



CONSUMPTION OF INDIGENOUS FRUITS IN ULUGURU NORTH AND RUVU NORTH FOREST RESERVES, TANZANIA

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ABSTRACT

The study was conducted between 1998 and 2000 to compare the number, types and consumption of indigenous fruit species by sex and age classes in the Uluguru North Forest Reserve (UNFR) and Ruvu North Forest Reserve (RNFR). Data were collected through household interviews and forest inventory. A total of 120 households from six villages (3 bordering the RNFR and 3 near the RNFR) were randomly selected for interviews. Plots with the size of 0.1 ha were established along the transects after every 400m during forest inventory for the purpose of identifying fruit plants. A total of 25 indigenous fruit species were identified in the study areas. 20 and 16 species were identified in the UNFR and the RNFR respectively. 9 species were only found in UNFR while 5 were identified in RNFR. 11 species were identified in both study areas. Responses on consumption by age showed that, in both sites, children consumed more indigenous fruits than any other age group followed by adult women. The consumption of these fruits in UNFR was 64% (children), 47% (adult women) and 25% (adult men) while in RNFR consumption was 46% (children), 39% (adult women) and 23% (adult men). Seasonality and availability of exotic species had effect on consumption of indigenous fruits. The consumption of indigenous fruits appeared to be much higher when the supply of exotic fruits was low and vice versa.

INTRODUCTION

FAO (1988) defined indigenous fruits as components of forest food accepted by rural communities to be edible through

custom, habit and tradition. Most of the indigenous fruit species occur naturally in the forests and woodlands in various parts of the world. These fruits are important in developing countries due to their contribution in the nutritional well being of rural populations and economic potential obtained through subsidizing the household income derived from their sale (Kwesiga & Mwanza 1994, Makonda *et al.* 1998, Luoga *et al.* 2000).

From the nutritional point of view, indigenous fruits are cheap sources of vitamins (such as A, C and folic acid); minerals; proteins; carbohydrates and fats. For instance, the white pulp of *Adansonia digitata* fruits contains the highest percentage of vitamin C of all fruits (Iddi & Nagoda 1992). Iron content is high in fruits like *Syzygium guineense* (Saka 1994). In addition, indigenous fruits contain organic acids such as malic, citric and tartaric acids. Indigenous fruits are also good sources of refreshments, flavors, and aroma (Kochhar 1981).

In Tanzania, many indigenous fruits are found in the forests, woodlands and nurtured in farmlands (Ruffo 1989, 1992, Ruffo & Maliondo, 1991, Temu & Msanga, 1994, Luoga *et al.* 2000). However, despite of the economic potential of the fruits in enhancing the food security and subsidizing the household income, little is known about this potential in Tanzania. The consumption status is either not well known or documented. This deficiency calls for a rigorous investigation. In attempting to



address the deficiency the study sought to identify the species and number of indigenous edible fruits in Uluguru North Forest Reserve (UNFR) and Ruvu North Forest Reserve (RNFR) and compare their consumption by sex and age classes. The study also looked into factors affecting consumption of these fruits by different groups.

MATERIALS AND METHODS

Study areas

This study was conducted in Uluguru North and in Ruvu North Forest Reserves. ¹Uluguru North Forest Reserve (UNFR) is located 2,000 metres above the sea level (m.a.s.l.) in the South-East of Morogoro town. It lies between latitudes 6° 52' and 6° 54' South and longitudes 37° 40' and 37° 42' East. The reserve covers an area of 580 ha. The eastern part of the reserve receives over 3,000 mm of rainfall per year while the western part receives less than 500 mm per year (Ulvila, 1993). The mean annual temperature is as low as 12 °C. The type of soils found in this area is sandy loam (Ulvila 1993).

The ²Ruvu north forest reserve (RNFR) is approximately 60 km west of Dar es Salaam city along Dar es Salaam-Morogoro highway. The reserve is situated 80 m.a.s.l. between latitudes 6° 33' and 6° 43' South and longitudes 38° 48' and 39° 03' East. The reserve covers a total area of 31, 930 ha. The area experiences a bimodal rainfall pattern with short rains falling between November and December and long rains between March and May. The mean annual rainfall is 900 mm falling in average of 81 days per year (Maghembe, 1979).

¹ For the purpose of this study an abbreviation UNFR will be used to mean the Uluguru North Forest Reserve.

² For the purpose of this study the abbreviation RNFR will be used to mean the Ruvu North Forest Reserve.

Temperatures are higher during months of January and February with mean monthly temperatures of 23 °C to 27 °C having occasional maxima up to 33 °C and minima as low as 18 °C. The soils are free draining, primarily sand, sandy loam and gravels but clay may be found in valley bottoms and areas close to streams (Maghembe 1979).

Data collection and analysis

Six villages bordering the reserves, 3 for each reserve were randomly selected for this study. Towelo, Kibwe and Magadu were selected for UNFR while Kongowe, Mwendapole and Msangani were selected for RNFR

The primary data were collected through household interviews and forest inventories. The formal interviews were conducted by using open-ended questionnaire to gather information about indigenous fruits found in the area. The data collected involved the local names of the fruits, their consumption by sex and age classes and the impact of seasonality on consumption. A total of 120 households (20 from each village) were interviewed.

Forest inventories to identify edible fruit plants involved establishment of three transects in each reserve. Transects length varied depending on the size of the reserve under study. The distance between transects was 50 m. Plots of the size 0.1 ha were established along the transects after a distance of 500m. Plot of 0.1 ha is the recommended size for the plots established along the transects (Hall & Bawa 1993). In each plot, indigenous forest plants providing edible fruits were identified. In some cases where it was not possible to get botanical names, samples were collected for further identification in the herbarium. Secondary data were collected from various offices.

Both qualitative and quantitative methods were employed in analyzing the data.



Simple statistical parameters (*viz.* Frequency and percentage) were used in analyzing the data. Frequency is defined as the number at which an observation has been reappeared. The following formula was used to calculate the percentage:

$$P = \frac{F}{n}$$

Where:

P = Percentage of respondents.

F = Frequency of the households which had positive responses.

n = Total number of households selected for interview in a given village or reserve.

Microsoft excel computer programme was used in data analysis. The analyzed data were presented in a tabular form or in graphs.

RESULTS AND DISCUSSION

The number and types of indigenous fruits

A total of 25 indigenous plant species providing edible fruits were identified in the two study areas (Table 1). Of these, 9 (36%) species were identified from UNFR only, while 5 (20%) were from RNFR. 11 (44%) species were found in both forest reserves. Therefore, UNFR and RNFR had 20 (80%) and 16 (64%) species of edible fruits respectively (Table 1).

The results show that despite of the bigger size of RNFR – 31 930 ha Maghembe (1979) compared to UNFR – 580 ha (Ulvila 1993), the number of indigenous plant

species supplying edible fruits in UNFR is much higher than in the RNFR. This difference could be linked to ecological factors (*viz.* soils, climate and altitude) in two zones (Maghembe 1974, Ulvila 1993).

Knowledge on indigenous fruits

The knowledge and experience on indigenous fruits is much higher among the villagers living around UNFR than those of RNFR. The most probable factor causing this difference in knowledge is the availability of the fruits. Most of the people have knowledge on fruit species growing on their areas and have little or no knowledge on species growing outside their environment. Availability of exotic fruit species which serve as alternative for indigenous fruits may also influence the difference on knowledge. This can be explained by less interest shown on indigenous fruits by villagers around RNFR compared to those living around UNFR. The former grow more exotic fruit species on their farmlands compared to the later.

Essentially, there is an inverse relationship between the cultivation of exotic fruits and the knowledge and uses of indigenous forest fruits. Little attention in terms of knowledge and care is accorded to indigenous fruits where there is high supply of exotic species and vice versa. Similar observations are made by Hives and Eckman (1993) to back-up this argument. They argue that where exotic fruits such as mango (*Mangifera indica*), pawpaw (*Carica papaya*) and banana (*Mussa spp.*) are grown, little use is being made of indigenous forest fruits. Contrarily, large number of indigenous fruits are collected and utilized by local people, in areas with limited supply of exotic fruits.



Table 1. Indigenous edible fruit plants identified in Uluguru North and Ruvu North Forest reserves, Tanzania

S/no	Botanical name	Local name	Uluguru North Forest Reserve	Ruvu North Forest Reserve
1	<i>Adansonia digitata</i>	<i>Mbuyu</i> (Sw)	0	×
2	<i>Ancylbothrys petersiana</i>	Vitoja (Lu)	×	0
3	<i>Annona senegalensis</i>	Mtopetope (Sw) Mtomokwe (Lu)	×	×
4	<i>Berchemia discolor</i>	Nyahumbu (Lu), Mnago (Sw)	×	×
5	<i>Bridelia micrantha</i>	Msumba (Lu)	×	0
6	<i>Carissa edulis</i>	Mkumbaku (Za)	0	×
7	<i>Ficus sycomorus</i>	Mkuyu (Sw)	×	0
8	<i>Flueggea virosa</i>	Mkwambekwambe (Lu)	×	0
9	<i>Grewia similes</i>	Mkole (Sw)	×	×
10	<i>Myrianthus arboreus</i>	Msemerere (Lu)	×	0
11	<i>Parinari excelsa</i>	Mgama (Lu)	×	×
12	<i>Physalis angulata</i>	Songwa (Lu)	×	0
13	<i>Pachystela msolo</i>	Msambia (Lu)	×	0
14	<i>Rhus natalensis</i>	Mkumba (Sw)	×	×
15	<i>Rubus sp.</i>	Lufifi (Lu)	×	0
16	<i>Saba florida</i>	Mabungo (Sw)	×	×
17	<i>Slerocarya birrea sbsp. Caffra</i>	Mng'ongo (Sw)	×	×
18	<i>Sorindeia madagascariensis</i>	Mhilihili (Lu)	×	0
19	<i>Sorondya sp.</i>	Mpilipili (Lu)	0	×
20	<i>Strychnos schumanniana</i>	Mtonga (Sw)	0	×
21	<i>Syzygium guineense</i>	Msu (Lu), Mzambarau (Sw)	×	×
22	<i>Tamarindus indica</i>	Mkwaju (Sw)	0	×
23	<i>Vangueria infausta</i>	Msada (Lu), Mviru (Sw)	×	×
24	<i>Vitex doniana</i>	Mfulu (Sw)	×	×
25	<i>Ximenia caffra</i>	Mhingu (Lu)	×	×

Sw = Swahili, Lu = Luguru, Za = Zaramo, × = Presence of the species, 0 = Absence of species.

Consumption of indigenous fruits by age and sex classes

The results on the response of consumption of indigenous fruits by sex and age classes showed that in both study areas, the proportion of consumption by children was the highest for all indigenous fruits except for fruits of *Syzygium guineense* (Table 2). Adult female ranked the first in consumption of fruits of *Syzygium guineense* and second for fruits of all other species identified in the study areas. On average, the consumption of indigenous fruits by children was 64% and 46% in UNFR and RNFR respectively. Adult women consumed 47% and 39% while men consumed 25% and 23%. Generally, consumption was much higher in UNFR than in RNFR.

The tendency for children to consume more indigenous fruits than adults is also

common in other parts of the world (Ogle & Grivetti 1985, Wickens 1991, Startz 1997). In Swaziland, for example, 12% of the identified edible indigenous fruit species were eaten frequently by over 25% of the population, children being generally eating the most (Ogle & Grivetti 1985). The attitude held among the adults with regards to consumption of indigenous fruits, ability to access the fruits from the trees and knowledge on fruits are put forward to explain the tendency for children to eat more indigenous fruits than adults. Most of the adults, particularly men, view the forest fruits as poor man's food (FAO 1989). This makes the fruits unpopular to adults and therefore limited attention is paid to them. The fruits are eaten occasionally as snacks, especially when adults are carrying out activities in the fields.



Table 2. The proportion of consumption of indigenous fruits (in %) by sex and age classes in the Uluguru North and Ruvu North Forest Reserves, Tanzania

Species' botanical name	Uluguru North Forest Reserve			Ruvu North Forest Reserve		
	Sex and age class			Sex and age class		
	Adult men	Adult women	Children	Adult men	Adult women	Children
<i>Adansonia digitata</i>	-	-	-	23	48	60
<i>Ancylbothrys petersiana</i>	23	38	60	-	-	-
<i>Annona senegalensis</i>	68	85	95	30	47	58
<i>Grewia similes</i>	38	55	88	18	32	47
<i>Carissa edulis</i>	-	-	-	8	15	25
<i>Ficus sycomorus</i>	3	13	28	-	-	-
<i>Pachystela msolo</i>	22	48	72	-	-	-
<i>Berchemia discolor</i>	15	35	50	13	28	35
<i>Vitex doniana</i>	13	30	55	25	35	43
<i>Ximenia caffra</i>	38	65	78	18	32	40
<i>Saba florida</i>	40	60	82	35	50	60
<i>Bridelia micrantha</i>	20	45	60	-	-	-
<i>Syzygium guineense</i>	28	85	75	45	78	58
<i>Vangueria infausta</i>	27	53	73	17	32	50
<i>Flueggea virosa</i>	10	25	60	-	-	-
<i>Physalis angulata</i>	13	28	48	-	-	-
<i>Sorindeia madagascariensis</i>	30	55	60			
<i>Sorondya sp.</i>	-	-	-	8	20	35
<i>Strychnos sp.</i>	-	-	-	10	18	28
<i>Rhus natalensis</i>	10	40	45	10	35	30
<i>Sclerocarya birrea</i>	55	67	82	28	42	52
<i>Rubus sp.</i>	13	25	55	-	-	-
<i>Parinari excelsa</i>	30	53	68	18	25	35
<i>Myrianthus arboreus</i>	8	25	40	-	-	-
<i>Tamarindus indica</i>	-	-	-	65	85	73
Average consumption (%)	25	47	64	23	39	46

*For convenience of this study, adult male and adult female are also considered as different age classes.

On accessibility, consumption of indigenous fruits by adults is said to be limited by the fact that most of the fruits are obtained from trees that are difficult for old men and women to climb (Startz 1997). The Experience from Swaziland and Senegal shows that knowledge and frequency of consumption of the indigenous forest fruits were much higher for children than adults (Ogle & Grivetti 1985).

The high consumption for fruits of *Syzygium guineense* by adult women compared to children and adult men (Table 2) is triggered by experience and knowledge women possess with regards to nutritional value of these fruits. The demand is said to increase during the

pregnancy. Nutritional analysis of the fruits of *Syzygium guineense* has confirmed that the fruits contain high content of iron (Saka 1994), which is very essential in the diet of expectant mothers.

The effect of supply of exotic species on consumption of indigenous fruits

Scarcity or abundance of exotic species have influence on consumption of indigenous fruits in both study areas (Figure 1 & Table 3). The consumption of indigenous fruits was much higher at the period of low supply of exotic fruits and vice versa (Figure 1). In both study areas, indigenous fruits from all species identified were consumed at the period when exotic fruits were scarce. However, the numbers

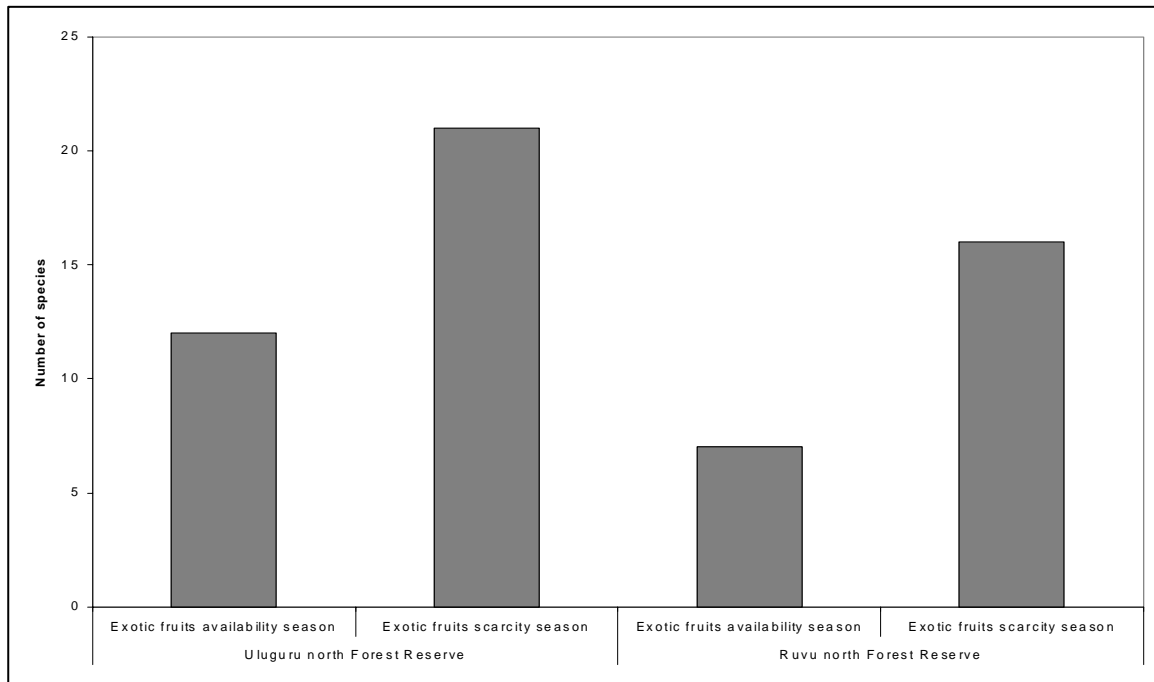


Figure 1. Comparison of the number of indigenous fruit species consumed in the seasons of abundance and scarcity of exotic fruits in Uluguru North and Ruvu North Forest Reserves, Tanzania.

of indigenous fruit species dropped to 12 (60%) and 6 (37.5%) in UNFR and RNFR respectively when exotic species became abundant.

The interviewed households also indicated that the proportion of consumption of individual indigenous fruits in both reserves was higher at the period of short supply of exotic fruits compared to the period of abundance (Table 3). Average consumption of indigenous fruits in UNFR was 28% and 46% when the exotic fruits were abundant and scarce respectively. In RNFR average consumption for two respective periods were 23% and 35% (Table 3). *Ficus sycomorus* was not consumed at all when the supply of exotic fruits was high, but the consumption of the same rose to 13% at the period of scarcity.

In a study conducted in Geita, Makonda *et al* (1998) tie the preference for indigenous

fruits over exotic species with availability and costs. They argue that, “wild fruits were available at least throughout half of the year while most of domesticated fruits ripened between December and April and were relatively expensive and urbanized.”

Experiences from other countries also concur with the observations that supply of exotic species and food availability influence consumption of indigenous species. In Senegal, for example, shortage of exotic fruits caused an increase in numbers and quantity of indigenous fruits consumed by local people (Becker 1983). Three species, *Adansonia digitata*, *Sclerocarya* spp. and *Boscia* spp. were consumed when the exotic fruits were short in supply (Becker 1983, FAO 1989). Campbell *et al.* (1991), on the other hand found that, in Zimbabwe indigenous fruits were gathered mostly at the periods of famine.



Table 3. Proportion of the consumption of indigenous fruits by seasonality in the Uluguru North and Ruvu North Forest Reserves, Tanzania

Species' botanical name	Consumption in % age			
	Uluguru north forest reserve		Ruvu north forest reserve	
	Season of abundance for Exotic fruits	Season of scarcity for exotic fruits	Season of abundance for Exotic fruits	Season of scarcity for exotic fruits
<i>Adansonia digitata</i>	-	-	18	33
<i>Ancylobothrys petersiana</i>	37	42	-	-
<i>Annona senegalensis</i>	56	73	33	42
<i>Berchemia discolor</i>	25	40	22	30
<i>Bridelia micrantha</i>	23	37	-	-
<i>Carissa edulis</i>	-	-	17	22
<i>Ficus sycomorus</i>	0	13	-	-
<i>Flueggea virosa</i>	18	33	-	-
<i>Grewia similes</i>	35	58	22	33
<i>Myrianthus arboreus</i>	13	30	-	-
<i>Parinari excelsa</i>	27	52	17	28
<i>Physalis angulata</i>	22	30	-	-
<i>Pachystela msolo</i>	38	55	-	-
<i>Rhus natalensis</i>	17	32	10	28
<i>Rubus sp.</i>	25	48	-	-
<i>Saba florida</i>	58	62	40	48
<i>Slerocarya birrea sbsp. cafra</i>	47	73	35	43
<i>Sorindeia madagascariensis</i>	28	45	-	-
<i>Sorondya sp.</i>	-	-	10	25
<i>Strychnos sp.</i>	-	-	17	33
<i>Syzygium guineense</i>	23	57	32	47
<i>Tamarindus indica</i>	-	-	45	42
<i>Vangueria infausta</i>	30	52	13	38
<i>Vitex doniana</i>	10	23	20	35
<i>Ximenia caffra</i>	28	57	18	40
Average consumption (% age)	28	46	23	35

CONCLUSION AND RECOMMENDATIONS

Uluguru North and Ruvu North Forest Reserves are the important sources of indigenous edible fruits. These fruits play a vital role in the nutrition of people bordering the two forest reserves. However, consumption of these fruits is governed by sex and age classes with children and adult women ranking the first and second respectively. High consumption of these fruits by children is justified by their ability to access the fruits from the trees which the adults can hardly climb. Low consumption of fruits by adult men is tied with the misconception that indigenous fruits are poor man's food. The high consumption of fruits of *Syzygium guineense* by adult women compared to adult men and children

is justified by women's physiological demand during the pregnancy. The fruits of *Syzygium guineense* are proved to contain high content of Iron compared to fruits from other species. Supply of exotic fruits i.e. scarcity and abundance also affect the demand and consumption for indigenous fruits by local people. More indigenous fruits are consumed at the period when there is short supply of exotic fruits while less are consumed at the period of abundance. Supply of exotic fruits in RNFR is higher than in UNFR and therefore consumption of indigenous fruits is much lower in RNFR. Higher consumption of indigenous fruits in UNFR is also attributed to availability and knowledge of the fruits. UNFR had more species indigenous fruits and the



knowledge of the villagers was much higher compared to RNFR.

Given the role indigenous fruits play in nutrition and the economic potential that can be tapped from these fruits, their conservation is imperative. In order to ensure effective conservation people should be educated and encouraged people on the potential of these fruits in enhancing food security and subsidizing their household income. Also domestication of the indigenous fruits to allow sustainable conservation and utilization is suggested. Lastly commercialization of the fruits in order to create a monetary value for the fruits and therefore create an incentive for their conservation is also important.

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