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Article

Perceptions on indigenous fruits processing in Sikonge district in Tanzania: Is it sustainable?

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A study on perceptions of indigenous fruits (IFS) processing was conducted in Sikonge district, Tanzania. The objectives were to (1) involve stakeholders in evaluating processing of indigenous fruits (2) recommend strategies for combating the effects of processing indigenous fruits (3) perform economic analysis on the technology. Structured questionnaires and focus group discussions were used to collect data. Results revealed that over 90% of people involved in IFS processing were women while collection and selling of fruits were mostly done (86%) by children and elders over 55 years. Economic analysis showed that about US$ 26.04 per month per individual can be earned through selling processed products. Results further showed that IFS processing was not sustainable. The study suggested community environmental sensitization, use of energy saving technologies, fruits diversification, proper packing and labeling, improved fruits handling, nutritional analysis, credit facility assistance and capacity building on financial, food hygiene and group formation to be instituted to sustain IFS processing. Information generated by this study could be utilized by indigenous fruits processors, NGOs and policy makers for sustainable fruit processing in the area.

Key words: Indigenous fruits, perception, processing, sustainability, Tanzania.

INTRODUCTION

Miombo woodlands are the major sources of indigenous fruits, fuel wood, construction materials, habitat for creatures and other socio-economic activities (Ngulube et al., 1997; Luoga et al., 2002; Chidumayo and Kwibisa, 2003). Several studies have shown that, miombo woodlands are no longer supporting human activities due to significant reduction in size and increased demand (Prins and Kikula, 1996; Ngulube et al., 1997; Chidumayo and Kwibisa, 2003; Walker and Desanker, 2004). FAO (1982) estimated that tropical forests were vanishing at a rate of 7.3 million ha annum^{-1}. According to Burgess (1993) the extent of tropical deforestation reached 16.9 million ha annum^{-1}, at an annual deforestation rate of 0.9% throughout the 1980s. Projections by FAO (1982) indicated that 150 million ha or 12% of the remaining closed tropical forests and roughly 76 million ha of open tropical woodlands would be deforested within 20 years. In Tanzania, miombo woodland is disappearing at high rate. A study conducted in Tanzania showed that, about 91,200 ha of forest is cleared each year through tobacco curing, field expansion, fuel wood, construction, bush fire and lumbering (MTRE, 1989). As the area under forestry in the world is decreasing, the population is increasing at alarming rate. Every year approximately 100 million people are added to the globe.

This rate will lead to a population of 8.5 billion people by the year 2025 (Turner, 1996). The increased population means increased land and food which depends on the expansion of cropping land for food production (Chidumayo and Kwibisa, 2003; Walker and Desanker, 2004). This will further deplete miombo ecozones in the world and hence the concern on the miombo ecozones sustainability.

Miombo forest plays an important role in the world. It is the source of energy for majority of people, medicinal plants, food, animal feed and acts as a cushion for global warming. In Tanzania it provides areas for crop production, source of timber, food and shelter for wildlife (Monela et al., 1993; Schwartz et al., 2002). As a result, a number of projects that utilizes miombo woodland have been initiated. One of the prosperous projects is indigenous fruits processing. The IFS project was launched in Sikonge which is one of the districts of Tabora region in Tanzania. The primary goal of the project was to empower farmers through utilization of fruits processing technologies. The main source of fruits was the nearby

miombo forest. The project expanded as more farmers, processing groups, NGOs and business society were entirely involved in IFS processing activities. In Tabora alone, about 270 individuals started to practice IFS processing after attending training at various stages (MATF, 2006). Previously a baseline survey carried out by Tumbi researchers showed that, more than 50% of respondents were involved in indigenous fruits processing (Nyoni et al., 2003). As number of individuals, groups and NGOs involved in IFS processing is escalating, the large amount of fruits will be needed to meet the generated demand (Schwartz et al., 2002). But previous studies showed the decline of miombo forest reserve due to human activities (Hyde and Sieve, 1993; Schwartz et al., 2002). This has lead to the general concern on the sustainability of the initiated IFS processing project in the area and hence the need for designing sustainable utilization of miombo woodlands. But, effective planning needs the incorporation of community opinions and perceptions which starts with society diagnosis (Magigi and Majani, 2006; Obeng and Ugboro, 2008). Therefore, the study on farmers' perception about indigenous fruits processing and sustainability in Sikonge district was conducted. Six villages with ten respondents each were used to generate information on indigenous fruits processing perceptions. The objectives were to

i. Involve stakeholders in evaluating processing of indigenous fruits
ii. Recommend strategies for combating the effects of processing indigenous fruits
iii. Perform economic analysis on processing of indigenous fruits.

METHODOLOGY

Study area description

Tabora region exhibits mono-modal type of rainfall with an average of 928 per annum which falls between November and May. The region is situated at the area between 4^0 and 7^0 south of the equator and between 31^0 and 34^0 east of the Greenwich line. Tabora region is about 1300 masl with the mean temperature of 23.8^0C (Nyadzi et al., 2003a; Nyadzi et al., 2003b). Sandy loam dominates soils of Tabora and classified as Ferric Acrisol according to FAO soil nomenclature. Bush land thicket, grassland, lowland, wetland vegetation and woodland cover a large portion of the region. More than 80% of Tabora population depends on unstable agricultural production environment (Byerlee and Heisey, 1996).

Majority of the people in Tabora are economically disadvantaged and frequently suffer from food insecurity problems (Mugo et al., 2005). The major source of income is from tobacco (*Nicotiana tabacum*) and maize (*Zea mays*) (Ramadhani et al., 2002). This farmers have less access to credit facilities which leads to inadequate input use and grows unimproved crop varieties which results into low crop yields (De Groote et al., 2002; Doss et al., 2003). Low returns per capital and frequent hunger exerts constant pressure of seeking for other sources of income (Mwakalobo and Kashuliza, 1999). This accelerates initiation of many community development projects in the area.

Respondents and village selection

The study was carried out in Sikonge district in Tanzania from January to June, 2006. A total of 60 respondents were selected from six villages practicing indigenous fruit processing activities. The selected villages include Mole, Tutuo, Usanganya, Mkolye, Mitowo and Kisanga. A random selection procedure was employed to select respondents that constituted the focus group. The focus group consisted of processing groups, people who are involved in harvesting/selling indigenous fruits, individual processors, farmers by gender, village leaders, district leaders, NGOs, grouping by age and government employees in the village.

Data collection and analysis

Structured questionnaires were used to collect data. These were supplemented with focus group informal discussion, secondary data and personal observations. SPSS (2006) computer software was used to analyse data gathered from the study.

RESULTS AND DISCUSSIONS

Focus group discussions showed that, over 90% of people involved in IFS processing were women. Fruits collection and selling were mostly done (86%) by children and elders over 55 years. The skewdness towards mostly economically disadvantaged population showed by this study implies that IFS processing was not stable since males who are decision makers were scarcely involved. The lower participation of males could be attributed to socio-cultural values as cooking is culturally considered as female activity in the area (Mbilinyi, 1972).

Demographic characteristics

Table 1 presents demographic characteristics of the studied area. Most of the respondents were married couples and majority of them were females. Results further revealed that, most of the population were adult over 18 years and lived in villages for the period over 20 years dealing with farming, business or employed in NGOs or civil servants. The domination of female adults and the longer years stayed in the village could be argued that, the technology of IFS processing fits well female living environment as traditionally known to be food processors. These findings are accordance with (Mbilinyi, 1972).

Seventy two percent of the respondents depend on growing crops for their livelihood need (Figure 1). Other sources of income in descending order were livestock keeping, lumbering, fruits processing, honey harvesting and kiosk business. This implies that, about 90% of earnings in Sikonge depend on forest and its derivatives. Although results showed 72% of income as coming from crop farming, the direct effect is on the forest as farmers grow tobacco which is the number one crop source of income and the first source of forest destruction in the district (Ramadhani et al., 2002).

Table 1. Demographic structure of respondents in Sikonge district, 2006

Item	Frequency	Percentage
Marital status		
Married	47	78.33
Single	8	13.33
Widow	2	3.33
Divorced	3	5.00
Sex		
Female	51	85
Male	9	15
Age distribution		
<18	3	5.00
18-35	4	6.67
36-55	24	40.00
>55	29	48.33
Number of years in the village		
Over 20 years	49	81.67
10- 20 years	6	10.00
Bellow 10 years	5	8.33
Occupation		
Farmer	29	48.33
Business	8	13.33
NGO member	17	28.33
Civil servants	6	10.00

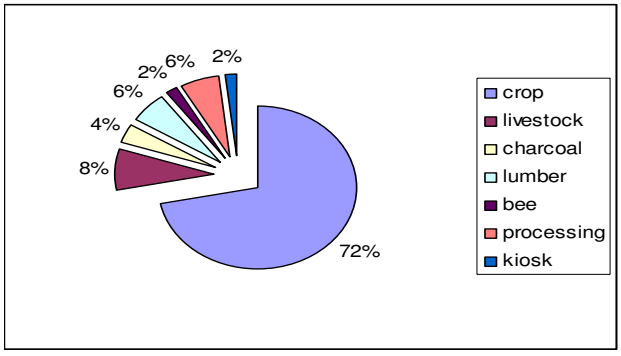

Figure 1. Sources of income in Sikonge district, 2006.

The impact of IFS processing in Sikonge district

Table 2 presents the mostly used plant species for fruits processing in Sikonge district. Results showed that, about 56% of processing genotypes are indigenous trees. These findings are accordance with previous studies in the district (Simon et al., 1998). The dependency on natural forest as source of fruits seemed to be not inevita-ble during the project initiation due to their abundance and underutilization (Akinnifesi et al., 2006). These stimulated mushrooming growth of IFS processors to the extent that, miombo woodlands failed to accommodate. To date there are about 270 IFS processors in Tabora region and the number is expected to rise (MATF, 2006). Table 3 further presents the impact of IFS processing in the district. Results revealed that, about 66% of processors collect fruits from the forest to produce juice, jam, wine and oil products which were mainly sold in nearby town due to lack of market within the village. Table 4 elaborates three most stresses namely food shortage, fruits unavailability and money scarcity that affecting IFS processors in the district. The most stress months were November, December and January whereby at least two of the stresses occur together. This implies that, efforts must be put in place to fight the frequent hunger in that period. Introduction of IFS processing technology could be the best alternative if fruits could be available during the peak stresses period (Kalaba, 2007).

Economic analysis

Economic analysis showed that, a processor can earn about 11,000 – 45,000 with the average of 32,557 Tsh (US$ 26.04) per month from selling processed products (Table 5). The realized income could be the positive motive towards meeting the Millennium Development Goals (MDGs) that aims at reducing poverty by 50% in 2015 and thus reducing food crises.

IFS processing problems and coping strategies

Table 6 presents problems and ways used to curb the situation. Result showed that, fruits unavailability and shelf life of products ranked high. The main market coping strategies employed by processors include proper packaging and targeting community gathering. The common community gathering in the district includes wedding and crop harvesting ceremonies.

Sustainability of indigenous fruits processing

Results as revealed by Figure 2 showed that, majority of processors in all six villages were skeptical on the sustainability of IFS processing unless the project is accompanied with tree planting (75%) to fight deforestation in the district. The main concerns are summarized in Table 7. Respondents recorded seven factors leading to IFS processing instability due to forest depletion and six interventions to curb the situation. Tobacco leaf curing accounted for 60% of the forest destruction followed by field expansion (13.33%). Tobacco curing have been reported by other researchers as one of the factors leading to deforestation (Siddiqui, 2001). Sauer and Abdallah (2007) reported that, to cure 57 kg of tobacco, a farmer requires 1m^3 firewood which mostly comes from natural forest. On the other hand deforestations through field expansion and shifting cultivation poses another threat to the miombo ecozone and the sustainability of IFS pro-

Table 2. Common plants used for processing in Sikonge district, 2006

Common name	Scientific name	Type	Main product
Groundnut	*Arachis hypogaea*	Crop	Jam/jam
Simsim	*Sesamum indicum*	Crop	Snack
Oil palm	*Elaeis guineensis*	Domestic tree	Oil/wine
Mango	*Mangifera indica*	Domestic tree	Juice
Mkwaju	*Tamarindus indica*	Indigenous tree	Juice/jam
Mbuyu	*Adansonia digitata*	Indigenous tree	Juice
Mzambarau	*Syzium guineense*	Indigenous tree	Juice/wine
Mtonga	*Strychnos cocculoides*	Indigenous tree	Juice
Mtalali	*Vitex mombassae*	Indigenous tree	Juice/jam
Mbula	*Parinari curatellifolia*	Indigenous tree	Juice/jam
Furu	*Vitex doniana*	Indigenous tree	Juice/jam
Mbuguswa	*Fracourtia indica*	Indigenous tree	Juice
Mng'ong'o	*Sclerocarya birrea*	Indigenous tree	Juice
Pawpaw	*Carica papaya*	Domestic tree	Juice/wine
Guava	*Guava psidium*	Domestic tree	Juice
Orange	*Citrus sinensis*	Domestic tree	Juice

Table 3. Fruits sources, products and market availability in Sikonge district, 2006

Fruit source	Frequency	Percentage
Buying	15	25.00
Own farm	5	8.33
Forest	40	66.67
Total	60	100.00
Processing product		
Jam	20	33.33
Juice	32	53.33
Wine	6	10.00
Oil	2	3.33
Total	60	100.00
Market		
Within village	20	33.33
Nearby town	28	46.67
Home consumption	12	20.00
Total	**60**	**100.00**

processing (Walker and Desanker, 2004). Therefore, sustainability of IFS processing will largely depend on the reduction of fuel wood used to cure tobacco leaves. The use of Malakisi barn which can save up to 40% of fuel wood could be highly promoted in this area (Sauer and Abdallah, 2007).

Indigenous fruits processing supporting services

Four agents were recorded to be involved in the development and transfer of IFS processing technologies (Figure 3). The major two were Agricultural Research Institute (ARI) – Tumbi and NGOs. However, their collaborations are still lower.

The lower collaborations showed by this study could be attributed to differences in objectives and missions. There is a need of increasing collaboration so as to spearhead the IFS processing industry in Sikonge.

Suggestions and way forward

The study suggested the following: Community sensitiation on environmental issues is a paramount aspect. Currently, the society views the natural forest as a gift. There is less concerned on what is happening to the natural forest. Calamities like excessive timber making, charcoal making and bush fire are common and occur frequently without much attention. The use of energy saving technologies like Malakisi barn for tobacco curing and energy saver cooker could be the best alternative to curb the deteriorating miombo woodland. Another area which needs attention is the diversity of processing materials. The society is heavily depending on natural forests for fruit gathering. There is a need of seeking for alternative crops like watermelon (*Citrullus lanatus*) and cucumbers (*Cucumis sativus*). Processors should improve the hygiene conditions, packing and labeling of processed products. This will increase shelf life, more value addition as well as attracting customers and market expansion. This should go hand in hand with nutritional content analysis of processed products. To date, information on the nutritional ingredient supplied by the product is lacking. Nutritional information on food items plays a significant role on attracting customers since nutritional information is highly associated and correlated to food quality (Kennedy et al., 2001). Stakeholder are highly encouraged to support this project to reduce poverty and thus contributing to MDGs

Table 4. Fruits processors three most stresses during the year in Sikonge district, 2006

Level/Month	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
High	F	F	F									F
	T									T	T	T
	M	M	M									
Medium									T			
					M					F	F	
Low					F	F	F	F	F			
			T	T	T	T	T	T				
							M	M	M			

Key: F= Food shortage; T = Fruits unavailability; M= Money scarcity.

Table 5. Economic analysis of fruit products in Sikonge district, 2006

	Min	Max	Range	Mean	STD	SE	CV
Planted trees	1.00	34.00	33.00	13.30	33.00	1.028	59.88
Income (TSh/month)	11000.00	56000.00	45000.00	32557.66	45000.00	1572.20	37.00
Jam Kg/week	3.00	14.00	11.00	6.48	11.00	0.40	47.56
Juice litres/week	15.00	48.00	33.00	29.92	33.00	1.09	28.19
Wine litres/week	7.00	36.00	29.00	19.90	29.00	0.92	35.75
Oil litres/week	1.00	9.00	8.00	4.70	8.00	0.28	45.73

Table 6. IFS processing problems and their corresponding copping strategies in Sikonge district, 2006

Problem	Rank
Unreliable market	4
Fruits unavailability	1
Lack of packing materials	3
Short shelf life	2
Unreliable market	5
Coping strategy	
Reduction amount of the product	4
Targeting community gathering	2
Selling at reduced prices	3
Proper packaging	1

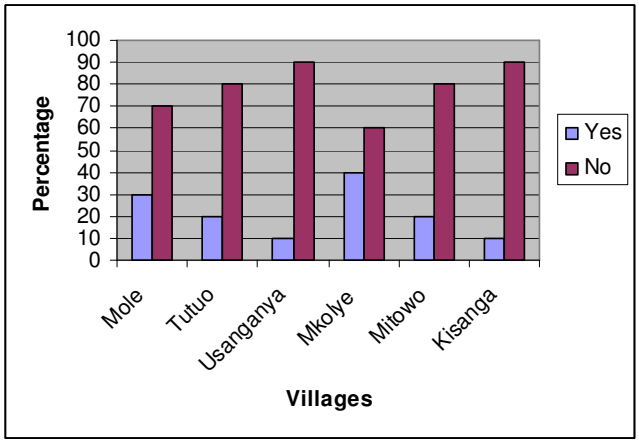

Figure 2. Respondents opinions on the sustainability of IFS processing in Sikonge district, 2006.

goals of having access to basic human needs like food. The highly needed support includes credit facilities and training on financial and group formation. This will ensure smooth operation of the project within and outside the society.

Conclusion

Majority of respondents revealed that, IFS processing is not sustainable under current situation. To curb the situation, environmental issues, the use of energy saving technologies would play a significant role towards deforestation reduction. Other factors includes socio-economic, processing materials diversity, formation of processing groups, market soliciting, proper packing and labeling, hygienic condition and nutritional aspects. Solving these problems will lead into sustainable IFS processing, increasing income and thus reduced poverty in Sikonge district.

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I am grateful to the government of Tanzania officials,

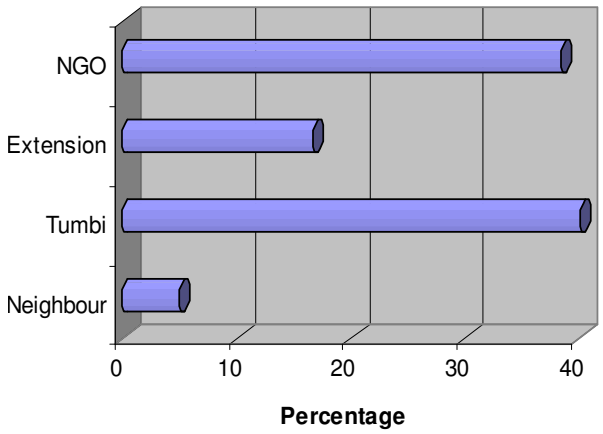

Figure 3. Fruits processing supporting services for Sikonge district, 2006.

Table 7. Causes of forest depletion and their solutions in Sikonge district, 2006

	Frequency	Percentage
Reasons		
Field expansion	8	13.33
Lumbering	4	6.67
Charcoal	3	5.00
tobacco curing	36	60.00
Fuel wood	5	8.33
Bush fire	2	3.33
Honey harvesting	2	3.33
Total	**60**	**100.00**
Interventions		
Tree planting	45	75.00
sensitization	4	6.67
Use of crops	3	5.00
Tree domestication	1	1.67
Energy saving stoves	2	3.33
Malakisi barn	5	8.33
Total	**60**	**100**

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