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Research Article

Indigenous Knowledge for Utilization and Conservation Practices of *Adansonia digitata* L. (Baobab) by Berta Community in Sherkole Woreda Northwest, Ethiopia

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Abstract

Baobab (*Adansonia digitata* L.) is an indigenous tree of global traditional importance. This study aimed to document indigenous knowledge on the use and conservation of A. digitata among the Berta ethnic group in Sherkole district. Conducted from September to December 2023, the study involved 90 households using semi-structured interviews, key informant discussions, focus groups, and guided field observations. Data were analyzed using descriptive statistics. Eight main traditional uses were identified: food, fodder, medicine, fiber, hanging beehives, commerce, and soil improvement. The fruit pulp was most commonly used for food, beverages, and medicine, and was the only part sold commercially. Most respondents (26.7%) noted that baobab trees are abundant along riverbanks. Major threats to the species included livestock browsing, shifting cultivation, seed burning, deforestation, mining, and improper debarking. Conservation efforts and awareness programs are recommended, along with value addition and market linkages to enhance livelihoods and promote sustainable use.

Keywords: *Adansonia digitata* L., Baobab, Berta ethnic, Sherkole Woreda

1. INTRODUCTION

Adansonia digitata L. (Baobab) is a tree that belongs to the family Bombacaceae, a number of forest products from these woodlands are an important source of livelihood for millions of people across the world contributes to household food security, nutrition, and improves income of rural household in the lowland area of Ethiopia (Abdulla, 2013).

Adansonia digitata is mostly regarded as a multipurpose fruit-bearing tree used for medicine, food, fibers, clothing and soil protection from various plant parts (Sidibe & Williams, 2002; Galizia & DI-agr, 2005) It is a typical tree that has been given attention by the local people due to the multiple benefits derived from it for both humans and animals in sub-Sahara and other dry areas of Africa (Wollenberg & Ingles, 1998). *Adansonia digitata* has more than 300 uses and commercial values that have been identified in the European Union and the United States (Sanchez, 2010; Gebauer *et al.,* 2016). Constitutional bodies of different countries have approved the fruit pulp as a food supplement because of certain nutritional products (Sundarambal *et al.,* 2015). For instance, the fruit pulp of have *A. digitata* is high vitamin C content, 10 times that of an orange, and can be used for making juice (Bamalli *et al.,* 2014).

African baobab is a very long-lived tree and thought that some trees are over 1000 years old. African baobabs are native and widely distributed throughout the savannas and woodlands of sub-Saharan Africa where it is found in areas of South Africa, Botswana, Namibia, Mozambique, Zimbabwe and other tropical African countries where suitable habitat occurs (Sidibé & Williams, 2002). It naturally occurs in Ethiopia at lower elevations between 500 m and 1400 m on both sides of Blue Nile River towards the Ethio-Sudanese border (Benshangul Gumuz Regional State in Sherkole, Guba and Kurumuke districts following Tekeze river in Tigray Regional States of Ethiopia mainly in Sekota and Gondar (Abere *et al.,*2022).

Thus, understanding cultural and ethnic patterns of selection, use and management of *A. digitata* is important to set priorities for conservation and/or domestication of the tree. To the best of our knowledge, there are no comparative studies that document the variation in traditional uses and management of *A. digitata* among ethnic groups in study area. This type of study is important to improve the livelihood of the rural households and the use of resources effectively and properly.

The aims of this study were thus to: (i) document traditional uses and local management practices of *A. digitata among* Berta ethnic groups and (ii) identify major threats that affect *A. digitata* populations in Sherkole woreda, Northwest, Ethiopia.

2 MATERIALS AND METHODS

2.1 Study Area

The study was conducted at Benshangule Gumuz regional state Assosa zone particularly in Sherkole woreda North West Ethiopia (Figure 1). Sherkole woreda (the town of the woreda) is found at about 760 km from Addis Ababa, capital of Ethiopia. It is located in a range of

latitudes at 100° 26′ 18.98″ to 110° 14′ 26.65″ and longitudes 340° 28′ 48.29″to 350° 13′ 3.14″ with an altitude range between 500 and 1000 m a.s.l. It covers an area of 351,857 ha out of which 6.89% cultivated land, 55.25% wooded and shrub land, 18.66% grass land and 19.20% other land uses.

The mean annual rainfall and temperature of the study area are 900 to 1200 mm and 10.8 to 42°C, respectively. The district is covered with relatively tall trees; at least with 20% canopy coverage including integral open space and felled areas that are awaiting restocking, the predominant species found in the area are *Combretum* sp*., Terminalia sp., Cordia africana, Adansonia digitata, Tamarindus indica, Dalbergia melanoxylon, Ficus* sp. and *Boswellia papyrifer*a (Awas, 2007).

The total population of the district is about 19,992 with 4,237 households these populations were settled in 15 kebeles. Sherkole has a population density of 6 /km2, which is far below compared to the national average (CSA, 2007).

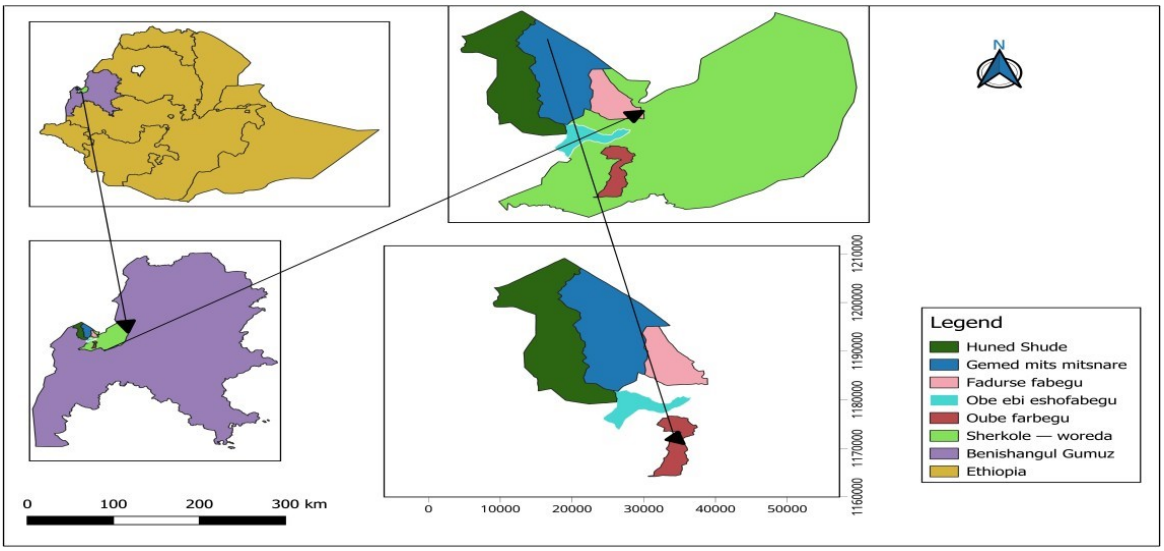


Figure 1. Map Showing the Sherkole District with selected study sites.

2.2. Sampling Techniques and Data Collection

2.2.1 Site selection for the study

A cross-sectional survey was carried out between Septembers to December 2023 in Sherkole districts. Primarily, the Sherkole district was purposively selected for the study among within ten districts of Assosa zone due to i) the availability of *A. digitata* tree species in natural range, ii) the highly abundant distribution and production of *A. digitata* product, iii) the presence of native Berta ethnic group in the district and IV) the district is found at the border of Sudan where illegal trading of *A. digitata* product is being practiced.

The multi-stage sampling procedure was used to select sample households. A total fifteen kebels of the district five kebeles namely (Huned shude, Gemed mits mitsnare, Fadurse fabegu, Oube farbegu and Obe ebi eshofabegu) were purposively selected for study based on with higher abundance and distribution of *A. digitata* tree species product and the availability high knowledgeable of key informants (Figure 1).

Five focus group discussions, fifteen key informant interviews and 60 semi-structural interviews were used to the collect of information about knowledge, utilization and conservation practices with regard to *A. digitata* tree population in the study area.

The selection for key informant interview was based on the being knowledgeable about *A. digitata* production, use and conservation, trade willingness to participate and who have always lived in the village and for long time. Individual household respondents were selected randomly from Berta ethnic group in the study area. The numbers of household respondents from the five PAs were determined based on the proportional sample size formula, which was adopted from (Yamane, 1976).

$$n = N/ (1+ N (e)^2)$$

Where n is the required total sample size, N is a total number of households in all selected kebeles, e is the minimum level of precision (0.09) where conditional level is 95% at P = ± 5

Maximum variability

For this study, 15 key informants were purposively selected from five kebeles for key information interview. Accordingly a total of 90 household respondents were selected for the interview the study districts.

2.3. Data Collection

Ethnobotanical data collection was carried out by using the method and protocol proposed by Martin (1995) and Alexiades (1996). Semi-structured interviews, focus group discussion, free listing and guided field walk with informed consent local informants. The questions were prepared in English and translated to '*Amharic* and *Benishangul languag*e' the official language of the country. The discussions were conducted to get general information on the multipurpose uses, marketability, traditional management and conservation and threats to the study plants in the study sites. The information made here was used to confirm the information saved from household respondents.

2.4. Data Analysis

The collected data from the questionnaires of household interview responses were coded and entered into Microsoft Office Excel. Data were grouped and summed by response category on the data sheet. After organizing the data on Microsoft Office Excel, the analysis was performed using Statistical Package for Social Science version 2020 for windows (IBM SPSS Inc, USA) software.

3. RESULT AND DISUCUSION

3.1. Socio-demographic characteristic of respondents

The majority of respondents were 64.4% of male. From the total, 34.4% of respondents were in the age of 35–65 years old, 27.7% in the age of 25–35 years old, 17.7% in the age of 18–25 years old are making up to the smallest proportion and 20% of respondents were above 65 years old. Most of the respondents (55.4%) did not get a formal education and could not read and write, 33.7% were from grades 1–8, 9.9% of the respondents could read and write and the rest 1.0% of the respondents were from grades 9–10. The majority of respondents had no formal education which is illiterate. Main sources of livelihood were crop farming (80%), livestock rearing (17.7%) and local trade (13.3%) (Table 1).

The limited participation of women was due to the cultural belief and low education level of women in Sherkole district. This finding is similarly to the finding of Abere *et al.* (2022).

Table 1. Socio-demographic characteristic of respondents

Sex		**Age**				**Education level**						**Household income**		
M	F	18-25	25-35	35-65	>65	illtreat	1-4	5-8	9-12	diploma	>dip	farming	Livestock raising	Local trade
58	32	16	25	31	18	50	20	10	5	3	2	72	16	12
64.4	35.5	17.7	27.7	34.4	20	55.5	22.2	11.1	5.55	3.33	2.22	80	17.7	13.3

3.2. Uses of *A. digitata* for local people

All respondents from the Berta ethnic groups mentioned *A. digitata* as an important tree with diverse traditional uses. The uses of *A. digitata* by Berta ethnic groups are summarized in (Table 2). In all study area kebeles, the main eight traditional uses category, the reported benefits derived from baobab were food, medicine, fiber, fodder, commercial, shelter for other organism, improvement of soil fertility and for beehives hanging. This study in line with this finding in Quara woreda by Abere *et al*., (2022) reported that by seven main use

types such as food, medicine, commercial, fiber, fodder, soil improvement, and for hanging beehives.

Table 2: Uses of *Adansonia digitata* L. plants parts used and mode of preparation in Sherkole Woreda

Use category	Plant part	Mode of preparation
Food	Pulp fruit	The fruit pulp is eaten raw
	Leaves	Used for food as cabbage
	Flower	Eaten by goats.
Medicinal	Bark	Important to activate cows' production
	Root	Root parts of the species important to increase the growth of premature babies. Root parts mix with water and wash the babies' bodies every morning.
	Bark & leaves	-Used together with bark for treatment of inflammation.
	Leaves	-Smoke from burnt leaves is used as insect repellent.
	Root	Roots are boiled in water and taken as a cough remedy
	Seed	Seeds are soaked in water and taken as a remedy
Fodder	Flowers	-For fodder, eaten by goat and sheep.
	Leaves	-Used as fodder for cattle, goat, donkey and camel
	Root	-Used as fodder for donkey
Shelter	Tree	-Used as shade for human and livestock.
Entire plant	Stem	Carries historical importance of local people used to hide from the enemies in the hollow stems of *A. digitata* during the Seville civil war. For instance, Emperor Haile Salase used giant tree hollow steam as a temporal house during the visit of Sudan and recreational. Tourism attraction due to the unique and massive structure.
Fiber	Bark	Ropes from fiber used in the construction of traditional houses Ropes from fiber used in the preparation of plow materials Bark harvested for making ropes that are used in making traditional mats.
Soil improvement	leaves tree	Important for soil fertilizer improvement Erosion controlling and to increasing water moisture content
Honey been (hanging beehives)	Tree	They are use as cavity of honey bee, Hanging of beehives.

A similar study in western Tigray north Ethiopia by Birhane *et al.,* (2020) and in Sudan by Osman *et al.* (2023) reported that leaf, bark, fruit, and root of *A. digitata* were used by local communities.

The finding of this study is strengthened with previous studies in different African counters of eastern Burki Faso by Amusa *et al.,* (2017) found out that is in Senegal 502, while in Burkina Faso 25 type-uses of *A. digitata* were identified and documented. Similar to this study finding by Lisao (2017) and Munyebvu (2015) reported ten main use-types such as food, medicine, fiber, fodder, sniffing, materials for crafts, and esthetic, shelter, spiritual and commercial purpose in Namibia.

3.3. **Use value of different parts of the** *A. digitata*

All the respondents mentioned that *A. digitata* fruit pulp had the highest percent citation (98.8, 97.7 and 95.5%) indicating it was consumed by all respondents followed by fodder and fiber in study area (Table 3). Shelter uses for other animals and Hanging honey bee hives had the lowest percent citations (72.2 and 66.6% respectively) probably because such knowledge is possessed by only a few people mostly elders, herbalists and traditional healers. The local community in study area consumes *A. digitata* L. fruit pulp directly as a snack and in form of juice, locally made beverage for home consumption by adding the fruit pulp to water.

Similar study by Munyebvu (2015) also observed that food use of baobab was the highest ranked benefit by the Ovambo people. Additionally, to that similarly study in North Namibia by Lisao *et al.,* (2017) showed that the *A. digitata* is predominantly used as a food source. Similar study conducted by Murage *et al.,* (2022) who report that *A. digitata* fruit pulp is highly nutritious and previous studies have revealed that baobab pulp is a rich source of Vitamin C, with values up to 500 mg/100 g edible portion.

The majority of the respondents, 95.5% in Berta ethnic group, mentioned that *A. digitata* L. Bark was an important product for making ropes in the study area. This finding agrees with, Amusa *et al.* (2017) and Lisao (2015) reported that rope making for tying purposes is done by twisting fiber of the inner bark of the tree.

In past year *A. digitata tree* bark were harvested for making ropes and making traditional mats in the study area. A similar study from South Africa by Venter and Witkowski (2010) indicated that rope from *A. digitata* bark is used for roof construction, for bundling firewood, tying domestic animals, making whips, weaving baskets and mats and the ends of palm-frond brooms. Similarly study by Amusa *et al.* (2017) and Lisao (2015) revealed that rope making for tying purposes is done by twisting fiber of the inner bark of the tree. Another study by Luckert *et al.* (2001) indicated that *A. digitata*

bark processed into the fiber is largely used commercially for making of crafts such as mats, bags, and hats in Eastern Zimbabwe.

The majority of the respondents, 88.8% in Berta ethnic group, mentioned that *A. digitata* leaf, root and flower parts was an important feed their livestock (Table 3). Few of the respondents mentioned that flowers and root parts of *A. digitata* have been used as a fodder for goat and donkey. The finding of this study is strengthened with previous studies in Quara woreda by Abere *et al.,* (2022) on their study results indicated that, the Amhara ethnic group use leaves and root parts of

A. digitata L. for fodder, Agaw ethnic group uses only leaf parts as fodder and Gumuz ethnic group uses leaf, flower, and root parts of *A. digitata* L. for fodder.

Studies in other African countries like Northern Namibia by Lisao (2017) and Munyebvu (2015) showed that leaves were recorded to be highly used in the Omusati region as feed for domestic animals. Another study in eastern Zimbabwe by Luckert *et al.* (2001) indicated *that A. digitata* L. leaves are important for browsing livestock.

As shown in (Table 3), 88.8% of the respondents from Berta ethnic group citrated by groups in the study area collect fruit pulp of *A. digitata* for commercial purpose. Additional to that they are collect seed of *A. digitata* to be sold by different government and NGO office for seedling preparation and income generation in study area. The finding of this study is strengthened with previous studies in Quara woreda by Abere *et al.,* (2022) on their study results indicated that Gumuze, Agaw and Amhara ethnic group collect fruit pulp for commercial purposes.

The old-aged native people respondents in Quara woreda mentioned that *A. digitata* fruit was exchanged for salt from Sudan in the past. Similarly, Sidibe and Williams (2002) indicated that *A. digitata* products were traded and were well known in Cairo markets in the sixteenth century. Despite this, the study in northern Venda by Venter and Witkowski (2011) indicated that commercial use of *A. digitata* fruit began in the northern part of South Africa since 2005. Furthermore, baobab fruit commercialization can be an important income source for smallholders with the additional income being spent on other food products. Baobab can also indirectly contribute to food security objectives (Venter and Witkowski, 2013). On the other hand, about 87.7% of the respondent's *A. digitata* has a medicinal use for the Berta ethnic groups in the woreda. Fruit pulp is taken to stop stomach pain or diarrhea and tonsils. All of the Berta ethnic groups in study area mentioned that root parts are used for medicinal purposes to increase the growth of premature babies; Barks are used to treat inflammation and activation of the cow for productivity and the

leaf burn to insect repellent. The finding of this study is strengthened with previous studies in Quara woreda by Abere *et al.,* 2022) on their study results indicated that, the fruit pulp had been used by local people to cure gastric pain. A similar study by Lisao *et al.* (2017) reported that root parts were used as a source of medicine mainly in Otjozondjupa and Zambezi regions.

Similarly, Munyebvu (2015) reported that medicinal uses were much less mentioned than food and fodder uses, which demonstrates that *A. digitata* plays a major role in human nutrition rather than in human health.

At the study district, 77.7% of the respondent's citation used *A. digitata tree* for improvement soil fertility. Mature *A. digitata* trees are sources of fertilizer for cropping fields when they die and decompose (usually within six months of falling). A similar study in Eastern Zimbabwe by Luckert *et al.* (2001) revealed that falling leaves are good sources of organic matter to improve soil fertility. They contribute to nutrient recycling and decrease soil erosion by keeping soil conditions humid. Similarly studies in other African by Adekunle and Zhn, (2022). Importantly, baobab trees help to keep the soil moist and promote ecosystem processes, and erosion control. Other similarly, study by (Kamato *et al.,* 2011; Marques *et al.,* 2016) who suggest that *A. digitata* tree is erosion controlling and to increasing water moisture content.

Similarly study in kenya by Meinhold and Darr, (2021) traditional agroforestry systems can help maintain tree and associated biodiversity reduce soil erosion and improve soil characteristics, increasing crop yield and household food availability year-round.

In the study site, majority (72.2%) of the respondents are cited that *A. digitata* tree is used as shade for livestock and other organism. We also noticed the use of the big trees as shade for livestock in the study sites. Another similar study in Northern Namibia by Lisao (2018) pointed out that the use of *A. digitata* as shade is of great importance among communities in Omusati where there is a low species diversity of trees. Hundreds of animals, including birds, lizards, monkeys, and even elephants, rely on them for food, drink, and shelter.

Similar study (Adekunle and Zhn, 2022) pointed out that the use of *A. digitata* as the tree is themselves provided shade and shelter for a variety of creatures, including butterflies, reptiles, squirrels, and elephants. Accordingly, about 66.6% of the respondents of Berta ethnic group mentioned that the cavities of *A. digitata* stem are an important niche for bees that use them as beehive and hanging of beehive. The finding of this study is relatively similar with the study result of Abere *et al.* (2022) who reported that among the seven main use-types *A. digitata* tree beehive and hanging of beehive in study area. According to the

interview of key informants and group discussion participants mentioned that *A. digitata* tree has also used as peoples preventing from different enemies during the war and additional to that it is also carries historical importance tree to local people.

Moreover, Lisao *et al.* (2017), on their study finding indicated that, local people used to hide from the enemies in the hollow stems of baobabs during the war in Namibian. Another study in Quara woreda by Abere *et al.* (2022) indicated that *A. digitata* tree has also a historical importance for kings and elites since it was used as temporal houses and for recreation. For instance, Emperor Haile Silase (the former King of Ethiopia) used a giant *A. digitata* stem cavities as a temporal house during the visit of Sudan. This huge and historical tree still exists in Ethiopia specifically in Omedila Kebele, in Guba Worda, Benshangule Gumuze regional state. The cavities of stems of *A. digitata* tree were used as a hiding place for local people from enemies during the civil war of Ethiopia.

Table 3. Frequency Citations of *A. digitata* uses

Use category	*A. digitata* **part used**	**No of Respondents**	**Total FC per use**	**RFC**	**Percentage Citation**
Food	Fruit, leaf	90	89	0.98	98.8
Fodder	Leaf, Root		88	0.97	97.70
Fiber	Bark		86	0.95	95.50
Commercial	Leaf, Bark		80	0.88	88.80
Medicine	Tree		79	0.87	87.70
Soil improvement	Leaf		70	0.77	77.70
Shelter to another organism	Fruit, Bark		65	0.72	72.20
Hanging of beehive	Tree, Stem		60	0.66	66.6

FC*Frequency of citation, RFC**Relative frequency of citation=Frequency of citation (FC) divided by number of respondents (n=90)

3.4. Parts of *A. digitata* Used in House Hold Consumption

The study results showed that, the parts of baobab tree that consumed by household were pulp fruit, bark, flower, root, leaves, seeds and stem. All respondents from study area mentioned *A digitata* as an important plant tree with diverse traditional uses Berta ethnic group. In the study area the most commonly used tree part as supplementary food by Berta ethnic group is (34.4%) fruit pulp flowed (22.2%) Bark, (14.4%) flower, (12.2%) root (8.88%) leaves respectively (Figure 2).

The most commonly used *A. digitata* part was the fruit pulp (34.4%). A similarly study in Quara district by Abere *et al.,* (2022) the local communities consume *A. digitata* fruit pulp directly as a snack and in form of juice, locally made beverage for home consumption by adding the fruit pulp to water.

A similar study in Namibia by Lisao (2017) and Munyebvu (2015) showed that food use of *A. digitata* was the highest-ranked benefit by the local people. Similar study in different countries by Dhillion *et al.,* (2004); Patrut *et al.,* (2007) supported that fruit is one of the world most nutrient dense meal. Additionally, a similar study in North and West Kordofan States Sudan by Osman *et al.,* (2023) who point out those local communities used *A. digitata* fruits in making juice, ice cream after mixed with sugar and cooled or freezing.

The second majority of respondent 20 (22.2%) in Berta ethnic group mentioned that *A. digitata* bark was an important at tree that recorded in the study districts. The traditional knowledge on Berta ethnic group rope made from the bark of *A. digitata* was used for making whips, roof construction and tying domestic animals. A similar study from Qara district by Abere *et al.,* (2022) indicted that rope from *A. digitata* bark has a higher resistance than a rope prepared from the bark of other trees.

However, detaching the bark from the trunk require high forces and has a negative impact on the survival of the tree. Due to replacement of ropes to nylon currently, they felt the *A. digitata* tree bark is not any longer important as a rope. A similar study from South Africa by Venter and Witkowski (2011) indicated that rope from *A. digitata* bark is used for roof construction, for bundling firewood, tying domestic animals, making whips, weaving baskets and mats and the ends of palm-frond brooms.

Similarly, Amusa *et al.* (2017) and Lisao (2017) revealed that rope making for tying purposes is done by twisting fiber of the inner bark of the tree. Another study in eastern Zimbabwe by Luckert *et al.,* (2001) indicated that *A. digitata* bark processed into the fiber is largely used commercially for making of crafts such as mats, bags, and hats. Similarly, study reviewed in sub–Saharan African by Adekunle & Zhn (2022) shows that inner bark fiber is robust and is commonly used to make rope, basket nets, snares, and fishing lines, as well as weaving.

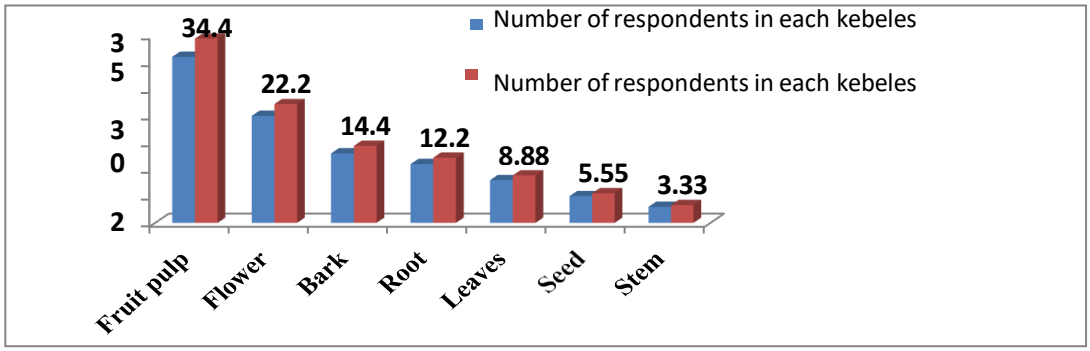


Fig. 2 The use of plant parts

3.5. Habitat of *A. digitata* L. in study area

The study results revealed that the highest population of baobab is presented land used types in study area riverine area, natural forest, grazing land, farm land and homestead according to 26.7, 22.2., 21.1, 15.6 and 14 % of the respondents, respectively (Fig. 3). In the study site, majority (26.7%) of the respondents reported that highest population of Africa Baobab tree is present in riverine areas. The finding of this study is supported with previous findings from by (Sanchez *et al.,* 2010; 2011; Lisao *et al.,* 2018; Birhane *et al.,* 2020). This support the riverine area have high amount of moister this moisture content is important for breaking *A. digitata* seed dormancy, facilitating the establishment and growth of seedling and fulfilling the water storage capacity of mature tree. During my field observation I vested high population of *A. digitata* tree in study area riverine area. This is idea supported by (Lisao *et al.,* 2018) relatively denser baobab stands were likewise observed in wetter areas compared to drier areas.

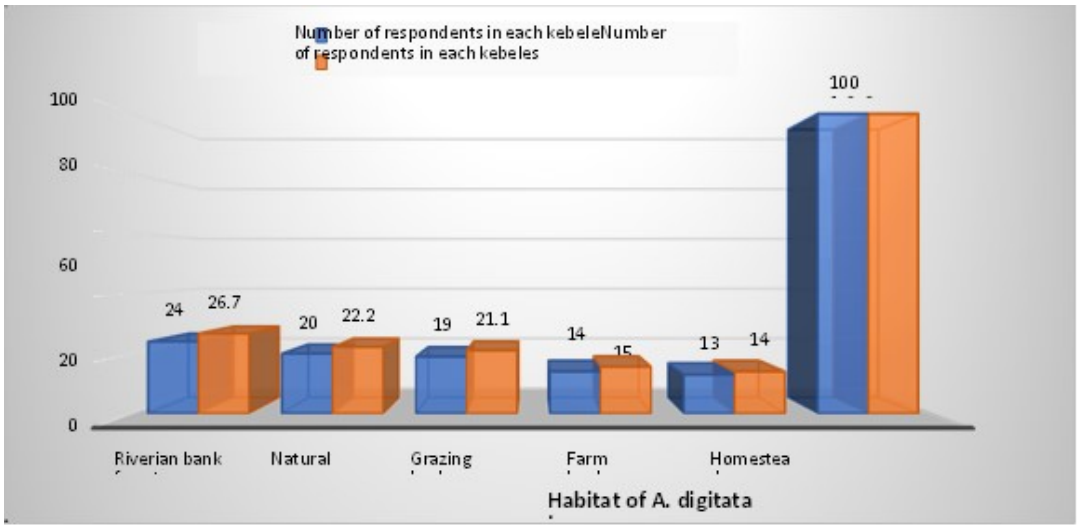


Fig. 3 Habitat of the *A. digitat* tree in the study area

3.6. The factors that affecting *A. digitata* population

In the study area, human activities (anthropogenic factors) are the main threats to vegetation which causes the decline of *A. digitata* tree species (Figure 4). In the study site, majority (38.8%) of the respondents the factor that affect *A. digitata* tree is browser and grazers. About 24.4 and 14.4% of the respondents' factors are shifting cultivation and burning of seed by fire.

In the study site, majority (38.8%) of the respondents indicated that browsers and grazers mainly cattle are destroying the young *A. digitata* trees. A similar study in Western Tigray by

Birhane *et al.,* (2020) in Namibia by Munyebvu (2015) suggested that factors by grazer and browsing are decline *A. digitata* tree species. Additionally, similar finding by Venter Witkowski, (2010) indicated that saplings were more susceptible to goat browsing than trampling and died more quickly when only browsed than when only trampled.

In study area cattle and goat are the most common domestic animal is occurred they may also destroy the seed when feeding. A similar study by Venter and Witkowski (2013) indicated that baobab seedlings may be destroyed by repeated browsing by livestock, contributing to lack of juveniles. Similar study in Western Tigray by Birhane *et al.,* (2020) note that, livestock browsing and trampling are likely the major causal factors for the low baobab population density and recruitment on grazing lands.

On the other hand, about 24.44% and 14.4% of the respondents suggest that shifting cultivation and burring of seed by in study area other factors respectively. The finding of this study is strengthened with previous studies in Quara district by Abere *et al.,* (2022) their study findings note that, land clearing for farmland and manmade fire set to burn cleared lands in the woreda are the other contributory factors that affect young *A. digitata* population. Agricultural cropping may result in fewer seedlings because baobab seedlings are normally removed when clearing new sites for growing crops, to reduce competition with their crops (Lisao *et al.,* 2017). Similar observations have been made in other countries, including Malawi (Dhillion and Gunnar 2004) and South Africa (Venter and Witkowski, 2013).

Out of the 12.2% respondents, mentioned that in the group discussion with key informant, participants the district is very rich in natural resource like gold that can be digging to find mining exploration that came to study area are the cutting and breaking the root of *A. digitata* tree responsible actors for gold digging and cut the tree root to disappears tree population.

Of all the respondents, 10% of households suggest that improper debarking of steam for other purpose is affect the *A. digitata* tree in study area. Similar observations have been made in other country (Lisao *et al.,* 2017) suggests a relationship between bark harvesting and sooty disease.

The finding of this study is supported with previous findings by Birhane *et al.,* (2020). According to their study findings, " in Welkayit and Kafta Humera district, Western Tigray, Northern Ethiopia who indicated that the decline was attributed to the excessive cutting of leaves and branches, excessive debarking, free grazing, agricultural expansion, climate change and the absence of conservation and management practices.

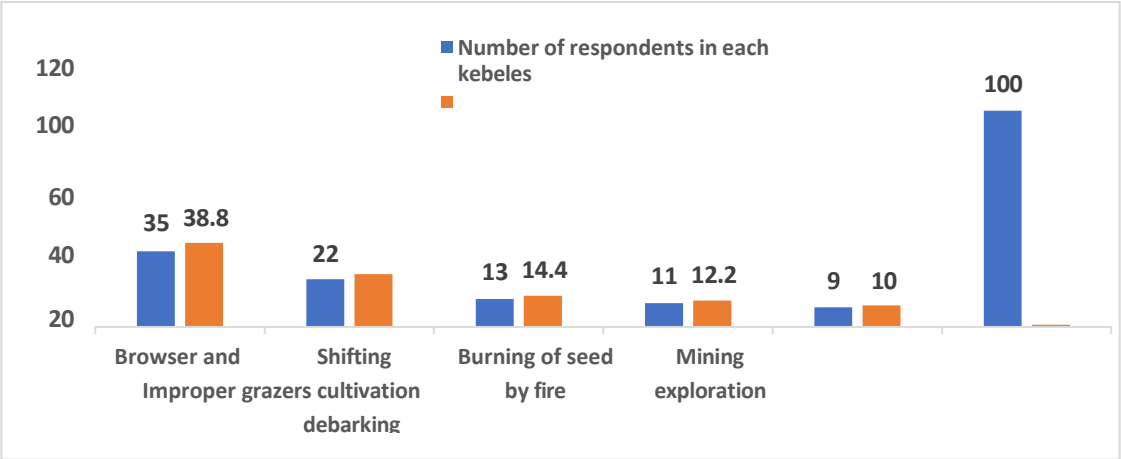


Figure 4. Factors that affect *A. digitata* population in study area

3.7. Conservation practice of *A. digitata* in Sherkole woreda

In the study area *A. digitata* is seriously threat by different anthropogenic factors. Most of the 78.7% respondents in study area mentioned that *A. digitata* trees have been growing naturally without any appropriate silvicultural management and conservation practice such as assisted natural regeneration, seeding, or transplantation of sapling. About 21.3% of respondents mentioned that awareness creation on sustainable harvesting and management and *in-situ* and *ex-situ* conservation were used to enhance the growth of *A. digitata* population, protect and sustain the around homestead and agricultural land use type area could be maintain for conservation.

Similar findings were reported by the study in western Tigray by Birhane *et al.* (2020) who indicated that an opportunity for awareness creation on sustainable harvesting and management.

Similar study by Dhillion and Gustad, 2004; Venter and Witkowski, 2010) note that current practice of preserving baobab trees on agricultural lands could be maintained while the protection of seedlings and saplings using silvicultural measures such as physical barriers to prevent livestock browsing, irrigation and installation of water collection structures.

Other study finding is in agreement with the observations by Sanchez *et al.,* (2011a) reported that to sustain baobab populations in the near future, the new suitable areas could be targeted for the in-situ conservation of existing stands through the design of effective protected area networks and the planting of seedlings and saplings.

Consistent with this study by Sanchez *et al.,* (2011) on their study findings indicated that in contrast, under the high emission scenario where high to complete mortality is predicted,

priority may be given to ex-situ conservation in germ plasma collections, gene banks or orchards and assisted migration to ensure the long-term viability of the species.

Therefore, they protect and allow growing *A. digitata* tree species can be maximized by awareness creation on sustainable harvesting and management. In-situ conservation in protected areas, ex-situ conservation in seed banks, and conservation via continual domestication and sustainability are the main conservation techniques in study area.

4. CONCLUSIONS AND RECOMMENDATIONS

Adansonia digitata (African baobab) is one of the multipurpose tree species, mostly used for wild edible plants and a key species with high ecological and socioeconomic significance in Sherkole woreda, Northwest Ethiopia. All plant parts of *A. digitata* tree are used by Berta ethnic groups but the fruit pulp is the most dominant. Overall, eight main traditional uses of *A. digitata* products (food, commercial, medicine, fiber, fodder, soil improvement, shelter and hanging beehive) were documented among the Berta ethnic groups. In the study site, majority (26.7%) of the respondents reported that highest population of *A. digitata* tree is present in riverine areas followed by natural forest. *A.digitata*. in study area are highly threatened for anthropogenic factors such as browsers and grazers, forest clearing for shifting cultivation, burring of seed by fire, mining and improper debarking are contributed to the decline of the species' populations.

Therefore, they protect and allow growing A. digitata tree species can be maximized by awareness creation on sustainable harvesting and management, in-situ conservation in protected areas, ex-situ conservation in seed banks, conservation strategy should be considered for sustainable development are the main conservation techniques are applied in study area. Furthermore, the benefits of the A. digitata tree need to be promoted in order to fully utilize its potential in improving livelihoods of rural communities in Sherkole woreda.

DECLARATION OF INTEREST STATEMENT

The authors declare that they have no conflict of interest.

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REFERENCES

Abdulla, A.M. (2013). Contribution of Non-timber forest products to household food security: the Case of Yabelo Woreda, Borana Zone, Ethiopia. *Food Sci. Qual. Manag*., 20, pp. 1-13, 10.1016/j.biocon.2006.06.020

Abere, M., Eshete, A. and Alemu, A. (2022). Traditional uses and local management practices of Adansonia digitata L. in different ethnic groups of Quara wereda, North West low land of Ethiopia.*Trees, Forests and People 7 .100188. https://doi.org/10.1016/j.tfp.2021.100188*

Adekunle, J. and Zhu, J. (2022). A Review of the Geographical Distribution, Indigenous Benefits and Conservation of African Baobab (*Adansonia Digitata L.)* Tree in Sub-Saharan Africa Preprints (www.preprints.org) |NOT PEER-REVIEWED doi: 10.20944/preprints 202205. 0287.

Alexiades, M.N. (1996). Collecting Ethnobotanical Data: An Introduction to Basic Concepts and Techniques. In: Alexiades, M. and Miguel, N., Eds., Selected Guidelines for Ethnobotanical Research, the New York Botanical Garden, Bronx, 53–94

Amusa, T.O., Aderinoye-Abdulwahab, S.A., Akanbi, S.O. and Idowu, O.P. (2017). Uses and prevalence of African baobab (Adansonia digitata L 1759) in Okoo community, Kwara State, North- Central Nigeria. *J. Agric. Food Environ*. 13 (1), 43–49. Retrieved from. http://www.njafe.org/NJAFE2017VOL13no1/8.

Awas, T. (2007). Plants diversity in Western Ethiopia: ecology, ethnobotany and conservation. PhD dissertation, University of Oslo, Norway, Europe.

Bamalli, Z., Mohammed, A., Karim, R. (2014). Baobab tree (Adansonia digitata L.) parts: nutrition, applications in food and uses in ethno-medicine - a review. *Ann. Nutr. Disord. Ther.* 1(3), 1–9.

Birhane, E., Asgedom, K.T., Tadesse, T., Hishe, H., Abrha, H., Noul`ekoun, F.(2020). Vulnerability of baobab (Adansonia digitata L.) to human disturbances and climate change in western Tigray, Ethiopia: conservation concerns and priorities. *Glob. Ecol. Conserv.* https://doi.org/10.1016/j.gecco.2020.e00943

Central Statistics Agency, (2007). Summary and Statistical Report of the 2007 Population and Housing Census. Population size by age and sex. Federal Democratic Republic of Ethiopia Population Census Commission, Addis Ababa, Ethiopia.International Household survey network, ETH--PHC P 1.

Sanchez, A., Haq, N., Assogbadjo, A.E. (2010). Variation in baobab (Adansonia digitata L.) leaf 646 morphology and its relation to drought tolerance. *Genetic Resources and Crop Evolution* 57, 17–647 25. https://doi.org/10.1007/s10722-009-9447-x

Sanchez, A., Osborne, P.E., Haq, N., (2011). Climate change and the African baobab (Adansonia 649 digitata L.) the need for better conservation strategies. *African Journal of Ecology*, 49, pp.234–245. 650 https://doi.org/10.1111/j.1365-2028.2011.01257.x

Sanchez, A.C., (2010). Predicting suitable areas for cultivation and conservation of the baobab tree and investigating superior sources of planting material.

Dhillion, S., & Gunnar, G. (2004). Local management practices influence the viability of the baobab (Adansonia digitata Linn.) in different land-use types, Cinzana, Mali. *Agriculture, ecosystems & environment* 101(1),85-103.https://doi.org/10.1016/S0167-8809(03)00170-1.

Galizia, D.J.G., DI-agr, M., 2005. Market brief in the European Union for selected natural ingredients derived from native species. Adansonia digitata L. United Nations Conference on Trade and Development 35.

Gebauer, J., Adam, Y.O., Sanchez, A.C., Darr, D., Eltahir, M.E.S., Fadl, K.E.M. (2016). Africa's wooden elephant: the baobab tree (Adansonia digitata L.) in Sudan and Kenya: a review. *Genet. Resour. Crop Evol*. 63 (3), 377–399. https://doi.org/ 10.1007/s10722-015-0360-1.

Kamatou, G. P., Vermaak, A., Viljoen, M. (2011). An updated review of Adansonia digitata: A commercially important African tree.*South African Journal of Botany,* 77, no. 4 908- 919. https://doi.org/10.1016/j.sajb.2011.08.010.

Lisao, K., Geldenhuys, C.J., Chirwa, P.W., 2017. Traditional uses and local perspectives on baobab (Adansonia digitata) population structure by selected ethnic groups in northern Namibia. *South African Journal of Botany*, 113, 449–456. 10.1016/j.sajb.2017.09.014

Lisao, K., Geldenhuys, C.J., Chirwa, P.W. (2018). Assessment of the African baobab (Adansonia digitata L.) populations in Namibia: implications for conservation. *Glob. Ecol. Conserv*. 14, e00386.

Luckert, N., Nemarundwe, L., Gibbs, I., Grundy, G., Hauer, D., Maruzane, S., Shackleton, J. (2001). Household livelihoods, marketing and resource impacts: A case study of bark products in Eastern Zimbabwe.

Marques, M. J, Gudrun, S., Nina L., Stephen, C., Mehreteab, T, J., Stolte, P.Z. (2016) Multifaceted impacts of sustainable land management in dry lands a review. *Sustainability*. 8;(2) 177. https://doi.org/10.3390/su8020177.

Martin, G.J. (1995). Ethnobotany A Method Manual. Chapman and Hall, London.

Meinhold, K., & Darr, D. (2021). Using a multi-stakeholder approach to increase value for traditional agroforestry systems the case of baobab (Adansonia digitata L.) in Kilifi, Kenya. *Agroforestry Syst.* 95:1343–1358 https://doi.org/10.1007/s10457-020-00562-x

Munyebvu, F. (2015). Abundance, Structure and Uses of Baobab (*Adansonia digitata* L.). Populations in Omusati region, Namibia.

Murage, M., Justus, M., Onguso, R., & Tofick, B. (2022). Morphological Characterization of Baobab Fruit (Adansonia Digitata L.) in Makueni, Taita Taveta, Kilifi and Kwale Counties in Kenya. *World Journal of Agricultural Research*,10(3)pp.82-93.doi: 10.12691/wjar-10-3-4.

Osman, M. E, Abdalhameed, H., Eltahir, A., Muneer, E. Adam, S., Ahmed, M., Sulieman Abdalgader, H., Adam, M. Krawinkel, C., and Faisal Musa, I. (2023). Uses, Harvesting, Consumption of Baobab Leaves, Pulps and Seeds in North and West Kordofan States Sudan. *Journal of Global Agriculture and Ecology,* 15, (1), pp. 20-28

Patrut, A., Karl, F., Von R., Daniel, A. Lowy, A., Alberts, H., John, Pohlman, W., Rudolf, W, Dana G., Li., and Clark S. (2007). Radiocarbon dating of a very large African baobab. *Tree Physiology* ,27, no. 11; 1569-1574. https://doi.org/10.1093/treephys/27.11.1569

Sidibe, M., Williams, J.T. (2002). Baobab (Adansonia Digitata L.). International center for underutilized crops, Southampton, UK.

Sundarambal, M., Muthusamy, P., Radha, R., AJS. (2015). A review on Adansonia digitata Linn. *J. Pharmacogn. Phytochem*. 4 (4), pp. 12–16.

Venter,S.M.& Witkowski. E.T.F. (2011) Baobab (Adansonia digitata L.) fruit production in communal and conservation land-use types in Southern Africa. For *Ecol.Manag.*261(3): 630-639. 10.1016/j.foreco.2010.11.017.

Wollenberg, E. & Ingles, A. (1998). Incomes from the forest. Methods for the Development and Conservation of Forest Products for Local Communities CIFOR, Bogor, Indonesia.

Yamane, T. (1976). Statistics: An Introductory Analysis, 2nd: Ed. Harper and Row, New York.

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