

ASSESSMENT OF WILD EDIBLE FRUITS (WEFS) OF NON-TIMBER FOREST PRODUCTS (NTFPs) IN NORTHERN TARABA STATE, NIGERIA

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ABSTRACT

This study aims to determine the abundance and ethnobotanical impact of wild edible fruits (WEFs) of non-timber forest product (NTFPs) in Northern Taraba State, Nigeria. The study used a multi-stage sampling technique to select three (3) local government areas (LGAs); Ardo-Kola, Lau, and Yorro. A structured questionnaire and focus group discussions (FGDs) was used to collect data from 180 sampled households. Descriptive statistics was used to analyze the data. The study findings reveal that, a total of 211 trees and 21 species of wild edible fruits were identified in the study area belonging to 16 families. *Moraceae*, *Malvaceae*, *Rubiaceae* and *Mimosaceae*, represented by two (2) species each were the highest number of WEFs species among the families; other families recorded only one (1) species each. The study found out that, the most dominant and mostly used wild edible fruit in the study area was *Adansonia digitata* and several fruits were also used for the treatment of various ailments. The study therefore recommends conducting a comprehensive species surveys in each of the study areas.

1. Introduction

Wild edible fruits (WEFs) of non-timber forest product (NTFPs), are wild plant products harvested from the forest, such as wild fruits, vegetables, nuts, edible roots, and medicinal plants fruits in developing regions, particularly in Asia and Africa. NTFPs are predominantly utilized for subsistence purposes and income generation. These NTFPs serve as a safety net, bridging gaps created by agricultural shortfalls or other emergencies, highlighting their vital role in providing support during times of need (Forbes & McConnell, 2021). The tradition of eating wild plants is increasing by the day, especially among the communities close to the forest, despite the primary reliance on conventional agricultural crops.

NTFPs constitute an important source of livelihood for millions of people across the world. There are more than 500 million people that are highly dependent on forest resources, particularly the NTFPs, in addition to their wide industrial applications in developed countries, NTFPs are consumed locally and are used in religious and cultural rituals (Chikamai *et al.*, 2008; Weseka *et al.*, 2010). The provisioning of NTFPs, such as food, medicines and cultural ornaments, constitutes important ecosystem services for communities in tropical areas, especially for poor rural communities (Ros-Tonen & Wiersum, 2005; Timko *et al.*, 2010; Shackleton & Pandey, 2014; Van Andel *et al.*, 2015; Shackleton *et al.*, 2018). However, NTFPs provisioning is threatened by the conversion and degradation of tropical forests worldwide (Barlow, 2018).

Approximately 2 billion people worldwide suffer from micronutrient deficiencies, which increase their vulnerability to disease and hinder economic growth (World Health Organization, 2004). Micronutrient deficiencies can have far-reaching consequences, including impaired physical and cognitive development, weakened immune systems, and reduced productivity. The global prevalence of micronutrient deficiencies underscores the need for sustained efforts to improve access to nutrient-dense foods, fortify staple crops, and implement evidence-based interventions to address these deficiencies. Food insecurity and malnutrition affects most of the world's population (Godfrey *et al.*, 2010). These food security issues are severe in the largely import-dependent countries of sub-Saharan Africa, where prices of stocks in 2006-2008 affected an estimated 12 million people, and the projected crop yield declines due to climate change (FAO, 2011; Moseley, 2012).

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2. Material and Methods

2.1 Description of the study Area

Taraba State is located in the North East region of Nigeria as shown in Figure 1. The state shares boundaries with Bauchi and Gombe states in the North. The state has a land area of 60,291km². It is divided into sixteen (16) Local Government Areas (LGAs) and three (3) senatorial districts (Taraba North, Taraba Central and Taraba South). Taraba State is regarded as Nature's Gift to the Nation because of its abundant natural resource.

Ardo-kola Local Government Area is located in the Northern part of the State as shown in Figure 2. The local government area shares a common boundary with Jalingo local government area, to the east, Gassol to the west, Karim-Lamido to the North and Bali LGA to the South. The local government area has a projected population figure of 13,896.9622 (Projected Population Figure, 2015).

Yorro Local Government Area is situated in Northern part of Taraba State. The LGA hosts several towns and villages, which include Demba, Sumbu, Kakware, Manzalana, Lanko, Lapu, Pantisawa, Mbang, and Pupule. The estimated population of Yorro LGA is 180,713 (Projected Population Figure, 2015). The inhabitants of the area are predominantly occupied by members of the Mumuye tribal division. The Mumuye language is commonly spoken in the LGA.

Lau Local Government Area is situated in Northern part of Taraba state. The Local Government Area is bordered by Ardo-kola, Jalingo, Yorro, and Zing LGAs and Southern parts of Adamawa state. Towns that make up Lau LGA include Lau, Kunini, Gowe, Abbare, Karlahi, Lainde, Jimlari, and Donadda. The estimated population of Lau LGA is 169,303 (Projected Population Figure, 2015). The inhabitants of the area are mostly made up of people from the Hausa and the Fulani ethnic groups. The Hausa and the Ffulde languages are commonly spoken in Lau LGA.



Figure 1: Map of Nigeria showing Taraba State

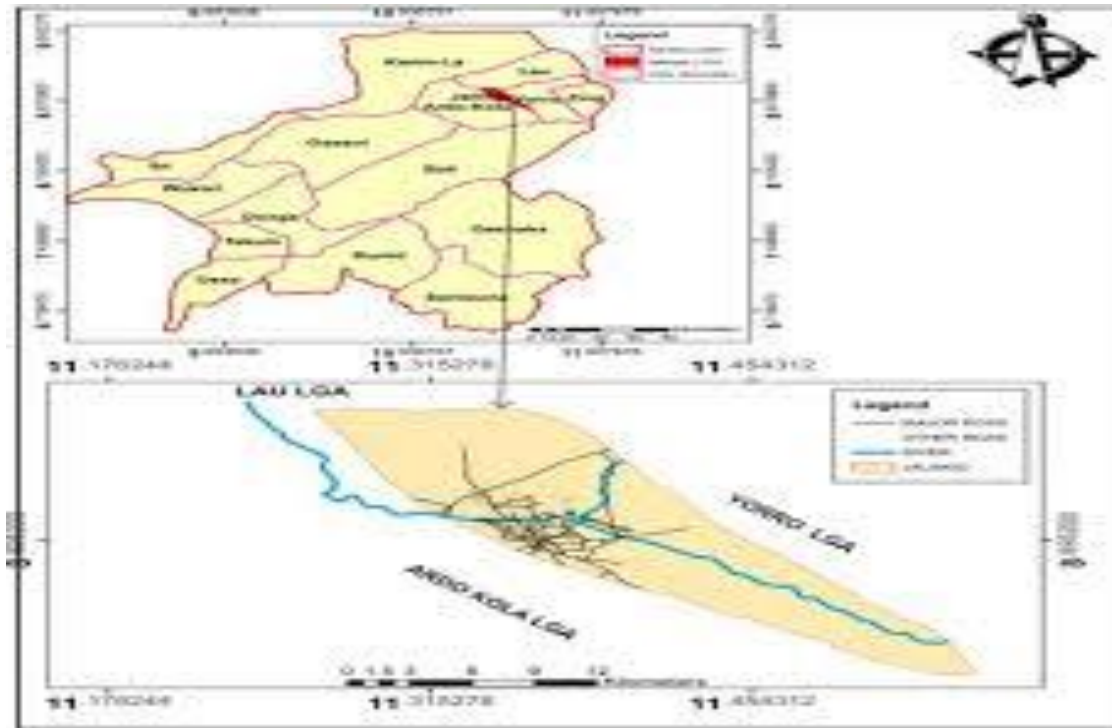


Fig 2; Map of Taraba State showing study Area.

2.2 Experimental Design

Multistage sampling technique was used for this study. Three (3) local government areas (LGAs), namely, Ardo-Kola, Lau, and Yorro were purposively selected because of the non-existence of reserved areas in their territories, as well as their high number of agricultural-dependent communities. At the second stage, three (3) villages each from Ardo-Kola, Lau and Yorro were purposively selected. Generally, these villages were selected due to their high tendency to depend on non-timber forest resources, extracted from their farmlands as well as small forest patches. A total number of 180 households were selected in three (3) local government areas of Northern Taraba state. Sixty (60) households each were randomly selected in 3 communities of Ardo-kola, Yorro and Lau making a total of 180 Households. Proportionate sampling was used for sample size determination, using the formula proposed by Yamane, (1967). Approximate sample size was computed taking from 18,133 households in the selected communities. The adoption of this formula was informed by the desire to draw a representative sample from the target population and also to minimize sampling error and bias.

The formula is express as:

$$n = \frac{N}{1 + Ne^2} \quad (1)$$

Where

n = the sample size to be estimated

N = the definite population of the communities and

e = the significance level (0.05)

The sample size of ($n = 180$ respondents) was computed from equation (1)

Respondents were randomly selected using the Random Number Table generator. Each questionnaire was evaluated for appropriateness of questions and answers. The study also included a field survey, where market, open fields and farmlands were surveyed using the Spot Transect Method (Roberts *et al.*, 2016). A size of 9km drawn from (9) transects scattered across the study area was surveyed cumulatively. In each study site, a one (1) km transect was sited. Some of these wild edible fruits which could not be identified in the field were plant pressed and brought to the laboratory in the department of Biological Sciences, Faculty of Science, Taraba State University for proper identification and also using relevant scientific literatures. Furthermore, it was sent to the Herbarium of the Department

of Biological Sciences, Ahmadu Bello University, Zaria for confirmation.

2.3 Method of Data analysis

Descriptive statistics was used for this study. Descriptive statistics includes frequency, percentages, and bar chart which was used to summarize the contribution of WEFTs to households' livelihoods, and partly the relative contribution of WEFTs to households' incomes.

3. Results

Table 1: Abundance of Wild Edible Fruits according to Local Government Areas found in Northern Taraba

S/N	Scientific name	Local name	Yorro	Lau	Ardo-kola	C/F	Percentage(%)
1	<i>Adansonia digitata</i>	Kuka	11	12	7	30	14.2
2	<i>Afraegle paniculata</i>	Kamomowa	3	2	0	5	2.4
3	<i>Borassus aethiopicum</i>	Giginya	9	14	4	27	12.8
4	<i>Bridelia ferruginea</i>	Kisni	1	0	0	1	0.5
5	<i>Cissus pulponea</i>		2	0	0	2	1.0
6	<i>Daterium microcarpum</i>	Taura	6	4	2	12	5.8
7	<i>Ficus sycomorus</i>	Baure	7	4	3	14	6.6
8	<i>Ficus sur</i>		5	4	0	9	4.3
9	<i>Gardenia aqualla</i>	Gaude	1	0	0	1	0.5
10	<i>Lannea schiniperi</i>	Faru	3	6	5	14	6.6
11	<i>Parinari curatellitolia</i>	Nunu	2	1	0	3	1.4
12	<i>Sarcocephalus latifolia</i>		11	7	4	22	10.4
13	<i>Parkia biglobosa</i>	Dorowa	5	5	7	17	8.1
14	<i>Strychnos spinosa</i>	Kokiya	3	0	0	3	1.4
15	<i>Vitellaria paradoxa</i>	Kadanya	7	3	4	14	6.6
16	<i>Vitex doniana</i>		1	3	1	5	2.3
17	<i>Ximenia americana</i>	Tsada	1	2	0	3	1.4
18	<i>Zizipus mauritiana</i>	Magariya	4	2	1	7	3.3
19	<i>Bombax costatum</i>		2	1	2	5	2.3
20	<i>Prosopis africana</i>		2	3	8	13	6.2
21	<i>Danya sclerocarya birrea</i>		0	0	4	4	1.8
<i>Total</i>			86	73	52	211	100

From Table 1, a total of two hundred and eleven (211) wild edible fruits were recorded with Yorro (86) taking the lead, followed by Lau (73) and the least was Ardo-kola (52). In terms of abundance, *Adansonia digitata* (14.7%) took the lead, followed by *Sarcocephalus latifolia* (10.7%) then *Parkia biglobosa* (9.31%) and *Borassius aethiopicum* (9.18%). Also these wild edible fruits occurred across the three (3) local government areas: *Adansonia digitata* (30) took the lead, followed by *Borassus aethiopicum* (27), then *Sarcocephalus latifolia* (22) and *Parkia biglobosa* (17); *Ficus syncomorus*, *lanea Schiniperi* and *Vitellaria parodosa* recorded (14) each. The least were *Bridelia ferruginea* and *Gardenia aqualla* recorded one (1).

Table 2: Species abundance and diversity of wild edible fruits in Yorro LGA

S/N	Scientific name	Local name	Frequency	Percentage(%)
1	<i>Adansonia digitata</i>	Kuka	11	12.8
2	<i>Afraegle paniculata</i>	Kamomowa	3	3.5
3	<i>Borassus arthiopum</i>	Giginya	9	10.5
4	<i>Bridelia ferruginea</i>	Kisni	1	1.2
5	<i>cissus pulponea</i>		2	2.3
6	<i>Deterium microcarpum</i>	Taura	6	7.0
7	<i>Ficus sycomoruss</i>	Baure	7	8.1
8	<i>Ficus sur</i>		5	5.8
9	<i>Gardenia aqualla</i>	Gaude	1	1.2
10	<i>Lannea schiniperi</i>	Faru	3	3.5
11	<i>Parinari curatellitolia</i>	Nunu	2	2.3
12	<i>Sarcocephalus latifolia</i>		11	12.8
13	<i>Parkia biglobosa</i>	Dorowa	5	5.8
14	<i>Strychnos spinosa</i>	Kokiya	3	3.5
15	<i>Vitellaria paradoxa</i>	Kadanya	7	8.1
16	<i>Vitex doniana</i>		1	1.2
17	<i>Ximenia americana</i>	Tsada	1	1.2
18	<i>Zizipus mauritiana</i>	Magariya	4	4.7
19	<i>Bombax costatum</i>		2	2.3
20	<i>Prosofis Africana</i>		2	2.3
TOTAL			86	100

From Table 2, twenty (20) species of wild edible fruits were recorded out of the overall twenty-one (21) species in Yorro LGA. *Adansonia digitata* and *Sarcocephalus latifolia* were most abundant and diverse species recording (11;12.79%), followed by *Borassus aethiopum* (9;10.41%), then *Ficus syncomorus* and *Vitellaria paradoxa* recording (7;8.14%). The least were *Bridelia ferruginea*, *Gardenia aqualla*, *Vitex doniana* and *Ximenia americana* recording each (1;1.16%).

Table 3: Species abundance and diversity in Lau LGA

S/N	Scientific name	Local name	No. of plants	Percentage(%)
1	<i>Adansonia digitate</i>	Kuka	12	16.4
2	<i>Afraegle paniculata</i>	Kamomowa	2	2.7
3	<i>Borassus arthiopum</i>	Giginya	14	19.2
4	<i>Deterium microcarpum</i>	Taura	4	5.5
5	<i>Ficus sycomorus</i>	Baure	4	6.8
6	<i>Ficus sur</i>		4	5.5
7	<i>Lannea schiniperi</i>	Faru	6	8.2
8	<i>Parinari curatellitolia</i>	Nunu	1	1.4
9	<i>Sarcocephalus latifolia</i>		7	9.6
10	<i>Parkia biglobosa</i>	Dorowa	5	5.5
11	<i>Vitellaria paradoxa</i>	Kadanya	3	4.1
12	<i>Vitex doniana</i>		3	4.1
13	<i>Ximenia Americana</i>	Tsada	2	2.7
14	<i>Zizipus mauritiana</i>	Magariya	2	2.7
15	<i>Bombax costatum</i>		1	1.4
16	<i>Prosofis Africana</i>		3	4.1
TOTAL			73	100

According to Table 3, Lau recorded sixteen (16) wild edible fruits out of twenty-one (21) overall species. *Borassus aethiopum* (14; 19.18%) was the most abundant and diverse species, followed by *Adansonia digitata* (12;16.44%), then *Sarcocephalus latifolia* (7;9:59%). While the least were *Parinari curatellitolia* and *Bombaxa costatum* (1; 1.37%) each.

Table 4: Species abundance and diversity of wild edible fruits in Ardo kola LGA

S/N	Scientific name	Local name	No. of plants	Percentage(%)
1	<i>Adansonia digitata</i>	Kuka	7	13.2
2	<i>Borassus aethiopum</i>	Giginya	4	7.5
3	<i>Deterium microcarpum</i>	Taura	2	3.8
4	<i>Ficus sycomorus</i>	Baure	3	5.7
5	<i>Prosofis</i>	Dorowa	8	15.0
6	<i>Lannea schiniperi</i>	Faru	5	9.4
7	<i>Sarcocephalus latifolia</i>		4	7.5
8	<i>Parkia biglobosa</i>	Dorowa	7	13.2
9	<i>Vitellaria paradoxa</i>	Kadanya	4	7.5
10	<i>Vitex doniana</i>		1	1.9
11	<i>Zizipus mauritiana</i>	Magariya	1	1.9
12	<i>Bombax costatum</i>		2	3.8
13	<i>ficus sur</i>		1	1.9
14	<i>danya sclerocarya birrea</i>		4	7.5
TOTAL			53	100

From Table 4, fourteen (14) species of wild edible were recorded out of the overall twenty-one (21) species in Ardo-kola LGA. *Prosofis* (8; 15.09%) was the most abundant and diverse followed by *Adansonia digitata* and *Pakia*

biglobosa (7;13.21%) each, then *Lanea schiniperi* (5;9.43%). The least were *Vitex doniana*, *Zizipus mauritiana* and *Ficus sur* (1;1.9%) each.

4. Discussion

The results for the wild edible fruits (WEFs) in Northern Taraba State reveal some notable plants species in the study areas. The findings pointed out that, *Adansonia digitata*, locally known as Kuka in Hausa, emerges as the most dominant species with the highest frequency occurrences highlighting its widespread availability in the region. The high frequency of *Adansonia digitata* in the study areas could be attributed to the indigenous nature of plants that adapt to grow in the Northern region due to good soil fertility, suitable humidity and the temperature in the areas. This might have been the major factors of their distribution. This finding is in line with the work of Parut *et al.* (2020) who pointed out that, *Adansonia digitata* are native to the African continent and can grow to enormous size, living for up to above 2000 years or more. And another factor that lead to high abundance of *Adansonia digitata* could be due to their economic value which serves as the source of livelihood in the communities. This is in conformity with the findings of Darr *et al.* (2020) who reported that, *Adansonia digitata* is contributing to food security and household well-being and recommended it as a species for both domestication and commercialization.

Borassus aethiopum (Giginya) had the moderate level of species distribution across the study areas when the two sampling period were pooled together as it was observed in this research. This might be because of the moderate level of anthropogenic influence, availability of soil nutrients, suitable temperature, its ability to tolerate and withstand high or low amount of rainfall, dispersal modes by rodents, primates and human dispersal due to its ethnobotanical usage to mammals. Their over popularity in the study area which some part can be eaten raw or cook as food contributes to its availability. This conform with the findings of Ali *et al.* (2010) who reported that the fruits of *Borassus aethiopum* are eaten as food and/or as food supplements, especially during the farming period by the rural people, emphasizing its significance

According to the findings of this research *Parkia biglobosa* (African locust bean) was noted to be sparsely spotted around, this might be attributed to its highly nutritional, commercial value and its income generation in the areas. It also provides employment opportunity to many household members, particularly women who are more involved in processing and marketing of dadawa (local maggi) which is more proteins than Maggi in our body systems. This is in line with Zaku, (2013a) which observed that *P. biblobosa* is highly nutritional providing income and Job opportunity to many household members, particularly women who are more involved in processing and marketing of African locust bean. Furthermore, *P. biblobosa* play a vital role in nutrient recycling and in controlling soil erosion in an environment and this is in consonant with Amuse and Jimoh (2012), that the tree act as a buffer against strong wind or water runoff that usually causes damage to crop and soil. *P. biblobosa* is a leguminous plant that fixes nitrogen in the soil thereby enriching the soil nutrients content (Zaku, 2013a). *Sarcocephalus latifolia* has been observed as one of the edible fruits in the region, based on the interview with some of indigenous communities in the Region, the specie has an extensive utilization and plays a vital role as fruits and for both food and traditional medicinal purposes. This is similar with findings of Adjanohoun *et al.* (1989) which he reported that the fruit of *S. latifolia* is used in traditional medicine; it is also consumed by local population.

Ficus sycomorus is another WEF species that was observed to moderate level of distribution due to its specialized features that allow them to thrive in specific ecological Niche. For example, species like *Ficus Sycomorus* is adapted to water loving environmental conditions, leading to their presence in the area. This finding agrees with report Makishima (2005) that found out *F. sycomoros* is the most abundant fruits supplier for *frugivorous* animal in Riverine forest in the semi-arid arid land of Nachola, Kenya. *Vitellaria paradoxa* (kadanya), with 14 cumulative occurrences, this is because of its economic importance by the indigenous people, which contributes to enrich the variety of WEFs. The presence of *V. paradoxa* in the study area could be as result of their most valuable fruits which are highly nutritional and divers in minerals to the indigenous communities in the study area. This results conforms to the findings of Honfo *et al.* (2014) which reported that the pulp is very rich in nutrients such as micronutrients, minerals in vitamin B and C as well as more than a dozen amino acids.

Adansonia digitata and *Borassus aethiopum* are vital, collectively; all these species contribute to the rich diversity of WEFs in the region. The findings in this research can be integrated into a holistic strategy for preserving the diverse wild edible fruit species found in northern Taraba State. Such strategies may include community-based conservation initiatives, traditional knowledge preservation, and raising awareness about the cultural and nutritional significance of these resources. Ultimately, this multifaceted approach will ensure the sustainable utilization and long-term conservation of WEFs in the region.

5. Conclusion

In conclusion, the assessment of Wild Edible Fruits (WEFs) in northern Taraba, Nigeria, the unveiled variations in the knowledge and utilization of WEFs among the distinct regions of Ardo-Kola, Lau, and Yororo, was shedding light on the importance of local ecological contexts. Ecological factors, such as climate, soil, and habitat, were observed to influence the distribution of WEF species, a thorough species frequency and distribution analysis revealed the dominance of key species like *Adansonia digitata* (baobab), *Parkia biglobosa* (African Locust Bean), and *Sarcocephalus latifolia*, which significantly contribute to the local diet, medicinal practices, and economic activities. Factors influencing distribution, including deforestation, geographical conditions, and land use practices, underscore the interconnectedness of the human-environment relationship. These WEFs contribute substantially to local livelihoods, providing food security, medicinal remedies, and economic opportunities, while also indirectly supporting ecological conservation.

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