

19 54

NIGERIAN JOURNAL *of* AGRICULTURE FOOD AND ENVIRONMENT

N
J
A
F
E



ISSN 0331 - 0787



Volume 13

2017

Number 1

**A Publication of Faculty of Agriculture
University of Uyo, Uyo,
Akwa Ibom State, Nigeria
www.njafe.org**

NIGERIAN JOURNAL

OF
AGRICULTURE,
FOOD AND
ENVIRONMENT.

EDITORIAL COMMITTEE

Editor-in-Chief
Prof. Nyaudoh U. Ndaeyo

Editor
Prof. Nyaudoh U. Ndaeyo
Email: dr_nundaeyo@yahoo.com
Phone: +2348023285242

Assistant Editor 1
J. C. Obi (PhD)
Email: obijbc@yahoo.com
Phone: +2348033497933

Assistant Editor 2
Dr. N. A. Etim
Email: etimbobo@gmail.com
Phone: +2348027900733

Business Editor
Dr. Samuel I. Udofia
Email: udofiasamuel2@gmail.com
Phone: +2348023642933

ASSOCIATE EDITORS

Dr. E. O. Effiong
Agric. Econs. & Ext.

Dr. (Mrs) U. H. Udoh
Animal Science

Dr. Ime O. Udo
Crop Science

Dr. G. U. Akpan
Soil Sci. & Land Res. Mgt.

Dr. (Mrs) D. Thompson
Human Ecol. Nutri. & Dietetics

Dr. M. P. Akpan
Forestry and Wildlife

Dr. B. J. Oribhabor
Fisheries and Aquaculture

Dr. U. E. Inyang
Food Science and Tech.

EDITORIAL ADVISORY BOARD

Dr. Sunday Khan
*University of Yaounde
Cameroon.*

Prof. B. I. Umoh
*University of Uyo
Nigeria*

Prof. A. I. Essien
*University of Calabar
Cross River State, Calabar, Nigeria*

Prof. John A. Ibeawuchi
*Michael Okpara University of Agriculture
Umudike, Abia State, Nigeria*

Prof. Jimmy E. Umoh
*University of Uyo
Uyo, Akwa Ibom State, Nigeria*

Prof. Paul Amaza
*University of Maiduguri
Maiduguri, Borno State, Nigeria*

Prof. Conrad J. Kercher
*University of Wyoming
Laramie, Wyo 82071, USA*

Prof. Lawrence Etim
*University of Uyo,
Uyo, Akwa Ibom State, Nigeria*

1-4	Marketing of plantain in Ikono Local Government Area, Akwa Ibom State of Nigeria. Obinaju, L. C.
4-11	Growth performance and sex ratio in interspecific and intergeneric hybrids of three <i>Clariid</i> catfish species. Akinwande, A. A., Fagbenro, O. A. and Adebayo, O. T.
12-16	Screening for resistance to botanical and synthetic insecticides by <i>Stophilus zeamais</i> and <i>Callosobruchus maculatus</i> on stored grains. Udo, I. O.
17-22	Economic efficiency and income earning potentials of agroforestry farming systems in Ogun State, Nigeria. Adewuyi, S. A., Shittu, A. M., Fajimi, O. O., Shotuyo, A. L. A. and Akerele, D.
23-28	Nutritive value of cocoa bean shell meal and its effect on growth and haematology of weanling rabbits. Ogunsipe, M. H., Balogun, K. B., Oladebo, A. D., Ayoola, M. A. and Arikewuyo, M. T.
29-33	Determinants of credit accessibility among cocoa farmers in Osun State. Adewuyi, S. A., Taiwo, O. T., Adegbite, D. A., Oyeyinka, R. A. and Akerele, D.
34-42	Intra and inter-specific crosses in <i>Abelmoschus caillei</i> and <i>Abelmoschus esculentus</i> and the implications on pod yield improvement. Chinatu, L. N., Okocha, P. I., Harriman, C. J., and Okoronkwo, C. M.
43-49	Uses and prevalence of African baobab (<i>Adansonia digitata</i> L 1759) in Okoo Community, Kwara State, North-Central Nigeria. Amusa, T. O., Aderinoye-Abdulwahab, S. A., Akanbi, S. O. and Idowu, O. P.
50-59	Empirical linkage between foreign direct investment inflow and agricultural sub-sectoral productivity in Nigeria. Akpan, S. B., Udoh, E. J. and Umoren, A. A.
60-63	Effects of weeding regimes and mineral fertilizer on growth components of <i>Basella rubra</i> in Ondo, Southwestern Nigeria. Adeyemi, A. T., Adeyemi, O. R. and Ayeni, L. S.
64-67	Performance of cocoa marketing cooperative in Ikwuano Local Government Area of Abia State, Nigeria. Offor, E. I., Onyebinama, I. C. and Mejeha, R. O.
68-74	Response of Japanese quail challenged with varying concentrations of Newcastle disease virus. Fayeye, T. R. and Omole, E. B.
75-79	Performance of broilers fed graded dietary levels of raw African yam beans (<i>Sphenostylis stenocarpa</i>). Eburuaja, A. S.
80-85	Effect of women co-operative activities on entrepreneurship development of members in Abia State Nigeria. Umeh, O. J., Agu-Aguiyi, F. N. and Onu, E. O.
86-92	Influence of <i>Heterodera sacchari</i> (Luc and Merny) population densities on growth and yield components and of some interspecific upland rice genotypes. Akpheokhai, L. I. and Udoyong, J. U.
93-98	Chemical and sensory attributes of complementary food from pigeon pea (<i>Canjanus cajan</i>) and rice (<i>Oryza glaberrima</i>) blends. Okudu, H. O., Umoh, E. J. and Njoku, G.
99-102	Effect of <i>Cratogeomys thomomys</i> dung on the concentrations of some mineral elements in the leaf of <i>Hibiscus sabdariffa</i> (Roselle). Musa, A.
103-108	Variable cost structure of catfish production in Obio Akpor Local Government Area of Rivers State, Nigeria. Onyebinama, I. C., Onyebinama, U. A. U., Offor, E. I. and Achiugo, S.
109-112	Preliminary studies on effects of maize/food legume intercropping systems on weed control and soil nutrient status under reduced inorganic fertilization in an ultisol. Udo, U. K., Onyishi, G. C. and Obiefuna, J. C.
113-120	Assessment of farm factor productivity of small scale cassava farmers in Oruk Anam Local Government Area of Akwa Ibom State, Nigeria. Akpan, S. B., Adah, A. J. and Udoh, E. J.
121-125	Evaluation of drinking water sources on the health safety of people of Ilorin, Kwara State. Dauda, A. O., Abiodun, O. A. and Olosunde, O. O.
126-132	Food production trend in Nigeria and Malthus theory of population: empirical evidence from rice production. Oladimeji, Y. U.
133-138	Dietary crude protein and digestible energy requirements of <i>Heterobranchius bidorsalis</i> (Geoffrey St. Hilaire, 1809) fingerlings. Aliu, B. S. and Olomu, J. M.
139-154	Value addition to food and agricultural wastes: a biotechnological approach. Elijah, A. I. and Edem, V. E.
155-159	Preliminary evaluation of the effects of different water volumes on fertilization and hatching rates of <i>Clarias gariepinus</i> in glass aquarium tanks. Yisa, T. A. and Mamman, J.
160-165	Egg production in the hairy toadfish, <i>Batrachoides liberiensis</i> (Teleostei: <i>Batrachoididae</i>) (Steindachner, 1867) from offshore waters of southeastern Nigeria. Udo, M. T., Udo, O. O., Offiong, U. S. and Essien, E. S.
166-169	Bacteriological quality of street - vended roasted plantain in Yenagoa, Bayelsa State, Nigeria. Opapa, C. N. and Elijah, A. I.
170-173	Knowledge, attitude and practice of extension agents towards the use of ICT for service delivery in Abia State, Nigeria. Igwe, C. O. K., Olojede, J. and Ekweanya, N. M.
174-179	Trophic status of the ribbonfish (<i>Trichiurus lepturus</i> , Linnaeus 1758) (Pisces: <i>Trichiuridae</i>) from the distant waters off Qua Iboe River Estuary, Nigeria. Udo, M. T., Daniel, U. I. and Udoekene, A. A.
180-187	Genetic variation in nutritional properties of African yam bean (<i>Sphenostylis stenocarpa</i> Hochst ex. A. Rich. Harms) accessions. Ojuederie, O. B. and Balogun, M. O.
188-193	Performance and carcass quality of broilers fed dietary scent leaf, garlic and antibiotic. Odoemelam, V. U., Unamba-oparah, I. C., Irondi, J. I. and Anyanwu, N. J.
194-200	Long and short run dynamics of institutional credit and productivity in agricultural sector: evidence from Nigeria. Ojo, S. O., Akinrinola, O. O., Udoh, E. J. and Okunola, A. M.
201-205	Growth and yield responses of sweet pepper (<i>Capsicum annum</i> L.) cultivars to infections with cucumber mosaic virus disease. Olobashola, N., Salaudeen, M. T. and Achikwu, M.
206-213	Nutritional and chemical properties of fluted pumpkin (<i>Telfairia occidentalis</i>) seed flours, protein concentrates and isolates. Udoh, I. E.
214-220	Genotype × environment interaction effect on soybean genotypes under rhizobia inoculation in the savanna region of Nigeria. Tolorunse, K. D., Gana, A. S., Bala, A. and Sangodele, E. A.
221-225	Slaughtering age effects on performance, carcass and organ indices of broiler chickens. Asaniyan, E. K.
226-233	Tree slenderness coefficients and crown ratio models for <i>Gmelina arborea</i> (Roxb) stand in Afi River Forest Reserve, Cross River State, Nigeria. Adeyemi, A. A. and Ugo-Mbonu, N. A.
234-239	Antibacterial activity of aqueous and ethanolic leaf extracts of <i>Murraya koenigii</i> and <i>Telfairia occidentalis</i> synergy. Akinnibosun, F. I. and Ogu, G. I.
240-246	Preliminary evaluation of some white yam (<i>Dioscorea rotundata</i> Poir) lines for morphological characters, yield and resistance to insect pests and yam leaf mosaic virus in Akwa Ibom State, Nigeria. Bassey, E. E., Nwankwo, I. I. M. and Eke-Okoro, O. N.
247-250	Population ecology of timber trees of food and medicinal values in Oban Forest Reserve, Cross River State, Nigeria. Olajide, O., Annah, A. A. and Etigale, E. B.

USES AND PREVALENCE OF AFRICAN BAOBAB (*Adansonia digitata* L 1759) IN OKOO COMMUNITY, KWARA STATE, NORTH-CENTRAL NIGERIA

Amusa, T. O., Aderinoye-Abdulwahab, S. A., Akanbi, S. O. and Idowu, O. P.

ABSTRACT

Department of Forest Resources Management, University of Ilorin, Ilorin, Kwara State, 240003, Nigeria.
*teejayui@gmail.com; +234-70-33831616

The study investigated the uses, management strategies and population status of the African baobab (*Adansonia digitata* L 1759) in Okoo community, in the Nigeria north-central State of Kwara. A total of seventy-three (73) individuals were interviewed using structured questionnaire. The population status of the plant was assessed on six farmlands within the community. Data were analysed using descriptive and inferential statistics. It was observed that the leaf of baobab has the highest level of utilization in the study area. The fruits were consumed as a snack and in the preparation of local beverage. The bark and root were used in traditional medicine. There was no significant difference in the uses of baobab by age of the inhabitants of the study area ($\chi^2 = 55.642$; $df = 69$; $P = 0.877$). Contrastingly, there was a significant difference in the uses of the plant by gender ($\chi^2 = 17.215$; $df = 1$; $P = 0.001$). While on the average, there were 3.8 stands of baobab per farmland, there was no deliberate management of the plant. Majority of the trees (26.1%) sampled were sub-adults within the diameter class 92.0 - 132.9cm. The regeneration potential of baobab trees was of major concern as only two stands were considered seedlings. Climbing and pruning of the branches, debarking and root digging of baobab trees may negatively impact the plant in the long run. It is recommended that artificial regeneration should be encouraged by giving farmers free seeds and seedlings. The community should be educated on the wide range of uses of baobab as documented in other places to increase the utilization potential of the plant. The people should also be enlightened on simple silvicultural activities that could be carried out in the management of the plant.

Keywords: African baobab, uses, management, population status, Kwara State, Nigeria

INTRODUCTION

Renewable natural resources, including non-timber forest products (NTFPs) are faced with a lot of challenges which threatened their continuous availability and potentials towards contributing to human socio-economic development. Some of these challenges are directly related to the uses and strategies employed in the management of these resources. In Africa and most developing countries where poverty and food insecurity is well defined, the use of NTFPs by local people has continued to play important roles in food and nutritional supplementation (Muok et al., 2000). Although there is a considerable awareness among farmers and rural communities on the value and uses of NTFPs, most NTFPs are still harvested from the wild with little or no deliberate planning for domestication (Tella et al., 2005). To this extent, most NTFPs used to meet a wide range of needs are collected in an unsustainable manner. Meanwhile, the potentials of the forest and woodlands in meeting the demand for NTFPs are declining due to the fact that the populations of NTFP-producing tree species are disappearing as a result of over exploitation, utilization pattern and inadequate management techniques employed by the locals (Djossa et al., 2008; Schumann et al., 2010; Jimoh et al., 2013). The African baobab (*Adansonia digitata* L 1759) is an example of non-timber forest products yielding tree species found within the humid savanna and sudano-sahelian ecosystems of west, east and southern Africa. It contributes immensely to the landscape ecology and widely used for food, beverages, oil, dye, medicine and fibre.

Despite the ecological and socio-economic importance of the baobab, there have been concern about the occurrence of the plant in many landscapes (Dhillion and Gustad, 2004; Chirwa et al., 2006). In particular, there is a paucity of information on the current status, management strategies and contributions of baobab to local livelihoods in many parts of Africa. Within the Nigerian humid savanna ecoregion, a number of threats including human pressure, fire, uncontrolled livestock grazing and wild animals have continuously threatened the prevalence and sustainability of the tree's contributions to local communities' livelihoods. In view of the foregoing, this study focused on the uses, management strategies and population status of African baobab in a savanna community, Okoo, in the Nigeria north-central State of Kwara. The objectives of the study were to document uses and management of the baobab, as well as assess its population status in the study area. This is expected to generate knowledge that will contribute to enhance conservation and economic potentials of the plant in the area.

METHODOLOGY

Study area

The study was conducted in Okoo village in Asa Local Government Area of Kwara State, north-central Nigeria (Fig 1). The village is set within the southern guinea savanna vegetation zone. It is geographically located on latitude N 08° 38' 22.5'' and longitude E 004° 23' 06.7'' covering an area of 9083 m². The mean annual rainfall in the area ranges from 1000 and 1500 mm. The rainy season normally commences from late March and ends in October. This is then followed by a dry season from November to early March. The vegetation is characterized by shrub, tree, and woodland savannas. The people in the community are of Yoruba descent and population was about 245 made up of 35 households. The population density was relatively high with 37 inhabitants per m². The primary occupation of the people was agriculture, with commonly cultivated crops made up of maize, yam, cassava, millet, sorghum and okra in scattered trees on farmlands. One of the most prominent trees on farmlands is the African baobab (*Adansonia digitata*). Other highly valued trees such as *Vitellaria paradoxa*, *Parkia biglobossa* and *Parinari polyandra* are also preserved on the fields. Grazing activities by cattle, sheep, and goat are quite extensive.

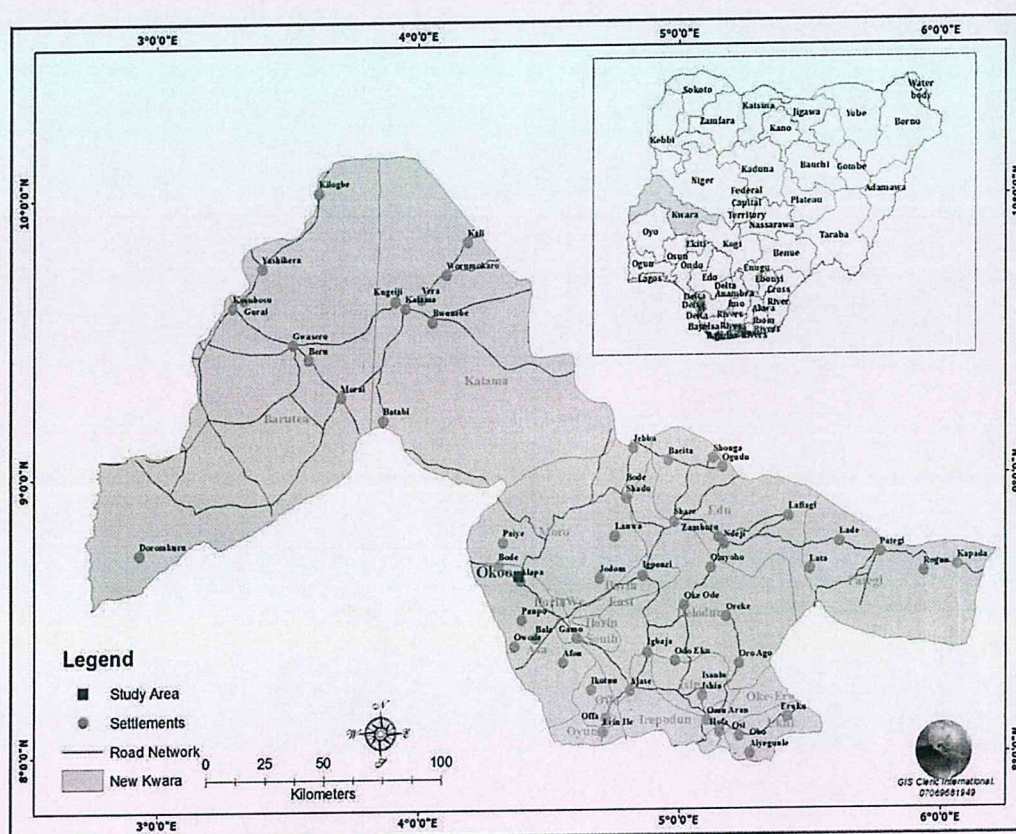


Fig 1: Map Kwara State, Nigeria showing the study area

Data collection and analysis

The targeted population for the study were the inhabitants of Okoo. Questionnaire survey was carried out on random sample of the inhabitants. A total of seventy-three (73) individuals were interviewed using the interview schedule (IS) approach. Forty males (40) and thirty-three (33) females were sampled during the course of the study. The age limit of eighteen (18) was set for the selection of respondents. The questionnaire consisted of open and closed ended questions. The questions were set to understand uses, management and prevalence of African baobab in the community. The Interviews were conducted in the local language (Yoruba) which is widely spoken within the community. At the commencement of each interview a brief introduction was done to let the respondent know the aim and seek permission.

The population status of the plant was assessed on six farmlands within the community. Data were collected on frequency of occurrence, diameter at breast height (dbh) and height of baobab trees encountered. The frequency of occurrence was determined by counting the number of individual stand of the species. Diameter at breast height was measured using a standard diameter tape, while height measurement was carried out with the use of haga altimeter. The data collected were analysed using descriptive and inferential statistics. The descriptive statistics comprised the use of frequency and percentages. The inferential statistics involved the use of the chi-square procedure. Specifically, the tests were used to compare differences in the uses of African baobab and management of the plant by age and gender distribution of respondents.

RESULTS AND DISCUSSION

Uses of African baobab by respondents

The leaf, bark, fruit and root of the African baobab were utilized in the study area. The leaf has the highest level of utilization among respondents. It is used in preparing a sauce called "luru" in the local language, and all the respondents indicated this use. The procedure for preparing the luru is such that leaves are collected by climbing and pruning of the branches with cutlasses. The pruned parts are carried to the village where the leaves are separated from the branches. The leaves are then spread on a nylon bag and sun dried. When properly dried, the leaves are pounded using a mortar and pestle. After pounding to fine powder the "luru" is ready and taken to the local market for sale or consumed within the households. The bark and root are put into two uses namely medicinal and rope making. Rope making for tying purpose is done by twisting fibres of the inner bark. The medicinal use is carried out by making the bark and root into concoction which is used to birth baby with small body size at birth in order to accelerate weight gain. It was revealed that when using the concoction, it is important to avoid bathing the head so that the child's head does not grow abnormally big in future. Furthermore, it was revealed that to make the concoction effective the pot used for preparation must not be put directly on the floor.

The fruit of African baobab is also utilized in two ways within the community. The first is as an additive to local beverage called "kunu", which is principally made from maize, sorghum or millet. The second is consumption as snacks. The process for preparing the beverage involves the baobab pods being broken up to depulp. The seeds are then collected and mixed with 'kunu' which is regarded as a milk supplement. The pulp is also commonly consumed raw as snacks. Table 1 shows the various parts of African baobab and the level of utilization by percentage in the community. For all the respondents, the use of the leaves to prepare "luru" sauce was the most important use-type. "Luru" is produced on a commercial scale by women in the community. This was followed by the medicinal use of the bark as well as utilization of the fruit as beverage additive. On the other hand, bark utilization for rope making and consumption of fruit as snacks were considered the least important use-type of African baobab in the community.

Table 1: Uses of African baobab by respondents in the study area

Part utilized	Uses	Frequency	Percentage
Leaf	Vegetable sauce	73	100.0
Bark	Medicinal	64	87.7
Bark	Rope	23	31.5
Root	Medicinal	30	41.1
Fruit	Beverages	47	64.4
Fruit	Snacks	19	26.0

Results of chi-square analysis showed no significant difference in the uses of African baobab by age of respondents in the study area ($\chi^2 = 55.642$; $df = 69$; $P = 0.877$). Contrastingly, there was a significant difference in the uses of African baobab by gender distribution of respondents ($\chi^2 = 17.215$; $df = 1$; $P = 0.001$). When compared with other studies on the African baobab, the level of awareness of the uses and benefits of the plant as well as its usage in the study area is poor. Only four uses have been documented in this study. In contrast, Prehler (2009) who worked in different regions of Senegal documented a total of 502 utilizations for the African baobab, of which almost half-234 (47.0%) were for nutritional purpose, 71 (14.0%) for medicinal, 14 (3.0%) for spiritual, 6 (1.0%) for veterinarian purpose and 177 (35.0%) for other utilizations. Schumann et al. (2012) identified 25 use-types for the African baobab in eastern Burkina Faso. These use-types included 17 medicinal, 7 food, and 1 construction. Similarly, Munyebvu (2015) working in Omusati Region of Namibia listed 10 different utilization categories for the African baobab which were consumption (human), medicinal (to cure diarrhoea, coughs),

sniffing, spiritual (e.g. to scare evil spirits), handicraft, medico-magical (e.g. fast growth of premature babies), shade (human), shelter (animals), fodder and commercial purposes.

Despite the commercialization of "luru" used as a sauce (prepared from the baobab leaves) in the study area, Omotesho *et al.* (2013) attributed a number of negative socio-cultural belief held among members of different rural communities about the plant as the strongest constraints to the usage of the baobab in Kwara State, Nigeria. Other constraints mentioned by the authors were poor level of awareness about its benefits and the poor knowledge of its processing in the State. Nevertheless, the use of baobab leaves for sauce and the use of the fruit pulp for beverages and snack remain of great importance. The medicinal use of both the bark and root of the plant in preparing concoction to strengthen baby with small body size at birth in order to accelerate weight gain also remain of striking note. Munyebvu (2015) reported similar case in the use of baobab roots to make strings tied around premature babies in order to speed up growth, while the people of Gulimanceba, Burkina Faso also use the bark as a strengthening agent for babies (Schumann *et al.*, 2012).

Test of significant difference in the uses of African baobab has shown that age has nothing to do with the uses in the study area. This demonstrates that knowledge about baobab uses is commonly shared among the different age group. However, the significant difference observed in the uses of African baobab by gender distribution of respondents showed the opposite. The women folks were more dependent of baobab products and the uses of baobab may further decline in case of a change in condition that prevent this group from further utilization of the plant. The dependent of the women folks might be explained by the fact that they often prepare and use the baobab products for both food and medicinal purposes for the general household.

Management strategies for African baobab

Investigation on management strategies for African baobab in the study area showed that about 72.0% of the respondents replied positively to not cutting down of baobab tree in the area stressing its importance to the community as a whole (Table 2). Also, there was active protection of baobab seedlings and saplings in farm fields and home compound. However, nearly all the respondents (98.6%) reacted negatively to deliberate planting of the baobab tree in the area. In other words, planting, sowing, transplanting, thinning and pruning of baobab trees were not common activities carried out in the community. Even for the one who claimed to engage in deliberate planting of the baobab, the area it was planted could not be verified as at the time of the survey.

Table 2: Management strategies for African baobab in the study area

Avoid cutting down baobab tree	Frequency	Percentage
No	20	27.4
Yes	53	72.6
Active protection of baobab seedlings and saplings		
No	18	24.7
Yes	46	63.0
Not specified	9	12.3
Deliberating planting of baobab		
No	72	98.6
Yes	1	1.4
Carry out silvicultural practices on baobab		
No	72	98.6
Yes	1	1.4

Meanwhile, leaf harvesting of baobab were usually carried out during the rainy season in the study area. Most of the leaf harvesting was carried out usually once a year (67.8%) or when needed (32.9%) by respondents (Table 3). Bark and roots were harvested at any time of the year when needed. Collection of the fruits often takes place during the dry season from December to June, and it is done when fruits are mature. There were three harvesting methods used by respondents. These are climbing and cutting, debarking and natural fruit drop. Results of chi-square analysis showed that there is no significant difference in the management of African baobab by both age ($\chi^2 = 49.840$; $df = 69$; $P = 0.636$) and gender ($\chi^2 = 2.124$; $df = 1$; $P = 0.547$) distribution of respondents in the study area.

That there was no deliberate management (planting, sowing, transplanting, thinning, pruning etc.) of baobab tree in the study area indicates a passive attitude to management of the plant. This may also be attributed to general low demand for baobab products (except the leaves) in the study area. In their study, Buchmann *et al.* (2009) reported that local people have no tradition for planting of indigenous trees, as they are considered as "wild". This was attributed to local belief systems, referring among other things to tree spirits and taboos. This also lends credence to the submission of Omotesho *et al.* (2013) on socio-cultural belief that negatively impact usage of the plant in Kwara State.

In the intervening time, the harvesting regimes and methods used on baobab tree seem to be adequate in maintaining the current populations of the tree in the study area. As noted, leaf harvesting of baobab were usually carried out during the rainy season, and mostly once a year. This further shows the low demand for the baobab product. However, the technique of climbing and pruning of the branches appear to be destructive. This could lead to a reduction of the number of flower buds (Buchmann *et al.*, 2010), as these are either damaged or removed entirely. Moreover, the bark and roots were harvested at any time of the year whenever needed. This is also a cause of concern for bark regeneration, if recovery process is not taken into consideration (Schumann *et al.*, 2012). Our findings of no significant difference in the management of African baobab by both age and gender show that no group within the community hold any special management activities on the conservation of the African baobab. This is consistent with the report of Schumann *et al.* (2012).

Table 3: Harvesting regimes on African baobab in the study area

Leaf	Frequency	Percentage
When needed	24	32.9
Once a year	48	65.8
Not specified	1	1.4
Bark		
When needed	57	78.1
Not specified	16	21.9
Fruit		
When needed	1	1.4
Once a year	45	61.6
Not specified	27	36.9
Root		
When needed	23	31.5
Not specified	50	68.5

Population status and threat indices on African baobab in the study area

A total of twenty three (23) baobab trees were sampled, two of which were seedlings (8.7%). Majority of the trees sampled fall within the diameter class 92.0 - 132.9 cm (26.1%), followed by those in the range 10.0 - 50.9 cm (17.4%). One tree stand of the African baobab was encountered within the diameter class 414 - 454.9 cm. The height of African baobab recorded during the survey was in the range 20-29 m (43.5%), followed closely by those of 2.0 - 10.9 m (34.8%) and those below 2m (8.7%). Figures 2 and 3 showed the size-class distribution for diameter and height of the African baobab as measured across six different farms in the study area.

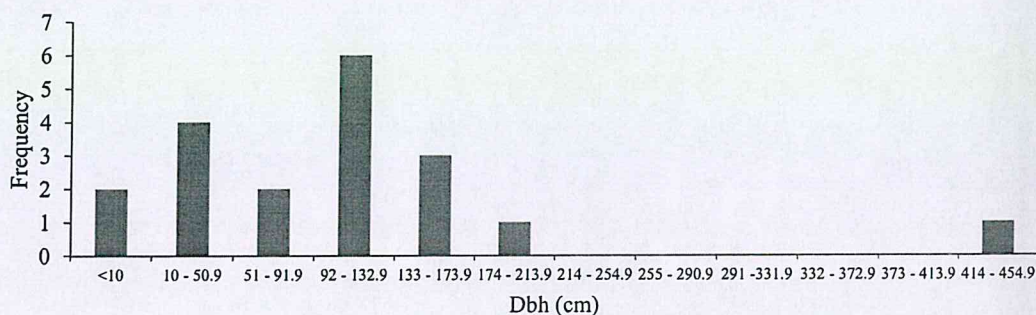
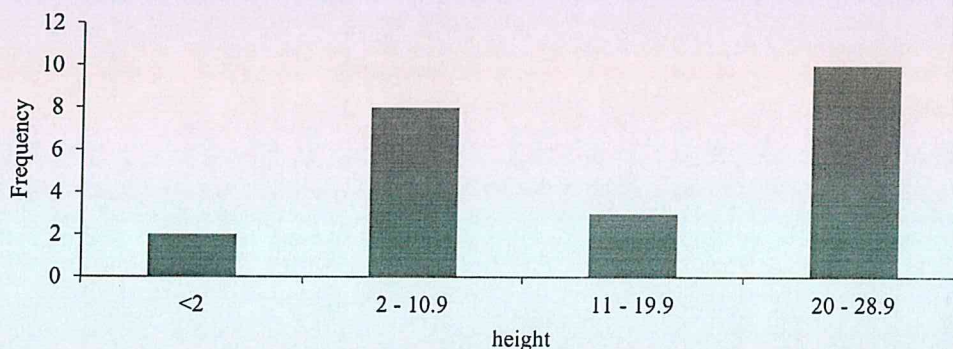


Fig. 2: Size-class distribution (diameter) of African baobab in the study area

The results of six farmland survey revealed on the average existence of approximately 4 stands of baobab per farmland. This compares favourably with the results of Munyebvu (2015) who reported values of 4.13 trees per ha and 3.96 trees per ha in different constituencies of Namibia. Mpofu *et al.* (2012) reported a far less value of 0.48 trees per ha as highest record in Gonarezhou National Park, southeast Zimbabwe. This shows that baobab occurs in sizeable population within the study area. However, there is a contrast in size-class distribution of baobab plant when compared with the work of Munyebvu (2015). Our finding showed that the largest baobab tree recorded was 450 cm dbh, while Munyebvu (2015) recorded the largest baobab with about 1200 cm dbh. Majority of the trees

(26.1%) sampled were sub-adults within the diameter class 92.0 - 132.9 cm. Factors such as herbivory, agricultural activities and land development tend to affect the baobab population. Venter and Witkowski (2011) suggested that baobab densities are also affected by a number of factors such as baboon mediated seed dispersal, soil characteristics and topography. Meanwhile, the regeneration potential of baobab trees in the study area is of major concern as only two stands were considered seedlings. A critical factor that may be influencing seedlings recruitment is the use of fire as a means of land clearing in the study area. Debarking and root digging of baobab also remain a source of concern.



Fig/ 3: Height-class distribution of African baobab in the study area

Majority of the baobab trees (78.0%) encountered in the study area showed no indices of threat (Fig. 4). However, those (18.0%) showing form of threats had debarking as the highest risk, while root injury as a result of animal hunting in the area constitute 4.0% of threat on the plant population.

■ Debarking ■ Root injury from hunting ■ not threatened

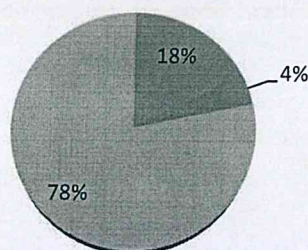


Fig. 4: Threat indices on population of African baobab in the study area

CONCLUSION

The socio-economic potential of baobab trees in the study area has not been well explored, as the level of usage was low. Whereas the harvesting regimes and methods used on baobab trees seem to be adequate in maintaining the current populations of the tree, there was a passive attitude to management. Also, while the baobab trees occur in sizeable population within the community, the regeneration potential of the plant was a major concern. Climbing and pruning of the branches, debarking and root digging of baobab trees may negatively impact the plant in the long run. It is recommended that artificial regeneration should be encouraged by giving farmers free seeds and seedlings. The community should be educated on the other uses of baobab as found in other places to increase the potentials of the plant. The people should also be enlightened on simple silvicultural activities that could be carried out in the management of the plant.

REFERENCES

- Buchmann, C., Prehsler, S., Hart, A. and Vogl, C. R. 2009. To plant or not to plant? Cultural reasons and barriers for adoptive transplantation of wild fruit trees in West Africa'. In Tielkes E (ed) International research on food security, natural resource management and rural development - Tropentag 2009 - biophysical and socio-economic frame conditions for the sustainable management of natural resources. DITSL GmbH (German Institute for Agriculture in the Tropics and Subtropics), Witzenhausen, Germany.
- Buchmann, C., Prehsler, S., Hart, A. and Vogl, C. R. 2010. The importance of baobab (*Adansonia digitata* L.) in rural West African subsistence—suggestion of a cautionary approach to international market export of baobab fruits. *Ecology, Food and Nutrition* 49:145–172.
- Chirwa, M., Chithila, V., Kayambazinthu, D. and Dohse, C. 2006. Distribution and Population Structures of *Adansonia digitata* in Some Parts of Ntcheu, Dedza and Mangochi Districts, Malawi. Zomba, Malawi: FRIM.
- Dhillon, S. S. and Gustad, G. 2004. Local management practices influence the viability of the baobab (*Adansonia digitata* Linn.) in different land use types, Cinzana, Mali. *Agriculture, Ecosystems and Environment* 101:85-103.
- Djossa, B. A., Fahr, J., Wiegand, T., Ayihouenou, B. E., Kalko, E. K. and Sinsin, B. A. 2008. Land use impact on *Vitellaria paradoxa* C. F. Gaerten. stand structure and distribution patterns: a comparison of Biosphere Reserve of Pendjari in Atacora district in Benin. *Agroforestry System* 72:205–220.
- Jimoh, S. O., Amusa, T. O. and Azeez, I. O. 2013. Population distribution and threats to sustainable management of selected non-timber forest products in tropical lowland rainforests of south western Nigeria. *Journal of Forestry Research* 24, (1): 75-82.
- Mpofu, E., Gandiwa, E., Zisadza-Gandiwa, P., and Zinhiva, H. 2012. Abundance, distribution and status of African baobab (*Adansonia digitata* L.) in dry savanna woodlands in southern Gonarezhou National Park, southeast Zimbabwe. *Tropical Ecology*, 53(1):119-124.
- Munyebyu, F. 2015. Abundance, structure and uses of baobab (*Adansonia digitata* L.) Populations in Omusati region, Namibia. A thesis submitted in partial fulfilment of the requirements for the degree of Master of Science in Biodiversity Management and Research of the University of Namibia.
- Muok, B.O., Owuor, B., Dawson, I. and Wer, J. 2000. The potentials of indigenous fruit trees: results of a survey in Kitui District, Kenya. *Agroforestry Today* 12:13–16.
- Omotesho, K. F., Sola-Ojo, F. E., Adenuga, A. H. and Garba, S. O. 2013. Awareness and Usage of the Baobab in Rural Communities in Kwara State, Nigeria. *Ethiopian Journal of Environmental Studies and Management* 6 (4):412-418.
- Prehsler, S. 2009. The use and management of Baobab (*Adansonia digitata*) and Tamarind (*Tamarindus indica*) by three ethnic groups (Peulh, Serer, Wolof) in Senegal - An ethnobotanical study. Master / Diploma Thesis submitted to the Department of Sustainable Agricultural Systems University of Natural Resources and Applied Life Sciences, Vienna Universität der Bodenkultur Wien.
- Schumann, K., Wittig, R., Thiombiano, A., Becker, U. and Hahn, K. 2010. Impact of land-use type and bark- and leaf-harvesting on population structure and fruit production of the baobab tree (*Adansonia digitata* L.) in a semi-arid savanna, West Africa. *Forest Ecology and Management* 260:2035–2044.
- Schumann, K. W., Wittig, R., Thiombiano, A., Becker, U., and Hahn, K. 2012. Uses, management and population status of the baobab in eastern Burkina Faso. *Agroforestry Systems*, 85:263-278.
- Tella, I. O. Ijomah, J. U., Akpan, M., Akosim, C., Jatau, D. J. and Wakili, A. 2005. Fuelwood consumption pattern of the rural communities of Adamawa State, Nigeria. *Journal of Environment Sciences* 9(2):89-96.
- Venter, S. M., and Witkowski, E. T. F. 2011. Baobab (*Adansonia digitata* L.) fruit production in communal and conservation land-use types in Southern Africa. *Forest Ecology and Management* 261:630-639.