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# Edible Wildfruits; an alternative source of Livelihood in the Rural Context

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Given the traumatic impact of banditry coupled with Covid-19 pandemic, diversification of sources of livelihood is not only essential but necessity, especially in the rural context. However, this paper assesses the contribution of edible wild fruits (EWFs) to rural livelihoods in Sokoto, North-western Nigeria. Data for this research were collected through a survey, focus group discussion and a structured questionnaire administered to 200 randomly selected respondents. Simple random and multistage sampling techniques were adopted in selecting respondents and sample areas respectively. Financial capital was chosen as a proxy of livelihood, while the overall data collected was analysed using descriptive statistics. The results show that, most of the respondents were dependant on multiple sources of income (mainly untaxed income) for their livelihoods, which made their actual income level relatively difficult to quantify. A total of 19 wild fruit trees belonging to 11 genera were identified. The overall species density of wild fruit trees in the study area averaged at >1.0 to 3.0 stems/ha. However, the average annual income from the sales of wild fruits ranges from \$400 to \$4,500, which shows that marketing of edible wild fruits is profitable. However, the inventory data revealed that the current standing stock is not adequate enough to satisfy the market demand of EWFs in the State. Similarly, losses were often incurred by both the wild fruit vendors and gatherers due to spoilage resulting from poor transportation, preservation and lack of storage facilities. However, sequel to the revenue generated from the commercialization of edible wild fruits, marketing and conservation of wild fruit trees in the study area should be prioritized.

**Key words:** Livelihoods, Edible Wild Fruits (EWFs), Commercialization, Marketing.

## INTRODUCTION

For savings and security, trees are comparable to jewellery" (Chambers and Leach, 2012), Wild Fruit Trees (WFTs) are uncultivated woody perennials that grow on a natural or semi-natural environment. They provide life support to rural communities (Mabaya, *et al.*, 2014; Akinnifesi, *et al.*, 2007). Many species of wild animals and birds rely on WFTs for their sustenance, which together form an integral part of rural livelihood. However, many WFTs with prospective commercial and ecological value are underutilised (Mabaya, *et al.*, 2014; Iranbaksh, *et al.*, 2009) despite the urgent need for balance between the growing rural population and sources of livelihood (Adeboye and Ajayi, 2008; NNHS, 2015).

Henceforward, in an attempt to avail poverty and malnutrition in developing countries, commercialization and domestication of WFTs are receiving attention from researchers and international organisations globally

(Akinnifesi, *et al.*, 2007).

Although, conservation of EWFTs is not integrated into the national development plans of many developing countries (Aryal, *et al.*, 2009; Mahapatra and Panda, 2012) yet, recently emphasis has been stressed on promoting fast-growing species with the aim of relieving the pressure on the existing forest crops and enhance income generation of smallholder farmers (Hines and Eckman, 2008). For instance, 'World Agroforestry Centre' (ICRAF) in Nairobi has identified over two hundred multipurpose trees. The species are, cultivated, preserved and managed for commercial, household income, land protection and soil improvement purposes (Dawson, *et al.*, 2014; Hines and Eckman, 2008). These species provide rural communities with fuel, fodder and food in the form of edible fruits which together serve as an alternative source of income during off-farm periods

(Saka and Msonthi, 1994).

Moreover, products such as edible wild fruits (EWFs), fuelwood, medicines and bush meat are gathered and traded at local and regional markets and mostly destined for urban markets (Akintan, *et al.*, 2013; Powel, *et al.*, 2013). The degree to which these products are collected and traded varies with the need for cash, accessibility to marketplaces as well as people preference at a particular time of the season (Okafor, 1980). However, they provide an opportunity for income generation, especially in the rural areas. For instance, an average household in eastern India gathers 240kg of wild fruits annually. Although, the degree of WFs gathering varies with socioeconomic factors such as family income and food security yet, about 15% of the total household income is generated from the sales of EWFs. Unfortunately, cultivation of WFTs in the tribal communities of eastern India is quite low (Mahapatra and Panda, 2012).

Wild fruits provide nourishment during the hunger periods in the agricultural cycle. The fruits ripen at a different time of the year which can be targeted to meet specific needs whenever required. For example, a study conducted across rural communities in Zambia, Mozambique and Malawi revealed that 26 – 50% of rural household relied on EWFs as a coping strategy during critical hunger period which usually last for three to four months annually (Akinnifesi, *et al.*, 2007). Similarly, In South Africa and Botswana commercialization of EWFs has been providing employment opportunities to many rural communities since 2007. For example, employment opportunities and rural household income was reported to have increased significantly since the establishment of “Wild Fruit of Africa,” a company specialised in producing food products made from sustainably harvested wild fruits. Example, the “Amarula Cream Liquor” (Mabaya, *et al.*, 2014).

Although evidence is little yet, there has been optimism that commercialization of EWFs can be an engine of economic growth in developing countries (Mabaya, *et al.*, 2014). A study in South Africa revealed that, harvesting of EWFs substantially boost rural income and provide employment opportunities. Market and financial analysis in the area revealed that EWFs contributed significantly to the overall household income as well as a remarkable expansion of rural markets (Akinnifesi, *et al.*, 2007). Moreover, many studies revealed that collection of EWFs is a profitable business enterprise that promotes income earnings of rural communities. For example, Communities in South Africa collectively harvest 2,000 tonnes of *Sclerocarya birrea* fruits and earn USD180, 000 annually which represent more than 10% of average annual household income in the communities (Akinnifesi, *et al.*, 2007).

In Nigeria, many rural communities depend mainly on forest products to meet most of their household needs (Onuche, 2011; Akintan, *et al.*, 2013). For example, in South Oyo about 25% of the total household income is

generated from the commercialization of indigenous fruits and vegetables (Oladele, 2011). Despite several success stories on EWFs, many species with higher revenue generation potential are underutilised and not known in the global market. Given this, it is important to assess the contribution of EWFs to rural household income with a view to enhance utilization, conservation and commercialization of the species especially in the rural areas.

## METHODOLOGY

### Study Area

The study area is **Sokoto state** in the extreme North-Western Nigeria. It falls within the Savannah region trademarked with scattered trees amongst dominating herbaceous layers. It lies between the latitude 13<sup>o</sup> 05' N and 05<sup>o</sup> 15E with a total area of 25, 973 km<sup>-2</sup> (Musa, 2014). The area is characterised by two seasons (Wet and dry season) of varying duration and intensity. The rainy season is short, usually 3 – 4 months (Atiku, *et al.*, 2011). The mean annual rainfall is 500 – 700mm and temperature is relatively high, though it varies with season (NIMET, 2015). The average annual temperature is 28.3<sup>o</sup>C (Anonymous, 2017).

The soils in most part of the state are well-drained sandy soils with low organic matter content (FMEN, 2001; Ojanuga, 2003). The state has an estimated area of forest reserve of 602, 631ha while the area of forest plantation is 10, 943ha (NBS, 2014), which is subjected to intensive deforestation due lack of alternative sources of fuel especially in the rural areas. Moreover, the edible wild fruit trees in the area include *Balanites aegyptiaca*, *Parinari curatellaefolia*, *Ziziphus mauritiana*, *Ziziphus spina-cristi*, *Phoenix dactylifera*, *Borassus aethiopicum*, *Sclerocarya birrea* and *Tamarindus indica* among others. The species are distributed at different concentration in various parts of the State. However, data on the economic and nutrition value of EWFs is not yet documented.

### Sampling Procedure

The study area (Sokoto state) has 23 local government areas, of which 10 were randomly selected, these include; Kebbe, Wamakko, Gada, Tangaza, Binji, Yabo, Illela, Tambuwal, Gwadabawa and Sabon birni local government. Each local government was divided into “districts” according to the traditional ruling council of the state (NPC, 2016).

Moreover, two districts were sampled from each local government. A focus group discussion (involving six participants from each district) was also conducted to obtain an indepth knowledge of the state of rural livelihoods in the study area (after: Krueger, 2002; Eliot &

**Table 1:** Sampling frame and Procedure.

Study area	Total number of LGA in the study area	Number of sampled LGA	Total number of sampled districts	Total number of sampled markets.	Total number of EWFs vendors sampled in the markets	Total number of sampled heads of HH	Total number of people sampled in the research	Total number of sample plots
Sokoto State, Nigeria	23	10	20	10	100	100	200	80

**Note:** LGA = Local Government Area, HH = Household

Associates, 2005). An inventory was conducted with a view to determine the current standing stock of EWFTs in the study area. Four sample plots (1ha each) were randomly established in each district and all the EWFTs therein were identified and enumerated (after: Zobrists, *et al.*, 2012; Mueller-Dombois and Ellenberg, 1974)

However, measuring rural livelihoods is not straight forward (Angelsen, *et al.*, 2011) due to myriad coping mechanisms adopted by rural people to meet their end meets. Therefore, in this research, financial capital was chosen as a proxy of livelihood (Huai, 2016; Lax and Krug, 2013). Questionnaires were designed and administered to the randomly sampled heads of household (five from each district) and 100 EWFs vendors (ten from each LGA) who were sampled in the LGA central markets. However, the data obtained in this research were analysed descriptively.

## RESULTS AND DISCUSSION

### The state of rural livelihoods and general characteristics of respondents

Today, the state of rural livelihood in the study area is critical, which is attributed to Covid-19 pandemic, kidnappings and banditry in the rural areas of the State. Similarly, the removal of government subsidy on petroleum products resulted in subsequent increase (75% increase) in fuel pump prices. In view of this, virtually the prices of all commodities have skyrocketed, leading to economic stress on citizens especially the rural people. The rate of poverty in the study area has increased from 80% in 2012 to 86.4% in 2016 (NBS, 2016), a situation whereby many people in the rural areas cannot afford three square meals on a daily basis.

However, the respondents live under different socioeconomic conditions with regards to income, food, family size, occupation and age. They use EWFs to satisfy diverse needs ranging from a food source, revenue generation, medicine and other social activities such as birthday celebration (Figure, 1). Nevertheless, rural people in the study area depend on multiple coping strategies for their livelihoods. The finding corroborates with the results of Akinnifesi, *et al.*, (2007) that, the rural

people rely on multiple coping mechanisms during the period of stress.

The total number of sampled respondents was 200, which include both male (95.8%) and females (4.7%) of different socioeconomic status. One hundred (100) were randomly sampled heads of the household, while the other 100 are the EWFs vendors situated in the ten selected local government area central markets. Similarly, a total of 60 participants (6 participants from each of the ten sampled districts) were involved in the focused group discussion. This agreed with Krueger, (2002) and Eliot, (2005), that a group of 6 – 8 people are preferred in a focus group discussion.

However, 2%, 42% and 56% of the respondents belongs to the age groups of 15 – 20, 21 – 30 and above 31 years respectively. The finding agreed with the work of Adegboye (2016) that, 58.9% of the randomly sampled rural dwellers in northern Nigeria are between the age of 31 to 50 years. The average number of dependents per household is 5, which concur with the Statistics of NBS (2012) that, the average size of rural household in northern Nigeria is 6 persons.

Agriculture, involving growing arable crops and or rearing of domestic animals is a shared practice to all respondents in the study area. Additionally, farming is a common income-generating activity among the rural dwellers, which is predominantly at subsistence level, and the farm produce are not sufficient enough to last the household up to the next cropping season. This finding is supported by the NBS (2014) report on agriculture and the work of Daudu and Mohammed (2013), that the rural people of the northern states of Nigeria predominantly rely on subsistence farming as the primary source of livelihood. Also, most of the respondents commonly engage in different activities such as manual skilled and unskilled labour to earn a living, which serves as a coping mechanism during the agricultural slack periods.

Moreover, adoption and domestication of EWFTs by the respondents was found to be quite low. Also none of the respondents was found to be actively cultivating WFTs for mass production. However, except for junior civil servants (involved in the group discussion), determination of income level was extremely difficult due to lack of a consistent source of revenue, taxation rate and minimum wage for both manual and skilled labour



Figure 1: Birthday Celebration with EWFs (Umar, A. Pictures).



Figure 2: Seeds and grounded fruit pulp of *P. biglobosa*

carried out by the respondents. This is in line with the findings of Zezza, *et al.*, (2007) that, it is relatively difficult to assess the income generating activities of rural people in developing countries.

#### Marketing of edible wild fruits (EWFs) in Sokoto State, Nigeria.

Fruit business ("Gwari") in Sokoto, is a lucrative business that has been practised by the inhabitants since pre-historical era. It serves as the principal source of livelihood to many people in the rural areas. Exotic and tender fruits (such as apples, Oranges, Grapes, etc.) dominates the market even though EWFs are the most affordable to the inhabitants. Today, the market demand

for fruits is high due to population increase, although the supply cannot be met by the available species growing in the study area. Therefore, fruits are imported into the state to compliment demand at the different time of the year.

However, not all fruits are brought to the market for sale. For example, *Ximenia americana* is usually sold by children in rural settlements. Also, market availability of EWFs is not dependent on species fruiting season. Some fruits are usually consumed when fresh or in a dry form. Therefore, traded in different forms; fresh, dry, fruit pulp powder and also seeds, depending on the preference and importance of 'fruit part' to the consumers. For instance, figure 2 below shows seeds and grounded powder obtained from the fruit pod of *Parkia biglobosa*.

**Table 2:** Prices and average annual income from the sales of EWFs

S/NO	Species	Product Form	Average Price/KG (₦)	Average Profit (₦)/yr.
1	<i>Adansonia digitata</i>	Fruit pulp	60	6,000 – 15,000
2	<i>Balanites aegyptiaca</i>	Fruit	30	1,000 – 3,000
3	<i>Borassus aethiopum</i>	Fruit	20	10,000 – 32,000
4	<i>Detarium microcarpum</i>	Fruit	70	4,000 – 12,000
5	<i>Dialium indum</i>	Fruit	150	4,500 – 20,000
6	<i>Diospyros mespiliformis</i>	Fruit	80	3,000 – 10,000
7	<i>Hyphaene thebaica</i>	Fruit	60	10,000 – 40,000
8	<i>Iannea microcarpa</i>	Fruit pulp	10	N/A
9	<i>Parinari curatellifolia</i>	Fruit	50	5,000 – 20,000
10	<i>Parkia biglobosa</i>	Seeds	120	10,000 – 120,000
11	<i>Parkia biglobosa</i>	Grinded Fruit pulp	80	5,000 – 20,000
12	<i>Phoenix dactylifera</i>	Fruit	170	15,000 – 430,000
13	<i>Piliostigma reticulatum</i>	Pods/pulp	20	N/A
14	<i>Sclerocarya birrea</i>	Fruit	20	1,000 – 2,500
15	<i>Tamarindus indica</i>	Fruit	60	4,000 – 25,000
16	<i>Vitellaria paradoxa</i>	Fruit	160	10,000 – 30,000
17	<i>Vitex doniana</i>	Fruit	100	8,000 – 25,000
18	<i>Ximenia americana</i>	Fruit	10	N/A
19	<i>Ziziphus mauritiana</i>	Fruit	70	5,000 – 12,000
20	<i>Ziziphus spina-christi</i>	Fruit	40	2,000 – 6,000

Note: \$ = ₦386 as at September, 2020.

The products serve different functions and they are highly cherished by the inhabitants.

Marketing of EWFs in Sokoto usually involves gatherers (who are primarily rural people, men and women of age 15 and above), dealers or whole sellers, retailers and hawkers. Gatherers obtained fruits directly from the mother trees and sold to the dealers at prices usually determined by the quantity and quality of the fruit as well as the distance from the source to the point of sale. Except for high-value species such as *P. dactylifera*, *P. biglobosa*, *B. aethiopum* and *A. digitata*, there is no actual price tag on the quantity gathered or sold to the vendors by gatherers. This finding is in consonance with the research of Ramadhani and Schmidt (2007) that, as at the time of their work, there is no formal price information on indigenous fruits in South Africa.

Moreover, Collecting EWFs from the mother tree is mostly free of charge, except when high-value species are involved, token is given to the land owners (who has the ownership of the WFTs growing on their land) specifically whenever a mass harvest is going to be carried out by the gatherers. However, in most cases gatherers are found to be relatives of the landowners, hence only on the compassionate basis that a token is given to console harvest. Similarly, gathering of fruits is not restricted to a particular individual in the household or community, which makes it relatively difficult to quantify the exact quantity of fruits sold per annum.

The market demand of the EWFs cannot be met at a certain period of the year due to poor transport system and lack of appropriate preservation techniques by the marketers, which resulted in fruit failures especially during the hot season. The finding is supported by the

work of Akinnifesi, *et al.*, (2007) that, unsuitable transport system and economic inefficiencies are important obstacles to the marketing of indigenous fruits in Africa. Nevertheless, marketing EWFs in Sokoto provide source of livelihood to many people all year round. The average prices and profit generated (by fruit vendors) from the EWFs business are presented in table 2 below.

The findings of this research shows that, some fruits (for example, *P. reticulatum*) are without a point of sale or even active salespersons, hence it is extremely difficult or impossible to calculate the annual profits. In the same vein, some dealers realised more than the average profit shown in Table 2, although they incurred more losses due to spoilage. However, except for dealers, most of the vendors do not take into account the actual profit as well as the capital used at the beginning of the business. They focus primarily on getting a daily meal (“Chefane”). Therefore, the actual amount invested and net profit realised are quite hard to quantify. This finding confirmed the report of Zezza, *et al.*, (2007) that, income sources of rural people are mostly informal and relatively difficult to assess.

As presented in table 2, the mean annual profit generated from the sales of EWFs is quite remarkable. However, the vendors are not entirely dependent on the marketing of EWFs as the only source of livelihood yet, the business accounts for more than 70% of their needs. This is synonymous to the conclusions of Ibrahim, *et al.*, (2014) that, in the South Sudan wild fruits contribute 70% and 153% of the household income and expenditure respectively.

Table 3 above shows a relatively high diversity with low density of EWFTs in the study area. Given this, the

**Table 3:** Checklist of the identified EWFTs in the study area.

NO	Species	Family	Common Name	Local Name	F	SD (stem/ha)
1	<i>Adansonia digitata</i>	Malvaceae	Baobab	Kuka	17	0.21
2	<i>Balanites aegyptiaca</i>	Zygophyllaceae	Desert date	Aduwa	38	0.47
3	<i>Borassus aethiopum</i>	Arecaceae	African fan palm	Giginya	4	0.05
4	<i>Detarium microcarpum</i>	Caesalpiniaceae	Tallow tree	Taura	9	0.11
5	<i>Dialium indum</i>	Fabaceae	Velvet tamarind	Tsamiyar biri	0	0.00
6	<i>Diospyros mespiliformis</i>	Ebenaceae	Jackal berry	Kaiwa	5	0.06
7	<i>Hyphaene thebaica</i>	Arecaceae	Doum palm	Goriba	16	0.20
8	<i>Iannea microcarpa</i>	Anacardiaceae	Lannae	Faru	0	0.00
9	<i>Parinari curatellifolia</i>	Chrysobalanaceae	Hissing tree	Gawasa	5	0.06
10	<i>Parkia biglobosa</i>	Fabaceae	African Locust	Dorawa	8	0.10
11	<i>Phoenix dactylifera</i>	Arecaceae	Dates palm	Dabino	6	0.07
12	<i>Piliostigma reticulatum</i>	Fabaceae	Camel's foot	Kalgo	47	0.59
13	<i>Sclerocarya birrea</i>	Anacardiaceae	Marula	Danya/Loda	14	0.17
14	<i>Tamarindus indica</i>	Fabaceae	Tamarind	Tsamiya	7	0.08
15	<i>Vitellaria paradoxa</i>	Sapotaceae	Shear tree	Kade	0	0.00
16	<i>Vitex doniana</i>	Lamiaceae	Vitex	Dunya	6	0.07
17	<i>Ximenia americana</i>	Olacaceae	Wild plum	Tsada	3	0.03
18	<i>Ziziphus mauritiana</i>	Rhamnaceae	Jujube	Magarya	18	0.23
19	<i>Ziziphus spina-christi</i>	Rhamnaceae	Christ's thorn	Kurna	31	0.39
<b>TOTAL</b>					<b>234</b>	<b>2.89</b>

F: Frequency, SD: Species density

gatherers earn little income compared to vendors. Which was due to a limited population density of EWFTs in the study area (**Table, 3**), a situation that warrant vendors to import fruits from the neighbouring states in order to compliment market demand. Also the gatherers in the study area seldom exchange fruits for other materials such as Soap, Perfumes, Shoes, Cloth and sometimes food materials (example: Noodles, Pasta, Vegetable oil etc.). In view of this, it is virtually impossible to quantify the exact annual income contribution of EWFTs to gatherers. Nevertheless, commercialization of EWFTs provide source of livelihood to many rural dwellers, although the business is branded with various inefficiencies especially in the areas of production, marketing and fruit storage.

## CONCLUSION AND RECOMMENDATIONS

The sustainable rural livelihood can usually be expressed in terms of household income as well as access to goods and services. Agriculture is the primary source of rural livelihood. Although due to climate change, it is relatively declining while the rural population is ever increasing (Abimbola and Oluwakemi, 2013; Ramadhani and Schmidt, 2007), hence the need for economic diversification in order to alleviate poverty in the rural areas (Abimbola and Oluwakemi, 2013). Given this, various coping strategies were adopted by rural people during the off-farm period. These include fuel wood and EWFTs gathering, hunting and fishing among others.

However, commercialization of EWFTs provides income and employment opportunities to rural people in Sokoto

state. An enough number of wild tree species with high economic value are found in the study area, thus providing livelihood support especially to rural people. The mean annual profit generated from the sales of EWFTs is relatively high (Table, 2), though the vendors are not entirely dependent only on the marketing of EWFTs yet, the business accounts for more than 70% of their needs. On the other hand, the gatherers earn little income compared to vendors. Which was due to a limited population density of EWFTs in the study area (Table, 3), a situation that warrant vendors to always import fruits from the neighbouring states in order to compliment market demand. Despite this, the gatherers rely on collecting EWFTs as a coping mechanism during the off-farm period, which provides them with cash and other domestic house material such as soap, detergents, perfumes and even cloth.

In this research, none of the respondents was found to be actively cultivating EWFTs for mass production, though the most valuable species such as *P. dactylifera*, *P. biglobosa* and *B. aethiopum* are protected by the inhabitants.

Moreover, both vendors and gatherers annually records a considerable loss to fruit spoilage due lack of preservation and transport systems. Nevertheless, the contribution of EWFTs to rural livelihood is distinctly noticed in the study area, though its potential is yet to be fully actualized due various inefficiencies surrounding production, utilization and commercialization of wild fruits in the study area. In view of this, there is an urgent need for reorientation of research and extension services with a view to increasing conservation and commercialization of WFTs in the study area.

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