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UTILIZATION POTENTIALS OF ENDANGERED SAVANNAH TREE SPECIES IN NORTH-WEST NIGERIA

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Abstract

This study evaluated the utilization potentials of some endangered savannah tree species in north-west Nigeria. A multistage sampling procedure was employed. Three Local Government areas were selected, from which 36 villages were selected. A structured questionnaire was administered to 360 respondents and ten respondents were randomly selected in each village. Data obtained were analyzed with descriptive statistics. Descriptive statistics were used to assess the collected data. Most (38%) were in the 30- to 39-year-old age range. The majority sex was 100% male, 75% were married and had a family size of at least one to ten people per home. 69% of the respondents have completed formal schooling. (65%) were primarily farmers and (49%) had inherited land. Sixty-five percent of the farms were smaller than one hectare. (40%) had been farmers for an average of 21–31 years. Most farmers (100%) utilized trees as boundary demarcation, 98% as shade and 93% as medicine and wind control. However, 99% utilized trees for medicine. The predominant tree families include Fabaceae, Combretaceae, Rubiaceae, Euphorbiaceae and Caeselpiniaceae. The most familiar tree species were Azadirachta indica, Adansonia digitata, Parkia biglobosa, Lawsonia inermis, Mangifera indica, Vitellaria paradoxa, Tamarindus indica, Jatropha carcus, Diospyros mespiliformis and Acacia nilotica used to treat and cure various ailments and diseases for optimum benefits.

Keywords*: Evaluation; Demographic; Farming; Procedure; Predominant; Sampling*

Introduction

As a result of improving the upkeep of sustainable production systems on the same land, agroforestry rationally blends agriculture and forestry, either concurrently or successively providing the best solution to issues with soil infertility and land degradation [1]. Agroforestry is a sustainable land management technique that farmers in the sub-humid tropical regions can use to preserve supporting practices and revitalize their farms. It covers any methods that purposefully mix crops, livestock and/or trees and bushes over some time or place. Many cultures have long employed this technique to maintain their food production systems [2].

Thus, agroforestry practices can potentially improve agricultural land use systems and the livelihood of rural communities, providing lasting benefits and alleviating adverse environmental effects at local and global levels. Despite global awareness and the existence of agroforestry, finding trustworthy and accurate information on the scope of the condition in the study area remains a difficulty.

It is important to remember that agroforestry, as a notion of sustainable living, helps farmers become more resilient and raises household income by harvesting a variety of goods at different times of the year. The processing of tree products also creates jobs, boosting the

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national and rural economies' financial gains. Successful agroforestry systems maximize the beneficial interactions among their constituent parts, resulting in a more valuable end product than monocultures. Simultaneously, the likelihood of unsuccessful harvests and reliance on chemical inputs decreases. International policy has acknowledged agroforestry's ability to support sustainable development [3].

In the fight to guarantee the continuous provision of ecosystem services, boost food production and lessen poverty, afforestation, reforestation of forest woodlots and agroforestry systems are at the forefront [4]. Economic trees can be used in agricultural landscapes to help reduce climate change and ensure biodiversity conservation while also assisting in limiting the issue of environmental degradation and ensuring sustainable food production. Additionally, by including economically valuable tree species in the farming system, agroforestry supports biodiversity preservation and improves soil quality. Furthermore, because cash crops and forest trees were interplanted, farmers' incomes rose simultaneously. Consequently, higher living standards, economic expansion and development follow [5].

According to *B. Mukadasi and W. Nabalegwa* [6], despite the considerable progress in agroforestry research and dissemination, the awareness and attitude of land users practicing agroforestry systems are of utmost value before any recommendation. Studies in several parts of Africa, including Nigeria, have demonstrated these practices' economic, environmental, ecological and agronomic returns [7, 8] highlighted that several benefits accompany the practice of agroforestry. The benefits are economic as income generation and environmental, such as decreased runoff and increased infiltration rates.

When examining the functions of trees in agroforestry, it is crucial to focus on the effects of perennials or trees with numerous uses. Legumes are the most significant of these trees because of their capacity to fix nitrogen and subsequently release it for use by other plants. The functions of trees on a small farm include providing food in the form of fruits, nuts, edible leaves and other edible materials; they also serve as sources of non-edible materials like sap, resins, tannins, insecticides and medicinal compounds; used as sources of fuel; they provide shade and beautification; they improve soil fertility, especially on hillsides and they can be used as sources of extra income [9].

By giving wildlife a place to live, the agroforestry system's cultivation of many tree species also increases biodiversity [10]. Trees can also stop landslides and erosion on steeper slopes because their extensive root systems encircle the soil matrix [11, 12]. By providing shade, trees in agroforestry systems can potentially modify the microclimate by lowering solar radiation and regulating the surrounding temperature [13]. Incorporating trees through agroforestry might enhance crop growth and, consequently, its yield, as highly amplified solar radiation can impair crop physiology and growth [13, 14].

Planning the use of trees in agroforestry systems requires a thorough understanding of their characteristics. Benefits, adaptation to local conditions (temperature, soil, pressures), size and structure of the canopy and root system and appropriateness for different agroforestry strategies are all desirable details for each species. Numerous studies have emphasized the socio-economic advantages of agroforestry for rural communities and its favorable environmental effects. As a result, agroforestry may also prove to be a viable remedy for the current environmental and socio-economic problems [15]. Trees are an essential component of the agroforestry systems. When people clear land for farming, they leave a wide selection of species on farmlands. The management of these species is to meet the immediate needs of the population, such as food, medicines, income, agricultural materials and ecological needs [16]. Agroforestry utilization is the process of harvesting, converting and disposing of agroforestry produce and other resources [17].

Agroforestry satisfies innumerable human needs, i.e., tangible or intangible. *Wong* [18] claimed that the overall income of agroforestry systems is greater than that of monoculture systems. Hence, the systems are seen as an approach to sustainable agriculture practices since they contribute to the positive development of the agriculture industry in terms of environmental, social and economic aspects [19, 20].

Materials and method

Study description

Nine Local Governments in Kano State were involved in this study: Bebeji, Dawakin Kudu, Gwarzo, Karaye, Kiru, Kura, Madobi, Rogo and Shanono. The location of Kano State is between latitudes 13^0 North and 110 South and longitudes 8^0 West and 10^0 East. The forty-four Local Government Areas that makeup Kano State are as follows (Fig. 1). Kano State has a population of 9,383,682 people living in its 20,760 square kilometer total land area (2006 provisional data). While Hausa and Fulfulde are the predominant languages in the region, Islam is the predominant religion in Kano [21].

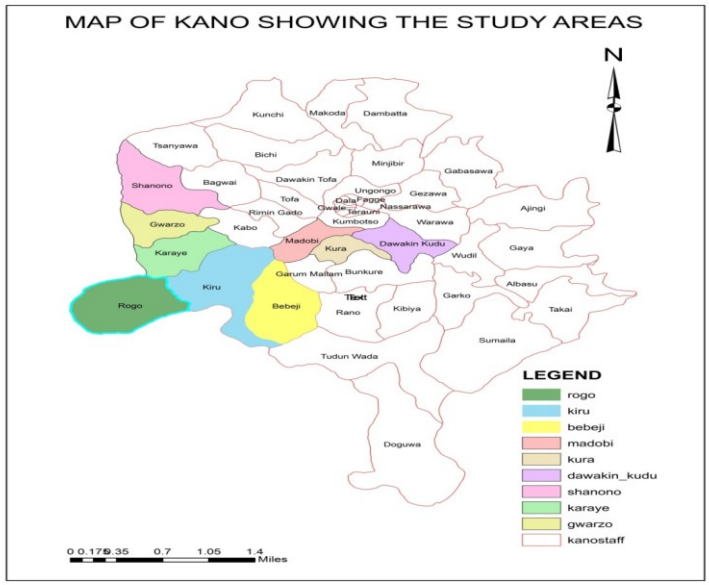

Fig. 1. Kano State Map

Procedure for sampling and sample size

For the investigation, four multistage sampling strategies were in use. The current division of Kano State into three senatorial districts—Kano North, Kano Central and Kano South—was followed in the first stage of stratification. Nine Local Government Areas were selected in the second step by randomly selecting three Local Governments from each senatorial district. In creating 36 farming communities, four farming communities were randomly chosen from each of the nine Local Government Areas in the third stage. In the last step, three hundred sixty (360) respondents were selected for the study, with ten respondents picked randomly from each of the 36 farming communities. Throughout the day, information gathered included early trips to the farms to speak with the farmers whenever it was convenient for them. They interviewed Hausa, the local tongue.

Data interpretation

The acquired data were processed using the IBM SPSS Statistics V21 x86 software. Descriptive statistics were used to show and understand the data results, including frequency distribution tables, bar charts and percentages.

Result and discussion

The distribution of respondents in the research region is shown in Tables 1.

Table 1. The demographic characteristics of the research area's respondents (n = 360)

Variables	Kano north		Kano central		Kano south		Mean	Total	Mode
	Freq	%	Freq	%	Freq	%		%	
Age (years)									
<20-29	22	18	17	14	28	23	67	19	
30-39	42	35	46	38	49	41	137	38	30- 39
40-49	32	27	30	25	33	28	95	26	
50-Above	24	20	27	23	10	08	61	17	
Language									
Hausa	120	100	120	100	120	100	360	100	Hausa
Sex									
Male	120	100	120	100	120	100	360	100	Male
Female	0	0	0	0	0	0	0	0	
Marital status									
Single	20	17	41	34	28	33	89	25	
Married	100	83	79	66	92	77	271	75	Married
Number of persons per household									
1-10	41	41	43	55	39	42	123	45	1-10
11-20	38	38	20	25	35	38	93	34	
21-30	21	21	16	20	18	20	55	20	
Educational status									
Primary	40	33	30	25	37	31	107	30	Primary
Secondary	26	22	39	32	32	27	97	27	
Tertiary	13	11	21	18	11	09	45	12	
No Western Education	41	41	30	25	40	33	111	31	
Quranic Knowledge	120	100	120	100	120	100	360	100	
Major occupation									
Farming	85	71	62	52	87	73	234	66	Farming
Civil servants	17	14	21	18	14	12	52	14	
Student	08	07	15	12	11	09	34	09	
Trading	10	08	22	18	08	06	30	11	
Subsidiary occupation									
Farming	35	29	58	48	33	28	126	35	
Have subsidiary occupation	28	23	33	28	36	30	97	27	
Don't have a subsidiary occupation	57	48	29	24	51	42	137	38	No subsidiary
Land acquisition									
Inheritance	57	48	60	50	59	49	176	49	Inheritance
Purchase	29	24	33	28	40	33	102	28	
Rent	13	11	10	08	09	08	32	09	
Family land	21	17	17	14	12	10	50	14	
Farm size (ha)									
<1-2	78	65	69	58	86	72	233	65	< 1-2 ha
2-3	29	24	31	26	19	16	79	22	
3-4	13	11	20	16	15	12	48	13	
Years of farming experience									
1-10	18	15	17	14	15	13	50	14	
11-20	32	27	30	25	33	28	95	26	
21-30	40	33	46	38	57	47	143	40	21-30
31-40	22	18	20	17	10	08	52	14	
41-50 >	08	07	07	06	05	04	20	6	
Total	120	100	120	100	120	100	360	100	

Freq: Frequency

Interviews with 64% of the farmers revealed that most were between 30 and 49. In the research locations, Middle-aged farmers were the primary source of human resources for agroforestry techniques in the research settings. Middle-aged persons are more likely to be better agents for technology acceptance and transfer than older farmers, who are skeptics and critical of advances, according to *O.C. Ajayi et al.* [22]. The implication is that they may have more desire to accept new technologies.

Farmers from all parts of the study areas were Hausa/Fulani and the dominant language (100%) they spoke was Hausa. Also, all (100%) of the farmers were male. It follows that compared to their female counterparts, men are more engaged in agricultural and agroforestry activities. But agriculture encompasses a variety of industries and according to the respondents, women work in agricultural fields such as harvesting, processing and occasionally marketing. Hausa is the most widely spoken language in the study area; this is because Hausa is the most dominant language in Northern Nigeria. The outcome supports the findings of literature data [23-25], which stated that men predominated in farming activities in Kano State, Ondo State and Osun State, respectively. This finding may point to the labor-intensive character of farming techniques. The conclusion was further reinforced by *J.O. Oladejo et al.* [26], which stated that while agroforestry cultivation is typically seen as labor-intensive and tiresome, few women could handle the activities.

Across the research areas, 75% of the respondents were married and the majority (45%) had families with between one and ten members per home. This finding is consistent with literature data [27, 28], who found that married people comprised most of Nigeria's agroforestry farmers in their independent research. They concluded that having a large household is beneficial for farming because there may be labor from the members. Every respondent in every research region stated that they have 100% of their Islamic education (Quran). While the majority of respondents (69%) had either primary (30%), secondary (27%), or postsecondary (12%), 31% claimed to have no Western education. The farmers in the research areas hold native and outdated knowledge of agricultural systems, tree species, shrubs and agroforestry techniques. Their vision and willingness are influenced by this indigenous wisdom [29].

Given that most of the population in the study areas is agrarian and depends primarily on farm and tree products for food and revenue, farming accounts for 66% of the respondents' primary occupations. This research aligns with *S.K. Vihi et al.* [30] report on farmers in Jigawa State's Gwaram Local Government region adopting agroforestry practices. In all study zones, 38% of farmers reported having no secondary occupation. By contrast, a quarter (35%) of the participants stated that farming was their secondary source of income, while 27% worked in other jobs such as trading, bike man, gate guy etc.

A significant portion of the respondents (49%) obtained their farm by inheritance, which typically impacts the farm's size, as most farmers (65%) have a farm size of less than 1-2 hectares. It follows that most farmers in the research regions manage small agricultural holdings. According to a study by *V.A.J. Adekunle and Y. Bakare* [31], 87% of Nigerian farmers typically own farms between one and two hectares in size. In Nigeria, the average size of a small-scale farm is frequently less than 4 hectares [32]. The inability of the respondents to implement additional agroforestry techniques or keep more trees on their farms may be the result.

Years of farming experience measure how long a farmer has been in the farming system. According to the study, 40% of the farmers had been farming in the study areas for 21–30 years. Therefore, via learning by doing, farmers with more years of experience tend to be more productive [33].

The provision of medicine is another benefit most respondents claimed to derive from practicing agroforestry (Fig. 2).

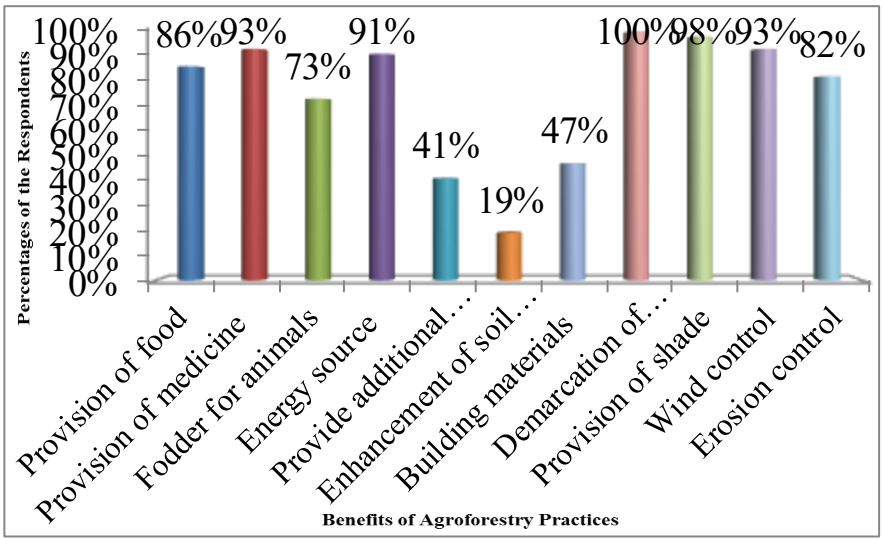

Fig. 2. Benefits of agroforestry practices by farmers in the study area

Thus, traditional medicine is widely acceptable among the people in the study area as all the tree species are medicines for treating various ailments. Literature data [36, 37] claimed that orthodox medicine alone cannot achieve effective health in Africa unless complemented with traditional medication. The result relates to the poor economic situation and the expensive and inadequate availability of orthodox medicines [38]. However, 50.7% of respondents said that their means of subsistence had little bearing on the quantity of animals or the river park's ability to remain intact. Most of the respondents' cooking energy came from firewood (80%), with the village forest accounting for 34.7%. Additionally, 41.3% of those surveyed farmed property 4–6 km from the river park. Regarding livelihood pursuits and reliance on parks near Osse River Park, most of those surveyed (72.0%) indicated they could harvest natural resources.

Table 2 shows that forty-seven trees/shrubs spread across 16 families in 360 farms visited during the study. The most familiar found were *Azadirachta indica* (Darbjiya, Neem) and *Adansonia digitata* (Kuka, Baobab), found in 73% and 44% of the farms visited across the study area. *Parkia biglobosa* (Dorawa, Locust bean) was 38% of the farms visited across the study area. *Lawsonia inermis* (Lalle, Henna) (22%), *Mangifera indica* (Mangwaro, Mango) (19%), *Vitellaria paradoxa* (Kadanya, Shea butter) (16%), *Tamarindus indica* (Tsamiya, Tamarind) (11%), *Jatrofa carcus* (Binida zugu, Barbados nut) (10%), *Diospyros mespiliformis* (Kanya, Jackals) (7%) and *Acacia nilotica* (Bagaruwa, Gum arabic) (7%) of the farms visited across the study area. Trees species found in less than 5% of the farm visited include; *Ceiba pentandra* (Rimi, Kapok tree), *Detarium microcarpum* (Taura, Tallow tree), *Ficus thonnongii* (Shirinya, Strangler fig), *Anacardium occidentale* (Cashew), *Phoenix dactylifera* (Dabino, Date palm), *Euphorbia poisonii* (Tinya, Candle plant), *Terminalia macroptera* (Kwandari, Indian almond), *Stereospermum kunthianum* (Sansame, Pink jacaranda), *Terminalia avicenioides* (Baushe, Kpace) and *Securinege virosa* (Fulasco, fleague), among others.

The richest families were Fabaceae and Combretaceae, which had five species each. Families Rubiaceae, Euphorbiaceae and Caeselpiniaceae had two species each. The high occurrence of the family Fabaceae could explain that most species belonging to the Fabaceae family are primarily found throughout the seasons because they are adapted to withstand the adverse effects of Sahel regions [39]. The predominant ten agroforestry tree species found in the study area include *Azadirachta indica*, *Adansonia digitata*, *Parkia biglobosa*, *Lawsonia*

inermis, Mangifera indica, Vitellaria paradoxa, *Tamarindus indica*, *Jatropha carcus*, *Diospyros mespiliformis* and *Acacia nilotica.* This record agrees with *Kankara et al*. study on "tree compositions in selected farms in parts of Kano State, Nigeria".

Table 2. Trees/shrub species found on farmers' farmland in the study area

Botanical names	**Local/Common name**	**Family name**	**Frequency**	**%**
Acacia nilotica	Bagaruwa, Gum Arabic	Fabaceae	26	7
Adansonia digitata	Kuka, Baobab	Malvaceae	158	44
Anacardium occidentale	Kashew, Cashew	Anacardiaceae	2	1
Annona squamosal	Fasadabur, Sugar apple	Annonaceae	12	3
Anogeissus leiocarpus	Marke, African birch	Combretaceae	17	5
Azadirachta indica	Darbjiya, Neem	Meliaceae	261	73
Balanites aegyptiaca	Adu, a Desert date	Zygophyllaceae	8	2
Burkea africana	Qirya, Wild Syringa	Fabaceae	5	1
Carica papaya	Gwanda, Paw paw	Caricaceae	10	3
Ceiba pentandra	Rimi, Kapok tree	Malvaceae	4	1
Citrus spp	Leman tsami/ lime	Rutaceae	12	3
Combretum micranthum	Geza, Kinkeliba	Combretaceae	5	1
Commiphora africana	Durimi, African myrrh	Burseraceae	4	1
Commiphora hildebrandtii	Dashi, African Myrrh	Burseraceae	11	3
Detarium microcarpum	Taura, Tallow tree	Fabaceae	3	1
Diospyros mespiliformis	Kanya, Ebony/Jackals	Ebenaceae	26	39
Eucalyptus camaldulensis	Turare, River red gum	Myrtaceae	13	4
Euphorbia poisonii	Tinya, Candle plant	Euphorbiaceae	2	1
Faidherbia albida	Gawo, Winter thorn	Fabaceae	17	5
Ficus platyphylla	Gamji, Rubber tree	Moraceae	6	2
Ficus sycomorus	Baure, Fig mulberry	Moraceae	6	2
Ficus thonnongii	Shirinya, Strangler fig	Moraceae	2	1
Guiera senegalensis	Sabara, Moshi	Combretaceae	18	5
Hura crepitans	Durimin bature, Sad box	Euphorbiaceae	5	1
Hyphaene thabaica	Goruba, Doum palm	Arecaceae	6	2
Jatropha carcus	Binida zugu, Barbadus nut	Euphorbiaceous	36	10
Khaya senegalensis	Madachi, Mahogany	Meliaseae	9	3
Lannea acida	Faru, Ripening fruit	Anacardiaceae	4	1
Lawsonia inermis	Lalle, Henna	Lythraceae	78	22
Mangifera indica	Mangwaro, Mango	Anacardiaceae	69	19
Moringa oleifera	Zogale, Drum stick	Asclepiadceae	17	5
Musa spp	Ayaba, Banana	Musaceae	15	4
Parkia biglobosa	Dorawa, Locust bean	Fabaceae	137	38
Phoenix dactylifera	Dabino, Date palm	Arecaceae	2	1
Piliostigma thonningii	Kalgo, Carmel foot	Fabaceae	6	2
Psidium guajava	Goba, Guava	Myrtaceae	15	4
Sclerocarya birrea	Danya, Marula	Anardiaceae	21	7
Securinege virosa	Fulasco, Fleague	Lythraceae	1	1
Stereospermum kunthianum	Sansame, Pink jacaranda	Bignoniaceous	1	1
Syzygium guineinse	Malmo, Water berry	Myrtaceae	9	3
Tamarindus indica	Tsamiya, Tamarind	Fabaceae	38	11
Terminalia avicenioides	Baushe, Kpace	Combretaceae	1	1
Terminalia macroptera	Kwandari, Indean almond	Combretaceas	1	1
Vitellaria paradoxa	Kadanya, Shea butter	Sapotaceae	57	16
Vitex doniana	Dinya, Black plum	Verbanaceae	17	5
Ziziphus mauritiana	Magarya, Jujube	Rhamnaceae	6	2
Ziziphus spinachristi	Kurna, Christ/ jujube	Rhamnaceae	7	2

Source: Field survey, 2021.

Figure 3 shows the result of tree utilization of resources farmers derived from the agroforestry trees they retained on their farms, which includes nutrition, medicine, economic, environmental, energy sources, fodder for animals and building material. The study revealed that 99% of the trees have unique medicinal properties, which could cure different diseases. 81% of the tree species provide specific environmental values and 61% of the trees are for energy sources. In contrast, 57% of the trees are for nutritional purposes such as fruits, leaves and oil. 21% of the tree species were for fodder for animals and building materials.

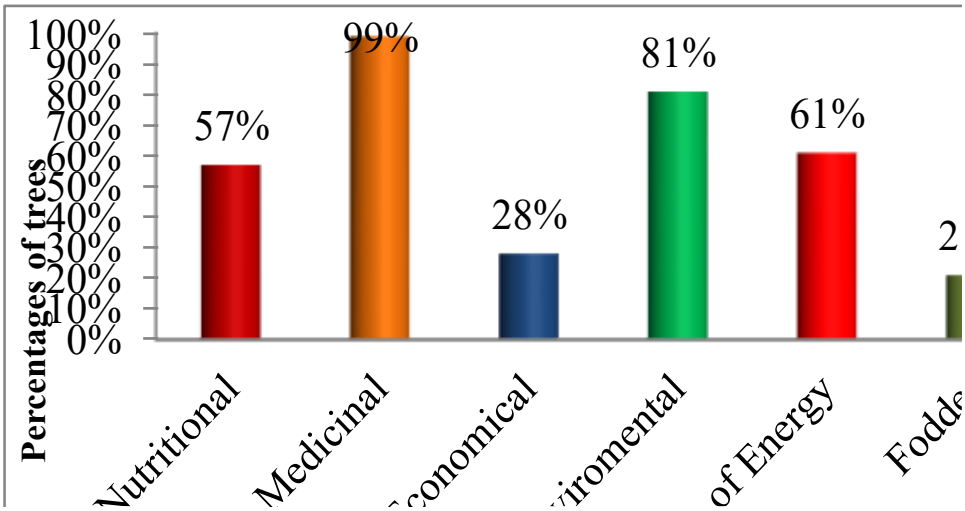

Fig. 3. Utilization of agroforestry tree resources by farmers in the study area

Table 3 reveals that farmers utilized 57% of the agroforestry tree species for nutritional purposes. The parts of the trees used include the fruits, seeds and leaves. Twenty-four (24) of the tree species provide nutrition to the farmers by consuming their fruits raw, dried, or processed, while *A. digitata, M. oleifera* and *C. micranthum* give food to the farmers by consuming their leaves when cooked. However, Trees like *Parkia biglobosa, Adansonia digitata, Mangifera indica, Vitellaria paradoxa, Diospyros mespiliformis, Tamarindus indica, Ficus sycomorus, Moringa oleifera,* among others, provide resources that are useful for food of high nutritional value. An example is that the seed of *P. biglobosa* is processed locally in Kalwa for cooking. *A. digitata, M. oleifera* and *C. micranthum* produce leaves to eat.

The leaves of *A. digitata* are dried, ground into powder and used locally to make a stew known as Miyan Kuka. In addition, the fruits of *A. digitata,* when dried, are used to prepare a local beverage called Kwalba da Nono. One can prepare *M oleifera leaf* as Moringa stew (Miyan zogale) and other local dishes (Kwadan zogale, Danbun etc.) *C. micranthum* leaves are boiled and taken as tea or mixed as tea spices. *T. indica* and *Citrus spp.* also produce fruits, which are processed to make juice or pap (Kunu). Those tree products can serve as main dishes or staple food. They can also be processed and used as condiments, thickening agents, flavours, edible oils (e.g., *Vitellaria paradoxa*), fruit drinks etc. Moreover, these agroforestry tree foods add flavour to the diet while providing protein, energy, vitamins and essential minerals. These are in the report of *N.A. Oyebamiji et al*. [35].

Table 4 shows that 99% of the tree species treat different ailments using tree parts such as leaves, branches, barks, seeds, fruits, roots, flowers and oils. Ailments treated include piles, fever, skin diseases, stomach disorders, jaundice, toothaches, diarrhoea and general well-being. Mode of preparation includes boiling/decoction, maceration, drying and grinding the part into

powder, or eating the parts raw/dried. The administration mode includes oral, external application (applying on the affected area, body bath and soaking), or steaming.

Table 3. Distribution of respondents according to the nutritional utilization of agroforestry trees in the study area

Name of trees	Part used	Mode of consumption	Frequency	%
Adansonia digitata	Leaf, Fruits	Cooked/ Dried	158	44
Anacardium occidentale	Fruits	Raw	2	1
Annona squamosal	Fruits	Raw	12	3
Balanites aegyptiaca	Fruits	Dried	8	2
Carica papaya	Fruits	Raw	10	3
Citrus spp	Fruits	Raw	12	3
Combretum micranthum	Leaf	Boiled	3	1
Commiphora africana	Fruits	Raw	4	1
Detarium microcarpum	Fruits	Dried	3	1
Diospyros mespiliformis	Fruits	Raw	26	39
Ficus sycomorus	Fruits	Raw	6	2
Hyphaene thabaica	Fruits	Dried	6	2
Lannea acida	Fruits	Raw	2	1
Mangifera indica	Fruits	Raw	69	19
Moringa oleifera	Leaf	Cooked	17	5
Musa spp	Fruits	Raw	15	4
Parkia biglobosa	Fruits, Seeds	Raw	137	38
Phoenix dactylifera	Fruits	Raw/dry	2	1
Psidium guajava	Fruits	Raw	15	4
Sclerocarya birrea	Fruits	Raw	21	7
Syzygium guineinse	Fruits	Raw	9	3
Tamarindus indica	Fruits	Raw or cooked	38	11
Vitellaria paradoxa	Fruits	Raw	57	16
Vitex doniana	Fruits	Raw	17	5
Ziziphus mauritiana	Fruits	Raw	6	2
Ziziphus spinachristi	Fruits	Raw	7	2

Table 4. Distribution of respondents according to the medicinal utilization of agroforestry trees in the study area

Name of trees	Part used	Treated illness	Method of preparation and administration	Total	%
Acacia nilotica	Fruit	Wound healing Haemorrhage, Diarrhoea	Decoction (soaking)	26	7
	Leaf	Tuberculosis/ Pneumonia	Decoction (oral)		
Adansonia digitata	Leaf	Pile	Powder (oral)	158	43
Anacardium occidentale	Fruit	Diabetes	Eating (oral)	2	1
	Bark	Skin infection	Powder (external)		
Annona squamosal	Leaf	Fever/ Tuberculosis	Decoction (oral)	12	3
	Root	Hepatitis			
Anogeissus leiocarpus	Bark	Piles and Fever	Soaked in water (oral)	17	4
Azadirachta indica	Leaf	Fever/ Stomach ache	Decoction (oral/body bath)	210	58
	Branch	Skin diseases Mouth diseases	Maceration/powder (external) Chew (external)		
Balanites aegyptiaca	Fruit	Pile	Fruit-eating (oral)	8	2
	Leaf	Stomach ache	Maceration (oral)		
Burkea africana	Bark	Malaria	Maceration (oral)	5	1
Carica papaya	Leaf	Fever	Decoction (oral)	10	3
Ceiba pentandra	Leaf	Diarrhoea	Powder (oral).	4	1
Citrus spp	Fruit	Skin diseases Weight lost	Apply the juice (external) Drinking the juice (oral)	12	3
	Leaf	Fever /Nausea	Decoction (oral/steaming)		
Combretum micranthum	Leaf	Boost immunity	Decoction(oral)	5	1
Commiphora africana	Fruit	Typhoid	Decoction (oral)	4	1
	Bark Leaf	Malaria	Decoction (oral)		
	Root	Snakebite, Disinfection	Powder (external) Decoction/Powder(external)		

Name of trees	Part used	Treated illness	Method of preparation and administration	Total	%
Detarium microcarpum	Bark/ Fruit	Pile	Maceration (oral)/ Eating	3	1
Diospyros mespiliformis	Branch Bark	Stomach disorder Breast milk enhancement	Maceration (oral)	26	7
Eucalyptus camaldulensis	Leaf	Fever	Decoction (steaming)	13	4
Euphorbia poisonii	Leaf	General well-being	Decoction (oral)	2	1
Faidherbia albida	Bark	General well-being	Decoction (oral)	17	5
Ficus platyphylla	Bark	General well-being	Powder (oral)	6	2
Ficus sycomorus	Leaf/ Root	Diarrhoea/ Coughing	Decoction (oral)	6	2
Ficus thonnongii	Bark	Fever	Powder (oral)	2	1
Guiera senegalensis	Leaf	General well-being	Powder (oral)	18	
Hura crepitans	Leaf	Skin disease	Powder (external)	5	2
Hyphaene thabaica	Fruit Bark	Nausea Sickle cell	Eating (oral) Boiled with potash (oral)	6	2
Jatropha carcus	Whole Tree	General well-being	Maceration (oral)	36	10
Khaya senegalensis	Bark	Stomach ache	Maceration (oral)	9	3
Lannea acida	Bark	General well being	Maceration (oral)	4	1
Lawsonia inermis	Fruit Bark Leaf	Jaundice Skin infections	Decoction (oral) Powder (external)	78	22
Mangifera indica	Bark/ Fruit/ Leaf	Pile	Decoction (oral)	69	19
Moringa oleifera	Leaf Root Seed	Anaemia Skin disease Virginal infection Pneumonia/ Cold Diabetes	Boiled (oral) Powder (external) Boiled (oral) Swallow (oral)	17	5
Musa spp	Leaf/ Fruit	Fever	Decoction (oral)	15	5
Parkia biglobosa	Bark	Pile	Powder (oral)	137	
Phoenix dactylifera	Fruit Seed	Stomach ache Toothaches	Eating the fruit.	2	38
Piliostigma thonningii	Leaf	Diabetes	Decoction (oral)	6	2
Psidium guajava	Leaf	Fever	Decoction (oral)	15	4
Sclerocarya birrea	Bark	Stomach upset	Powder (oral)	21	6
Securinege virosa	Leaf /Flower	Stomach disorder	Decoction (oral)	1	1
Stereospermum kunthianum	Bark	Diarrhoea	Powder (oral)	1	1
Syzygium guineinse	Leaf	Diabetes	Boiled (oral)	9	3
Tamarindus indica	Fruit/ Leaf Bark	Pile General well-being	Decoction (oral) Maceration (oral)	38	11
Terminalia avicenioides	Root	Wound treatment Skin infections	Powered (external)	1	1
Terminalia macroptera	Bark Root	Gonorrhoea Pile and Dysentery	Powder/decoction (oral)	1	1
Vitellaria paradoxa	Oil Bark	Skin disease Common cold Stomach ache	Apply on skin (external) Oral/nasal Maceration (oral)	57	16
Vitex doniana	Bark	Stomach disorder Fertility	Decoction (oral)	17	4
Ziziphus mauritiana	Leaf	Jaundice Blood clotting	Maceration (oral) Powder (external)	6	2
Ziziphus spinachristi	Bark	General well being	Maceration (oral)	7	2

All the trees recorded have been utilized as medicine to treat ailments such as piles, fever, skin diseases, stomach disorders, jaundice, toothaches, diarrhoea and general well-being, among others in the study area. Parts of the trees, such as leaves, barks, fruits, roots, branches, seeds and oil extracts, were used either individually or combined in the preparation (through maceration or decoction using water, eating the parts raw/dried or in their powdered form). The mode of administration was either oral, external application, or steaming. *M. Saeed et al.* [39]

opined that medication was orally (84.68%), whereas only a few (15.32%) were administered by body bath, dermal, soaking, or steaming methods. However, two or more parts of different tree species can combine as traditional medicines. For example, the bark of *Ficus thonnongii* can cure fever, the leaves/ flower of *Securinege virosa* can cure stomach upset and general well-being and *Tamarindus indica* fruits and leaves are excellent cures for the pile. However, these traditional medicines do not have a specific dosage; hence, there is a need for closer collaboration between herbal medical practitioners and stakeholders in medical practices, as well as conservationists, to ensure the safe and wise use of these plant species [37].

The respondents revealed that most of the trees, such as *Ceiba pentandra, Ficus platyphylla, Faidherbia albida, Ficus sycomorus, Parkia biglobosa and Adansonia digitata* among others, are excellent sources of fodder and medicine for their animals. Their leaves are an excellent source of nutrition as well as medication for the animals. Trees such as *Parkia biglobosa* (the trees have a reasonable amount of nutrients in their seeds and pods; the seeds contain between 25-30% crude protein, 20% fatty acids, 3.8% crude fiber and 5.3% oils) and *Adansonia digitata* to treat stomach disorder in animals [40, 41]. Fodder trees contribute in several ways to the overall food security of households. They contribute significantly to domestic livestock production, influencing milk and meat supplies [34, 35, 41-43].

Conclusions

Agroforestry has become a recognized land use management system capable of overtaking other land management methods because of its potential to improve farmers' livelihood. However, agroforestry trees benefit farmers by providing shade and shelter, controlling wind and erosion, improving soil fertility and improving environmental ameliorations and medicine. Traditional medicine is widely acceptable among the people in the study area as all the tree species help treat and cure various ailments and diseases. The richest family trees in the study area include Fabaceae, Combretaceae, Rubiaceae, Euphorbiaceae and Caeselpiniaceae. The predominant trees species were; *Azadirachta indica*, *Adansonia digitata*, *Parkia biglobosa*, *Lawsonia inermis, Mangifera indica, Vitellaria paradoxa*, *Tamarindus indica*, *Jatropha carcus*, *Diospyros mespiliformis* and *Acacia nilotica.* Almost all the trees assessed were used as medicine to treat ailments such as piles, fever, skin diseases, stomach disorders, jaundice, toothaches, diarrhoea and general well-being. Parts of the trees, such as leaves, barks, fruits, roots, branches, seeds and oil extracts, were used either individually or combined in the preparation (through maceration or decoction using water, eating the parts raw/dried or in powdered form). They could be administered orally or by external application or steaming.

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