



Full Length Research Article

INDIGENOUS FRUITS BUSINESS AND CONSERVATION OF EDIBLE INDIGENOUS FRUIT TREES IN SONGEA DISTRICT, TANZANIA

***Dr. Michael J. Haule**

Director of Postgraduate Studies, College of Business Education, Box 1968, Dar es Salaam-Tanzania

ARTICLE INFO

Article History:

Received 22nd May, 2016
Received in revised form
16th June, 2016
Accepted 26th July, 2016
Published online 24th August, 2016

Key Words:

Indigenous fruits,
Key actors,
Conservation.

ABSTRACT

Indigenous fruits (IFs) are among the best nutritional food materials in the world. Such fruits, available in Tanzania, include *Uapaca kirkiana* (Masuku), *Parinari curatelifolia* (Mbula), *Strychnos cocculoides* (Madonga), *Tamarindus indica* (Ukwaju) and many others. Despite their role in ensuring rural livelihood and enhancement of household income, Indigenous fruit trees (IFTs) are at the risk of vanishing due to anthropogenic factors that culminate into deforestation. The paper investigates whether the actors in IFs sector, i.e. those dealing with collecting, consuming, processing and selling are actually engaged in ensuring sustainability of IFs availability in the area. In case they do or they do not; then explaining why. The theory is that of "let the beneficiaries conserve resources for their own survival and development". A qualitative approach was adopted whereby data were collected through in-depth interviews and key informant interviews using Interview guides. Five (5) localities were selected for the study in which 5 respondents attended in-depth interviews and remaining 3 attended key informant interviews. Selection of respondents was purposeful so as to obtain maximum variation of responses. Probe questions were asked for detailed information. The data were processed into themes coded and similar information was linked for interpretation and analysis. The paper observes lack of IFs actors' engagement in conservation activities; caused by the lack of awareness on the need to conserve IFTs, coupled with absence of any planned mechanisms for forest conservation. The IFs actors appreciated the role of IFs in terms of improving livelihoods and household incomes while conversely conceding that nothing was done to conserve the natural forest in general, IFTs in particular. The number of IFs and quantities of IFs produced in a year declined tremendously causing concerns on their future availability. Nobody was thinking of reversing the trend as all the IFs were considered to be just "a gift of nature." Lack of awareness and absence of programmes to educate local people on the need to conserve, and more important how to conserve limited potential efforts was vividly observed. The paper proposes on concerted efforts for in situ conservation of IFs. Domestication and propagation of IFs are complex forestry management procedures and may take much longer time for the people of the area characterized by low levels of education and affected by poverty to be adopted.

Copyright © 2016, Dr. Michael J. Haule. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Forests are a home of many flora and fauna species which coexist in requisite habitats living in interdependent life system, called ecosystem. Among plant species growing in the miombo woodlands are wild fruit trees which are an important source of food with plenty of vitamins and macronutrients consumed by the rural and urban population. In the miombo woodland of Songea district of Southern Tanzania, a broad range of wild fruit trees were observed characterizing the forest of the area.

***Corresponding author: Dr. Michael J. Haule**

Director of Postgraduate Studies, College of Business Education, Box 1968, Dar es Salaam-Tanzania

As the paper concentrates on edible wild fruits, some of the common types include masuku (*Uapaca kirkiana*), mbula (*Parinari curatelifolia*), ndavatava (*Flacourtia indica*), makowozi (*Syzygium guineense*), maviro (*Maltidentia crassa*), madonga (*Strychnos cocculoides*) and others. The phenomenon wild fruits as business as observed in the area, which transfers bulk of wild fruits from rural areas to urban centres for sale, calls for an attention. Coupled with augmenting deforestation observed in the same area (Haule, 2010) there is a lot of implications to the survival of such important trees. Due to population increase there is the need to obtain extra volume of fruits from the forest so as to cater for the expanding urban demand. The issue of wild fruits sustainability remains key for both continuous utilization and biodiversity conservation. The paper therefore strives to

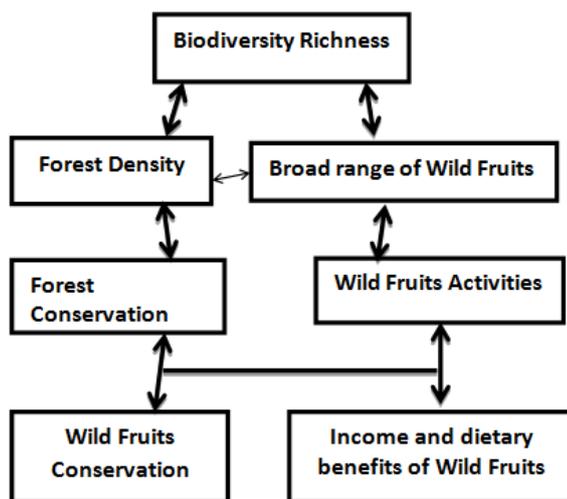
establish the existing link between utilization of wild fruit trees and existing conservation efforts for their tree species. This is an effort towards unveiling the existing conservation mechanisms and systems in place that would guarantee adequate supplies of edible wild fruits for the rural setting and urban market. The main question is what steps and mechanisms are in place in Songea district to ensure adequate and sustainable supplies of edible wild fruits for the consumers? To meet this purpose, the paper strives to identify types of edible wild fruits which are collected and sold and used for different purposes in the area. It also tries to determine the way edible wild fruit trees are cared for and/or conserved. The paper is set to establish the link between utilization of wild fruits and conservation of the same wild fruit trees.

Conceptual Framework and Conceptual Model

Conceptual Framework

The paper conceptualizes that biodiversity richness is the basic aspect for continuous presence of the forest cover and tree species used for different purposes which include indigenous tree fruits. Biodiversity richness is determinants of forest density hence influencing the range of wild fruits obtained. Forest diversity enhances varieties of wild fruits which is both a product and reinforcing factor for forest conservation, while at the same time broad range of wild fruits enhances wild fruits activities. Forest conservation and wild fruits activities are related in the way that they should reinforce each other. In this manner forest conservation constitutes wild fruits conservation as its component part; while wild fruits activities enhances household income and livelihoods whose sustainability hinges on forest conservation.

Conceptual Model



Source: Researcher's own construct, 2016

Literature Review

Definition and Characteristics of Miombo Woodlands

Miombo is a vernacular adopted by ecologists to mean those ecosystems dominated by trees in the genera *Brachystegia*,

Julbernardina and *Isorberlina*. These are giant trees found in canopy and represent 80% of all the trees (Dykstra, 1983). These forests shed leaves before rains start, i.e. they are deciduous (Tuohy and Choinski, 1990). Countries in which miombo woodlands occur are Angola, Malawi, Mozambique, Tanzania, Democratic Republic Congo, Zambia and Zimbabwe (White, 1983). In miombo woodlands, the canopy height is usually greater than 15 m indicating moist soils which are favourable for growth. Dry Miombo is in southern Tanzania area with 1000mm of rainfall (*ibid*). Miombo woodlands are a home of various types of wild fruits trees such as *Uapaca kirkiana* (Masuku), *Strychnos cocculoides* (Mtonga), *Tamarindus indica* (Mkwaju), *Parinari curatelifolia* (Mbula), *Vitex mombassae* (Mtalali), *Vitex doniana* (Furu), *Adansonia digitata* (Mbuyu) and many others (Muok *et al.*, 2001; Eyog-Matig & Chikamai, 2009; Temu & Chihongo, 1998; Ndakibunze, 2011). According to Abdallah and Monela (2007) recent data for Miombo woodlands in Tanzania is lacking. Miombo constitutes 90% of forested land in Tanzania, covering an equivalent to 44.6 million ha; of which 54% is in general lands, hence exposed to dangers of deforestation. In Southern Tanzania, main concentrations of Miombo vegetation are in Iringa, Lindi, Mtwara and Ruvuma administrative regions. Other regions of Tanzania with Miombo woodlands are Tabora, Rukwa and Kigoma (*ibid*).

Potentials of Miombo Woodlands for Livelihood Improvement

Miombo woodlands are central to livelihood systems of millions of rural and urban dwellers in Tanzania (Chikamai *et al.*, 2005; Abdallah & Monela, 2007). They provide important goods and services that support livelihoods of local communities. The goods offered include medicines, energy, food, fibers and construction and craft materials. While the services provided by miombo woodlands include cultural and spiritual values, climate regulations, control soil erosion and providing hydrological control (Chikama *et al.*, 2005). Studies have shown that households harvesting wild fruits from forests and farms can avoid hunger, boost rural employment and generate income (Mithofer, 2004). It is imperative arguing that indigenous fruits play a vital role in livelihoods of many rural communities, those living in Africa, Tanzania inclusive. Forest products become more valuable especially to those living in dry lands and/or during dry seasons (NRC, 2008).

In West and central Africa wild fruits form part of local diet (Schreckenber *et al.*, 2006). In Zimbabwe, wild fruit trees represents about 20% of the total woodland resources used by rural households (Campbell *et al.*, 1997); whereby wild fruits are collected and consumed in both fresh and processed forms; sell and use the proceeds to buy food and other household goods (Ramadhani, 2002). In this way, they are an important component in the nutrition of most families especially during famine on in the event of natural disasters (Chikamai *et al.*, 2006; Fukushima *et al.*, 2010). According to Maduka (2004) rural communities of Tanzania have for many years depended on indigenous fruits from natural forests mainly for household consumption and income generation. However, several studies concede to the fact that these resources have been declining rapidly due to high rate of deforestation as a result of increasing human pressure (Buyecheki, 2008; Temu and

Chihongo, 1983; Fukushima *et al.*, 2010). FAO (1982) estimated that tropical forests were vanishing at the annual rate of 7.3 million ha, therefore affecting wild fruits trees as they grow in natural forests.

Another synthesis workshop which was carried out in Ethiopia, Kenya, Sudan and Tanzania by the Association of Forest Research institutions of eastern Africa (AFREA) is of the opinion that East Africa has the potential for development of wild fruits based resources, but the forest cover change, due to deforestation tended to threaten its sustainability (Chikamai *et al.*, 2006). Agroforestry Programme of Sokoine University of Agriculture, Tanzania Forestry Research institute (TAFORI), Regional Land Management Unit (RELMA) and Shinyanga Soil Conservation Programme (HASHI-ICRAF) conducted a joint study aimed at promoting use of indigenous fruits and enhance food security, improve income, health and nutritional status of rural and urban communities (Maduka, 2004).

The initiative confirms that the sector was unsustainable, hence concerted efforts are highly demanded to improve it. This was a necessary step in realizing the maximum and sustainable exploitation of the existing natural vegetation utilization potential. From the above presentation it is partly evident that utilization of Miombo woodlands is unsustainable and inefficient (Prins & Kikula, 1998; Ngulube *et al.*, 1997; Walker & Desanker, 2004); mainly due to expansion of human activities that cause deforestation. In Tanzania, miombo woodlands disappear at annual high rate of 91,200 ha due to clearing for obtaining tobacco, field expansion, fuel wood, construction, bushfires and lumbering (URT, 1989). Deforestation has resulted into declining plant species including wild fruits (Temu & Chihongo, 1998); hence making sustainability of miombo ecozones questionable (URT, 1989). This call for the need to address all factors that tends to destroy persistent presence and continuity of natural vegetation cover in general, miombo woodlands in particular.

Effective and Sustainable Utilization of Indigenous Fruit Trees

To fully economically exploit the potential of indigenous fruits and increase their supply, there are few actors involved in research and development in Tanzania. One of the he studies involved SADC-ICRAF, Agroforestry Programme at Sokoine University of Agriculture, TAFORI, RELMA, TISA and HASDHI-ICRAF and HASHI (Maduka, 2004). The aim was to promote utilization and sustainable use of indigenous fruits in order to enhance food security, improve income, health and nutritional status of rural poor and urban communities. According to Akinnifesi *et al* (2005) wild fruits are said to be supplied to urban sector for the urban poor. However, Chikamai *et al* (2006) observes wild fruits being important articles of commerce in the local, national and regional markets. The first contention needs to be validated as to whether it sounds true for the context of Songea as well. As it is known that urban centres of developing world are characterized by rural-urban migration (Brueckner, 1990; Todaro, 1976 in Cornwell and Inder, 2004), it is kind of generalization to assume class characteristics as larger proportions of population are essentially tied to the rural.

Urbanites of poor countries are essentially rural hence they might be missing the rural touch if they would not consume rural products, wild fruits in particular. Maduka (2004) concludes that future research and development of indigenous fruit species for wider domestication, conservation, commercialization of products, processing and marketing within Tanzania need to be promoted in order to improve nutrition and household income of the majority. It is in the spirit of this conclusion that this paper was developed.

Forest Resource Base and Key Players

The actual number of indigenous trees species in Tanzania has not been documented neither estimate figures. However, Tanzania boasts to be one of the richest diversity of plant species in the region and that it has an equally large number of the shrub as well as tree species that bear IFs. This is claimed by ICRAF-SADC programme which carried out domestication of IFs in collaboration with TAFORI (Chikamai *et al.*, 2006). One wonders as to how sustainability of specific forest resources can be planned and managed without knowing the potential and actual resources available. In this way sustainability of Tanzanian natural forest resources remains highly questionable. Ethiopia has about 370 indigenous food plants (belonging to 70 different families) out of which 182 species (40 families) are shrubs/ trees with edible fruits/seeds. But the country experiences low status of research. Kenya is known to have 800 indigenous food plants (belonging to 105 families) out of which 400 species are fruit plants (57 families). Several institutions are involved in research and development; hence evidencing high level research activity. KEFRI has carried out several studies on germplasm, collection, handling, processing and storage and production of seedlings (Chikamai *et al.*, 2005).

Kenya is reported to have diverse interest of key players in production, trade and research in indigenous fruits in terms of food value, market potential, self-life, potential for other uses, level of occurrence and germplasm availability (Chikamai *et al.*, 2006). These resources have been weighed basing on level of importance articulated by communities during field appraisal and that priorities were ranked. Such arrangement is important for control on the sustainable resource utilization. The National Museum of Kenya conducted a study on indigenous fruits through various departments and recorded indigenous knowledge of traditional food plants of Kenya and hold data base of such important resources (Chikamai *et al.*, 2006). No such efforts are documented, for the case of Tanzania, which has been classifying its indigenous fruit diversity basing on taste, multiple uses, marketability and food security in famine and hunger, yield potential and availability (ibid). The indicators used are relative and subjective to individuals and socio-cultural communities. More specific and scientific indicators are to be developed for effective practical application.

A study of 700 of Tanzanians observed that at locally marketed wild fruits are Mtalali (*Vitex mombassae*) *Vitex doniana*, Mbuyu (*Adansonia digitata*), Mbula (*Parinari curatellifolia*) and Mbula (*Strychnos cocculoides*). Furthermore the study identified country priority wild fruit species for Tanzania which are Mbula (*Parinari*

curatellifonia), *Mtonga* (*Strychnos cocculoides*), Masuku (*Uapaca kirkiana*), *Mtalali* (*Vitex mombassae*) and *Fufu* (*Vitex doniana*) (Ruffo *et al.*, 2002). Several knowledge gaps identified for Tanzanian wild fruits sector are in terms of value addition of indigenous fruits, efficient harvesting and post harvesting handling methods and enhancement of product preservation. These are considered to be important interventions geared to assisting stakeholders especially women in improving fruit processing and marketing of products from indigenous fruits and awareness creation (Chikama *et al.*, 2006). Knowledge in such identified areas is critical for effective utilization and conservation of forest reserves, wild fruit trees in particular.

Moreover, Ndakibunze *et al.* (2000) suggested further studies on identification of anti-nutritive factors contained in indigenous fruits products such as phytic acid, tannins and trypsin inhibitors. With present knowledge on food technology, understanding these factors and inactivating them will help to conserve the bio-available in these products. Improving product shelf life of indigenous fruits will be hand in hand with identification of physical and bio-chemical changes that take place during maturation, processing and storage (Ndakibunze *et al.*, 2000). Such information is useful for preservation of nutrients of most fruits both in raw and processed forms.

Ndakibunze *et al.* (2000) recommended for developing models for understanding yield per year per single tree basis which will help in understanding how much a farmer can harvest from a single tree if fruit species are to be included in the agro-forestry system. It is based on understanding the number of fruit species in estimate that may enable calculation of an estimated total wild fruits potential for planning on the sustainable resource utilization. FAO (2013) observes the potential of women in forest conservation while appreciating their knowledge, skills and skills diversity in forest management for various uses. Since women have specific roles in agroforestry and forest value chain, which contributes significantly to their incomes, it is imperative that they may actively engage in conservation. They are the key stakeholders in the forest sector.

Another study by FAO (1999) indicated women's farms having broader species range as they preferred trees for various uses than men. Having been the main agents against climate change, women are the potential victims of the same (Peach Brown, 2011), hence they are naturally forced act prudently. As managers of natural resources, women influence a total amount of genetic resources used and conserved (World Bank, FAO & IFAD, 2008). This observation influences one to consider women as actors in conservation. However one may ask himself as to whether it is the active attitude linked to conservation of wild fruits.

From the above literature it seems imperative to establish the existing linkage between wild fruits utilization and conservation. It practically means the link between roles of wild fruits collectors, sellers and processors (if any) in ensuring the continuity of presence of wild fruit trees, an aspect critical for sustainability of wild fruits business. How users of the forest and forest products play role in conserving

it at location-specific context is central to the maintenance of the forest cover quality. Poulton and Porle (2001) propose that domestication of indigenous fruit trees be more advanced to enhance household food and income security instead of introducing exotic fruit species. Involving agricultural and/or forestry science in enhancing sustainability is accepted to be crucial. However, adaptation of complex scientific procedures, such as those outlined by Akinnifesi *et al.* (2007), i.e. selection of priority species, germplasm collection and tree genetic improvement, propagation systems and field management; by local community members, becomes difficult and prohibitive. The limitation hinges of low levels of education coupled with high levels of illiteracy. This status remains to be a fetter to success is opted to the alternative. The author is of the tenet that those who benefit from the sector are likely to be the best actors in conservation activities. These are the most knowledgeable and experienced on the qualities, characteristics and trends in forest cover change within a locality. They may, in collaboration with specialists in forestry chart out appropriate and effective ways to ensure sustainability of both human life and environment, particularly forest cover.

MATERIALS AND METHODS

The paper was written based on a study that made use of qualitative data collected from respondents living in five (5) localities; whereby four (4) from areas closer to Songea Municipality, which is the headquarter for Ruvuma region and one (1) from an area near the border with Namtumbo township a district heard quarter. Such localities were considered appropriate as there were forests from where edible wild fruits were collected and wild fruits business was observed taking place. Data were collected using in-depth interviews (IDIs) conducted at Lipaya and Mahilolocalities; and Key Informant Interviews (KIIs) covered Mpitimbi, Lipaya and Mlete. Interview guides were used during interviews, while probe questions were administered for clarity and additional information about investigated phenomena. In total 5 respondents participated in IDIs while 3 took part in KIIs. While IDIs provided information about particular households, KIIs tended to give information about edible wild fruits and wild fruit trees conservation for the entire area basing on experience of the key informants involved.

Table 1. The Distribution of respondents for IDIs and KIIs

SN	Locality	Method	Respondents
1	Lipaya	IDI	3
3	Mahilo	IDI	2
2	Lipaya	KII	1
4	Mpitimbi	KII	1
5	Namtumbo	KII	1
	TOTAL	-	8

Source: Field Survey, 2015

The participants were selected basing on *purposeful sampling*, in order to obtain wide variations of responses as a way to enriching the volume of information and data collected. Data were processed manually by transcribing and translating the same from Kiswahili to English. The transcripts were coded after themes were identified. Analysis was carried out through linking the themes and subjects as specified by the codes.

Findings were generated basing on the content of the coded information, respondents gestures and their specific points of emphasis.

Presentation and Discussion of Findings

It was unveiled that several types of wild fruit tree species were growing in the area, making the same edible fruits consumed and sold in the area. The wild fruit trees mentioned to grow in the area include *Masuku* (*Uapaca kirkiana*), *Mtonga* or in vernacular *Madonga* (*Strychnos cocculoides*) Furu, in vernacular Ufudu (*Vitex doniana*), *Syzygium guineense* in vernacular makowozi, zabibupori in vernacular Ndatavava (*Vitex Mombassae*), *Maltidentia crassa* in vernacular Maviro and *Ximenia caffra* in vernacular mbingimbingi. These fruits were said to have been consumed by people of the area for ages. The fruits get to be known through inter-generational information passage and practices. Despite this range of wild fruits, the threemain types of wild fruits which are normally sold in the market are *Masuku*, *Madonga* and *Mbula*. Reasons put forward for preference to sell these types of fruits are basically two, i.e. their shelf life which implies that they may be kept at the market place, without any kind of treatment for a considerable time. *Masuku* may be stored for relatively shorter time, say a maximum of five (5) days; while *Madonga* may endure even 3 months. The second reason is their long term availability. While *Madonga* are available for 3 months, i.e. from September to December; *Masuku* are also available for 3 months, i.e. from October to January. The longevity of the period means more consumption and expanded opportunity for business gains.

Other types of wild fruits are directly consumed in rural areas as they may not endure long stay, hence likely to cause loss to sellers. The study observed that though some fruits were not sold in the market, they were still a popular snack and refreshment in the villages located closer to where they are found. These fruits provided an alternative source of proteins and micronutrients to vast sections of the rural population. On conservation of wild fruit trees, the findings portray that wild fruit trees received no care from the collectors of wild fruits. The villagers who happened to visit the forest for gathering edible wild fruits were not, in any way, involved in protecting the forest neither wild fruit trees. The respondents voices used words like "trees were growing taking care of themselves" others mentioned that "it was for nature to care and conserve the trees."

One of the respondent uttered responses like:

"Wild fruits are there for us to collect and eat. We do not have to labour to make them grow. They are just there growing naturally to be eaten by humans and wild animals. Nobody has to claim that he owns them"

To themajority of rural dwellers such fruit trees were just a gift of nature. One of the respondents had the following words to comment in this regard:

"when the season comes the fruits get ready to be eaten. They are a gift from God. We collect and eat them. Even if we do not eat, then monkeys and other animals will eat

them. In some places they just rot. Nobody has the duty to ensure that they grow and bear fruits"

The reality on the ground was even the opposite, i.e. more human activities invaded forest areas engaged on the use and misuse of natural vegetation resources even where the authorities restricted them. A picture (Fig 1) below indicates a farm located just adjacent to the banner which restricts such actions.

One wonders as to how such people, with a negatively skewed perception, may conserve trees in the unrestricted forest for its utility; while they cannot conserve in a restricted area. This does not guarantee environmental sustainability, hence raising questions of wild fruits supply and their future availability. The study could not establish any alternative on how the existing natural resource users guaranteed its conservation; in this way, demonstrating presence of a change which was demonstrated by deforestation, and the vivid lack of continuity. It was visually observed that in some farms it was a common place for farmers to leave some wild fruit trees for a source of fruits and shadow for resting during cultivation seasons. The conserved trees in farms were considered a public utility as anybody may trespass the farms to just collect fruits from the trees left behind by the farm owner. However, the invaders are not allowed to cut the tree as it is in somebody's farm. The same practice occurs around homesteads whereby some few wild fruit trees are left to grow as a source of fruits and a shadow for resting during day time.

To support this stance, a respondent uttered statements:

"In my farm I have left some wild fruit trees like misuku, mimbula and ndavatava. The trees [provide shadow and fruits during the seasons. I enjoy such services from wild fruit trees by my farm. In many farms people cut all trees including wild fruit trees. Such people are short sighted"

One prominent respondent mentioned that "I cannot wonder seeing a wild tree fruit around the homestead. They are important for fruits and during sunny days we may just sit under the tree to rest and enjoy". The practice to keep wild fruits in farms and near homestead is highly recommended, but perceiving it as public utility reduces eagerness of other to do the same. This is one of the areas that may need a consideration by agricultural and/or forestry extension service. It was observed further that collectors were knowledgeable on locations of most wild fruits. It implies that they were going to the forest knowing the sites and locations of several indigenous fruit trees. One respondent gave a profound statement like:

"When we go to the forest to gather wild fruits such as Masuku, Madonga, Mbula and others, we do know exactly where we should go and which trees we should visit. There are few trees which we happen to see them just abruptly, and consider them as new ones"

This knowledge on specific locations and sites of indigenous fruit trees would be used for planning of interventions for at least not cutting or setting fire on them. Reducing human disturbances to such natural vegetation is hereby considered

important for its long term survival and maintenance of its naturalness.

Conclusions and Recommendations

Conclusions

The study findings highlight on several important aspects which provide significant information on the status of conservation of wild fruit trees by wild fruits collectors living in the area. Such information is useful for the planning of sustainable conservation of indigenous fruits in Songea district and elsewhere in the African continent.

On care and conservation of wild fruits

Observations on the forest cover, tallied with responses obtained from the study participants, would make one to note that there are negligible efforts linked to conservation of indigenous fruit trees in Songea district. The collectors of wild fruits considered wild fruits as a gift of nature which should take care of itself. The actors in IFs were in generally not engaged in forest conservation initiatives, IFTs in particular.

On mechanisms used for conserving wild fruits

The noted conservation efforts were mainly among those few people who left a few indigenous fruit plants to grow in their farms. Such people kept the indigenous fruit trees to obtain fruits and a shadow within the vicinity of their homesteads and farms. They actually reduced distance and guarantee to harvest even a few fruits annually, forgetting that vegetation regeneration is natural and more important for environmental sustainability.

On the existing link between wild fruits utilization and conservation of IFTs

There exists a weak link between wild fruits utilization and the conservation of wild fruits. It means that the collectors and consumers of wild fruits do very little, if any to conserve IFTs. This threatens existence and survival of these important tree species. Since forest conservation is not an activity which is practiced as planned; the continuous and augmented deforestation is perpetually expected. This has no exception for protected areas, and areas with plenty of indigenous fruit trees are affected. The situation observed becomes more pathetic with time. High rate of population growth coupled with the observed lack of concerted conservation initiatives augments the possibility for further deforestation leading into extinction of all wild fruit species.

Recommendations

The paper proposes several recommendations:

All the wild fruits species, i.e. both prioritized fruits and those which are not prioritized for sale have to be conserved so that they are available for the current and future generations.

On care and conservation of wild fruits

The paper recommends that users of the wild fruits should spearhead IFTs conservation initiatives as they are the most

beneficiaries of the same resource. These actors constitute a section of the population which is knowledgeable about utility, location, sustainability, volume, profitability of indigenous fruits are the ones supposed to be motivated to play role in forest conservation in general, IFTs in particular.

On mechanisms used for conserving wild fruits

It is proposed that further efforts should be put in place to enhance farmers leaving a sizeable number of wild fruits in their farms. This will enable such plants to share services given to traditional crops grown in the same farm. It means that weeding of crops shall as well take care of the IFTs. Since IFs collectors know the location of wild fruits in the forest, it is high time that such trees are cared of by the collectors themselves. This may be achieved through preparation of fire lines which will limit bushfires from destroying a considerable numbers of IFTs within the locality. General posters which prohibit human activities and patrols by conservation staff should be used so as to control deforestation causing activities. Enforcement of environmental laws be in place so that forest conservation is successful.

On the existing link between wild fruits utilization and conservation

The observed missing link between IFs collectors and conservation of IFTs should be forged through educating them on the significance of conservation in enhancing sustainable IFs availability. The theory of "let the beneficiaries be responsible for conservation" is to be promoted for continuous wild fruits supplies for future generations.

REFERENCES

- Akinnifesi F, Jordaan D, Ham C., 2005. Building Opportunities for Small-holder Farmers to Commoditize Indigenous Fruit Trees and Products in Southern Africa: 2 Processing, Markets and Rural Livelihoods. Conference on International Agricultural Research. Stuttgart-Hohenheim, October 11-13 2005
- Akinnifesi, F, Ajayi, O, Kadzere, I and Akinnifesi, A. 2007. Domesticating and Commercializing Indigenous Fruit and Nut Tree Crops for Food Security and Income Generation in Sub Saharan Africa. A Paper presented at the New Crops International Symposium, 3-4 September, 2007. Southampton, United Kingdom.
- Brueckner, J. 1990. Analyzing Third World Urbanization: A Model with Empirical Evidence. University of Chicago.
- Buyecheki, T. 2008. Perceptions on Indigenous Fruits Processing in Sikonge District in Tanzania: is It sustainable? International NGO Journal Vol. 3 (6) pp 155-121, June 2008
- Campbell B, Lukert M and Scoones I. 1997. Local level valuation of Savannah Resources: A case Study from Zimbabwe Econ Bot 41(3): 375-385
- Chikamai, B., Eyog-Matig, O. and Kweka D. 2005. Regional Consultation on Indigenous Fruit Trees in Eastern Africa. Kenya Forestry Research Institute, Nairobi.
- Chikamai, B., Eyog-Matig, O. and Mbogga, M. 2006. Review and Appraisal on the Status of Indigenous Fruits in East Africa. Report prepared for IPGRI-SAFORGEN in the Framework

- Cornwell, K and Inder, B. 2004. Migration and Unemployment in South Africa: When Motivation Surpasses the theory. Retrieved from www.csae.ox.ac.uk/conference/2004
- Dykstra, D., 1983. Forestry in Tanzania. *Journal of Forestry* 81: 742-746
- FAO, 1999. *Agroforestry Parklands in sub-Saharan Africa*. FAO Conservation Guide No. 34. Rome. FAO (2013)
- Fukushima, T., Morimoto, Y., Maundu, P. Kahindi B & Fondo J. 2010. Local Preference of Indigenous Fruit Trees in Coast province of Kenya. *African Journal of Environmental Science and Technology*, Vol. 4 (2), pp. 872-885, December 2010
- Luoga, E. 2000. The Effect of Human Disturbances on Diversity and Dynamics of Eastern Tanzania Miombo Arborecent Species. A Doctoral thesis submitted to Faculty of Science, University of Witwatersrand Johannesburg
- Maduka, S. 2004. Status of Indigenous Fruits in Tanzania. In Review and Appraisal on the Status of Indigenous Fruits in Eastern Africa, Chikamai B, Eyog-Matig and Mbogga M (Eds) IPGRI_SAFORGEN, Nairobi, Kenya pp 81-99
- Mithofer, D. 2004. Economics of Indigenous Fruit Tree Crops in Zimbabwe. PhD Thesis. Department of Economics and Business Administration. University of Hannover, Germany.
- National Research Council. 2008. Lost Crops of Africa: Vol. III Fruits. Washington DC, The National Academies Press. www.nap.edu
- Ndabikunze B, Masambu B, Tiisekwa B and Issa-Zacharia A 2000. The Production of Jam from Indigenous Fruits using Baobab (*Adansonia digitata* L.) Powder as a Substitute for Commercial Pectin. *African Journal of Food Science* Vol. 5 (3) pp 168-175, March 2011
- Ngulube, M., Hall, J. and Maghembe, J. 1995. Ecology of a Miombo Fruit Tree *Uapaca kirkiana* (Euphorbia). For Ecol. Manage 77:105-117
- Peach Brown, H. 2011. Gender, climate change and REDD + in the Congo Basin Forests of Central Africa. *International Forestry Review*, special issue 13(2).
- Ramadhani, T. 2002. Marketing of Indigenous Fruits in Zimbabwe, Socio-economic Studies on Rural Development 129. Wissenschaftsverlag Vauk. Kiel, Germany
- Schreckenber, K. 2004. The Contribution of Shea Butter (*Vitellaria Paradoxa* CF Gaetner) to Local Livelihoods in Benin. In Sunderland, T, Ousseynou N 2004 (Eds) Forest Products, Livelihoods and Conservation. Case Studies of Non-timber Forest Product Systems. CIFOR, Bongor
- Temu, S and Chihongo, A. 1998. Field Survey of Wild and Underutilized Edible Plants of Ruvuma Region, Tanzania. COSTECH Dar es Salaam
- Tuohy, J. and Choinski, J. 1990. Comparative Photosynthesis in Developing Leaves of *Brachystegia Spiciformis* Benth. *Journal of Experimental Botany* 41:919-923
- URT, 1989. Tanzania Forestry Action Plan 1990-2007/8. Ministry of Tourism, Natural Resources and Environment. Dar es Salaam, Tanzania
- White, F. 1983. The Vegetation of Africa, a Descriptive Memoir to Accompany the UNESCO/AETFAT/UNSO Vegetation Map of Africa (3plates, Northwestern Africa, Northeastern Africa and Southern Africa). 1:5000,000. UNESCO
- World Bank, FAO & IFAD, 2008. *Gender in agriculture sourcebook* (available at: <http://worldbank.org/genderinag>).
