

# Prevalence, Utilization and Conservation Strategies for Non-Timber Forest Products in South western Zone of Nigeria

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**Abstract** The study was carried out to investigate the prevalence and utilization of non-timber forest products (NTFPs) plant species in Omo and Shasha Forest Reserves, Southwestern Nigeria. Data were obtained through the use of structured questionnaires administered to households in forest communities. To complement information from the household survey, focus group discussions (FGDs) were also carried out in each of the sampled communities. In-depth interview (IDI) of forestry staff was further used to supplement the information collected. A simple random sampling technique was employed for the study. In Omo Forest Reserve (OFR), a total of seventy five species distributed in forty three families were recorded, while fifty six species in thirty one families were documented in Shasha Forest Reserve (SFR). Local end-uses of NTFPs include food and food supplements, snacks/sweeteners, wrapping leaves, soup and spices, beverages, dental care supplies, washing tools, roofing/construction materials, medicine and traditional rites items. While access to these resources is important to guarantee the socio-economic well being of the forest dwellers and communities, their sustainable management has not been taken seriously by policy makers thereby contributing to reduction of biodiversity and gradual but irretrievable loss of indigenous knowledge on the uses of most species. To ensure the sustainable utilization of NTFPs in these and similar tropical forest environments therefore, a number of conservation approaches are proposed.

**Keywords** Tropical Rainforest, Non-Timber Forest Products, Utilization, Prevalence and Conservation Strategies

## 1. Introduction

Non-timber forest products (NTFPs), sometimes referred to as minor forest products or non-wood forest products, encompass a wide range of natural resources. NTFPs are goods and services of biological origin other than wood derived from forests and allied land uses[1]. The focal view of NTFPs excludes the timber and that the products, benefits or services should come from a forest or associated ecosystems *i.e.* any part of plant or animal harvested for human or animal use or which contributes directly or indirectly to welfare can be described as NTFPs. These NTFPs are an integral part of the survival and development strategy for the continued well – being of man, livestock, flora, and fauna. Though both natural and plantation forests are a rich source of NTFPs, their relevance had been over shadowed in the past by the over – concentration on the timber component of the forests[2]. The timber-first orientation arose from the high premium placed on wood

by early foresters as the major economic crop from forests.

The role of NTFPs in rural livelihoods is an important factor stimulating interest in bringing them back into forest management focus. Jimoh and Adebisi[2] averred that the integration of NTFPs with timber production could provide local benefits and make timber extraction more environmentally sustainable and economically viable. The relevance of NTFPs in sustainable forest management has been highlighted to include its potential in curbing environmental degradation; putting paid to insecurity of forest properties; and promoting traditional / indigenous natural resource management technique[2]. FAO[1] listed three overarching benefits of NTFPs integration in sustainable forest management as: (1) income generation for rural development; (2) more equitable sharing of the benefits of forest; and (3) local participation in forest management.

In economic terms, NTFPs contribute substantially to national economic growth and international trade. The wild plant resources contribute an income of US\$ 194–1114 per household per year in Southern Africa[3]. Globally, herbal medicines entering the international market were valued at US\$ 14 billion in 1996[4]. Jimoh and Haruna[5] reported that the contributions of NTFPs to household income around the Onigambari Forest Reserve, Nigeria, amount to 68.1% of

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total monthly income. In the Southeast of Cameroon, NTFPs have been found to contribute more than 50% to village household incomes[6]. In two out of eight villages studied in Ghana, collecting forest leaves for wrapping food, sponge-making and basket-weaving provided the main sources of income to the households[7]. In Nepal, the Forestry Department collects US\$ 15 million yearly revenue from the trading of NTFPs[8].

NTFPs occur in all the ecological zones of Nigeria and they include biotic and abiotic resources of wild species of plants and animals plus soil minerals[9]. The numbers, types, population and diversity of species which occur in the different ecological zones vary in accordance with inherent genetic characteristics, land use practices, edaphic conditions and environmental influences. The use of NTFPs in natural or planted forests is normally not restricted; hence they have been increasingly exploited without a long-term view towards their sustainable use. Equally, the rich variety of non-timber forest products in the country, many of which have been used by people for centuries, has not been well-documented. Therefore, this study was carried out to: prepare a checklist of the major non-timber yielding plant species in Omo and Shasha Forest Reserves, Southwestern Nigeria; document their utilization in the area and; proffer possible conservation approaches for sustainable utilization of these valuable products.

## 2. Materials and Methods

### 2.1. The Study Areas

The study was conducted in Omo and Shasha Forest Reserves of tropical lowland rainforest zone in southwestern Nigeria. This densely populated zone covers about 2% of the total land area of Nigeria.[10]. Within this zone, a number of studies[11, 12] have documented progressive shifts in the ecological boundaries of the tropical lowland rainforest as a result of human pressures. The cluster of forest reserves in the study area when taken together forms the Omo-Oluwa-Shasha complex (Fig. 1).

### 2.2. Omo Forest Reserve

Omo Forest Reserve (OFR) is located between Latitudes  $6^{\circ} 35' - 7^{\circ} 05' \text{N}$  and Longitudes  $4^{\circ} 19' - 4^{\circ} 40' \text{E}$  in the Ijebu East and North Local Government Areas of Ogun State, southwestern Nigeria. The Reserve covers an area of about 130,500 hectares forming common boundaries with Osun, Ago-Owu and Shasha Forest Reserves in Osun State and Oluwa Forest Reserve in Ondo State. The Nigerian Government legally gazetted it a forest through Order No. 10 Gazette No. 40 of 7th May 1925 which was amended in 1952[13]. The government in 1946 established a 460 ha Strict Nature Reserve (SNR) within Omo Forest Reserve. This was upgraded to a Biosphere Reserve (BR) in 1977 by UNESCO[14, 15]. The rainy season in OFR usually commences in March. The mean annual rainfall in the area

ranges from about 1600 to 2000 mm with two annual peaks in June and September. Temperature ranges from  $32.15^{\circ}\text{C}$  to  $21.40^{\circ}\text{C}$  and a minimum relative humidity of 76.34 % [16]. The vegetation of the Reserve is a mixed moist semi-deciduous rainforest. Most of the forests are disturbed with a substantial part converted to monoculture plantations of *Gmelina arborea* in a programme assisted by loans from the World Bank and the African Development Bank to provide material for a pulp mill at *Iwopin*. For effective management, the reserve was subdivided into four areas or sectors viz: J1, J3, J4 and J6. These subdivisions were apportioned to enclave dwellers in isolated villages or camps. Estimated total population in the area is between 20,000 and 25,000. Farming, fishing, hunting and NTFPs gathering are the predominant occupations for the majority of the enclaves' population.

### 2.3. Shasha Forest Reserve

Shasha Forest Reserve (SFR) is located between Latitudes  $7^{\circ} 00' - 7^{\circ} 30' \text{N}$  and Longitudes  $4^{\circ} 00' - 5^{\circ} \text{E}$  in Osun State, southwestern Nigeria. The reserve was first gazetted in 1925 as part of the Old Shasha Forest Reserve under an agreement with the Ijebu Native Authority. The reserve shares boundaries with Omo Forest Reserve on the west. The northern and eastern boundaries are with Ife Native Authority Reserve and Oluwa Forest Reserve in Osun and Ondo States respectively. The total area of the Reserve is currently 23,064 ha. Out of this, about 1,523 ha are under plantation of various species such as *Gmelina arborea*, *Tectona grandis*, *Terminalia spp*, *Pinus spp* and *Nauclea diderichii*. The remaining 21,541ha is currently dominated by pockets of degraded natural forests characterized with broken canopy[17]. The rainy season in SFR usually commences from March/April and lasts till November. Total Annual rainfall ranges from 887mm to 2,180mm. The mean annual temperature is about  $26.5^{\circ}\text{C}$  with annual range of between  $19.5^{\circ}\text{C}$  and  $32.5^{\circ}\text{C}$ . The original vegetation structure of Shasha Forest Reserve is three storied with scattered emergents[18]. The Reserve is subdivided into two major areas viz, Areas 4 and 5. There are about forty communities within and around the Forest Reserve. The population of these communities range from 200 to 2000 inhabitants.

### 2.4. Data Collection and Sampling Procedure

Data were collected through socio-economic approach. This included household survey; focus group discussion; and in-depth interview with forest communities and forestry personnel. Four enclaves were sampled in the J4 Sector of Omo Forest Reserve, and six communities within and around Shasha Forest Reserve. Household surveys were conducted among randomly selected sub-set of households in each site. In a sampling intensity (S.I), 30% S.I was used where total number of households was less than 100 while 10% S.I was used where number exceeded 100[19]. Thus, a total of 81 and 85 households were sampled in OFR and SFR

respectively. To complement information from the household survey, focus group discussions (FGDs) were carried out in each of the sampled communities. This provided forum for weighing the relative importance of identified NTFPs. Semi-structured questionnaires with a mixture of open-ended and fixed-response questions through an in-depth interview were further used to access information from the forestry staff in the two reserves. There were fourteen Uniform and Technical forestry personnel in OFR, while SFR had twenty as at the time of the survey. All the Uniform and Technical forestry personnel (fourteen) in OFR participated in the survey, while twelve questionnaires were administered in SFR (being the number of those available and willing to participate in the survey).

### 2.5. Data Analysis

The Chi-square test- a nonparametric test which involves the analysis of the frequency or percentage count of two different variables and hence the relationship between these variables was used to analyse information gathered on the utilization of NTFPs in the study area. The data analyses were carried out using the Statistical Package for Social Sciences[20].

## 3. Results and Discussion

### 3.1. Prevalence and Uses of NTFPs in the Study Area

Seventy five NTFP species distributed in forty three families were recorded in OFR, while fifty six species which spread across thirty one families were documented in SFR (Table 1). Twenty nine species were peculiar to OFR including; Epo omo (bark of *Cordia millenii*), Ewe ogbo (leaf of *Parquetina nigrescens*) Gbokonisa (*Beilschimidia mannii*) and Gbongbo agboin (root of *Piptedeniastrum africanum*), among others. On the other hand, nine species were peculiar to SFR including: Asunwo (*Senna alata*), Ayin (*Annoeissus leiocarpa*), Dongoyaro (*Azadirachta indica*), Opepe (*Nauclea diderichii*), Ewuro (*Vernonia amygdalina*), Igba (*Parkia biglobosa*), Iya (*Daniellia oliveri*), Ose (*Adansonia digitata*), Osun (*Pterocarpus osun*), and Sanda (*Carpolobia spp*). Local end-uses of NTFPs in the two reserves include food and food supplements, snacks/sweeteners, wrapping leaves, soup/soup ingredients, beverages, chew-stick, washing items, roofing/construction, medicine and traditional rites. Medicinal uses occupy the modal use category in both sites (51.47%; Fig. 2). NTFPs are extracted from different plant life-forms including trees, shrubs, herbs, palms and lianas with trees constituting the highest (Fig. 3). Virtually all parts of the plants except the flower find usefulness as NTFPs. Leaves (30.44%), fruits (25.96%) and bark (16.19%) are the predominant parts commonly utilized as NTFPs in both sites (Table 2).

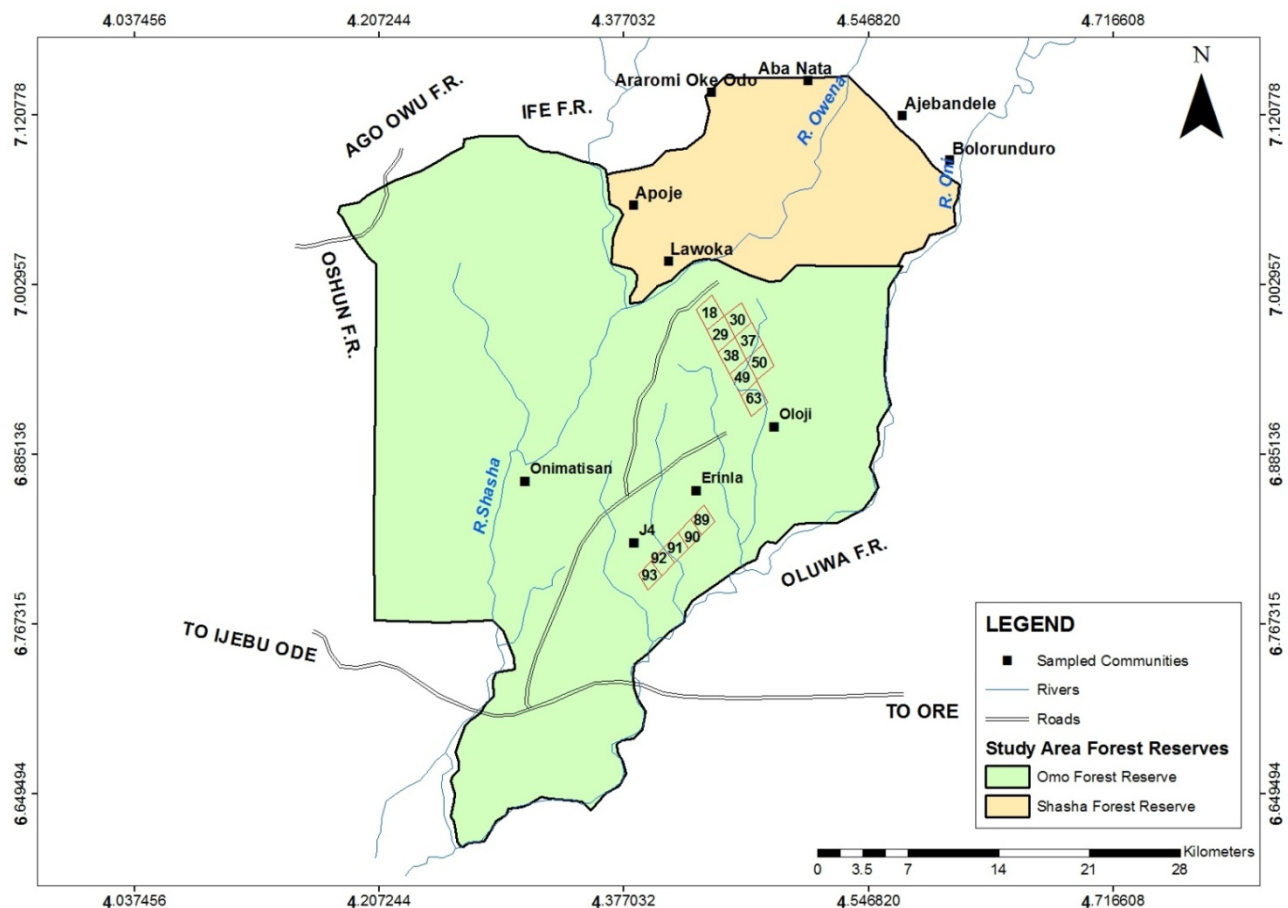
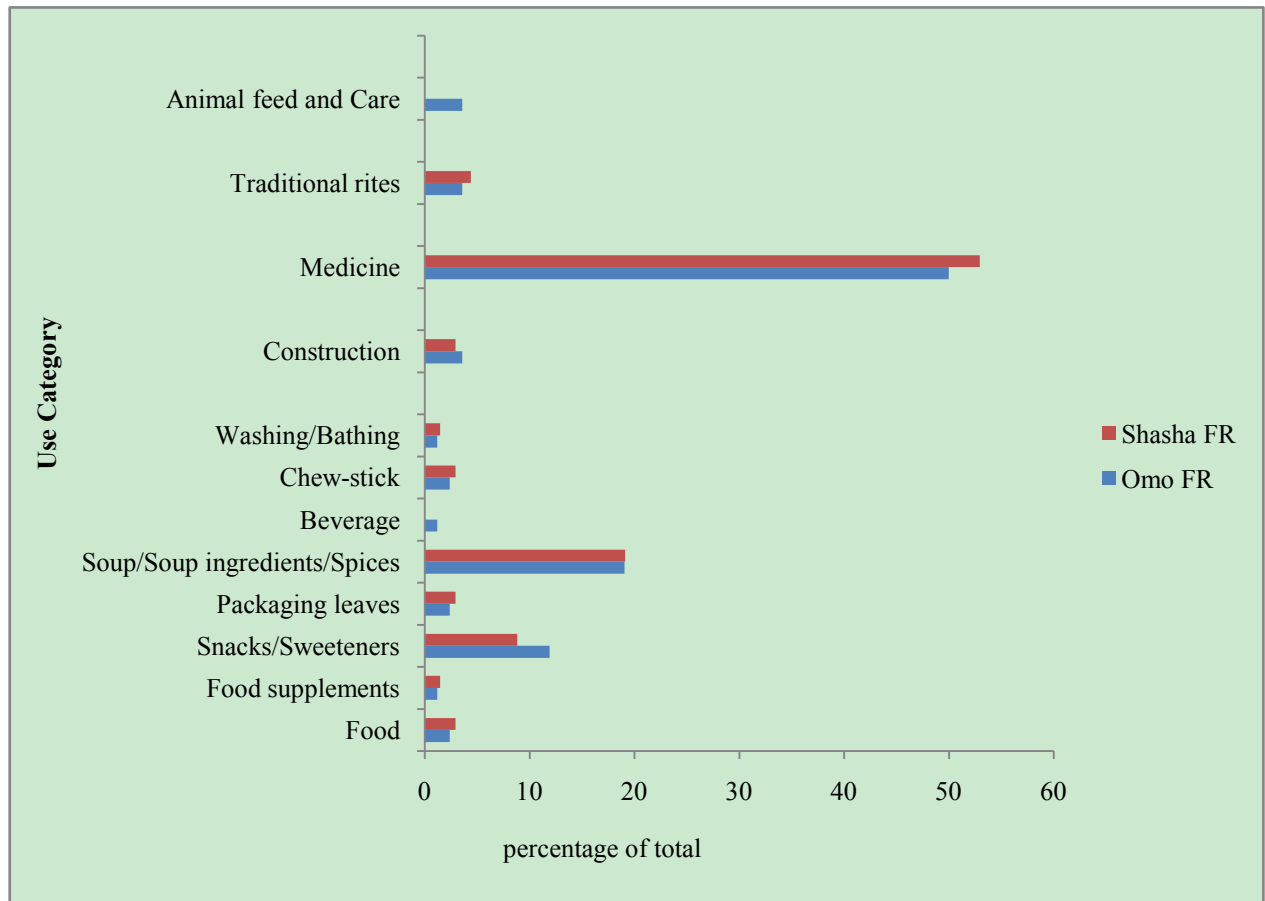


Figure 1. Map of Omo-Oluwa-Shasha Forest Reserves Complex

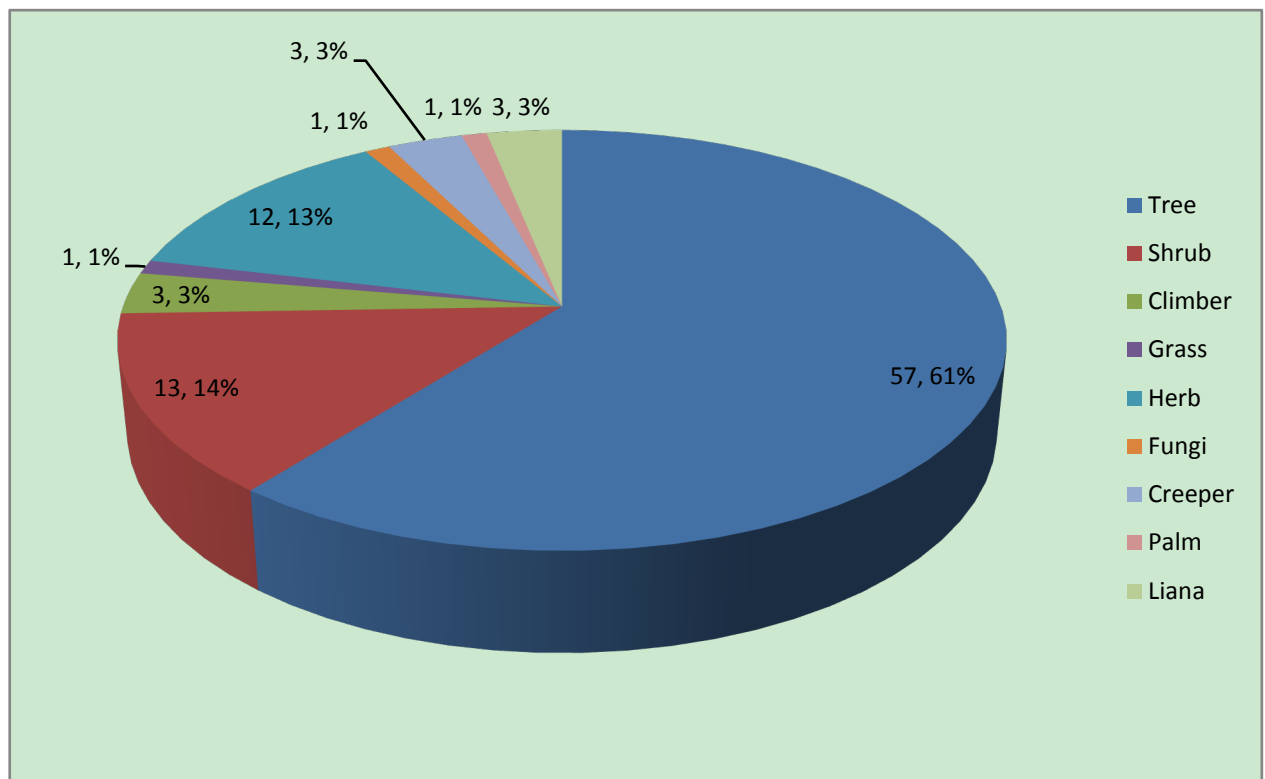
**Table 1.** Prevalence and Uses of NTFPs in Omo and Shasha Forest Reserves, Nigeria

Utilization Category	Species	Local Name	Habit	Site	Part(s) used
Species Used as Food/Main Dish	<i>Treculia africana</i> Decne. (Moraceae)	Afon	Tree	OFR, SFR	Fruit, Seed
	<i>Artocarpus altilis</i> (Parkinson) Fosberg (Moraceae)	Berefuutu	Tree	OFR, SFR	Fruit
Species Used as Food supplement	Edible mushrooms (Varies)	Ataase (Olu)	Fungi	OFR, SFR	Whole fungus
Species Used as Snacks/Sweeteners	<i>Treculia africana</i> Decne. (Moraceae)	Afon	Tree	OFR, SFR	Fruit, Seed
	<i>Chrysophyllum albidum</i> , G. Don (Sapotaceae)	Agbalumo	Tree	OFR, SFR	Fruit
	<i>Synsepalum dulcificum</i> (Schumach. & Thonn.) Daniell (Sapotaceae)	Agbayun	Shrub	OFR, SFR	Fruit
	<i>Tetracarpidium conophorum</i> (Mull.Arg.) Hutch. & Dalziel (Euphorbiaceae)	Asala	Climbing shrub	OFR, SFR	Fruit
	<i>Blighia sapida</i> , K.D.Koenig (Sapindaceae)	Isin	Tree	OFR	Fruit
	<i>Irvingia gabonensis</i> (Aubry-Lecomte ex O'Rorke) Baill (Irvingiaceae)	Ooro	Tree	OFR	Fruit
	<i>Garcinia kola</i> , Heckel. (Clusiaceae)	Orogbo	Tree	OFR, SFR	Seed
	<i>Sida veronicifolia</i> , Lam. (Malvaceae)	Esi-ile	Creeper	OFR	Fruit
	<i>Dialium guineense</i> Willd. (Ceasalpinaceae)	Omoyin	Tree	OFR	Fruit
Species Used as Soup/Soup ingredients/Spices/Condiments	<i>Irvingia gabonensis</i> (Aubry-Lecomte ex O'Rorke) Baill (Irvingiaceae)	Aapon (Ogbono)	Tree	OFR, SFR	Seed
	<i>Brachystegia eurycoma</i> Harms, B. (Caesalpinaceae)	Akporachi (EKU)	Tree	OFR	Seed
	<i>Azafia africana</i> Sm. (Caesalpinaceae)	Apa	Tree	OFR, SFR	Seed,
	<i>Crassocephalum crepidioides</i> (Benth.) S. Moore (Asteraceae)	Ebolo	Herb	OFR, SFR	Leaf
	<i>Ceiba pentandra</i> , (L.) Gaertn. (Malvaceae)	Eegun	Tree	OFR	Leaf
	<i>Adenopus breviflorus</i> Benth. (Cucurbitaceae)	Egusi ile	Climber	SFR	Leaf
	<i>Boerhavia diffusa</i> , L. (Nyctaginaceae)	Etiponnla	Herb	OFR	Leaf
	<i>Vernonia amygdalina</i> , Del. (Asteraceae)	Ewuro	Forb or Shrub	SFR	Leaf
	<i>Beilschimidia mannii</i> , (Meisn.) Benth. & Hook. f (Lauraceae)	Gbokonisa	Tree	OFR	Leaf
	<i>Erythrina senegalensis</i> D.C (Fabaceae)	Ilaka ile	Tree	OFR	Leaf
	<i>Mondia whitei</i> (Hook.f.) Skeels (Asclepiadaceae)	Isigun	Herb	OFR	Root
	<i>Gongronema latifolium</i> Benth. (Asclepiadaceae)	Iteji	Shrub or Tree	OFR, SFR	Leaf
	<i>Cissampelos owariensis</i> , P. Beau (Menispermaceae)	Jenjoko	Climber	OFR	Leaf
	<i>Dichapetalum pallidum</i> (Dichapetalaceae)	Marigbo	Tree	OFR	Leaf
	<i>Adansonia digitata</i> , L. (Malvaceae)	Ose	Tree	SFR	Leaf
	<i>Pterocarpus osun</i> Craib. (Papilionaceae)	Osun	Tree	SFR	Leaf
	<i>Peperomia pellucida</i> , (Linn.) HB & K. (Piperaceae)	Rinrin	Herb	SFR	Leaf
	<i>Capsicum</i> spp. (Solanaceae)	Ata ijosi	Shrub	OFR, SFR	Fruit
	<i>Aframomum sceptrum</i> (Oliv. & Hanb.) K Schum. (Zingiberaceae)	Ata oguro	Herb	OFR, SFR	Fruit, Seed
	<i>Zingiber officinale</i> , Roscoe (Zingiberaceae)	Ata-ile (Ginger)	Tuber	OFR	Root
	<i>Zanthoxylum zanthoxyloides</i> , (Lam.) Zepern. & Timler (Rutaceae)	Igi ata	Shrub	OFR, SFR	Leaf
	<i>Piper guineense</i> Schumach. & Thonn. (Piperaceae)	Iyere	Liana	OFR, SFR	Fruit, Seed, Leaf
	<i>Parkia biglobossa</i> , (Jacq.) R.Br. ex G.Don. (Mimosaceae)	Igba	Tree	SFR	Seed
Species Used as Beverage	<i>Raphia hookeri</i> G.Mann & H.Wendl. (Palmae)	Ako (Raffia palm)	Palm	OFR	Stem
Species Used as Chew-stick	<i>Zanthoxylum zanthoxyloides</i> , (Lam.) Zepern. & Timler (Rutaceae)	Igi ata	Shrub	OFR, SFR	Root
	<i>Massularia acuminata</i> (G Don) Bullock (Rubiaceae)	Pako ijebu (chew stick)	Tree	OFR, SFR	Stem, Branch
Species Used for Packaging	<i>Mitragyna ciliata</i> , Aubrév. & Pellegr (Rubiaceae)	Abura	Tree	OFR, SFR	Leaf
	<i>Thaumatococcus daniellii</i> (Benn.) Benth. (Marantaceae)	Ewe eeran	Herb	OFR, SFR	Leaf
Species Used for Washing	<i>Momordica angusticephalas</i> , Harms (Cucurbitaceae)	Kainkanin	Climber	OFR, SFR	Fruit
Species Used for Medicines	<i>Parinari excelsa</i> Sabine (Chrysobalanaceae)	Abere	Tree	OFR, SFR	Fruit, Bark
	<i>Mitragyna ciliata</i> , Aubrév. & Pellegr (Rubiaceae)	Abura	Tree	OFR, SFR	Leaf, Bark
	<i>Terminalia ivorensis</i> A. Chev. (Combretaceae)	Afara dudu	Tree	OFR, SFR	Bark
	<i>Treculia africana</i> Decne. (Moraceae)	Afon	Tree	OFR, SFR	Fruit, Seed
	<i>Musanga cecropioides</i> R.Br. (Moraceae)	Aga	Tree	OFR, SFR	Stem, Branch
	<i>Gossweilerodendron balsamiferum</i> (Verm.) Harms (Caesalpinaceae)	Agba	Tree	OFR, SFR	Bark

	Piptadeniastrum africanum, (Hook.f.) Brenan (Mimosaceae)	Agboin	Tree	OFR	Root
	Culcasia saxatilis, A.Chev. (Lamiaceae)	Agunmona	Herb	OFR	Fruit
	Tetrapleura tetraptera (Schumach. & Thonn.) Taub. (Mimosaceae)	Aidan	Tree	OFR, SFR	Fruit
	Newbouldia laevis (P. Beauv.) Seem. ex Bureau (Bignoniaceae)	Akoko	Tree or Shrub	OFR, SFR	Leaf
	Monodora myristica (Gaertn) Dunal. (Annonaceae)	Ariwo	Tree	OFR, SFR	Seed, Bark
	Rauvolfia vomitoria Afzel. (Apocynaceae)	Asofeyeje	Tree	OFR, SFR	Leaf
	Senna alata (L.) Roxb. (Caesalpinaceae)	Asunwo	Shrub	SFR	Leaf
	Aframomum melegueta K. Schum. (Zingiberaceae)	Ataare	Herb	OFR, SFR	Fruit, Seed
	Pativera alliacea, L. (Phytolaccaceae)	Awogba	Herb	OFR	Leaf
	Annickia (syn. Enantia) chlorantha (Oliv.) Setten & Maas (Annonaceae)	Awopa (Yaani)	Tree	OFR, SFR	Bark
	Alstonia boonei De Wild. (Apocynaceae)	Awun	Tree	OFR, SFR	Bark
	Anogeissus leiocarpus (DC.) Guill. & Perr. (Combretaceae)	Ayin	Tree	SFR	Fruit
	Allium sativum, L. (Alliaceae)	Ayuu (Garlic)	Creeper	OFR	Fruit
	Azadirachta indica, L. (Meliaceae)	Dongoyaro	Tree	SFR	Bark
	Ceiba pentandra, (L.) Gaertn. (Malvaceae)	Eegun	Tree	OFR	Leaf
	Chloris pilosa Schumach. (Poaceae)	Eeran	Grass	OFR	Leaf
	Hunteria umbellata (K. Schum) (Apocynaceae)	Eerin	Tree	OFR, SFR	Fruit
	Nauclea diderrichii (De Wild. & T.Durand) Merrill (Rubiaceae)	Egbesi	Shrub	OFR, SFR	Leaf
	Adenopus breviflorus Benth. (Cucurbitaceae)	Egusi ile	Climber	SFR	Leaf, Bark
	Momordica foetida Schumach. (Cucurbitaceae)	Ejinrin	Herb	OFR, SFR	Leaf
	Picalima nitida (Stapf) Th. & H. Dur (Apocynaceae)	Erin	Tree	OFR, SFR	Seed, Bark
	Cnestis ferruginea, DC (Connaraceae)	Gboyin-gboyin	Tree	OFR	Leaf
	Ocimum basilicum L. (Labiatae)	Igi ota	Shrub	OFR, SFR	Stem, Branch
	Ageratum conyzoides, L. (Asteraceae)	Imi esu	Herb	OFR, SFR	Leaf
	Ficus exasperata Vahl (Moraceae)	Ipin	Tree	OFR, SFR	Leaf
	Blighia sapida, K.D.Koenig (Sapindaceae)	Isin	Tree	OFR	Fruit, Leaf, Bark
	Daniellia oliveri (Rolfe) Hutch. & Dalz. (Caesalpinaceae)	Iya	Tree	SFR	Root
	Spondias mombin L. (Anacardiaceae)	Iyeye	Tree	OFR, SFR	Fruit, Leaf
	Cissampelos owariensis, P. Beau (Menispermaceae)	Jenjoko	Climber	OFR	Leaf, Bark
	Buchholzia coriacea Engl. (Capparaceae)	Kokoroijemu/Obii koro (wonderful kola)	Tree	OFR, SFR	Seed
	Trichilia rubescens, Oliv (Meliaceae)	Kurere	Tree	OFR	Stem, Branch
	Hippocratea indica Willd. (Celastraceae)	Mawole	Climbing shrub or Liana	OFR, SFR	Root
	Khaya ivorensis A. Chev. (Meliaceae)	Oganwo	Tree	OFR, SFR	Bark
	Parquetina nigrescens (Afzel.) Bullock (Asclepiadaceae)	Ogbo	Twine	OFR	Leaf
	Sansevieria trifasciata, Prain. (Ruscaceae-Agavaceae)	Oja ikoko	Creeper	OFR	Leaf
	Abrus precatorius, L. (Fabaceae)	Oju ologbo	Tree	OFR	Seed
	Erigeron floribundus (Kunth) Sch.Bip. (Asteraceae)	Olowojeja	Herb	OFR	Leaf
	Cordia millenii, Baker (Boraginaceae)	Omo	Tree	OFR	Bark
	Gardenia erubescens, Stapf & Hutch. (Rubiaceae)	Oruwon	Shrub or Tree	OFR	Leaf
	Morinda lucida Benth. (Rubiaceae)	Oruwo	Tree	OFR, SFR	Leaf, Bark
	Adansonia digitata, L. (Malvaceae)	Ose	Tree	SFR	Root, Bark, leaf
	Lophira alata Banks ex Gaertn. (Ochnaceae)	Pahan	Tree	OFR, SFR	Bark
	Kigelia africana (Lam.) Benth. (Bignoniaceae)	Pandoro	Tree	OFR, SFR	Fruit
Species Used for Construction	Raphia hookeri G.Mann & H.Wendl. (Palmae)	Ako (Raffia palm)	Palm	OFR	Leaf
	Bambusa vulgaris Schrad. (Poaceae)	Oparun	Grass	OFR, SFR	Stem, Leaf
	Morinda lucida Benth. (Rubiaceae)	Oruwo	Tree	OFR, SFR	Bark
Species Used for Traditional rites	Parinari excelsa Sabine (Chrysobalanaceae)	Abere	Tree	OFR, SFR	Fruit
	Newbouldia laevis (P. Beauv.) Seem. ex Bureau (Bignoniaceae)	Akoko	Tree or Shrub	OFR, SFR	Leaf
	Cola acuminata Schott & Endl. (Malvaceae-Sterculioideae)	Obi Abalaye	Tree	OFR, SFR	Fruit
Species Used as Animal feed and Care	Afzelia africana Sm. (Caesalpinaceae)	Apa	Tree	OFR, SFR	Leaf
	Euphorbia hirta L. (Euphorbiaceae)	Tomide	Herb	OFR	Leaf



**Figure 2.** Utilization Categories of NTFPs in Omo and Shasha Forest Reserves Expressed in Percentage



**Figure 3.** NTFPs Life-form and Corresponding Number of Plant Species Expressed in Percentage

**Table 2.** Summary of NTFPs Parts and Corresponding Number of Plant Species

	Number of Species		Percentage of Total	
	Omo FR	Shasha FR	Omo FR	Shasha FR
Fruit	22	20	22.92	28.99
Seed	12	07	12.50	10.14
Flower	0	0	0.00	0.00
Stem/Branch/Latex	12	05	22.92	7.25
Leave	32	19	33.33	27.54
Root	5	05	5.21	7.25
Bark	13	13	13.54	18.84

### 3.2. NTFPs for Medicinal Purposes

Forty two medicinal plant species were documented for OFR while thirty six were recorded for SFR. Medicinal plant species of great local importance in the study area include: *Piptadeniastrum africanum*, *Tetrapleura tetraptera*, *Annickia* (syn. *Enantia*) *chlorantha*, *Bucholzia coriacea*, *Hippocratea indica*, *Piper guineense*, *Morinda lucida*, and *Kigelia africana*. Several factors account for dependency of the communities on traditional medicine. These include: culture, efficacy, holistic nature of plant therapy, cost, availability, accessibility, poverty, and poor infrastructure[21]. The knowledge of medicinal uses of these plants is transferred from generation to generation.

### 3.3. NTFPs for Culinary Uses

The culinary uses of NTFPs include their consumption as food, food supplements, snacks, spices, condiments, flavouring and beverages. In this category, thirty two and twenty four plant species were documented for OFR and SFR respectively. Important NTFPs used as forest food and food supplement include: *Treculia africana*, *Artocarpus artilis* and mushroom. Similarly, the leaves and seeds of some plant species are used as vegetables, soup/soup ingredients and spices. This is the case with such species as *Brachystegia eurycoma*, *Capsicum* spp, *Crassocephalum crepidioides*, *Beilschimidia mannii*, *Irvingia gabonensis*, and *Piper guineense*. Wild fruits, which contain vital nutrients (carbohydrates, protein, and minerals) and essential vitamins are also important in the study area, especially for growing children, who are prone to malnutrition and related diseases[22]. Among the indigenous fruits with considerable commercial potential in the study area are: *Irvingia* spp., *Synsepalum dulcificum*, *Tetracarpidium conophorum*, *Garcinia cola*, *Chrysophyllum albidum*, and *Dialium guineense*.

### 3.4. NTFPs for Miscellaneous Functions

Two plant species, *Zanthoxylum zanthoxyloides* and *Massularia acuminata* are commonly used as chew-stick (for tooth care) in the study area. *Momordica angusticephalas* is also used as local sponge for washing and/or bathing. *Bambusa vulgaris*, *Morinda lucida* and *Raphia hookeri* are widely used for construction purposes. *Parinari excelsa*, *Newbouldia laevis* and *Cola acuminata* are

important NTFPs for social, cultural and religious functions. In the same vein, *Euphorbia hirta*, *Azelia africana* and *Carpolobia lutea* are employed in animal feed and care. *Euphorbia hirta* is fed to rabbits, the leaves of *Azelia africana* are lopped as cattle forage while, *Carpolobia lutea*, which is also widely exploited from the forest reserves is particularly used for driving cattle by *Fulani* herdsmen.

Ola-Adams[23] recorded 54 wild or semi-wild relatives of cultivated crops which also abound in the Omo Forest Reserve. Such species include species of *Capsicum*, *Coffea*, *Cola*, *Dioscorea*, *Solanum*, *Irvingia* and *Ipomea*. Similarly, Jimoh[21] listed 35 NTFPs of high priority attention in Shasha Forest Reserve. Some of these include: *Irvingia gabonensis*, *Chrysophyllum albidum*, *Annickia* (syn. *Enantia*) *chlorantha* and *Piper guineense*. Etkin and Ross[24] have also documented about 119 plants as foods in the savannah ecozone of Nigeria. Similarly, Okafor *et al*[25] identified 8 NTFPs from the mangrove swamp, 19 traded products from the moist forest, 17 from the southern guinea savannah, 12 in the Sudan savannah and 56 for the whole country.

According to Okafor *et al.*,[25], forest foods which are either eaten raw or processed form the major intake of proteins, vitamins, minerals, fats and carbohydrates among the majority of rural communities in Nigeria. Many NTFPs provide both social and economic benefits to rural communities. Some of these commodities also play an economic role in the national and regional economies. Extraction of NTFPs for local consumption and/or markets is carried out as part of livelihood strategies at household level. Arnold[26] reported NTFP species are found cultivated in gardens and farms for ease of access, control and management.

For the time being, while there is a full Department of Non-Timber Forest Products in the Ogun State Ministry of Forestry which holds the jurisdiction over the Omo Forest Reserve based on the development of NTFPs in non-reserve areas within the State, NTFPs operation is still a sub-sector under the Department of Forest Management in the Osun State Ministry of Environment. Based on this, the development of NTFPs in Osun State remained neglected and relegated to harvesters' payment of a token fee to register with Forest Management Unit (FMU) Authorities. Generally, NTFPs are still being regarded as minor forest products and they are not subjects of GDP calculations hence they are treated with levity.

### 3.5. Conservation Approaches for Sustainable Utilization of NTFPs

Several approaches have been suggested for the conservation of NTFPs. These include; research intervention (including regular and appropriate inventory), domestication of selected species; in-situ and ex-situ conservation; conservation through biotechnology; NTFPs trade regulation; medicinal plants farming; legal and institutional reforms among others[27, 28, 2]. The following strategies as

expounded by Subedi[29] are further examined:

### 3.6. Improving Production from the Wild on a Sustainable Basis

This will involve the management of natural regeneration of NTFP species and will not deteriorate the resource base in the condition where the extraction of resources does not exceed the production capacity of the resource base. Controlled harvesting technique will be a simple, easy and inexpensive management system to implement by community forest user groups (CFUGs) for natural regeneration of NTFPs in forest land. This option will ensure the natural regeneration in the controlled area and check the over exploitation of NTFPs. Controlled harvesting can be enforced by applying one or more of the following alternatives: rotational harvesting, fixing of harvesting regimes and selective harvesting. These will include: cleaning the site, providing light, space, etc on the forest land. Other management applications such as thinning, coppicing, etc. as needed, will also be maintained to ensure high yields. This strategy will be useful for high quality and high production of species. However, it will be costly and quite tedious.

### 3.7. Domestication

The domestication of promising, under-exploited species in private farm land, community forest land and leasehold forest land can contribute a lot in this sector. Some important stages among them are characterization, germplasm exploration, vegetative propagation, genetic selection, and incorporation into a sustainable land-use system. For more important NTFP species, strategies for more intensive and systematic domestication might include[30]:

- screening of candidate species through species trials on farmland in collaboration with farm households;
- identification of preferred characteristics of chosen species;
- seed collection and distribution;
- study of interactions between genotype and environment; and
- establishment of seed orchard.

### 3.8. Conservation Education and Training Activities

Providing conservation education in conjunction with technical assistance may be a way to reach forest users in order to help them see their resource situation from a different perspective. Similarly, there is a need to provide training and conservation educational activities on NTFP for extension workers and forest users.

### 3.9. Local Value Addition

NTFPs collected from forest or cultivated land can be sold in different forms - crude raw materials, improved raw materials or processed raw materials. This can also be through different market channels. An improved market

channel could bring out more value than a primitive one. Value addition can also make the same products more valuable so that it plays a greater role in the local economy. When value additions are encouraged for NTFPs, it will create employment for local people and help to uplift their living standard. This will further motivate the local communities to help ensure conservation of NTFP species.

## 4. Recommendation

NTFPs are a very crucial component of forest ecosystem which deserves better attention of policy makers and other forest stakeholders, hence informed policy interventions, equity of access and use, and sustainable harvesting of the multitude of resources is essential for both economic development and sustainable forest management.

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