



Socio-Economic and Market Potentials of *Chrysophyllum albidum* in Rainforest and Derived Savanna Vegetation Zones of Osun State, Nigeria

O. V., Oyerinde.

Department of Forestry and Wood Technology,
Federal University of Technology, Akure, Ondo State, Nigeria

Email: voyerinde@gmail.com

Abstract

This research work was carried out to rainforest and derived savanna of Osun State, Nigeria; to investigate the socio-economic and market potentials of *Chrysophyllum albidum* for the sustainability of the people, especially the rural dwellers. Nine and fifteen communities were purposely selected from rainforest and derived savanna zones for socio-economic and market potentials assessments, respectively. Two sets of semi-structured questionnaires (Household and Key informant questionnaire) were used to obtain information from the respondents. Majority of the respondents in both vegetation zones were mostly male and they are between the age of 41 to 50 years of age. A high percentage of *C. albidum* trees in both rainforest (66.7%) and derived savanna (93.3%) are found on the farmland. The result revealed that, 11.1% and 17.3% of the respondents in both rainforest and savanna zones respectively that owned *C. albidum* either on their farmlands or home gardens had no formal education. *C. albidum* fruits were used for various purposes including food, nutritional supplement, income generation, medicinal, etc. Majority of the farmers sells *C. albidum* fruits by selling the whole tree on farmland for the marketers to harvest the fruits. Annual income generated from the sale of *C. albidum* fruits was between ₦8,000- ₦150, 000 in both rainforest and derived savanna vegetation zones, respectively. This research paper highlights the socio-economic and market potentials of *Chrysophyllum albidum* in the two vegetation zones of Osun State.

Keyword: Socio-economic, market potentials, *Chrysophyllum albidum*, rainforest and derived savanna.

Cite as: Oyerinde V. O (2019). Socio-Economic and Market Potentials of *Chrysophyllum albidum* in Rainforest and Derived Savanna Vegetation Zones of Osun State, Nigeria. *Journal of Researches in Agricultural Sciences*. Vol. 7(1): 84 - 95

Introduction

Forest food tree species have immense indigenous, socio-economic, nutritional and traditional importance (Okafor, 1991; Ayuk *et. al.*, 1999a, 1999b), especially to the rural areas that depends on them. The edible products from the forest food trees serve as alternative source of food thus plays an important role in food security (Onyekwelu, *et. al.*,

2011) and increase the diversity of foods necessary to reduce monotony in diet of rural people (Bolanle-Ojo and Onyekwelu, 2014). It has been noted to contain high level of vitamin C, minerals, sugar, proteins etc, thus playing an important role in the nutritional balance of the people (Bolanle-Ojo and Onyekwelu, 2014). Most forest food tree species

have an important health benefits against malnutrition and conferring enhanced resilience to epidemics such as HIV/AIDS (Barany *et al.*, 2001). Their various parts (such as leaves, seeds, roots and bark) could be used to cure a variety of sicknesses and diseases (Barany *et al.*, 2001), thus contributing to the health care delivery to the rural people. Moreso, they contribute significantly to rural poverty alleviation by providing employment, income and enhancing economic empowerment of rural dwellers through the collection, processing and marketing of their products such as fruits, seeds, leaves, root, etc (Onyekwelu, *et al.*, 2015). Out of all, one of the forest food tree species that has been noted to high socio-economic importance and market potential is *Chrysophyllum albidum*.

Chrysophyllum albidum G. Don, commonly known as “Africa star apple” belongs to the Sapotaceae family. It is primarily a forest tree species, native to many parts of tropical Africa, widely distributed in West, Central, and East Africa for its edible fruits and various ethno-medical uses (Amusa *et al.*, 2003). *C. albidum*, an indigenous plant is known by various tribal names in Nigeria as *agbalumo* (Yoruba), *Udara* (Ibo, Efik and Ibibo), *ehya* (Igala) and *agwaluma* (Hausa) (Ehiagbonare *et al.*, 2008). Its fruits are harvested annually between December and April, which makes it a highly seasonal product (Onyekwelu and Stimm, 2011). The fleshy fruit pulp is suitable for jams and eaten especially as snack by both young and old (CENRAD, 1999; Amusa *et al.*, 2003). The juice of the fruit has potentials as an ingredient of soft drinks and can be fermented for wine or other alcohol production (Ajewole and Adeyeye, 1991). *C. albidum* has been found to have nutritive value to provide nutrient supplements for children and women in rural communities (Ureigho, 2010) and high content of ascorbic acid (between 1, 000 to 3, 330 mg per 100 gm of edible fruit), which is about 100 times higher than that of oranges and 10 times higher than that of guava or cashew (Adisa, 2000). Commercially, *C. albidum* fruit is highly valued in Ghana and Nigeria and it is an excellent source of vitamins, irons, and raw materials to some manufacturing industries (Boateng and Yeboah, 2008). The market attractiveness of the species is derived from the sweet taste of the fruit pulp (Agbelade and Onyekwelu, 2012).

Despite the importance of *C. albidum* and other forest food tree species, their regeneration and improvement have been greatly neglected. *C.*

albidum grows in the wild and if continues, there will be low probability of obtaining its much valued fruit on a sustainable basis (Bolanle-Ojo and Onyekwelu, 2014). In Nigeria, *C. albidum* is classified among the endangered tree species

(FORMECU, 1999), with a high possibility of going into extinction in the near future except something is done to conserve the species or increase their population. The short shelf life of *C. albidum* fruit (Boateng and Yeboah, 2008) as well as the lack of storage facilities poses a serious problem for its marketing. However, marketing of *C. albidum* has the prospect of providing a considerable income generating opportunity for rural people. From December 2005 to February 2006, the price of a basket of the fruits of *Chrysophyllum albidum* in Ghana ranged from about US\$7 to US\$17 (Boateng and Yeboah, 2008). In the humid lowland of Nigeria, the average value of production for 2007, the fruit of *C. albidum* was estimated at about US\$16 million (Franzel *et al.*, 2008). The general objective of this research is to analyze the socio-economic contributions and market potentials of *Chrysophyllum albidum* in the rainforest and derived savanna vegetation zones of Osun State, Nigeria.

Research Methodology

Study Area

The study was conducted in tropical rainforest and derived savanna vegetation zones of Osun State, Nigeria. From each vegetation zone, three LGAs (Atakumosa West, Ife North and Isokan) from tropical rainforest and five LGAs (Boripe, Iwo, Ejigbo, Ede North, Odo-Otin) from derived savanna were purposively selected (Figure 1) and three communities with good concentration of *C. albidum* were purposively selected from each of the LGA. In each of the communities, five farming households who have *C. albidum* especially on their farms and home gardens were selected through snowball sampling technique. In addition, one key informant (farmer) was interviewed in each of the communities to gather information on the marketing. The GPS reading of the selected communities were overlaid to generated maps that show the distribution of the communities as shown in Figures 2 using QGIS software.

Data Collection

Data for this study were collected using two sets of semi-structured questionnaires. The first category of questionnaire (Household questionnaire), which was

used to gather information (e.g. annual income from the sale of the fruits, percentage contribution of *C. albidum* to total annual income, yield of *C. albidum* per annum). The second set of questionnaire (Key informant questionnaire) was used to obtain data on fruit price (both at the market and farmgate), where the marketing takes place and people that are

involved etc. The questionnaire was pre-tested before final administration to respondents. Thus, a total of 120 respondents were interviewed across the two vegetation zones in Osun State, Nigeria. The data were subsequently analyzed using descriptive statistics.

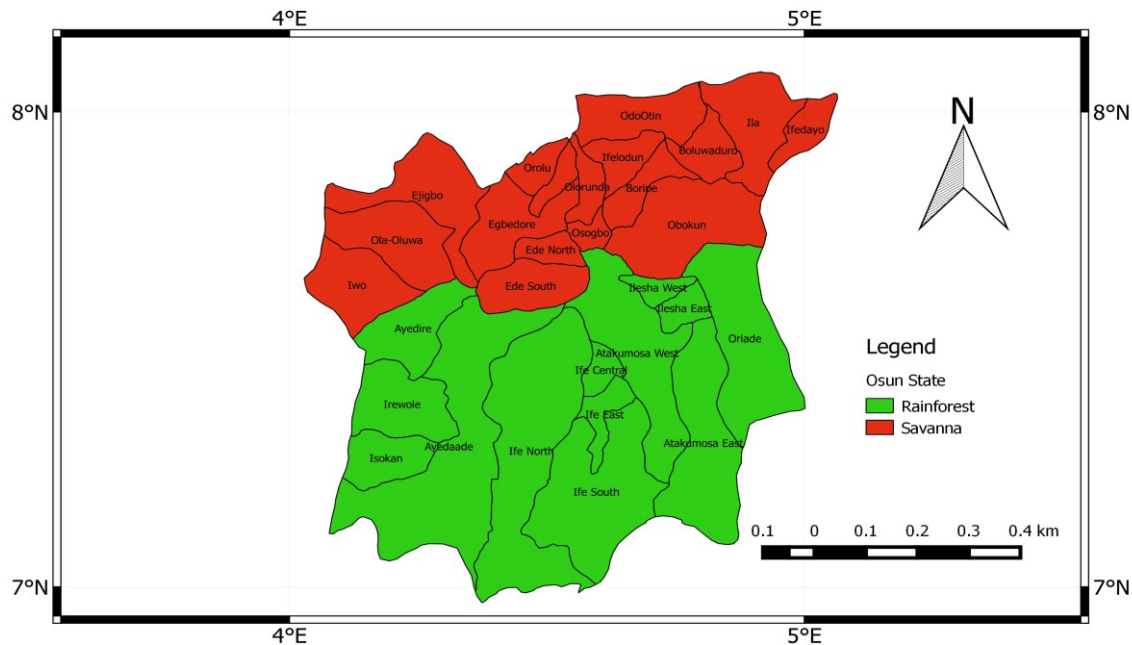


Figure 1: Map of Osun State showing the Study area

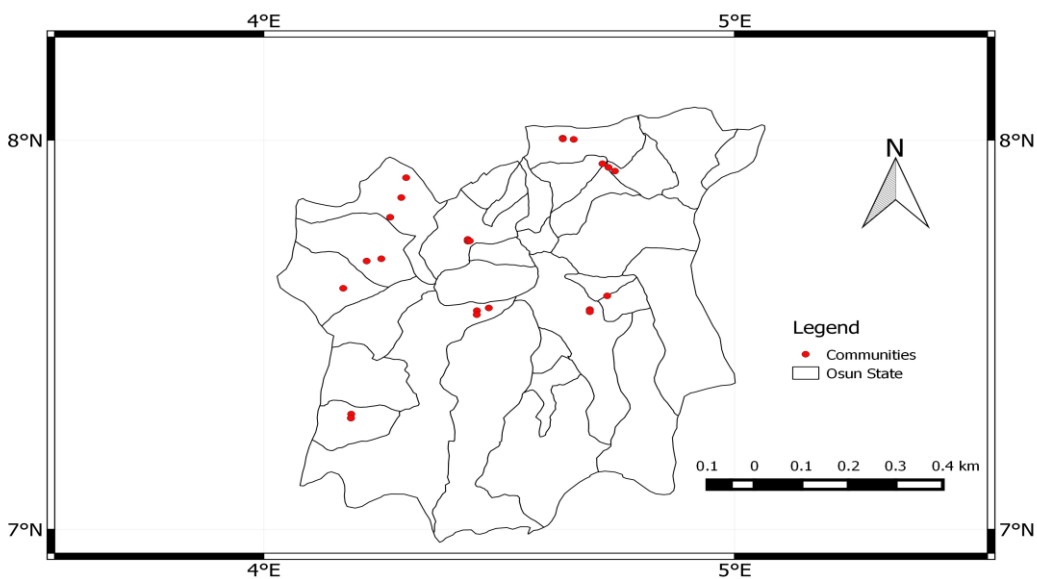


Figure 2: Distribution of communities visited (red dots)

Result and Discussion

The research work covered a total of 24 communities. The results obtained in this study show that people that have *C. albidum* either on their farmlands or homes are mostly males, which is to be expected since the majority of respondents are males. They are married and their age ranged between 41 and 50 years (Table 1). This age range is active and will thus ensure active labour force for the domestication of the species as confirmed with the findings of Bolanle-Ojo and Onyekwelu (2014), and their major occupation is farming, in both vegetation zones. The high percentage of middle aged found in the two vegetation zones is an indication that they have high tendency to generate higher income from the sales of fruits, which is also similar to the view of Ajibefun *et. al.* (2006).

Table 1 revealed that, 11.1% and 17.3% of the respondents in both rainforest and savanna zones respectively that owned *C. albidum* either on their farmlands or home gardens had no formal education. Thus, respondents with no formal education are higher in the savanna than in rainforest ecosystem. In the rainforest zone, majority of the

respondents have up to secondary school education (46.7%). The higher educational level of the respondents in the rainforest zone might have contributed to higher domestication level for the improvement on the production of *C. albidum* in the ecosystem. The low educational status observed among the farming populace is supported by earlier studies such as Adams *et. al.* (2000) and Adhikari, *et. al.* (2004). Stoian (2005) opined that education is one of the important human capitals, which plays important role in determining status in the society. Education is expected to contribute to people's ability to read and understand instructions and hence help them to adopt new technologies (Chigbu *et. al.*, 2011).

Prominent high level of illiteracy in the savanna zone can lead to deforestation of the forest resources as it was noted by Adekunle *et. al.*, (1999) as a major threat factor of the species in the savanna ecosystem. Educational level may also affect future domestication of the forest fruit tree species, this is because it is easier to create awareness among educated people than among the non-educated (Bolanle-Ojo and Onyekwelu, 2014).

Table 1: Demographic Information of Respondents

Variables	Variants	Rainforest (n=45)		Savanna (n=75)	
		F	%	F	%
Age of Respondents	20-30 years	3	2.2	7	9.3
	31-40 years	10	22.1	13	17.3
	41-50 years	16	35.4	24	33.3
	51-60 years	15	33.1	17	22.6
	61-70 years	1	2.2	5	6.6
	71-80 years	0	0.0	7	9.2
	81-90 years	0	0.0	1	1.3
	No Formal Education	5	11.1	13	17.3
Highest Education Attained	Primary Education	18	40	46	61.3
	Secondary Education	21	46.7	15	20.0
	Tertiary Education	1	2.2	1	1.3

Figure 3 show that in both rainforest and derived savanna zones most of *C. albidum* trees are located on the farmlands. None of the respondents had been deliberately involved in planting of *C. albidum* trees.

Dominant reasons by the respondents for not planting the tree was the belief that if *C. albidum* tree is planted, they might experience early or immature death.

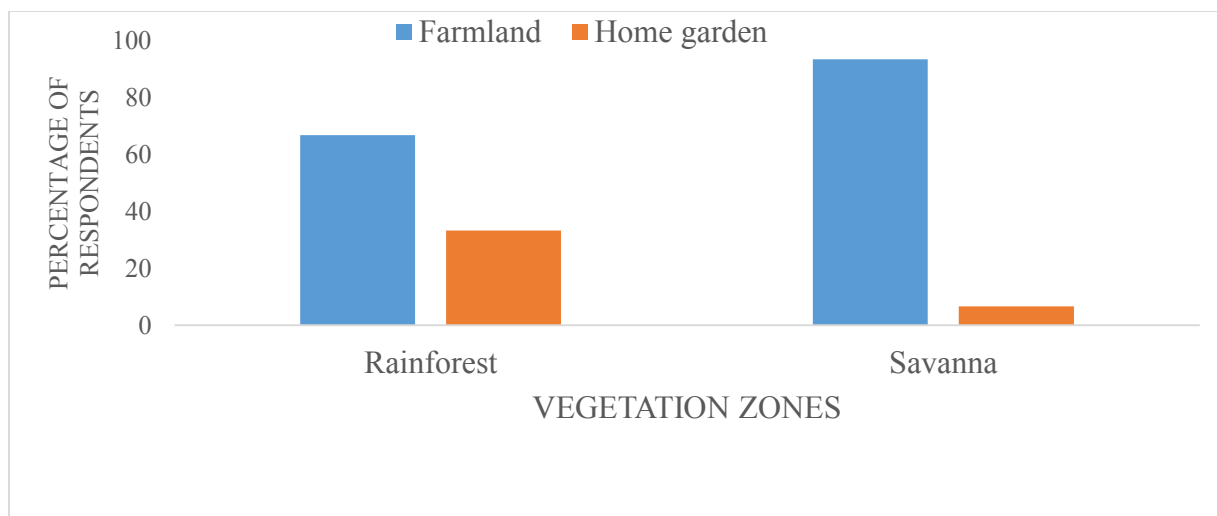


Figure 3: Locations of *Chrysophyllum albidum* trees

Figure 4 highlights the multipurpose uses of *Chrysophyllum albidum* in the study area. The use categories of *C. albidum* in the study area were food, income and medicine. Food and medicine emerged as most dominant use categories among the respondents in both rainforest and savanna part of the study area. The findings confirmed previous

studies that reported on the rich and diverse array of uses of *C. albidum* trees (Falade, 2001; Boateng and Yeboah, 2008; Adu-Boadu, 2009). Besides these common uses, it was also mentioned by Houessou *et.al.*,2012, that *C. albidum* leaves were occasionally used for fodder and rotten or damaged fruits were used to feed pigs

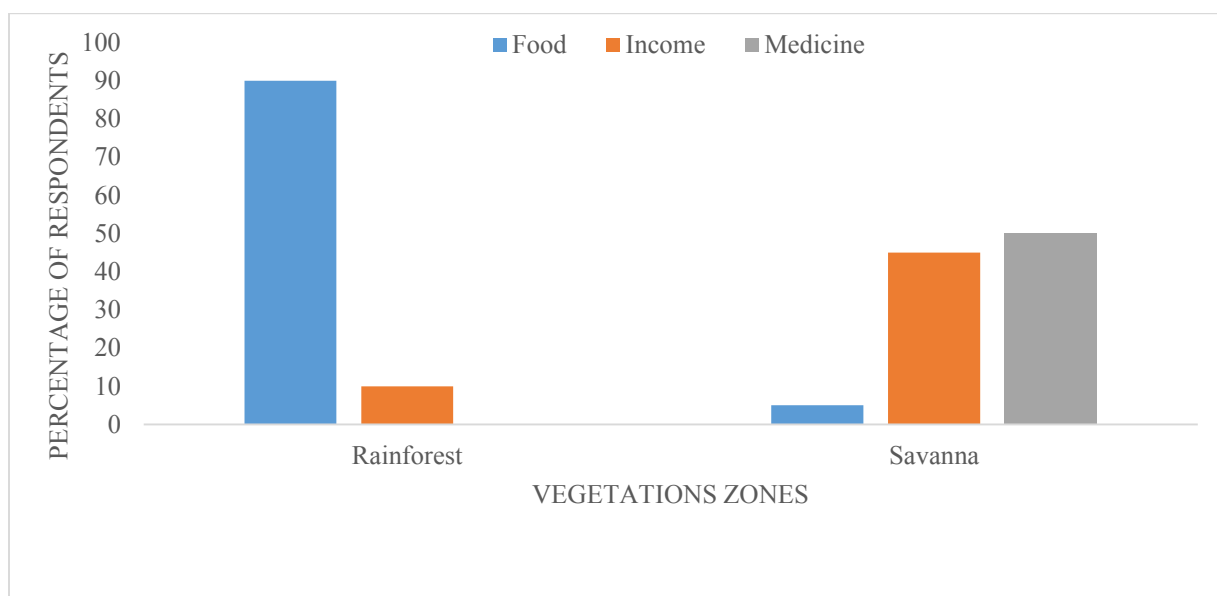


Figure 4: Uses categories of *C. albidum*

The number of trees owned by respondents across the vegetation zones is presented in Figure 6, In the rainforest zone, majority of the respondents (51.1%) had two trees of *C. albidum*, 37.8% had only one

tree, 8.9% had three trees and 2.2% had four trees of *C. albidum*. Majority of the respondents (48%) in the derived savanna zone, had only one tree of *C. albidum*, 33.3% had two trees, 10.7% had three

trees, 2.7% had five trees, 2.7% had six trees, 1.3% had eight trees, and 1.3% had ten trees

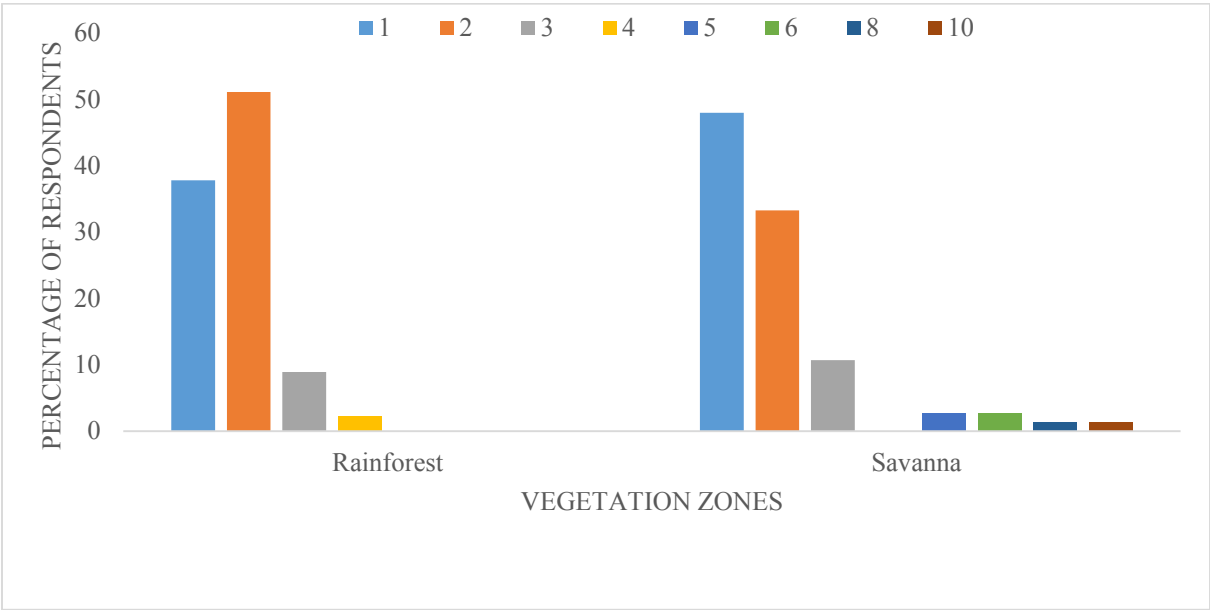


Figure 5: Number of *C. albidum* trees owned by respondents in the study area

The result obtained in this study show that, all the respondents (100%) in both vegetation zones retained *C. albidum* tree, either on their farmlands and/or in their home gardens. Figure 6 shows that in the rainforest zone, majority of the respondents (57.8%) retained *C. albidum* tree for the purpose of food security and income, 40% retained *C. albidum* tree for food security, and only 2.2% retained *C. albidum* tree for food security, income and medicinal purposes. This shows that the people in the rainforest zone have poor knowledge about the medicinal value of *C. albidum*. However, in the

derived savanna zone, 2.7% of the respondents retained *C. albidum* tree for food security, 6.6% for income generation and 52% for medicinal, income, and food security purposes, and 38.7% for food security and income generation. In the rainforest zone, majority of the respondents (88.9%) sell the fruits while on the tree on farmland and the traders harvests the fruits thereafter while 11.1% periodically harvest the fruits from the trees and sell. All the respondents (100%) in the savanna sells the fruits by selling the entire fruits on the tree (Figure 7).

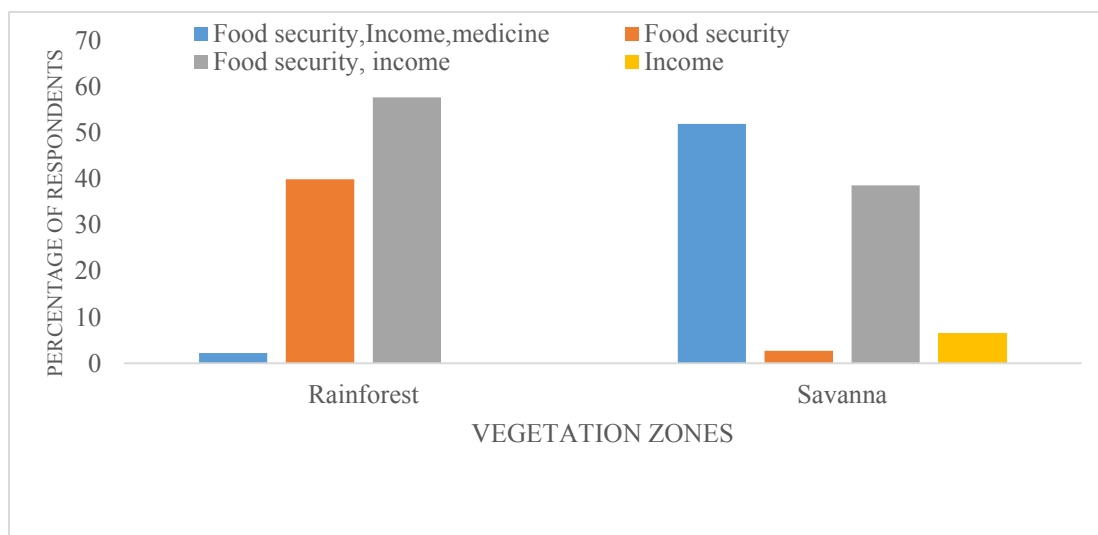


Figure 6: Respondents reasons for retaining *C. albidum*

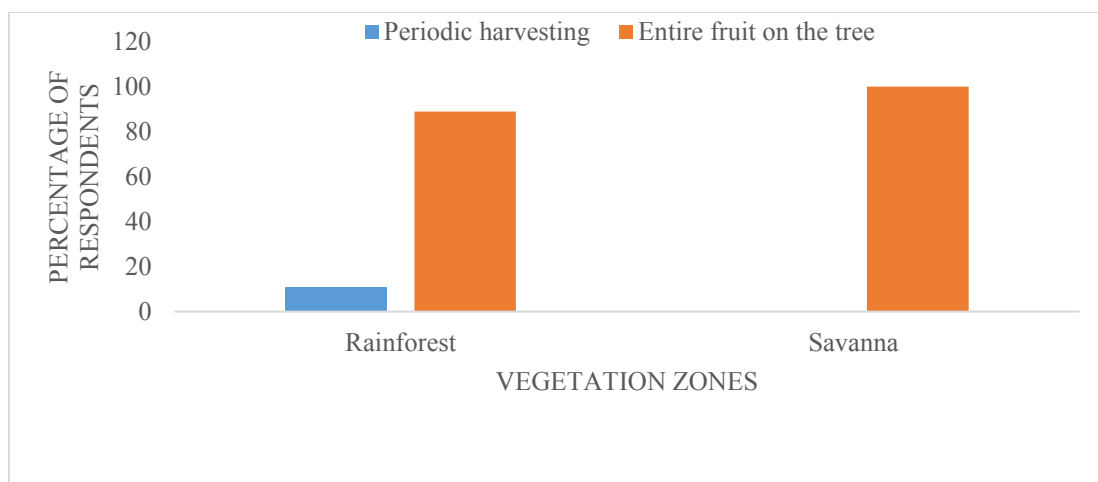


Figure 7: Methods of sales of *C. albidum*

Table 2 shows that, majority (88.9%) of the respondents in the rainforest zone claimed that the cost/basket of *C. albidum* fruits at the farmgate ranged from ₦1,500 - ₦2,000 and 11.1% claimed that it was ₦1, 500 - ₦1, 800 while 100% of the respondents claimed that at the market was ₦1, 500 - ₦2,000. In the derived savanna zone, majority of

the respondents (53.3%) and 46.7% claimed that the cost/basket of *C. albidum* fruits at the farmgate ranged from ₦1,500 - ₦2,000 and ₦1, 500 - ₦1,800 respectively. At the market, majority of the respondents (93.40%), 6.6% claimed that the cost/basket of *C. albidum* fruits ranged from ₦1,500 - ₦2,000, and ₦1,500 - ₦2, 500 respectively.

Table 2: Cost of *C. albidum* fruits in rainforest and derived savanna zones

	Rainforest		Derived Savanna	
	Farmgate (%)	Market (%)	Farmgate (%)	Market (%)
₦ 1,500 - ₦ 1,800	11.1	0.0	46.7	0.0
₦ 1,500 - ₦ 2,000	88.9	100	53.3	93.4
₦ 1,500 - ₦ 2,500	0.0	0.0	0.0	6.6

Figure 8 presents the annual income generated by the respondents. Annual income generated from sale of *C. albidum* fruits ranged from ₦5,000 to ₦150,000 in the rainforest vegetation zone and ₦8,000 to ₦100,000 in the savanna vegetation zone. Generally, higher income was generated from the sale of the species by the marketers in rainforest marketers than derived savanna marketers as indicated in Figure 8. For example, majority of respondents (15.6%) in the rainforest zone realized ₦30,000 while only 2.2% of the respondents realized ₦150,000. In the derived savanna, majority of respondents (29.3%) earned ₦10,000 while 1.3% of the respondents realized ₦85,000. The mean annual income realized from the sales of *C. albidum* fruits were ₦22,955.56 and ₦21,813.33 for the rainforest and derived savanna zones respectively. Based on the fact that a high percentage of traders

generated high annual income from the sale of the fruits, it can be opined that marketing of the fruits is rewarding business. Some other studies conducted in various parts of the world demonstrated that households utilize forest fruits due to their great subsistence role and cash income generation potentials (Kiplagat *et al.*, 2007; Shackleton and Shackleton, 2006). The high annual income recorded in this study is supported by Adedayo (2002) and Bada (1997) in Kwara and Ekiti States respectively. They reported that, large number of rural dwellers in Kwara and Ekiti States earned over ₦200,000.00 per annum from Non-timber forest products marketing. Some researchers (Neumann and Hirsch, 2000; Campbell and Luckert, 2002; Sunderland *et al.*, 2004) have shown that NTFPs could contribute between 25 and 70% to rural household income.

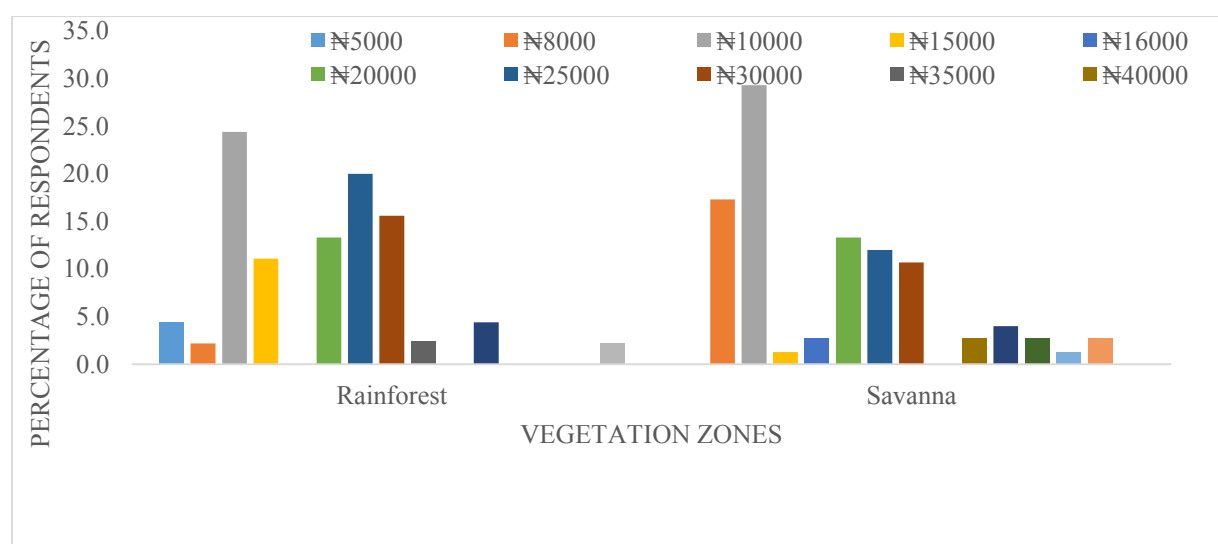


Figure 8: Annual Income from the Sales of *C. albidum* fruits

Figure 9 shows the percentage contribution of *C. albidum* to respondent's total annual income. Result shows that, majority of the respondents (97.8%) claimed that *C. albidum* contributes less than 20% to their total annual income and the remaining 2.2% of

the respondents claimed that *C. albidum* contributes 20-40%. All the respondents (100%) in the derived savanna claimed that, *C. albidum* contributes less than 20% to their total annual income.

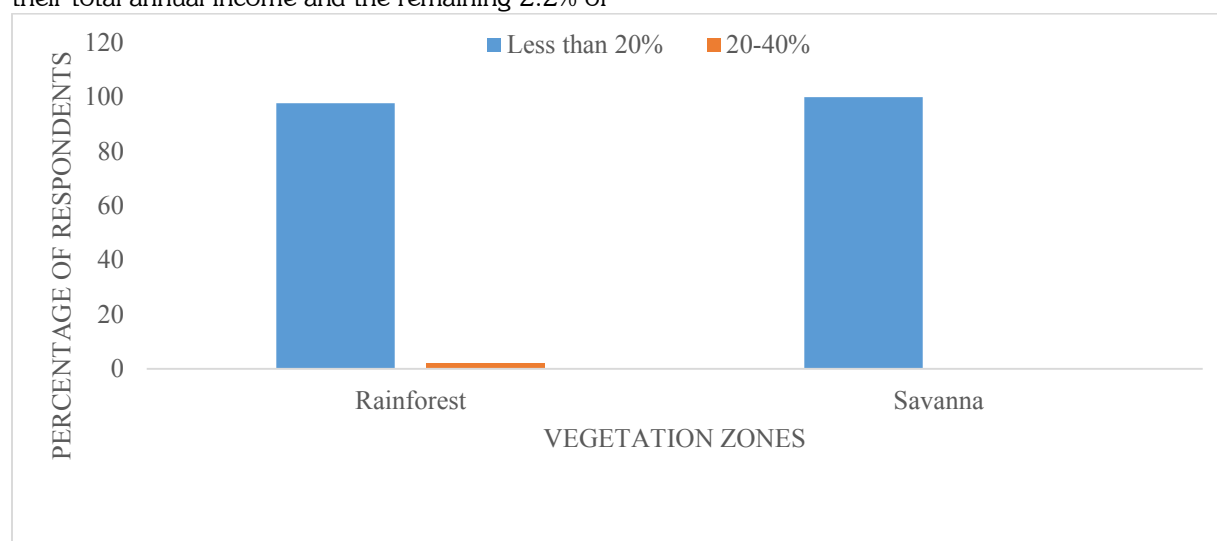


Figure 9: Percentage contribution of *C. albidum* to the total annual income of the respondents.

Conclusion and Recommendation

Chrysophyllum albidum is a multipurpose tree species, which economically important to the two vegetation zones and thus contributes greatly to the socio-economic and sustain the life of the people in Osun State through the production, collection and marketing of its fruits. The people depend on them for medicinal, food and economic purposes which contribute to improve health, nutrition, food security and income to the local communities. Thus, it can serve as an alternative source of food during low production of agricultural products (such as fruits) and source of employment to generate income for unemployed people especially in the rural areas. However, farmers are willing to have more of this multipurpose tree species because it is economically viable, socially accepted, and environmentally sound

when planted. There are indications that, there is a great demand for sweeter and bigger sized fruit and this can be done through tree improvement programme. Full domestication of this valuable fruit tree would be more beneficial and as a companion fruit for perennial crops in Agroforestry system which could have significant effects on food security and income generation by small scale farmers in Nigeria. Consequently, there is need for domestication of *C. albidum* in the study area.

Also, there should provision storage facilities to preserve the fruit from wastage and to generated higher income, especially during offseason period. In addition, *C. albidum* is threatened by logging and deforestation in the study area when visited. Therefore, it is important to develop sustainable strategies for its conservation.

References

- Adams, M., Cousins, B. and S. Manona, (2000): *Land tenure and economic development in rural South Africa: constraints and opportunities*. Overseas Development Institute, United Kingdom. Working Paper 125, 35pp. ISBN 0 85003 439 6.
- Adedayo, A.G (2002): Gender Roles in Forest Resource Utilization and its Impact on Rural Environment in Kwara State, Nigeria.

- Nigeria Journal of Forestry*, 33 (1&2): 17-22.
- Adekunle, M.F., Oluwalana, S.A., and Onadeko, S.A., (1999). Omo Forest Reserve, Ogun State, Nigeria. *Journal of Tropical Ethnobotany*. 2 (1): 23-33.
- Adhikari, M., Nagata, S. and M. Adhikari, (2004): Rural household and forest: an evaluation of household's dependency on community forest in Nepal. *Journal of Forest Research*, 9:33-44
- Adisa, S.A., (2000). Vitamin C, Protein and Mineral content of African Apple (*Chrysophyllum albidum*). In *proceedings of the 18th Annual Conference of NIST*. Edited by Garba, S.A., Ijagbone I.F., Iyagba, A.O., Iyamu, A.O., Kiliani, A.S., Ufaruna, N; 141-146
- Adu-Boadu M. (2009). Evaluation of the agroforestry potential of *Chrysophyllum albidum* in the Akuapem North District. *Unpublished Msc thesis*. College of Agriculture and Natural Resources. Kwame Nkrumah University of Science and Technology, Ghana. 420pp.
- Agbelade, A.D. and Onyekwelu, J.C., (2012). Market Potential of Socio-Economic Contributions of *Chrysophyllum albidum* to Livelihood Sustainability in Two Ecological Zones of Ondo State. *For. and For. Prod. J.*
- Amusa, N.A., Ashaye, O.A and Oladapo, M.O., (2003). Biodeterioration of African star apple (*Chrysophyllum albidum*) in storage and effect on its food value. *Afr.J.Biotechnol.* 2:56-59
- Ajewole, K. and Adeyeye, A. (1991). Seed oil of white star apple (*Chrysophyllum albidum*) physio-chemical characteristics and fatty acid composition, *Journal of Science, food and Agriculture*. 54.313- 315.
- Ajibefun, I.A., Daramola A.G. and A.O. Falusi (2006): Technical Efficiency of Small-scale Farmers: An Application of the Stochastic Frontier to Rural and Urban Farmers in Ondo State, Nigeria. *International Economic Journal*, 20 (1): 87-104.
- Ayuk ET, Duguma B, Franzel S, Kengue J, Mollet M, Tiki-Manga T, and Zenkeng P. (1999a). Uses, management and economic potential of *Garcinia kola* and *Ricinodendron heudelotii* in the humid lowlands of Cameroon. *J Trop For Sci*. 11:746-761.
- Ayuk E. T., Duguma B., Franzel S., Kengue J., Mollet M. Tiki-Manga T. and Zenkeng P., (1999b). Uses, management and economic potential of *Irvingia gabonensis* in the humid lowlands of Cameroon. *Forest Ecology and Management*, 113: 1-9.
- Bada, S.O. (1997). Preliminary information on the ecology of *Chrysophyllum albidum* G. Don, in West and Central Africa, In: *Proceedings of a National Workshop on the Potentials of the Star Apple in Nigeria CENTRAD Nigeria Ibadan*.
- Barany M, Hammett, A. L., Sene, A., Amicher, B. (2001). Non timber forest benefits and HIV/AIDS in Sub Saharan Africa. *J. For.* 99:36-42.
- Boateng, S.K., and Yeboah, E.A., (2008). A study of areas of cultivation and Marketing of *Chrysophyllum albidum* fruits in the Eastern Region of Ghana. Develop Africa Foundation. [http://www.dafoafrica.eu/?content=lands/ghana/ghana asoacamocafiterog](http://www.dafoafrica.eu/?content=lands/ghana/ghana%20asoacamocafiterog). 9pp
- Bolanle-Ojo, O.T. and Onyekwelu J.C. (2014). Socio-economic importance of *Chrysophyllum albidum* G. DON. in Rainforest and derived savanna ecosystem of Ondo State, Nigeria. *European Journal of Agriculture and Forestry Research*, 2(.3): 43-51.
- Campbell, B.M., Luckert, M.K. (2002). *Towards understanding the role of forests in rural livelihoods*. People and Plants Conservation Series In: Luckert, M.K. and Campbell, B.M. (eds.). Uncovering the hidden harvest: valuation methods for woodlands and forest resources. :1-12. London, UK, Earthscan Publications. <https://hdl.handle.net/10568/18475>
- CENRAD, (1999): Centre for environmental renewable natural resources management,

- research and development, Jericho Ibadan publication number CEN., 011/1999 85.
- Chigbu, K., Chigbu, U. E and Onyekwelu, J.C. (2011). Non-Timber Forest Products for rural livelihood security: evidence from Akure markets, Nigeria. *Applied Tropical Agriculture*, 16:60 – 68.
- 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. *Sci. Res Essay*, 3(12), 567–570.
- Falade K., (2001). Drying, sorption, sensory and microbiological characteristics of osmotically dried African star apple and African wild mango. *Unpublished PhD thesis*, University of Ibadan.432pp.
- FORMECU, (1999). Forest Resources Study, Nigeria. Revised national report Vol. 2. Prepared for FORMECU by Beak and Geomatics international, 224pp.
- Franzel, S. Akinnifesi, F.K. and Ham, C. (2008): Setting priorities among indigenous fruit tree species in Africa: example from southern, eastern and western Africa. In: Part I - Indigenous fruit trees in the tropics: domestication, utilisation and commercialisation (Akinnifesi *et al.*, editors), CAB International, pp 1 – 27
- Houessou, L.G., Toussaint, O.L., Francois, G.H., Lisette, E.S., and Brice, S., (2012). Ethnobotanical study of the African star apple (*Chrysophyllum albidum* G. Don) in the Southern Benin (West Africa). *Journal of Ethnobiology and Ethnomedicine*, 8:40.
- Kiplagat, A.K., D.N. Mugendi and J. Mburu, (2007): Valuation of the Economic Role of NTFPs Consumption by Rural Households Living Around Kakamega Forest, Western Kenya. Paper presented at Tropentag, October 9-11, 2007, Witzhausen, Germany. 21pp.
- Neumann, R.P. and Hirsch, E. (2000): Commercialisation of Non-timber Forest Products: Review and Analysis of Research. Centre for International Forestry Research (CIFOR), Bogor, Indonesia. 176 pp.
- Okafor, J.C., (1991). Improving edible species of forest products. *Unasylva* 42(165): 17-22
- Onyekwelu, J.C. and Stimm, B., (2011). *Chrysophyllum albidum*. In: Roloff, A.; Weisgerber, H.;Lang, U.; Stimm, B. (Eds.): *Enzyklopädie der Holzgewächse*, Wiley-VCH, Weinheim, 59.Erg.Lfg. 10/11, 12pp.
- Onyekwelu J.C., Stimm B., Monardl R., and Johnson O. A. (2011): Domestication of *Chrysophyllum albidum* from rainforest and derived savanna ecosystem - phenotype variation and selection of elite trees”. Conference on International Research on Food Security, Natural Resource Management and Rural Development.
- Onyekwelu J. C., Johnson O. A., Stimm, B., Monardl,R. Mosandl and Agbelade A. D., (2015). Farm-level tree growth characteristics, fruit phenotypic variation and market potential assessment of three socio-economically important forest fruit tree species, *Forest, Trees and Livelihoods*, 24:1, 27-42, DOI: 10.1080/14728028.2014.942386
- Shackleton C.M. and Shackleton S.E. (2006): The use of woodland resource for direct household provisioning. In *Indigenous Forests and Woodlands in South Africa: Policy, People and Practice*, In: M. Lawes, H. Eeley, C.M. Shackleton and B.S. Geach, (eds). University of KwaZulu-Natal Press, Pietermaritzburg. Pp 195–226
- Stoian, D. (2005). Making the Best of Two Worlds: Rural and Peri-Urban Livelihood Options Sustained by Nontimber Forest Products from the Bolivian Amazon. *World Development* 33(9):1473-1490
- Sunderland, T.C.H, Harrison, S.T. and Ndoye, O. (2004). “Commercialisation of non-timber forest products in Africa: history, context and prospects”. In: Sunderland, T.C.H and Ndoye, O. (eds), *Forest products livelihood conservation: case*

- studies of non-timber forest product systems, CIFR, Indonesia, 2, pp. 1-24.
- Ureigho, U.N., and Ekeke, B.A., (2010). Nutrient values of *Chrysophyllum albidum* Linn African Star Apple as a Domestic Plantation Species. An International Multi-Disciplinary Journal, 4 (2): 50-56.