Similarly, wild leaf vegetables that are important part of traditional diets in many parts of Tanzania contain more riboflavin, a vitamin necessary for good health, than eggs, milk, nuts and fish. FAO (1989b) reports that leaves of Baobab (*Adansonia digitata*) contain up to 13% protein.

Launaea cornuta (Mchungu) is a weed occurring in highly diversified habitats, widely distributed and growing up to an altitude of 2286 meters. The nutritional value of *L. cornuta* is high considering the levels of vitamin C, minerals (Ca, K, Na and Fe), proteins, crude fat and dietary fibre (Mtango and Mahunnah, 1998).

Insects are amazing sources of protein and vitamins. Polsen (1982) compared caterpillar consumption to vitamin pills. It is also reported that bee larvae are good sources of vitamin D (ten times greater than fish liver oil) and vitamin A (2 times greater than egg yolk). Nkara and Iddi (1991) reports that in Dodoma, the young leaves and fruits of *Adansonia digitata* are eaten locally and the seeds are used as a source of cooking oil.

Nutritional values of some Tanzanian specimens of forest mushrooms were analyzed in the State's Technical Research Center in Finland. Their protein contents ranged from 27g/100g to 49g/100g (Harkonen *et al*, 1995). These products surely have the potential of meeting some of the nutritional requirements for rural and even urban households of Tanzania.

FAO (1989b) reported that the chemical score of rat meat (Commonly eaten in Southern areas of Tanzania) is in the same range as that other animal foods. A giant rat is reported to have a protein content of 22.5% while other domestic animal products have protein content of between 20 and 25%.

Honey is primarily a high-energy carbohydrate food and valued as a source of sweetness and diversity in the Tanzanian diet. Honey provides dextrose and levulose; the latter in higher amounts, is an energy source *par excellence* in which sugars are ready for assimilation immediately on reaching the intestine (Kihwele *et al.*, 1999).

3.3 Indirect contribution of NWFP to food security

This refers mostly to the practice of selling forest products to generate income which is then used to purchase food. This analysis is restricted to the sales of NWFP that is the focus of this report. It refers to income obtained from:

- ◆ Bee products: Honey, bees wax, propolis and pollination services
- ◆ Medicinal and pharmaceutical products
- ◆ Extractive products: gums, resins, oleo-resins, latex, tannins, dyes and oils.
- ◆ Fodder, fibers and thatch grass
- ◆ Animals and animal products other than food; birds, insects, skins, horns, tusks, bones and feathers

3.3.1 Bee products

Main bee products include honey, beeswax, royal jelly, propolis and pollination services.

Tanzania has a high potential of bee resources, which is estimated to be 9.2 million colonies capable of producing about 138,000 tonnes of honey and 9,200 tonnes of beeswax/year. Yet, the production per year is estimated to be 4,860 tonnes of honey and 324 tonnes of beeswax only (MNRT 1998b). The beekeeping sector faces a number of problems which include: inadequate marketing information and networking, lack of reliable transport of bee products to market centres, obsolete processing machinery and storage facilities. Meanwhile the sector is making efforts to promote domestic market by encouraging families to use honey as food and medicine, and for food preservation.

Beekeeping is a source of food (honey, pollen and brood) and generating income for the people through sale of honey, beeswax and propolis. Honey and beeswax are the principal products of beekeeping, the bulk of which is produced by traditional beekeepers in rural areas (Kihwele *et al*, 1999). About 99% of the beekeeping industry in Tanzania is carried by forest based small- scale beekeepers who use common beehives made of log and bark hives. Other hives, movable- comb hives (box hives), pots, guards, etc account for less than 1%. Kihwele (1992) reported that one bee colony can produce an average of 15 kg of honey and 1 kg beeswax per year using the traditional hives. It was also recorded in Magugu – Arusha that using Tanzania commercial hives production was up to 100kg of honey per year.

Honey is much-valued product from forested areas around the world. Trees often play an important role in honey production as they collectively provide year round fodder for bees.

Women have better chance to practise beekeeping because it is fitted to their needs and ability. For instance, women can practise beekeeping together with other income generating activities and also it requires little inputs. Women also provide labour in the extraction of honey, beeswax preparation and ferrying of bee products to the market (Kagya 1992a). This was particularly found to be true in Shinyanga region where both men and women practice beekeeping, and honey and beeswax are considered as cash crop. However, according to Kagya (1992b) existing taboos, traditional beliefs, division of labour, and the nature of the job are still hampering women from participating fully in beekeeping activities.

Honey-based industries and products involve the use of honey as an important ingredient in: the pharmaceutical industry; food preservation; honey-beer brewing and meal preparations.

Honey when mixed with cereals is widely used in the preparation of local brew known as *Wanzuki*. The majority of women in Tanzania earn their income in this way.

Eaten directly or mixed with some plant materials honey is also regarded as medicine for the nursing. The larvae are used for making bee soup that is popular to some tribes in the country. Bee larvae contain 10 times as much vitamin D as fish liver oil and twice as much as vitamin A as an egg yolk (FAO 1989b). Royal jelly is used as an important ingredient in cosmetic and pharmaceutical industries.

The use of bees as pollinators in order to increase crop yields is a popular practice in countries with developed agriculture systems. Tanzania has not adequately harnessed this mutual relationship between honeybees and agricultural crops due to (MNRT 1998b)

- Lack of technical directives and assistance to beekeepers cum farmers on how to establish and manage colonies for pollination purposes;
- Unreliable supply of strong bee colonies if and when needed; and
- Lack of formal cross-sectoral arrangement for cooperation beekeeping and agricultural sectors in planning and implementing pollination programmes and projects.

Human activities such as intensive agriculture, increasing monoculture, massive deforestation, construction of highways and use of pesticides are today major threat to global biodiversity. The sustainable way to increase crop production lies not in increasing the area under cultivation but in increasing the production level of cultivated areas (Kihwele et al 1999). Honeybees play an important role in this direction. Other studies recommended the development of beekeeping-agroforestry system in order to improve the quality and quantity of fruits and seeds, and environmental conservation. Honeybees act as cost free bio-inputs in farming and forestry systems and increase cross pollination in cultivated as well as wild plant species.

Storing honey starts right at the beekeepers apiary site in the woodland or forests whereby the preferred vessels for storing honey is the 20 litre plastic pails, a 300 kg- drums, guard and clay pots. The honey is stored under favorable condition for instance in the roof, which is thatched with grass in order to avoid denaturing of honey by heat of the sun.

3.3.2 Medicinal and pharmaceutical products

It has been estimated by the World Health Organization (WHO) that 80% of the world's population rely on traditional medicines to meet their daily requirements (Akerlele 1993 quoted by Marshal 1998).

In Africa, reliance on such medicine is partly owing to the high cost of conventional medicine and the inaccessibility of the modern health care facilities, but also because traditional medicine is often deemed a more appropriate method of treatment (Marshal 1998). Kajembe (1994) commenting on the role of traditional medicine in Tanzania had this to say: "There is certain degree of mysticism, fear or awe when one hears of the practices of traditional healing methods. Ethnomedicine is that subject of traditional medicine. It is of great importance in traditional and modern Tanzanian society. Most interesting, however, is the connection between ethnomedicine and culture of the people. People of different cultural and social positions turn to different types of treatment when faced with illness or misfortune. Cultural background therefore has an important influence on the aspects of people's lives including beliefs, behaviour, perceptions and attitudes towards illness and pain. The skills of

traditional medical practice are acquired primarily through a long period of apprentice and observation. Most of the knowledge is passed from one generation to another. The power of trees and shrubs can not be denied”.

In Tanzania a survey by Otieno, (2000) has indicated that traditional medicine plays a very important role, not least owing to the high cost of western medicine, consultation and hospital fees and the number of western doctors compared with that of Traditional Medicine Practitioners (TMPs). Kahatano (1997), who carried out a study on TMPs, reported that TMPs in Tanzania are represented by the Tanzania Association of Traditional healers and medicines (Chama cha Waganga/Wakunga wa Tiba Asili Tanzania CHAWATIATA). At the time of the survey only about 3000 TMPs were registered with this Association. This shows that most TMPs are not members of CHAWATIATA considering the fact that in 1982 Helberg *et al.*, (1983) quoted in Kahatano (1997), estimated the number of TMPs to be 40,000.

Having carried out the survey in Dar es Salaam, Tanga, Arusha and Moshi, Kahatano (1997) reported that a total of 98 plants and 12 animal species were being traded locally for medicinal purposes. This means that a sizeable amount of income can be made out of the sales of the traditional medicines. It is reported for example that – “powdered medicines” were supplied by TMPs in 20 litre buckets and generally priced at around TShs 20,000 (USD 34) per bucket. (1 US\$ at the time of survey was equivalent to about 588 TShs). In Dar es Salaam, vendors of traditional medicines were surveyed in Kariakoo and Kinondoni markets and about 70 vendors were recorded in Kariakoo market alone, most of whom were Maasai women selling powdered plant material packed into small chloroquine injection bottles, selling at Tshs 1475 – 6000 Tshs (USD 2.5 - 10.2) per bottle. It is expected that prices from the sources in the rural areas are relatively lower. In any case the contribution of the medicinal trade to household food security through employment and income generation is substantial.

The traditional Medicine Research Unit of Muhimbili Medical Centre has conducted a number of surveys with the aim of taking the inventories of Medicinal plants in various parts of the country (Mahunnah 1991; Chhabra *et al.*, 1992; Chhabra and Mahunnah 1994 and Schlage *et al.*, 1999).

These studies have detailed botanical and tribal or vernacular names of the plants used, preparation and mode of application and whether the plant was used alone or in combination with other plants. There is therefore a wealth of knowledge as far as the inventory of medicinal plants is concerned. Such studies on traditional medicinal plants have shown that about 1000 plant species are used in traditional medicinal practice in Tanzania, representing 10% of the country’s flora. Chemical and biological studies indicate a rich wild and cultivated flora of medicinal and aromatic plants. Some 80 plants species are used in drug prescriptions by some world pharmacopoeias. About 30 plant species have shown promising chemical effects on treating parasitic infections and over 35 medicinal and aromatic plants used in various international pharmacopoeias have been acclimatized in the country. About 400 plant species widely used in traditional medicine in Tanzania are under detail phyto-chemical and phyto-pharmacological studies (Mahunnah 1993).

Regarding medicinal plants in tidal water ecosystems Mitzlaff (1990) reported that mangroves were mentioned at most places as one amongst the plants used for medicinal purposes. However no detailed data could be collected due to the limited time of her study.

Semesi, (1991) who worked in the same ecosystem reports that Fruits of *xylocarpus granatum* are used as medicine for treatment of hernia – ngiri

Studies that take stock of medical plants and go further to rank important ones based on the frequency of their reported are few. An example of such study is that of Dery *et al* (1999) who, through the use of PRA tools, were able to identify and rank medicinal trees in Shinyanga region. Parts from over 300 trees were reported as being used for the treatment of more than 100 human disease. Priority medicinal trees (PMTs) were identified through analysis of respondents' preferences. The top ten priority medicinal trees from the study are shown in table 2. The local names are all in Sukuma.

Table 2. Diseases treated with PMTs

Botanical name	Local name	Tree part used	Disease treated
<i>Securidaca longipedunculata</i>	Nengonengo	Roots, bark, leaves	Convulsions, abdominal problems Gonorrhoea, syphilis asthma
<i>Zanha africana</i>	Ng'watya (Mkalya)	Roots, bark, leaves	Convulsions abdominal problems psychosis
<i>Cassia abbreviata</i>	Mlundalunda	Roots, bark	Abdominal problems, pain relief, urinary problems
<i>Entada abyssinica</i>	Ngeng'wambula (Mfutwambula)	Roots, bark, leaves	Abdominal problems, coughs, asthma, hernia
<i>Turraea fischeri</i>	Ningiwe	Roots, bark, leaves	Abdominal problems, hypertension dysentery
<i>Albizia anthelmintica</i>	Mgada (Mkutani)	Roots, bark, leaves	Abdominal problems, convulsions, infertility
<i>Entandophragma bussei</i>	Mondo	Roots, bark, leaves	Abdominal problems, diarrhoea, anaemia
<i>Combretum zeyheri</i>	Msana	Roots, bark, leaves	Pneumonia, peptic ulcers, coughs, sore throat
<i>Zanthoxylum chalybeum</i>	Mlungulungu (nungubalagiti)	Roots, bark, leaves	Jaundice, abdominal problem, pain relief
<i>Terminalia sericea</i>	Mzima (Njimya)	Roots, bark leaves	Fever, anaemia, abdominal problems

Source Dery *et al.*, (1999)

Reliance on traditional medicine in Tanzania is significant, and there is no reason to suppose that it will decrease. According to (Otieno, 2000) TMPs and vendors of traditional medicines reported increased scarcity of certain species and the need to travel greater distances to procure supplies. Therefore, strategies to address conservation and management concerns of traditional medicines need to be put in place.

The Maasai pastoralists have used woody plants and other aromatic plant parts as herbs to cure their own illnesses and diseases of their domestic animals since prehistoric times. Their indigenous knowledge, related to treating domestic animals, has been summarized by Ole-Lengisugi and Mziray (1996). The Maasai treat their animals by using different types of plants that have been shown to have fungicidal, antiprotozoal, Bacteriocidal, antiviral, antimetazoal and insecticidal properties (Ole Lengisugi and Mziray 1996). Indicated in this

study are the specific plant species used to kill the different disease agents. The Maasai have also been noted to add non food items in their meat based diets. These food additives have been shown to contain cholesterol-lowering properties in an *in vitro* study. Such identified food additives with cholesterol lowering properties are *Albizia antihelminctica*, *Acacia goetzii*, *Myrsine africana* (Chapman *et al* 1996)

3.3.3 Extractive products

Tannins, dyes, latex, gums and resins are the main extractive products from forests. They provide employment and income opportunities for local people, they improve profitability of primary forest activities enable foreign exchange savings through import substitution and generate foreign exchange through exports.

Tannins are mostly extracted from an exotic acacia tree - wattle tree (*Acacia mearnsii*). It is an important product for export. For example in 1987, 5000 tones of wattle extract valued at US \$ 4 million were exported (MLNRT, 1989). In the coastal areas the bark of mangrove trees namely *Rhizophora mucronata* and *Bruguira gymnorrhiza* are sources of tannin used to treat leather (Semesi 1998). Other important tannin producing trees include *Ceriops tagal* (mangrove tree), *Dalbergia melanoxylon*, *Margaritaria discoides*, *Rumex usambarensis*, *Terminalia spp* and *Xylocarpus benadirensis* (Ruffo and Maliondo 1990)

Dyes of various shades can be obtained from many of the indigenous trees in Tanzania. The dyes can be obtained from leaves, barks and roots. It is however said that the knowledge about processing of the dyes is not widespread (Makonda 1997). Some indigenous tree species that have the potential for providing dyes have been earmarked (Hines and Eckman 1993). These include *Bridellia micrantha*, (Mkarati) *Milicia excelsa*, *Pterocarpus angelensis* (Mninga), *syzygium cordatum* (Mshwi) and *Euclea divinorum* (Mdaa). Other examples of dye plants and commonly occurring in the country and parts used in brackets are *Diospyros fischeri* (Red bark), *Garcinia huillensis* (Yellow bark), *Harrisonia abyssinica* (Yellow bark), *Harungana madagacarensis*, *Indigofera arrects* (whole plant), *Lannea schimperi* (Red bark), *Morinda asteroscepa* (Yellow bark) and *Ozoroa reticulata* (Red bark) (Ruffo and Maliondo 1990), The dyes find application in fabrics, fibres, crafts and make-up.

Most important for the local people in Tanzania is gum arabic from *Acacia senegal* tree. The annual production of this gum arabic was estimated by Chihongo (1992) at about 1,000 tones, out of which 50% was exported. The rural people are usually the ones who collect the gum arabic and sell it at an agreed price to a local agent (who has a link with the final exporter in the cities). This product therefore has a great potential for augmenting incomes of rural dwellers especially bearing in mind the fact that *Acacia senegal* is found in semi arid areas like Dodoma, Singida and Shinyanga.

Traditionally, gum arabic has been an important food for pastoralists and hunter-gatherers. Gum arabic is now used mainly in the confectionery industry. Other uses include manufacture of lithographic inks, office glue, emulsion prints, cosmetics, flocculating agents for certain minerals, pan coating, sizing agent in textiles and paper and as a carrier in tablets (FAO 1989c).

3.3.4 Fodder, fibers and thatch grass.

Avicenia species in the mangrove areas are used as animal fodder in the coastal villages of Tanzania (Semesi 1998). Fodder from trees and shrubs are particularly important during the dry season, when availability of grasses is markedly reduced. Feeding livestock inside forests therefore takes place during this season when resources within public lands have been exhausted. In this way, forests contribute to household food security indirectly by sustaining the livestock, which are in turn depended upon for direct food and income.

Miombo woodlands are fairly rich in browsing species. The livestock prefer mainly new regrowth, which has been shown to contain high protein and other nutrient content.

The importance of dry grass for thatching cannot be overstated. Most houses in rural areas of Tanzania are of grass thatch. Dry grass is used for thatching buildings and making fences around compounds.

Plant fibers are important both for domestic use and for sale. It has been reported for example that in Kondo district, bark fibers of *Adansonia digitata* are used for making filters, brooms and ropes (Nkara and Iddi 1991). Another example is from East Usambara where Kessy (1998) reports widespread use of the ropes by rural artisans to produce a range of woven baskets and mats. These are made from palms, grass, bamboo or climbers. They are used for harvesting, drying, winnowing, grinding and storing agricultural produce. Basketry techniques and plant materials are also used to weave granaries, fish traps, stools and tables (Makonda, 1997). The climber found in the mangrove areas *Derris trifoliata* is used as source of ropes and as fish and crab poison (Semesi 1998). Other fibre plants commonly found in Tanzania and parts used in basketry (Ruffo and Maliondo 1990) include *Abutilon* spp (bark) *Arundinalia alpina* (stem), *Borassus aethiopicum* (leaves), *Corchorus* spp (bark), *Crotalaria* spp (bark), *Hibiscus* spp (bark), *Hyphaene* spp, *Oreobambos buchwaldii* (stem), *Oxternanthera abyssinica* (stem) *Pavonia urens* (bark), *Phoenix reclinata* (leaves) *Phragmites maurianus* (stem), *Pandanus* spp (leaves), *Raphis* spp (leaves), *Sansevieria* spp (leaves), *Sida* spp (bark), *Triumferta* spp (bark), *Urena lobata* (bark) and *Waltheria indica* (bark)

4. NWFP AND GENDER ROLES IN HOUSEHOLD FOOD SECURITY

Gender has assumed a central importance in the studies being carried out by World Bank on household food security. Women's varying capacities for income generation, their generally lower access to education, their lack of control of resources and their tendency to put high priority on family food security, means that an understanding of household economic and social dynamics is crucial (Ishengoma, 1998). Therefore when analyzing food security at the household level, we are looking at food supply and distribution, as well as effective access of food by households.

Studies have revealed that collection of forest products at the household level entails a set of gender roles played by both men and women. As far as Non Wood Forest Products are concerned, Kessy (1998), reports that collection of wild vegetables in the East Usambaras is done by women on the days when collection of fuelwood is allowed in the reserves. This trend has also been observed in Zimbabwe, where it was reported that a significant difference across gender exists in terms of different resource demands (Campbel *et al.*, 1991). Along the same line it has been found that widows and widowers, though both resource dependent, utilize quite different products, the former utilizing fruits and grass while the latter rely on

hunting and fishing.

There does not seem to be any specialized trend on the roles of women and men with regard to collection of medicinal plants. Locally recognized traditional healers, whether men or women,

frequently carry out the collection themselves in the forests partly to maintain secrecy of knowledge of relevant species (Kessy, 1998; Otieno, 2000).

Fernandez (1994) reported that both women's and men's generation, adaptation and use of knowledge and technology are shaped by the economic, social, cultural, political and geographical contexts in which the two sexes live, but which each (gender) experiences in a different way. For example in Thailand and India women collect non-wood forest products such as herbs, mushrooms and medicinal plants, while in the Maasai culture, boys are traditionally assigned to pick up the knowledge of herbal medicines used in the home when they are looking after the small stock (goats and sheep) around the homestead. Girls receive their knowledge of herbal medicine from their mothers and grandmothers, with whom they spend a lot of time (Sindiga, 1994).

In fact in Tanzania, it is the women who are the real experts on the collection, processing, preservation of non-wood forest products for the household foods. Peasant women know the nutritional needs of their families as well as the nutritive content of the wild foods they collect from the bush, since they are responsible for sustaining the livelihood of the family. The food security of local communities is based on the availability, access to and control of non wood forest products from the nearby forests.

Katani (1999) in his study on the role of Gender Based Indigenous knowledge in developing coping strategies against deforestation carried out in Mwanza district revealed that firewood and wild foods (fruits and vegetables) collection from the forest are performed by women. Hence women are knowledgeable about tree species suitable for fuelwood, vegetables and fruits. On the other hand, men are responsible for the collection of fodder for livestock, hence men were knowledgeable with different fodder plants for different animals. The author observed that gender based division of labour, gender-based access to resources and control over those resources are the main factors contributing to the differences in local knowledge held by men and women about the management of forest resources.

The local knowledge of men on wild food is declining as a result of formal schooling and emigration, while women not only retain a high and widely shared level of general knowledge about wild foods, crafts and medicinal plants, but also acquire new-men's roles as duties change (Katani, 1999).

Commercialization of forest products also has a gender dimension. While most of the beekeepers in Tanzania are men, the majority of basket and mat makers are women. Also observations have shown that most of the wood carvers and hunters are men. Generally, in Tanzania, information on gender-based local knowledge on the collection, preservation and processing of wild foods (non wood forest products) is scarce and fragmented.

5. PROBLEMS/THREATS AND SOME OPPORTUNITIES

5.1 Problems/ Threats

5.1.1 Deforestation

Food and other non-wood forest products are available in the wild. The problems of availability of the non-wood forest products are therefore directly related to the problem of disappearance of forests. This is so because as trees disappear the integrity of the ecosystem is reduced and biodiversity is lost. Thus, the availability of NWFPs is reduced along with deforestation and associated biodiversity loss (Otieno, 2000).

Despite of the importance of agricultural biodiversity, the diversity of crop and livestock species currently in use worldwide is rapidly dwindling. Although people consume approximately 7000 species of plants, only 150 species are commercially domesticated. Just over 100 species account for 90% of the World's food crops. In fact, rice, wheat and maize alone account for nearly 60% of the calories and 56% of the protein people derive from plants (Thrupp, 1998). This narrowing of food crops base ultimately undermines the stability of the food security.

A loss of diversity in farms also leaves crops more vulnerable to pests and diseases. Serious economic loss and human suffering are inevitable when pests attack mono-cultural and uniform varieties. In addition, there has been serious decline in soil organisms, which are vital for soil fertility and structure, and beneficial insects and fungi are also disappearing. Such losses, along with reduced diversity of farming systems types, further increase risks and reduce productivity.

Accurate data on rate of deforestation in Tanzania is lacking, which is reflected in the estimates of deforestation rate reported. MLNRT, (1989) estimates that deforestation advances at a rate of 300,000 to 400,000/ha/year. It was later reported that deforestation rate is actually around 130,000ha/year in 1993 (MNRT, 1994). It is therefore common to find a wide range of deforestation rate between 130,000ha to 400,000ha per year being reported in the literature. The main reasons for deforestation in Tanzania were looked into. Chachage and Mvungi (1989) found out that most of the deforestation in Tanzania was due to shifting cultivation and not due to firewood collection. Traditional shifting cultivators, who once cut and grew crop and then gave the forest time to recover, now have neither land enough no time to let forests re-establish (WCED, 1987).

In Tanzania growing but impoverished peasantry is forced to depend on dwindling forests for NWFP. Most of the NWFPs in Tanzania come from secondary forests. A secondary forest is a term describing a forest that has regenerated following disturbances and a primary forest describes an undisturbed, old growth forest (Sargent and Bass, 1992).

5.1.2 Lack of proper forest management regimes

There are four main categories of resource ownership and management regimes mostly reported in the literature. These include State property with regulated access (*res publica*), open access property (*res nullus*), private property and finally local community property or common property or in short a common (*res communis*) (Bromley and Cernea, 1987; Matose and Wily 1996).

The common property regime has in the past been confused with an open access situation (Bromley and Cernea, 1987). This confusion influenced government decisions thereby discouraging common property regimes due to high vulnerability of open access regimes to degradation. By confusing an open access regime (free for all) with a common property regime (in which group size and behavioral rules are specified) the colonial government and the nation state that emerged denied the very possibility for resource users to act together and institute checks and balances, rules and sanctions, for their own interaction within a given environment.

Resource degradation in developing countries, while incorrectly attributed intrinsically to “common property systems”, actually originates in the dissolution of local level institutional arrangements whose very purpose was to give rise to sustainable resource use patterns.

There is, however, a common condition for a property regime to be successful. There should be effective mechanisms regulating the actions of the community members and ability of the members to limit access of non-members. This implies that there should be incentives involved for people to regulate the use of these resources and observe the laid down rules, regulations and sanctions.

It has been the practice of forestry and other authorities to urge villagers to establish their woodlands as a result of success stories elsewhere. This attempt is made even more difficult by the fact that probably very little of the precolonial common property forests remain traditionally conserved, including so called sacred forests. Examples of traditionally conserved forest have been reported in Mtwara, (Masayanyika, 1991), in Handeni (Mwihomeke *et al*, 1997) and in Babati (Gerden and Mtallo, 1990) For the majority of cases, however, the conditions for common property forests have been deteriorating and the forest management systems have degenerated into open access regimes. By urging villagers to set aside woodlands, the authorities are in essence attempting at elevating the property regime from open access to common property. Unfortunately one can not move from open access situation to a complex common property situation by an administrative decree. Such a move has to be preceded by an assessment of the feasibility of a common property regime by looking into pertinent socio economic variables. Assessment of these variables would reveal potentials and constraints to the common property regime.

The National Academy of sciences as quoted by Bromley and Cernea (1987) suggest important socio economic variables to be studied when a conversion from open access regime to common property regime is attempted. The important variables include mainly the supply and demand conditions of the resource, the characteristics of the users of the resources, the characteristics of the legal, socio economic and political environment in which the users operate.

Studies of these important socio economic variables are virtually non-existing in Tanzania, denying the authorities of empirical basis for the attempts at converting open access situations to common property systems. Newer Forest management regimes referred to as Joint Forest Management (JFM) or Collaborative Forest Management (CFM) have started being experimental upon. These are efforts in which more than one stakeholder or jointly manage a forest resource with specified benefits, responsibilities and obligations.

5.1.3 Non homogeneity of NWFP users

There is a sizeable literature on rural household NWFP use in Tanzania. This literature is mainly on utilization and importance of the NWFP generally and it does not relate the socio economic variables of local households to the amounts of NWFP consumed. As a result we do not have clear picture of the way socio economic differentiation affects the consumption of the NWFP in Tanzania. Such studies would permit a deeper understanding of the way the household socio economic differences are related to the use of NWFP. This is important because different socio-economic groups would be having differing incentives towards the management and protection of forests from which the NWFP are obtained. It would be a wrong approach to believe that all rural people have the same incentive to manage their forests, unless this is supported by empirical evidence on specific cases.

Studies in Zimbabwe have related the use of forest products somewhat to the household economies (Cavendish, 1997). They have casted some light on socio-economic differentiation and resource use. They support the point that socio-economic differentiation can lead to significant differences in resource use and value. They also record differential resource use by certain groups. For example, studies in Miombo areas have demonstrated how wild fruits, rodents, insects and birds can form a crucial source of foods for children from poorer households while at school (those from better off households being sent to school with food or money) or while herding.

Relating income to the use of some non wood products like manure use – a practice that entails a transfer of nutrients from woodland to field- a positive correlation has been found (Deweese, 1989). The use of termitaria as a soil amendment was also positively correlated with income.

As rural households grow richer, they enter riskier or higher return activities and abandon others. Such shifts in production activities will lead to a host of shifts in woodland resource uses, which are connected in different ways to different activities. For example, poor households depend more on the sale of various gathered products than the rich (Deweese, 1989).

Education has been found to play a role as far as shifts in household preferences are concerned. The importance of education in wild food demand regressions suggests that “modernity” reduces the use of wild soda, roots and bulbs and certain wild leaf vegetables, which are frequently regarded as children’s foods or suitable only for the poor.

Wild food demands also differ inter-seasonally. During the late dry and early rainy seasons, when other sources of nutrients are scarce, wild fruit consumption is at its highest (Campbell, *et al.*, 1991). Other reasons for shifts in household preferences include religious restrictions. Some evangelical Christian Missions ban the consumption of certain wild goods (such as insects, mice, fruit based wines and traditional medicines) as “heathen” practices. It follows that where this belief is widely held in rural areas, it is bound to have an impact on resource demands.

This evidence on social economic differentiation and resource use suggest that different factions of the society will have different incentives in participating in the management of forests. The heterogeneity in terms of occupation and other characteristics often lead people to have different interest in resources and hence this is possible source of conflicts in natural

resources utilization and management.

5.2 Opportunities

Despite the threats faced by forests and their products there are still opportunities that can enable sustainable management and utilization of use of forest resources largely for improvement of household food security:

5.2.1 Trade liberalization and decentralization Policies

Marketing opportunities are emerging in the country as trends towards economic liberalization and decentralization open new markets and give local communities more say in the management of their forest resources. Local communities therefore have more opportunities to benefit from forest resources, which is likely to give them greater incentive to better manage and protect those resources. However care should be taken so that increasing demand for forest products does not result in over exploitation of forest resources. What can be made possible is to assist local people in income generating enterprises while conserving tree and forest resources. This is possible through Market analysis and development.

5.2.2 Presence of legislative backing for the development of NWFPs

The New Forest Policy (1998) recognizes the importance of Managing forest for multiple products. In this way the NWFP are considered as important as other forest products. The forest policy goes on to direct that “resource assessment of non-wood forest products will be incorporated in forest inventories and resource assessment for management planning. Private sector investments will be promoted in order to utilize the full potential as well as to domesticate and commercialize products with high demands. Research, training and product development programmes will be strengthened in the existing forest research and training institutions. Information on potential markets will be produced and efficient marketing channels developed. Awareness raising on the products and markets will be intensified”.

The Forest Policy also emphasizes management of country’ forest land resources at various levels for sustainable and progressive development. These levels include Central government, Local government, Private investors and communities largely villages. This framework provides a good basis for participatory forest management regimes and is in line with the broader policy of decentralization and devolution of power. Joint Forest management regime is also explicitly encouraged in the New Forest Policy. Empowering local communities to manage forest resources is likely to result in sustainable utilization of NWFP.

5.2.3 Existence of organizations and projects with a philosophy of empowering local communities

Many organizations, mostly non-governmental organizations, and projects are operating in the country with a philosophy of empowering local communities to manage and utilize local forest resource (Kajembe and Monela, 2000). Experiences from the field regarding community-based natural resources are now emerging that can guide other new endeavors. What is required is effective coordination of these organizations and projects to avoid duplications and enable the information on best practices to be disseminated to all interested

parties.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

- From the literature available it can be concluded that available information in Tanzania regarding potentials of NWFP is inadequate. Most of information cited was of general nature indicating lack of depth in the analysis of NWFP's contribution to food security. It is therefore not possible at this juncture to indicate percentage contribution of NWFP to household food security. Such an endeavour would require a purposive field study to determine NWFP use in the context of the total household economy. All in all, It can be concluded that NWFPs are important for household food security and that they play an important role in coping with food shortages. Thus the importance of wild foods should not be underestimated.
- Regarding identification, selection, collection and preparation of all types of wild foods, gender based local knowledge is the main determinant. It is the women who mostly know the right species for household consumption. Integration of modern technologies in activities related to wild foods has not been widely reported. It is therefore pertinent that efforts be made to incorporate modern technologies in identification, preparation, preservation and storage of wild foods.
- It has been further established that NWFPs contribute either directly or indirectly to household food security. They contribute directly by providing food for consumption, and indirectly by income generation. The income can then be used to purchase food (not necessarily wild) from the market. The control of NWFPs are gender based. Products which have direct food contribution are normally controlled by women, while those related to cash earning are under men's domain.
- The study has revealed that deforestation, lack of proper forest management regimes and non homogeneity of NWFP users are the main threats against wild foods and other NWFPs, for household food security. Despite threats/problems related to sustainable use of NWFP for household food security, there exist some opportunities for its improvement. These include: trade liberalization and decentralization policies, the presence of legislative backing for development of NWFPs provided by the New Forest policy, and the existence of many projects with a philosophy of empowering local communities to manage their forest resources in a sustainable way.

6.2. Recommendations

- Gender and local knowledge are central in all activities related to wild foods. Despite the fact that both men and women are involved in collection of these foods, women are still the main actors. Men remain supportive or in control of prestigious activities, especially those related to income generation. It is therefore recommended that the government, NGOs or individuals committed to improving households food security should target women. It is the women who are managers of activities regarding household food security while men are managers of cash income, which may not necessarily be used for improving household food security.

- Regarding local knowledge, it is recommended that detailed studies be conducted to tap the available local knowledge with respect to wild foods before the fast modernization processes dilute it. Such knowledge should be documented and used by various authorities to improve household food security.
- The nutritive value of wild foods is quite notable. There should be countrywide campaigns to sensitize people on the use of wild foods instead of expensive domesticated ones. Wild fruits and vegetables are close substitutes of cultivated species. It is recommended that the nutritive value of different wild foods in different localities be investigated and advocated for food and nutrition security.
- It has been noted earlier in this study that cash owned by men may not lead to the improvement of household food security. It is recommended that forest based micro enterprises be advocated to empower households with income for food purchase. However such projects should focus women such that they become controllers of income from such enterprises. Income controlled by women is more likely to be used for family welfare, including household food security.
- For those who earn cash from sale of NWFP, the benefits they obtain are directly linked to markets. In many cases local processing receive very little for the product they sell. Instead, most of the benefits are captured by middlemen and urban traders operating further along the marketing chain. To assist local people in marketing of NWFP we need to strengthen the bargaining power of producers, provide producers with market information's, transport and storage facilities. Mount promotion and campaigned to encourage consumers to buy indigenous NWFP instead of imported alternatives. The existing agricultural extension network in Tanzania offers an opportunity for providing market information.
- Establishment of clear marketing channels for wild food products will provide income to households. Transparency and promotional activities will increase demand for the wild foods. In general, indirect contribution of NWFP to household food security through income generation depends on availability of market. Most policy makers have not acknowledged the need for markets for such products. It is therefore recommended that detailed studies on establishment of good marketing system of all types of wild foods be conducted.
- Large numbers of people already depend on gathering and processing tree and forest products as a source of income and food. These include products grown on farm and those obtained from the forest. By supporting those activities and helping to make them more profitable and sustainable, the livelihood of those concerned can be improved and their food security enhanced. This is of particular relevance for the landless and other disadvantaged groups, as these are the people who generally depend the most on these activities. Specifically women stand to benefit.
- To ensure mass production and sustainability of non-wood forest products efforts aimed at domestication of these resources should be enhanced. To this end, studies should be done on suitable cultural/agronomic practices of various species producing non-wood forest products.

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