Multipurpose Tree Species OF Akwa Ibom State and their Non-Timber Forest Products

Esiere, N. E[1]., Ndulue, N.B.[2], Umeh, C. L.[3] and Udofia, S. I.[3]

[1]*Directorate of Forestry and Environmental Conservation, Ministry of Environment and Petroleum Resources Akwa Ibom State*
[2]*Department of Forestry and Wildlife Management, Nnamdi Azikiwe University, Awka, Nigeria.*
[3]*Department of Forestry and Wildlife, University of, Uyo Akwa Ibom State, Nigeria.*

K E Y W O R D S

NTFPs,
Multipurpose trees,
Environmental services,
Agroforestry systems

A B S T R A C T

Multipurpose tree species are trees that have the ability to provide numerous products and perform diverse functions in farming or forestry. They play crucial role in the livelihood of the people of Akwa Ibom State, Nigeria. . Multipurpose trees are of significant importance as they are major source of Non-timber Forest Product. They produce environmental services such as soil conservation, nitrogen-fixation, Windbreaks, carbon sequestration, soil reclamation, erosion control and beautification. Therefore, integration of multipurpose tree species into an agricultural farmland will give the people economic stability and also control forest destruction. These tree species that provide NTFPs, need special attention and should be incorporated into suitable agroforestry systems. This review article discusses some indigenous multipurpose tree species of Akwa Ibom State that can be incorporated into suitable agroforestry systems.

* C O R R E S P O N D I N G A U T H O R

neetsam@yahoo.com

INTRODUCTION

The increasing population of humans and animals has been one of the most distressing factors for the depletion of forest in Akwa Ibom State. Forests in the tropical region are disappearing at an alarming rate and man is a silent spectator of the denudation of this natural resource which has been described as a "power house of evolution" and major source of "wild medicine" (Saxena *et al.*, 2001). The rate of forest destruction in the state is extremely high as a result of various developmental projects carried out by the government. This contributes immensely to the high rate of deforestation in Nigeria which according to Njungbwen and Mbakwe (2013) is one of the highest in the world. In Akwa Ibom State, developmental projects such as housing estates, airport, schools, hotels, roads, library and many more have led to the destruction of various forest lands.

The demand for forest products by man especially in Nigeria increased greatly during the colonial era. From then on, more and more natural forests were exploited. This resulted in destruction of forest products such as trees and other related products. This is what is called deforestation, a situation whereby forest plants and animals are destroyed, leading to their extinction (King and Udo, 2001). The impacts of deforestation manifested in soil degradation, increased erosion, air, land and water pollution, climate change (Udo, 2015).

In recent times, several attempts to rehabilitate the degraded forests and to bring more areas under forest cover by government officials, NGOs and individuals have been made. As the government of the day in making ultimate objective of bringing the degraded forests of the state under forested areas, there is a strong need to restore the forest through cultivation of suitable multipurpose tree species which will not only enhance the environmental services but will also provide Non Timber Forest Products to the people living within the forest areas. Multipurpose tree species should be incorporated into agro-ecosystem particularly agroforestry system.

Government agencies in forestry sub-sector should raise and distribute seedlings or seeds of these multipurpose trees to farmers for planting on their farms and gardens. Incorporation of multipurpose tree species in agroforestry system would protect the remaining wild population.

Some indigenous multipurpose tree species in Akwa Ibom State

***Dialium guineense* Wild (Velvet Tamarind)**

Dialium guineense, the velvet tamarind, is a tall, tropical, fruit bearing tree in the flowering plant family Febaceae. It has small, typically grape-sized, edible fruit with brown, hard, inedible shells. It is a fruit of a native West African tree cultivated not only for its fruits but as a source of timber and fuel. In Akwa Ibom State, tamarind is a very popular fruit snack, particularly among children, who peel the black velvet case to reveal an orange pulp that is eaten raw. *Dialium guineense* grows in dense forests in Africa, it has a straight, greyish and smooth stem.

Dialium guineense Wild is multipurpose tree that has various utility benefits. The fruit is popularly used as food. The fruit contains very hard seed, the pulp has a sweet-sour astringent flavour similar to baobab, but sweeter. It can be eaten raw when dry by man and animal (Matsuda, 2006). The pulp when peeled is also eaten raw in south-east Nigeria because of its refreshing properties and pleasant scorching taste (Ubbaonu *et al.*, 2003). It could also be used as flavour in snacks and non-alcoholic beverages (Effiong *et al.*, 2009).

The tree is used to make charcoal and the bank is used as chewing stick (indigenous tooth brush) among Nigerian populace (Akinpelu *et al.*, 2011). The bark, it is chewed for oral hygiene and stomach ache among the Esan people of Edo State (Besong *et al.*, 2016). It is also used to improve lactation and in checking genital infection in South East Nigeria (Besong *et al.*, 2016). In Akwa Ibom State, *Dialium guineense* is well known, valued and widely utilized. It serves different purposes of the local nature in the state. The tree is used for soil conservation, staking of yam, and the leaves are used as manure. It is well recognized by indigenous knowledge, as an agroforestry nitrogen fixing species. It is on the nutrient retention qualities of the tree that the farmers in the state retained, planted (scattered) them in traditional cropping system.

Economic Importance

1. *Dialium* is unique among plants. it is used as food.
2. It is a medicinal plant – use for oral hygiene and genital infection treatment.
3. Use as vitamin supplements
4. It has good timber quality used for construction
5. Wood is good for fuelwood and charcoals production

Environmental Services

1. It is used for soil conservation
2. The tree is used as natural fallow species for fertility restoration
3. The leaves are used as farmyard manure.

***Pentaclethra macrophylla* Benth. (Oil bean tree)**

Pentaclethra macrophylla also known as the African oil bean tree is a large size tree with long bipinnate compound leaves that is endemic to West Africa. It belongs to the family Fabaceae (Mimosoidae) and is the sole member of the genus occurring naturally in the humid lowlands of West Africa. It is evergreen tree growing to 30 m at a fast rate. *Pentaclethra macrophylla* is common in primary forest and secondary forest and coastal savannah, often in the vicinity of creeks and rivers. It is planted or retained along the edges of home gardens and farms mainly for its seed. In Nigeria, the oil bean tree is found in the southern rain forest zone. *Pentaclethra macrophylla* is one of the indigenous tree species in Akwa Ibom State. It is an important multipurpose tree for the people of the state. Seeds of oil bean tree have high fat content and are eaten along or used as food supplement. The seeds are slightly fermented and cut into small shreds to make a very nutritious snack called “Ukana” which is very popular among the Ibibios of Southern Nigeria. Women and children are into the collection and sale of oil bean seeds. Virtually all parts of this plant, including the seeds, leaves, stems, barks, trunks and roots are very useful for traditional and conventional medicinal health care.

Economic Importance

1. It is found very useful as a food supplement
2. It is potential source of income
3. The wood serves as firewood and charcoals
4. It is very useful for medicinal health care

Environmental Services

1. The wood and leaves serve as manure
2. It is good in soil conservation
3. It is a good source of shade and ornamental plant
4. It is well known nitrogen-fixing tree

***Gambeya albidum* G. Don *(*Africa star apple)**

Gambeya albidum is a climax tree species of tropical rainforest that belongs to the family Sapotaceae (Olaluwa *et al.,* 2012; Wole, 2013) which has up to 800 species and make up almost half of the order (Ehiagbonare *et al.,* 2008). African star apple, an indigenous plant is an edible tropical fruit known by various tribal names in Nigeria as agbalumo (Yoruba), Udara (Ibo, Efik and Ibibio), ehya (Igala) and Agwalumo (Hausa) (Dandare *et al*., 2017). The fleshy edible pulp is consumed by people (CENRAD, 1999) and for the purpose of stopping irritation, loss of appetite and salivation. Fruiting season of the plant is usually in the months of December to April during which it is found both in rural and urban cities (Amusa *et al.,* 2003). Studies have shown the fruit to be an excellent source of vitamins, iron, flavours to diet and raw materials to some manufacturing industries (Okafor and Fernandes, 1987; Bada, 1997; Umelo, 1997; Adisa, 2000).

It helps in prevention of mouth gum diseases, treatment of toothache as well as sore throat (Onyeakagbu, 2019). The diverse nutritional content of the fruit is very good for the digestive system and nutrient consumption of the pregnant mother and fetus (Agustin, 2018). The fruit is rich in fibre and contains compounds that are hypoglycemic that serve to lower blood sugar levels (Agustin, 2018). *Gambeya albidum* has been noted to be of great medicinal, nutritional (Adisa, 2000); Onyekwelu and Stimm, 2011) and economically values (Oboh *et al*., 2009).

Economic Importance

1. The fruit serve as raw materials to some manufacturing industries
2. It is used in the preparation of medicine for the treatment of disease
3. The fruits are consumed because of its sweetness and nutrition value
4. The fruits are widely eaten by people
5. Its fruit milky juice contains a high content of vitamin C
6. The oil is extracted and used in making soap and other products.
7. It can also be used in the preparation of wine, spirits and soft drinks, jam and jellies (Umelo, 1997).

Environmental Services

1. It is a good species for carbon sequestration
2. The trees are used for windbreak
3. It is a good source for shade and ornamental plant
4. It is well suited for degraded lands, it thrives on all kinds of soil
5. It is recommended for reclamation of wasteland.

***Treculia africana* Decne (African breadfruit)**

Treculia africana is a large evergreen tropical tree belonging to the family of Moraceae. Its distribution extends from latitude 13^{o} N of Angola and down to Saotome Island, and within the approximate latitude range of 15^{o} N to 20^{o} N (Keay, 1989; WAC, 2005). It is widely distributed in the following towns of Nigeria mostly in Oyo, Ogun, Anambra, Cross River, Delta and Imo States (Keay, 1989). It is specially called "Adiang" by the Ibibio people of the South South Nigeria.

Treculia africana is a source of food to many families in Akwa Ibom State. The seed is variously cooked as sole porridge or mixed with other food stuff such as Sorghum (Onweluzo and Nnamuchi, 2009), or roasted and sold with palm kernel (*Elaeis guineensis*) as road side snack. The flour is high potential usage for pastries (Onyekwelu and Fayose, 2007). The seeds are highly nutritious and constitute a cheap source of vitamins, mineral, proteins, carbohydrates and fats (Okafor and Okolo, 1974).

Proximate analysis shows that the seed contains 17-23% crude protein, 11% crude fat and other essential vitamins and minerals (Akubor *et al.,* 2000). The seed kernel is used in preparing pudding as a thickener in traditional soups and in the manufacturing food products such as flour for bread, beverages and weaning of children (Onyekwelu and Fayose, 2007). African breadfruit is an important natural resource for the poor, contributing significantly to their income and dietary intake, especially under poor heart conditions (Ogbonnia *et al.,* 2008), and as animal food (Ejidike and Ajuleye, 2007). It is also useful in the ethno-medical management of diabetes mellitus. The tree crop is widely cultivated in the Southern parts of Nigeria, where it serves as low-cost meal substitute for poor families in some communities (Ugwu *et al.,* 2011).

Economic Importance

1. *Treculia africana* is a source of food. The seed is cooked as sole porridge, the seeds are highly nutritious, source of vitamins, mienrals, proteins, carbohydrates and fats.
2. It is a good source of ethno-medical plant. It is used in treatment of diabetes mellitus.
3. It is a source of food to wild animals such as monkeys and chimpanzees
4. The wood as long been used for charcoal and fuel-wood

Environmental Services

1. Breadfruit trees are used for soil conservation projects and programmes.
2. Leaves are great source of manure. The leaf fall is a good source of mulch
3. Treculia trees help in combating the many inter-related environmental crises that threaten the very future of life on earth.
4. They are used as shade trees
5. The trees tolerate wide range of climatic conditions
6. It has been recommended as a promising species for used in home gardens, as for intercropping systems in agroforestry.

***Irvingia gabonensis* Baill (Bush mango)**

Irvingia gabonensis is a tree native to West Africa. It is sometimes known by the common names wild mango, African mango or bush mango. They bear edible mango-like fruits and are especially valued for their fat and protein rich nuts. It is evergreen dense rain-forest tree, it grows straight, up to a height of 25 m and 2 m in diameter (Omokhua *et al*., 2010). The fruit has sweet edible fibrous pulp which is rich in vitamin C. The most important part of Irvingia to the people of Akwa Ibom State is its nutritious seeds. It is known as mbukpabuyo by the Ibibio and Efik people. According to Ladipo *et al*. (1996), the Irvingia genus is made up of 7 species. The pulp of *Irvingia gabonensis* is sweet and juicy. This species can grow in a farmland, semi deciduous forest, and canopied bush or gallery forests. The seeds are primarily used for soup making in the state and many parts of Nigeria. Many rural people are involved in collection and marketing of the species edible pulp in many parts of the country where the species are in abundance. The species is one of the most useful forest trees in Akwa Ibom State as it forms an integral part in the livelihood of the rural communities. The trees improve air quality, windbreak and play important role in soil protection and formation.

Economic Importance

1. *Irvingia gabonensis* is used primarily for food.
2. The nuts provide fat and protein, while the pulp is rich in Vitamin C.
3. It is a good source of income generation to the rural communities
4. The wood is strong and durable, used in construction. It is used as fuel.
5. It is used as medicine. The seeds lower cholesterol because of their high fiber content. It is also used in treatment of diabetes and bacteria (Ngondi *et al*., 2005; Kuete *et al*., 2007 and Sulaiman *et al.*, 2015).
6. Fruits and seeds can serve as fodder fed to farmland livestock.

Environmental Services

1. The tree provides shade, useful in intercropping systems, where intense direct heat can damage crops.
2. It can be planted for preventing and controlling erosion
3. Trees are planted for Ornamental and beautification purposes.

CONCLUSION

Multipurpose tree species provide varieties of products including forest vegetables, fruits, fodder and products for medicinal purposes. These trees are used for food purposes all over the world. The multipurpose tree species provide nutritional security to rural and tribal population. These trees have potential to provide important community needs for improved rural livelihood. They also contribute to food security, create employment and generate additional income to farm household. Multipurpose tree species also helps in generating income for marginal farmers and provide environmental services including soil conservation, restoration and rehabilitation. The awareness of integrating trees/shrubs within traditional cropping system will help in ensuring multipurpose trees are adequately incorporated into agroforestry systems. These systems can be an important avenue in which trees/shrubs with multiple benefits can be same piece of land. This will not only boost agricultural production but will also provide food securities to the increasing population.

REFERENCES

Adaobi, O. A. (2019). 5 interesting health benefits of Agbalumo (African star apple). Pulse Nigeria I:1-5, Accessed on 28/08/2019.

Adisa, S. A. (2002). Vitamin C. Protein and Mineral contents of African Apples (*Chrysophyllum albidum)* In: proceedings of the 18th Annual Conference of NIST (Eds), S. A. Garba; I. F. Ijagbone; A. O. Iyagba; A. O. Iyanu; A.S.U. Kilanu; N. Faruna, pp 141-146.

Agustin, W. I. (2018). 10 Best health benefits of African Star Apple During Pregnancy. www.dr.health.benefits.com.Accessed 22/12/2019. Pp4

Akinpelu, A. O., Amamgbo, L. E., Ologede, A. O., Oyekale, A. S. (2011). Health implication of cassava production and consumption: *Journal of Agriculture and Social research* (JASR), Vol II:I.

Akubor, P.I., Isolukwum P.C., Ugbabeo, and Onimawo, I.A. (2000). Proximate Composition and functional properties of African breadfruit kernel and wheat flour blends. *Food Research Int.* 33:707-712.

Amusa, N. A., Ashaye, O. A. and Oladapo, M. O. (2003). Bideterioration of the African star apple (*Chrysophyllum albidum)* in Storage and the Effect on its Food value. *African Journal of Biotechnology* 2(3): 56-59.

Bada, S. O. (1997). Preliminary information on the ecology of *Chrysophyllum albidum* G. Don in West and Central Africa. In Proceedings of National Workshop on the potentials of the Star Apple in Nigeria (eds) Denton, D. A; Ladip, D.O., Adetoro, M. A. and Serum M. B., pp 16-25.

Besong, E. E., Balogun, M.E., Djobissie, S. F. A., Obu, D. C. and Obimma, J. N. (2016). Medicinal and economic value of *Dialium guineense. Afr.J.Biomed Res.* Vol 19; 163-170.

CENRAD., (1999). Centre for environmental renewable natural resources management, research and development. Publication No. CEN, 011/199985, Jericho, Ibadan.

Dandare, S. U., Mainasara, B. B., Magasi, U. F. Dandare, A., Lailaba, A. A. and Sadiq, M. E. (2017). In vitro Antioxidant Activity of *Chrysophyllum albidum* fruit. *Nigerian Journal of basic and Applied Science* 25 (1): 17-22.

Effiong, G. S., Ibia, T. O. and Udofia, U. S. (2009). Nutritive and energy value of some wild fruit species in south eastern Nigeria, *Elletr. J. Env. Food Chem.*, 8:917-923.

Ehiagbonare, J. E., Onyibe, H. I. and Okoegwale, E. E. (2008). Studies on the isolation of normal and abnormal seedlings of *Chrysophyllum albidum:* A step towards sustainable management of the taxon in the 21st century. *Scientific Research and Essay* 3(12): 567-570.

Ejidike, B.M. and Ajileye, O. (2007). Nutrient composition of African breadfruit/*Treculia africana* seed bull and it use in diets for the African giant land snail. *Archachatina marginata*. *Pakisitan journal of Nutrition* 6 (2): 201-203.

Keay, R. W. J. (1989). *Trees of Nigeria*. a revised version of Nigeria Trees. Oxford University Press, New York. 226pp.

King, E. J. and Udo, E. O. (2001). Deforestation in Akwa Ibom State: causes, Impact and Solution. In Udo, E. S. (ed.) *forestry and Sustainable Environment* pp 114-121. Proceeding of the 1st Workshop of the Forestry Association of Nigeria, Akwa Ibom State Branch.

Kuete, V.G.F. Wabo, B., Ngomeni, A. Tsafack Mbaveng, R, Metuna, F. X., Etoa, B., Tchaleu Ngadju, V., Penlap Beng, J. J., Marion Meyer and N. Lall, (2007). Antimicrobial activity of the methanolic extract, fractions and components from the steam bark of *Irvingia gabonensis* (Ixonanthanceae). *Journal of Ethnopharmacology,* 114.pp54-58.

Matsuda, R. (2006). Feeding ecology of the mona-monkey (*Cercopithecus mona* in a seasonally dry flooded forest in the dahomey gap). Dept. of Anthropology, graduate centre, city university of New York, New York, NY, 10016 (USAIPSP conference).

Ngondi, J.J., Oben and S. Minka (2005). The effect of *Irvingia gabonensis* seed on body weight and blood lipids of Obsese subject in Cameroon. *Lipids Health Diseases* 4:p12.

Njungbwen, E. and Mbakwe, R. (2013). A GIS and Remote sensing approach to Assessment of Deforestation in Uyo, Akwa Ibom State Nigeria. *Ethiopian Journal of Environmental Studies and Management*, 6 (4): 348-357.

Oboh, I. O., Aluyor, E. O. and Audu, T. O. K. (2009). Uses of *Chrysophyllum albidum* for the removal of metal ions from aqueous solution. *Scientific Research and Essay* 4 (6): 632-635.

Ogbonnia, S. O., Enwuru, N. V., Onyemenem, E. U., Oyedele, G. A. and Enwuru, C. A. (2008). Pytochemical evaluation and antibacterial profile of *Treculia African* Decne. Bark extract on gasto intestinal bacteria pathogens. *African journal Biotechnology* 8 (7): 1005-1008.

Okafor, J. C. and Fernandes, E. C. M. (1997). Compound Farms of South-East Nigeria: A Predominant Agroforestry Homegarden System with Crops and Small Livestocks. *Agroforestry Systems* 5:1534-168.

Okafor, J. C. and Okolo, H. C. (1974). Potentials of some indigenous fruit-trees of Nigeria, paper presented at the 5th Annual Conference of the Forestry Association of Nigeria. December 1974, Jos, Nigeria.

Omokha, G. E., Ukoima, H. N. and Aiyeloja, A. A. (2010). Fruit and production in *Irvingia gabonensis* (O'Rorke) and it's Role in the Economy of Edo Central, Nigeria; In: Popoola, L., Idumah, F. O., Adekunle, V.A.J. and Azeez, I. O. (Eds). The Global

Economic Crisis and Sustainable Renewable Natural Resources Management. Proceedings of the 33rd Annual Conference of the Forestry Association of Nigeria held in Benin City, Edo State, Nigeria. 25th – 29th October, 2020, pp 507-513.

Olaoluwa, T. A., Muhammad, N. O. and Oladiji, A. T. (2012). Biochemical assessment of the mineral and some antinutritional constituents of Aspergillus niger fermented *Chrysophyllum albidum* seed meal. *African Journal of Food Science* 6 (1): 20-28.

Onweluzo, J. O. and Nnamuchi, O. M. (2009). Production and evaluation of porridge-type break-fast product from *Treculia africana* and sourghum bicolor flours. *Pakistan journal of Nutrition* 8 (6): 731-736.

Onyekwelu, F. C., and Fayose, O. j. (2007). Effect of storage methods on title germination and proximate composition of *Treculia africana* seeds. Conference on International Agricultural Research for Development, University of Kassel-Witzenhausen and University of Gottingen October 9-11, 2007.

Onyekwelu, J. C., and Stimm, B. (2011). *Chrysophyllum albidum*. In: Roloff, A., Weisgerber, H., Lang, U. Stimm, B. (Eds): Enzyklopadia der Holzgewachse. Wiley VCH, Weinheim, 59, Erg.1.fg. 10/11, 12pp.

Saxena, K.G., Roa, K.S., Maikhuri, R.K and Sewual, R. K., (2001). Integrated natural resource management approaches and lessons from the Himalays. *Conservation Ecology* 5(2): 14.

Sulaiman, A. O., Auta, T. and Hassan, A. T. (2015). Evaluation of antidiabetic activity of *Irvingia gabonensis* (Aubry-Leconte et O^{I} Ronke) leaf and bark in alloxan induced diabetic rats, *Biosciences Research in Today;s World*, volume I. Issue I. pp 84-89.

Ubbaonu, C. N., Onuegbu, N.C., Banigo, E. O. J., Uzoma, A. (2003). Physiochemical changes in velvet tamarind (*Dialium guineense* Wild) during fruit development and ripening. *Nig.food.j.*23:133-137.

Udo, E. S. (2015). Forestry and Climate Change. Proceedings of the National Workshop of Forestry Association of Nigeria (FAN), Akwa Ibom State. Michael Akpan and Samuel Udofia (eds) pp xv-xxv. FAN. Ugwu, F. M., Ekwu, F. C. and Okoye, I. C. (2001). Protein quality indices and food intake pattern of parboiled and roasted breadfruit-corn diets. *J.Sci.Agric.Food technology and Environment*, 2: 97-100.

Umelo, R. (1997). Potentials for Utilization of Agbalumo (Yor.). (*Chrysophyllum albidum)* for jam making in Nigeria. Paper presented at the C. albidum Development Workshop. CENTRAD. Ibadan, Nigeria.

WAC (2005). Treculia africana in: Agroforestry Database http/www.Worldagroforestry.org/sites/treeobs/Aft/speciesinfo.cfm? SPID-1651.

Wole, O. (2013). Unlimited nutritional benefits of African star apple. *Journal of Natural Health* I(1): 1-4.

.