



Domestication of Wild Fruit Trees in Communities of Mayo-Belwa LGA, Adamawa State, Nigeria

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Authors' contributions

Author MRU designed the study, performed the analysis, wrote the protocol and wrote the manuscript while author FDN managed the study and literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

The study was carried out to assess the domestication of wild fruit trees in communities of Mayo-Belwa LGA of Adamawa State, Nigeria. Seven wards within the LGA (Tola, Mayo-Fareng, Binyeri, Gangfada, Gorobi, Gangwaso and Nasarawo Jereng) were selected for Agroforestry. 14 farms from each of the selected wards were randomly sampled and surveyed for observation and recording of indigenous fruit trees on the farms and also by ocular inspecting the proportion of farm land under fruit trees cultivation. Results shows that preference matrix ranking was used to generate a species priority list of indigenous fruit trees preferred by the local people through the use of questionnaire. Descriptive statistics such as table, frequencies and percentages were used to analyse the data obtained which includes, proportion of indigenous fruit trees DBH ranging (10.1-45.1), basal area ranging (80.1-1597.8), agricultural crops grown alongside fruit trees, local people towards wild fruit trees domestication, socio-economic variables of the respondents, and opportunities and constraints to on-farm cultivation of indigenous fruit trees. The result of the findings indicated that indigenous fruit trees species on-farm was relatively moderate:- The average proportion of farmland under indigenous fruit trees DBH was however low in Gorobi ward and higher in Binyeri ward. Some of the preferred indigenous wild fruit trees were *Vitallaria paradoxa*,

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Vitex doniana, *Annona senegalensis* and *Tamarindus indica* among others. The study recommended that in order for indigenous fruit trees to meaningfully contribute to household food security and incomes, there is need to: Formulate clear policies and by-laws on conservation of indigenous tree resources. Trees are assets, which contribute to the well-being of the rural community and through their longevity, serve as a cultural linking element throughout generations. Policy-makers and decision-makers also need to be kept informed of the latest advances in domestication and commercialization.

Keywords: Agroforestry; communities; DBH and basal area; indigenous; wild fruit trees.

1. INTRODUCTION

Fruit trees constitute significant biological resources in various agro-ecological systems and forest ecosystems all over the world. Fruits are full of nature's rich needed nutrients, antioxidants and health benefits for ready use by humans (and other animals) without further processing in most cases, unlike vegetables and other edible agricultural/horticultural produce that may require necessary pre-treatments, like heating, before consumption [1,2,3]. The tropics, more than any other region of the world, is endowed with great diversity of fruit tree species that have provided humans with basic food and nourishment for ages since the domestication of beneficial wild plants (crops species). There are about 3000 species of wild fruit trees in Africa, representing an enormously important, and largely untapped, natural resource (World Agroforestry Centre, 2010), and about 1000 species identified in America and 500 species in Asia [4,5]. Although only a fraction of these diversities are marketed worldwide, the diversities are nature's inestimable assets for the livelihoods of local people throughout the tropical regions [6]. Awodoyin et al. [6] reported that Africa has scarcely achieved the status of international recognition in commodity markets and research arena on tropical fruit trees which has constituted important biological resources in the global agro bio-diversity context.

Diversity of fruit trees dominate 80% of the world agronomic field eg ten annual cereal grains, pulses and oil seeds plants [6]. At present, wheat, rice and maize cover half of the world's croplands, while adding other annual grains and pulses accounts for up to two-third of all arable land in the world ([5], Jaramillo et al. 2011). However, fruit trees grow very well in the area due to the fertility of the soil, weather and atmospheric condition, climate and closeness to river. The area recorded 20% production rate of fruit trees in state, despite the fact that more than 90% of fresh fruit produce are consumed locally,

the demand for tropical fruits has been on steady increase globally in the past few decades. According to FAO [7], there is a great potential for growth of the fruit produce in the international markets due to the increasingly health consciousness and much hyped nutritional awareness about the consumption of more fresh fruits as well as vegetables in people's diets.

Today with a new understanding of the values of indigenous fruit trees in providing food security and meeting nutritional and economic needs (International Centre for Research in Agroforestry, [8]), these trees are receiving more attention than before. Indigenous fruit species such as *Psidium guajava*, *Senna siamea*, *Citrus pp*, *Carica papaya*, *Manifera indica*, *Citrus limon*, *Piliostigma thonningii* etc are high in fibre and minerals. Apart from their value in assuring food and nutritional security, the income potential from these trees is also enormous in the impoverished economy [9,6]. By selling fresh fruits from these trees, farmers' annual income may be doubled [8].

Very few studies have been undertaken on indigenous fruit trees in the study area. Moreover, there is a dearth of information on domestication of indigenous fruit trees in the study area. The promotion of agroforestry practices using domesticated indigenous fruit tree species will be a prominent feature in food security. However, this will be hampered by lack of information in the fruit trees that can be selected for domestication. There is a need to provide information on selected indigenous fruit trees already in use and also provide more awareness on unknown species to be adopted by agroforestry farmers for more income and food security consciousness. Fruit trees are commonly found in home gardens and planted around homesteads as short-term relief for food shortages when new crops are still maturing. As a result, farmers have not considered the cultivation of indigenous fruit trees as a means of improving food security and enhancing their

livelihood [6]. Mayo-Belwa LGA is not an exception there is need to upgrade the agroforestry productivity in the area, alleviate poverty and improve the livelihood of the subsistence farmers by promoting fruit tree cultivation. In agroforestry, the practice is referred to as fruit tree domestication. As such, there is a genuine need to assess the domestication potential of selected fruit trees for incorporation in the farming practices.

2. MATERIALS AND METHODS

2.1 The Study Area

The study was conducted in Mayo-Belwa Local Government Area of Adamawa State Nigeria. The area is located in the Southern part of the state lies between latitude 9°03' N and 12° 03' E longitude. It has land mass of 14,561,120 km²

(Fig. 1) [10]. It covered an area of 682.6 sqm (1768 km²). It has an estimated population of 212,534 inhabitants with vast majority of the area dwellers being members of Chamba, Yandan, Fulani ethnic group. The area has a density of 115.51 km², bounded in the south east by Cameroon Republic and in the west by Taraba State (National Population Commission, 2006).

2.2 Climate and Vegetation of the Study Area

It has an air temperature characteristic typical of the West African Savannah climate. Temperature in this climatic region is high throughout the year because of high radiation income which is relatively evenly distributed throughout the year. However, there is usually a seasonal change in temperature. There is a gradual increase in temperature from January to April. There is a

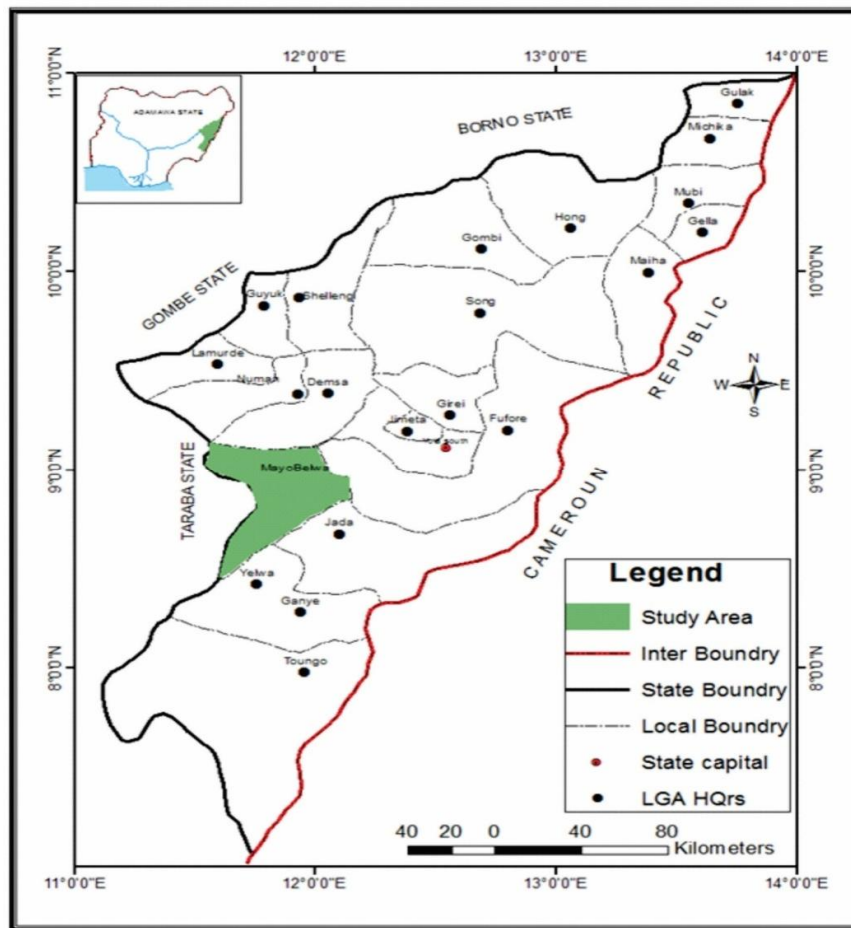


Fig. 1. Map of Adamawa State showing the study area
Source: Adebayo and Tukur, [10]

distinct drop in temperature at the onset of rains due to the effect of cloudiness. A slight increase after the cessation of rains (October – November) is common before the onset of harmattan in December when the temperature drops further. It has temperature of 32° centigrade. The river flows through the LGA. Average wind speed of the area is put at 10 km/h. it has a pressure 1012 mb and 18% level of humidity. Rainy season commences in April with highest rainfall mostly being recorded in September. The area has a good rainfall pattern with some areas having as high as 1,400 mm [10]. The vegetation of the zone has mean annual rainfall between 1100 mm and 1600 mm and the rainy season lasts for about 4-6 months from May-October. Mayo-Belwa LGA is in the Southern Guinea Savannah zone, other area in the zone includes;- Toungo, Ganye, Jada and the southern parts of Fufore local government area. The more abundant woody species in the zone are *Daniellia oliveri*, *Diospyros ellioti*, *Ceiba pentandra*, *Nauclea latifolia*, *Bombax costatum*, *Parkia biglobosa*, *Drypetes floribunda*, *Brachystegia eurycoma*, *Brysocarpus coccineus*, *Zanthoxylum zanthoxyloides*, *Vitex doniana*, *Piliostigma thonningii* and *Entada abyssinica*. Species of the Northern guinea and Sudan savanna zones also occur in this zone. The most abundant grasses in the zone are species of *Andropogon*, *Hyparrhenia*, *panicum* and *Ctenium* [10].

2.3 Data Collection

Data was collected for experimentation for One year. Random sampling method were adopted for information gathering in the study, where Seven (7) wards were selected from Mayo-Belwa LGA which are; Tola, Mayo-Farang, Binyere, Gangfada, Gorobi, Gangwaso and Nasarawo-Jereng wards based on population of (Table 1).

Fourteen (14) farms from each of the selected wards were randomly sampled and surveyed. Questionnaire was randomly administered to each ward. Information was sought via structured questionnaires, oral interviews and farm visit. Semi-structured questionnaire and interviews using Participatory Rural Appraisal (PRA) method [11] was adopted. The questionnaire cover socio-economic status the respondents; opportunities and constraints that promotes indigenous fruit tree cultivation and questions designed to assemble information on attitudes towards indigenous fruit tree cultivation as well as uses of indigenous fruit trees by the local communities. Copies of questionnaire were distributed to communities based on Cochran Proportion Allocation formula adopted by Dishan et al. [12] thus:

$$n_h = N_h \times \frac{n}{N}$$

Where,

n_h = number of questionnaire administered in each community

N_h = estimated population of the people in each community

n = total number of questionnaires administered

N = total number of people in all the communities

2.4 Data Analysis/Statistical Method

Preference matrix ranking were used to generate a species priority list of indigenous fruit trees preferred by the local people. Each respondent was asked to indicate 15 species in order of preference. The highest priority species out of thirteen (13) were assigned thirteen (13) points, twelve (12) points to the second highest and the lowest ranked species assigned one (1) point. The points for each species were summed

Table 1. Sample size according to wards (Agroforestry farmers)

S/No	Communities	Population	Sample size	No. of questionnaires administered	No. of questionnaires retrieved
1	Tola	125	51	51	51
2	Mayo-Farang	110	33	33	33
3	Binyere	87	26	26	26
4	Gangfada	84	28	28	28
5	Gorobi	57	17	17	17
6	Gangwaso	71	21	21	21
7	Nasarawo Jereng	80	24	24	24

Source: Field Survey, 2019

across all respondents. The species was then prioritized according to the total points scored. Descriptive statistics such as table, frequencies and percentages was used to analyse the data result obtained.

3. RESULTS

3.1 Checklist of Fruit Trees Species in Agroforestry System

3.1.1 Agricultural crops grown alongside indigenous fruit trees

Many tree species including exotic fruit trees were grown or retained to grow together with indigenous fruit trees on farm by local people (Table 2). The most common were *Mangifera indica*, *Carica papaya*, *Citrus limon*, *Citrus spp*, *Psidium guajava*, *Senna siamea* and *Piliostigma thonningii*. Others included *Acacia spp*, *Eucalyptus spp* and *Balanites aegyptiaca*. A large number of crops viz. Maize, millet, Sorghum, Groundnuts and beans, etc were

grown alongside indigenous fruit trees (Table 3). Many farmers said they are not willing to invest their labour on growing and managing indigenous fruit trees alone but would prefer to retain or plant fruit trees together with food or cash crops if planting materials for fruit trees were available.

3.2 Species Priority List of Indigenous Fruit Trees by Farmers

A wide range of trees has been identified as sources of edible fruits and fuel wood in the study area. However, the result in Table 4 showed that the highest ranked species among the listed was *Vitellaria paradoxa* trees followed by *Parkia biglobosa* and *Borassus aethiopum*. The average proportion of farm land under indigenous fruit trees Diameter at Breast Height (DBH) is between 10.1 and 45.1 and Basal Area ranged from 80.1 and 1597.8. There were only four farms with fruit tree DBH equal to 10.1 and one farm equal to 45.1 of the total farmland area (Table 5).

Table 2. Checklist of fruit trees species in agroforestry systems

S/N	Common name	Local name	Scientific name
1.	Mangoes	Mangoro	<i>Mangifera indica</i>
2.	Guava	Guava	<i>Psidium guajava</i>
3.	Pawpaw	Gwanda	<i>Carica papaya</i>
4.	Lemon	Lemun tsami	<i>Citrus limon</i>
5.	Oranges	Lemu	<i>Citrus spp</i>
6.	Bananas	Ayaba	<i>Musa spp</i>
7.	Cashew	Cashew	<i>Anacardium occidentale</i>
8.	Parkia	Doruwa	<i>Parkia biglobosa</i>
9.	West African ebony	Kanya	<i>Diospyrosmespili formis</i>
10.	Elephant palm	Giginya	<i>Borassus aethiopum</i>
11.	Doum palm	Goruba	<i>Hyphaene thebaica</i>
12.	Thorn tree	Aduwa	<i>Balanites aegyptiaca</i>
13.	Shea butter	Kadanya	<i>Vitellaria paradoxa</i>
14.	Black plum	Dinya	<i>Vitex doniana</i>
15.	Gum Arabic	Dakwara	<i>Acacia Senegal</i>
16.	Wild custard apple	Gwandan daji	<i>Annona senegalensis</i>
17.	Christ thorn	Magarya	<i>Ziziphus spina-christi</i>
18.	Buffalo thorn	Kurna	<i>Ziziphus mucronata</i>
19.	Tallow tree	Taura	<i>Detarium microcarpum</i>
20.	Camels foot	Kalgo	<i>Piliostigma thonningii</i>
21.	Eucalyptus	Zaiti	<i>Eucalyptus spp</i>
22.	Tamarind	Tsamiya	<i>Tamarindus indica</i>
23.	Neem	Neem	<i>Azadirachta indica</i>

Source: Field Survey, 2019

Table 3. Agricultural crops grown alongside fruit trees

S/N	Crop	Scientific name
1.	Sorghum	<i>Sorghum bicolor</i>
2.	Millet	<i>Pennisetum glaucum</i>
3.	Cowpea	<i>Vigna unguiculata</i>
4.	Cassava	<i>Manihot esculent</i>
5.	Sugarcane	<i>Sacharum officinarum</i>
6.	Groundnuts	<i>Arachis hypogen</i>
7.	Pumpkin	<i>Cucurbita</i>
8.	Maize	<i>Zea mays</i>
9.	Sweet potatoes	<i>Ipomea batatas</i>
10.	Banana	<i>Musa spp.</i>
11.	Soya beans	<i>Glycine max</i>
12.	Rice	<i>Oriza saliva</i>

Source: Field Survey, 2019

Table 4. Preference ranking of indigenous wild fruit tree species by farmers

Indigenous fruit trees	Ranking
<i>Vitellaria paradoxa</i>	1
<i>Parkia biglobosa</i>	2
<i>Borassus aethiopum</i>	3
<i>Balanites aegyptiaca</i>	4
<i>Tamarindus indica</i>	5
<i>Diospyros mespili formis</i>	6
<i>Detarium microcarpum</i>	7
<i>Ximenia americana</i>	8
<i>Ziziphus spina-christi</i>	9
<i>Santaloides afzelii</i>	10
<i>Vitex doniana</i>	11
<i>Acacia Senegal</i>	12
<i>Hyphaene thebaica</i>	13

Source: Field Survey, 2019

3.3 Tree Species Grown Together With Indigenous Fruit Trees on Farmland

Many tree species including exotic fruit trees are grown or retained to grow together with indigenous fruit trees on farm by local people (Table 6). The most common among the species were *Mangifera indica*, *Carica papaya*, *Citrus limon*, *Citrus spp.*, *Psidium guajava*, *Senna siamea* and *Piliostigma thonningii*. Others included *Ficus spp.*, *Acacia spp.*, *Albiziaspp.*, *Eucalyptus spp.*

3.4 Local People's Perception of Whether Indigenous Fruit Trees Should Be Cultivated

The result on respondent's view on indigenous fruit trees growth indicated that 85% indigenous

fruit trees growing naturally. Only a small proportion 15% indicated that some indigenous fruits were planted (Table 7). The indigenous fruit trees found in crop land were either planted or preserved when new plots were being cleared. Some may have regenerated from coppicing. In spite of the fact that few farmers are growing or managing indigenous fruit trees, many people seem to know their values. All respondents reported that families depend on indigenous fruits for food during food shortage and that indigenous fruit trees are a good source of income. Asked whether indigenous fruit trees have a medicinal value, 100% admitted to knowing medicinal value of fruit trees. The majority (95%) reported that indigenous fruit trees serve as fuel wood. Only 5% disagreed on fruit trees serving as fuel wood (Table 7).

Table 5. Proportion of farmland under indigenous fruit trees DBH (m) and Basal Area $[(m^2) \pi D_m^2/4]$

Farm No	Tola		Mayo-Fareng		Binyeri		Gangfada		Gorobi		Gangwaso		Nasarawo Jereng	
	DBH	Basal area	DBH	Basal area	DBH	Basal area	DBH	Basal area	DBH	Basal area	DBH	Basal area	DBH	Basal area
1	15.1	179.1	30.2	716.4	15.9	198.6	10.3	83.3	10.1	80.1	12.8	128.7	30.2	716.4
2	20.2	320.5	15.9	198.6	30.5	730.7	20.7	336.6	15.2	506.8	25.4	506.8	35.9	1012.4
3	25.3	502.8	25.6	514.8	10.8	91.6	15.5	188.7	30.3	721.2	15.1	179.1	15.6	191.2
4	10.5	86.6	10.9	93.3	15.5	188.7	25.4	506.8	20.8	339.8	20.9	343.1	10.8	91.6
5	15.1	179.1	15.8	196.1	30.9	750.0	20.1	317.3	20.6	333.3	10.0	78.6	25.3	502.8
6	30.2	716.4	35.0	962.2	25.5	510.8	15.3	183.9	10.9	93.3	15.7	193.6	10.4	84.9
7	40.0	1256.8	20.4	326.9	20.4	326.9	15.7	193.6	25.3	502.8	30.4	725.9	15.5	188.7
8	14.8	172.1	20.2	320.5	15.9	198.6	24.1	456.2	20.7	336.6	22.3	390.6	20.7	336.6
9	18.9	280.6	10.6	88.3	25.2	498.8	20.9	343.1	20.9	343.1	20.1	317.3	15.1	179.1
10	22.1	383.6	25.5	510.8	45.1	1597.8	16.3	208.7	10.3	83.3	25.9	526.9	10.9	93.3
11	16.4	211.3	30.2	716.4	15.9	198.6	10.2	81.7	10.8	91.6	20.8	339.6	30.8	745.2
12	14.5	165.2	15.8	196.1	30.0	706.9	12.1	115.0	40.7	1301.2	10.7	89.9	35.3	978.8
13	12.6	124.7	25.1	494.9	10.9	93.3	14.3	160.6	30.4	725.9	20.7	336.6	15.7	193.6
14	10.7	89.9	10.9	93.3	15.8	196.1	20.4	326.9	20.3	323.7	30.5	730.7	10.9	93.3

Source: Field Survey, 2019

Table 6. Other tree species grown together with indigenous fruit trees on farmlands

S/N	Common name	Scientific name
1	Mangoes	<i>Mangifera indica</i>
2	Guava	<i>Psidium guajava</i>
3	Pawpaw	<i>Carica papaya</i>
4	Lemon	<i>Citrus limon</i>
5	Oranges	<i>Citrus spp</i>
6	Bananas	<i>Musa spp</i>
7	Cashew	<i>Anacardium occidentale</i>
8	Eucalyptus	<i>Eucalyptus spp.</i>
9	Grewia	<i>Grewia mollis</i>
10	Moringa	<i>Moringa oleifera</i>
11	Piliostigma	<i>Piliostigma thonningii</i>
12	Cassia	<i>Senna siamea</i>
13	Ficus	<i>Ficus spp</i>
14	Albizia	<i>Albizia spp</i>

Source: Field Survey, 2019

Table 7. Values of indigenous (Wild) fruit trees

Variables	Agree	Disagree	Don't know
Families depend on indigenous fruits trees for food	85%	15%	-
Indigenous fruit trees are good source of income	90%	10%	-
Indigenous fruit trees have medicinal values	100%	0%	-
Indigenous fruit trees serves as fuel wood	95%	5%	-

Source: Field Survey, 2019

3.5 Socio-Economic Characteristics of Respondents

The socio-economic characteristics of the respondents are presented in Table 8. The majority (70%) of the respondents were aged between 20-40 years. Ninety eight percent of the respondents were male, ninety two percent married and about 82% were farmers. The family sizes of household revealed that 51% were between 6 -10 individuals and the least was 7% which is ≥ 20 individuals per household.

3.6 Market Potential of Indigenous (wild) Fruits

Fruits of *Detarium microcapum*, *Vitex doniana*, *Borassus aethiopicum*, *Ximenia americana* shear butter (*Vitellaria paradoxa*) and *Tamarindus indica* among others were reported to be sold in the local market (Table 10). Though their prices when compared to exotic tree fruits such as *Mangifera indica* (mangoes), *Psidium guajava* (Guava) and *Citrus reticulata* (mandarin) etc, are lower. This vividly shows that indigenous fruit trees have the potential for commercialization.

Lack of a developed market for indigenous fruits can be explained in part by the fact that many people have free access to wild fruits and do not perceived them marketable produce.

3.7 Constraints Attached to Planting/Managing of Wild Fruit Trees on Farm Land and their Possible Solutions

Various factors that militate against the planting and management of indigenous fruit tree species on the farms in the study area are listed in Table 11. Some of this factors include lack of awareness by farmers on the need to plant and manage indigenous fruit tree species; vague information about food values of the wild fruits; dearth of seedlings of indigenous fruit tree species in local nurseries; deficiency of clear markets for indigenous fruits, slow growth and low prices of indigenous fruits and poor propagation knowledge. Other associated problems are competition of trees with crops fruit trees attracting birds which destroy crops; lack of awareness of planting seasons and lack of money to buy improved planting materials.

Farmers advocated for the provision of better planting materials; sourcing information on planting seasons; information on the food values of wild fruits; developing markets of indigenous fruits and establishing demonstration tree nursery.

Table 8. Socio-economic characteristics of respondents

Variable	Frequency	%
Gender		
Male	98	98
Female	2	2
Age (years)		
<20	5	5
20 –40	70	70
>40	25	25
Marital status		
Single	6	6
Married	92	92
Divorced	0	0
Widowed	2	3
Level of Education		
None-formal	50	50
Primary	30	30
Secondary	20	20
Tertiary	0	0
Occupation		
Farmer	82	82
Trader	5	5
Civil servants	0	0
Pastoralist	10	10
Others	3	3
Family size		
< 5	27	27
6 to10	51	51
>10	15	15
>20	7	7

Source: Field Survey, 2019

Table 9. Continued socio-economic characteristics of respondents

Variable	Frequency	%
Annual income (N)		
<100,000	70	70
101,000-200,000	20	20
201,000-300,000	9	9
>300,000	1	1
Landownership		
Yes	66	66
No	44	44
Size of land owned (ha)		
< 1 ha	21	21
1 to3	40	40
4 to6	27	27
> 6	12	12

Source: Field Survey, 2019

Table 10. Local people towards wild fruit trees domestication

Variables	Percentage (%)
Are fruit trees planted or growing naturally	
Wild fruit tree grow planted	0
Wild fruit tree grow naturally	100
Should wild fruits be cultivated?	
To be cultivated	92
Through natural growth	8

Source: Field Survey, 2019

Table 11. Indigenous (Wild) fruits sold in local markets

Variable	%
Are wild fruits sold in local market	
Yes	0
No	100
Wild fruits sold in local market	
	Prices (per kg)
<i>Vitalleria paradoxa</i>	200
<i>Tamarindus indica</i>	300
<i>Diospyrosmespili formis</i>	150
<i>Detarium microcarpum</i>	350
<i>Ximeniaamericana</i>	200
<i>Ziziphus spina-christi</i>	250
<i>Santaloides afzelii</i>	200
<i>Vitex doniana</i>	450
<i>Borassus aethiopum</i>	150
<i>Hyphaene thebaica</i>	100

Source: Field Survey, 2019

Table 12. Constraints attached to planting/managing wild fruit trees on farm land and possible solutions

S/N	Variable
Constraints	
1.	Lack of awareness on the need to plant and manage indigenous fruit tree species
2.	Unclear information of food values of the wild fruits
3.	No clear market for wild fruits
4.	Some wild fruit trees have long gestation period
5.	Fruit trees attract birds which destroy crops
6.	Limited knowledge of nursery and tree propagation
7.	Some wild fruit competes with crops
8.	No planting materials
9.	Planting seasons of wild fruits are unknown to farmers
10.	No money to buy planting materials
Solutions to such Problems	
1.	Provision of planting materials
2.	Enlighten farmers with information on planting seasons
3.	Educate farmers on the food values of wild fruits
4.	Assure farmers of the markets of wild fruits
5.	Give money to farmers to buy seedlings
6.	Provide demonstration nursery to farmers

Source: Field Survey, 2019

Table 13. Conservation threats of indigenous (Wild) fruit trees

Variables	%
Charcoal burning	100
Firewood	100
Fires in dry seasons	90
Clearing land for Agriculture	100
Making mortars	90
Exploitation for timber	100
Some trees don't sprout once cut down	50

Source: Field Survey, 2019

3.8 Conservation Threats and Population Decrease of Indigenous (Wild) Fruit Trees

Indigenous wild fruits are faced with threats as reported by respondents such as tree cutting for charcoal production, fuel wood, crafts etc. Fires (via bush burning) in the dry season and clearing for agricultural farms (Table 12).

4. DISCUSSION

4.1 Checklist of Species of Fruit Trees Already in Existence in all the Agroforestry Systems Practices

Owing to the dearth and low level of formal research and investments for improvement, many of the Indigenous Fruit Trees (IFT) still preserve their natural and considerable size that would make group planting and management in orchards/ plantations setting difficult [13,14,15]. Over 25 species of indigenous fruit tree species were recorded in the different farms surveyed in the study area. The identification was aimed at knowing the most valuable wild fruit trees for smallholder farmers practicing agroforestry and for verifying the importance and potential towards boosting their economy. This result conforms to the findings of Akinnifesi et al. [16] on Domesticating and Commercializing Indigenous Fruit and Nut Tree Crops for Food Security and Income Generation in Sub-Saharan Africa.

4.2 Species Priority Preference List, Characterization and Documenting the Values of Indigenous Fruit Trees as Perceived by Farmers

The concept of participatory ranking towards domestication involves selection and management of the most highly valued trees and cultivars, prioritization is the foremost rational phase to obtaining best species with good genetic makeup. This result concurred with the

findings of [17]. The low proportion of farm land under tree cover implies that a lot has to be done if farmers are to fully integrate indigenous fruit trees in their farming systems. The high percentage of rare and occasional indigenous fruit tree species on-farm raises concern over the status of the species over time as clearing for agriculture, fuel wood and charcoal production continues. Sheail et al. [18]; Network of Nigerian Researchers and Research Users (NNRRU, 2018) to leave nature alone would defeat the purpose of nature conservation including Indigenous Fruit Trees (IFT) still preserve their natural and considerable size that would make group planting and management in orchards/plantations. Therefore, there is a strong need to advocate for the management of indigenous fruit trees on-farm. Although these fruit trees may not have high commercial value now, their existence is of high conservation importance.

4.3 Assess Farmer's Attitudes towards Indigenous Fruit Tree Domestication

The other reason for lack of a developed market for indigenous fruits could be related to consumers taste and preference for exotic fruits like apples, citrus (lemon, tangerine and orange), mangoes, guava, avocado, bananas and pawpaw. Many urban dwellers consider indigenous (wild) fruits as food for the poor. This perception of the wild fruits affects their market demand and consumption, a problem that needs to be overcome if indigenous fruit trees are to be domesticated to improve household food security and nutrition. This is in line with the findings of Network of Nigerian Researchers and Research Users (NNRRU) (2018).

Roshetko and Verbist, [19] recognized three pathways in which improved germplasm can be made available to farmers: distribution of seed originating from national research centers, community-based NGOs and the private sector,

dissemination of selected seeds originating from farmers and farmer groups, and direct diffusion through informal farmer-to-farmer exchange. Training of small holder farmers in nursery establishment will go a long way in determining the success and sustainability of IFT domestication and tree crop development. This include training smallholder farmers to collect quality germplasm from superior trees in a way that ensures genetic quality, efficient establishment and management of nurseries, tree establishment and management on-farm, harvest and post-harvest handling activities and marketing of germplasm and tree products.

5. CONCLUSION

The population of indigenous wild fruit trees is generally in declining state. This is a major concern for the domestication potential of the fruit trees. The major reasons for decline included cutting for charcoal production and firewood. Many farmers planted or retained indigenous fruit trees on-farm mainly because of the food, medicinal and cash value although their market prices are lower than those of exotic fruits. Many farmers have positive attitudes towards on-farm cultivation of indigenous fruit trees. However, gender, education level, farm size and occupation status influenced their willingness to plant fruit trees. Lack of awareness by farmers on the need to plant and manage indigenous fruit tree species, limited information about food values of the wild fruits, lack of seedlings of indigenous fruit tree species in local nurseries, poor demand for indigenous fruits and poor propagation knowledge were the major hindrances to cultivation of indigenous fruit trees.

COMPETING INTERESTS

Authors have declared that no competing interests exist. Yes

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