



Market Potentials and Socio-Economic Contributions of *Chrysophyllum albidum* to Livelihood Sustainability in Two Ecological Zones of Ondo State, Nigeria

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Abstract

This research work was carried out in the rainforest and derived savanna ecosystems of Ondo State, Nigeria to investigate the market potentials and socio-economic contributions of *Chrysophyllum albidum* to rural livelihood sustainability. Three villages and six markets (comprising of three urban and three rural markets) were purposely selected from each ecological zone for on-farm and market assessments, respectively. Two categories of pre-tested structured questionnaires were used to obtain information from the respondents. Farmers in both ecosystems were between 31 and over 60 years old, while the traders were between 21 and 60 years old. Majority of the farmers (37.5 – 80%) and traders (51 – 85.7%) in both ecosystems did not have formal education. A high percentage (92.3% to 100.0%) of *C. albidum* trees were found within farmlands. Depending on the ecological zone, the tree species could produce between 200 and over 1000 fruits. The fruit was being used for various purposes including food, nutritional supplements, income generation, medicinal, etc. While majority of the farmers (54.2 to 100.0%) harvested and semi-processed the fruits before sale, a few (4.8 to 29.0%) were 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 ₦150,000.00 and ₦200,000.00 in derived savanna and rainforest ecosystems, respectively. This research paper highlights the market potentials and the socio-economic contributions of *Chrysophyllum albidum* in two ecological zones of Ondo State, Nigeria.

Keyword: Market potentials, Socio-economic contribution, *Chrysophyllum albidum*, Livelihood sustainability, Rainforest and derived savanna Ecological zones

Introduction

The collection, processing and sale of the fruits, seeds, leaves, root, etc, as well as marketing of the products of forest food tree species, provide food necessary for survival, employment and enhance economic empowerment of rural dwellers, thus contributing significantly to rural poverty alleviation. *Chrysophyllum albidum* (Linn.) (Africa star apple) belongs to the Sapotaceae family. It is primarily a forest tree species, whose natural occurrences have been reported in diverse ecological zones in Nigeria, Uganda, Niger Republic, Cameroon and Cote d'Ivoire (Bada, 1997; Onyekwelu and Stimm, 2011). *Chrysophyllum albidum* fruits are harvested annually between December and April, which makes it a highly seasonal product. The plant has in recent times become a crop of

commercial value and it is highly embraced by people for food in Nigeria and other West African countries (Onyekwelu and Stimm, 2011). The fruit's fleshy pulp is eaten as snack and relished by both young and old (CENRAD, 1999). The African star apple fruit has been found to have 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. 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 market potentials and socio-economic contributions of *Chrysophyllum albidum* to rural livelihood in the derived savanna and rainforest ecological zones of Ondo State, Nigeria.

Research Methodology

Data for this study were collected using two sets of structured questionnaires. The first category of questionnaire (farm level questionnaire) was used to obtain information (e.g. annual fruit yield, demand for the fruits, market potentials, annual income from sale of the fruits, etc) from farmers in the study area. The second set of questionnaire (market level

questionnaire) was used to collect data on fruit price, demand and supply from traders who market the fruit. From each of the six villages sampled, ten farmers with *C. albidum* trees on their farms, home gardens or fallow field were purposely selected and the questionnaire administered to them. For the market analysis, ten respondents were purposely selected from the twelve markets (six rural and six urban markets) and the questionnaires administered to them. Thus a total of 60 questionnaires were administered to farmers while 120 questionnaires were administered to traders within nine (9) local government in Ondo State, Nigeria (figure 1).

Descriptive statistics such as frequency and percentage distribution, tables, graphs and Bar charts was used to summarize and represent the results. In addition, analysis of variance (ANOVA) arranged in randomized complete block design was also employed to test for the significance of some variables (e.g. price) of the three market structure (farm gate price, rural market price and urban market price) from the two ecological zones.

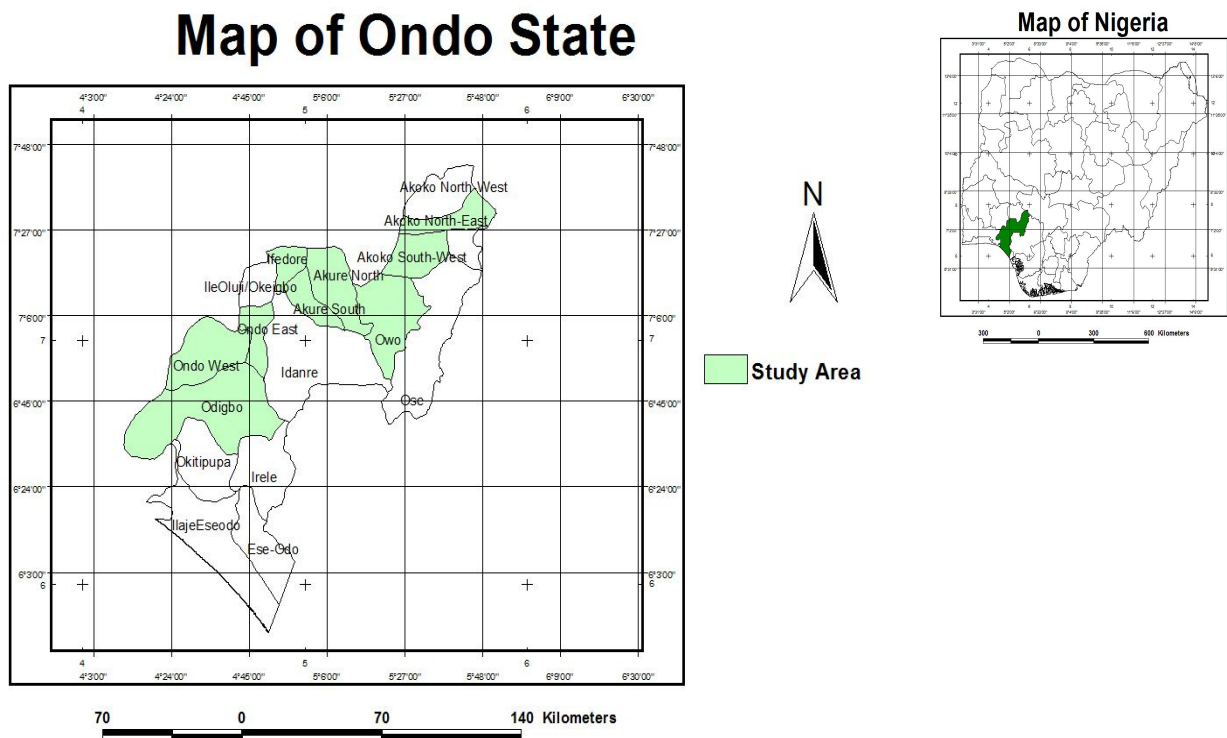


Figure 1: Map of Ondo State Showing the Study area

Results

The research work covered a total of 18 communities: 12 communities were sampled for market potentials analysis of the fruit while 6 communities were sampled for the on-farm assessment. The major occupations in all the sampled respondents in the study area are farming and trading. The age range of traders of the fruits of the species in rainforest and derived savanna ecosystems was between 21 to 60 years (Table 1). However, there was indication that majority of the traders of *C. albidum* fruits were middle aged. For example, results in Table 1 show that between 80% and 93% of traders of *C. albidum* in the rainforest ecosystem were between 31 and 50 years old. In the derived savanna ecosystem, the traders were between the age of 31 and 60 years (Table 1). Traders of *C. albidum* fruits in rural markets were generally older than their counterparts in urban markets (Table 1). Elderly people were more involved in the farming of *C. albidum*. In both ecological zones, between 70 and 90% of the farmers were 50 years and above while between 33.3 and 48.4% were above 60 years old. Middle aged people were not fully

involved in the production of the species, as only between 4.2 and 9.7% of the farmer are between 31 – 40 years old.

The result reveals that the female folks were more involved in the marketing of *C. albidum* fruits as shown in Table 2. All the *C. albidum* fruit marketers (100%) in rural markets in the rainforest ecosystem were females while 40% and 60% of the traders in urban markets in the rainforest ecosystem were males and females, respectively (Table 2). In the derived savanna ecosystem, all the traders of species in both rural and urban markets were female (Table 2). The dominant religions of respondents in the urban and rural areas in the two ecosystems were Christianity and Islam (Tables 2). While 100% of traders of *C. albidum* in rural markets in the rainforest ecosystem were Christians, 46.7 and 53.3% of traders of the species in urban markets in the same ecosystem were Christians and Muslims, respectively. In the derived savanna ecosystem, 38.5% and 61.5% of the traders in rural markets were Christians and Muslims, respectively while in urban markets 87.5% were Christians while 12.5 were Muslims.

Table 1: Age Distribution (%) of traders of *C. albidum* fruits in the rainforest and derived savanna ecological zones of Ondo State

Age Range	Rainforest		Derived Savanna	
	Rural Market	Urban Market	Rural Market	Urban Market
21-30 yrs	20.0	6.7	0.0	0.0
31-40 yrs	50.0	53.3	14.3	10.0
41-50 yrs	30.0	40.0	71.4	80.0
51-60 yrs	0.0	0.0	14.3	10.0

Table 2: Gender and Religious status (%) of traders of *C. albidum* fruits in the rainforest and derived savanna ecological zones of Ondo State

	Rainforest		Derived Savanna	
	Rural Market	Urban Market	Rural Market	Urban Market
Gender:				
Male	0	40	0	0
Female	100	60	100	100
Religion:				
Christianity	100	46.7	0	80
Traditional	0	0	0	0
Islam	0	53.3	100	20

Majority of the respondents in the markets (rural and urban) in both ecosystems did not have formal education (Table 3). Results indicate that between 37.5% and 80.0% of the traders in both rural and urban markets in the two ecological zones had no formal education. While between 6.2% and 42.9% of the traders had maximum of primary education, between 9.1% and 37.5% of the respondent had education up to secondary school level. Only few traders (between 5.3% and 18.2%) in the rural and urban markets in the two ecological zones involved in the sales of *C. albidum* fruits had post secondary education (Table 3).

A high percentage of *C. albidum* trees were located within farmlands in the two ecological zones. Results revealed that between 98.3% and 100.0% of all the trees were located

within farmlands. In the two ecological zones, majority of the farmers usually sell their fruits by harvesting the fruits and semi-processing them before selling to wholesalers, retailers or consumers. Most of the respondent (between 54.2% and 100.0%) harvest their fruits before selling them, while between 4.8% to 29.0% of the respondents sell the fruits while on the tree on farmland and the trader harvests the fruits thereafter (Figure 2). A large number of fruits were found on individual *C. albidum* trees in the two ecological zones. However, farmers differed greatly on the approximate number of fruits produced by this species in the two ecological zones. Results indicated that farmers believed that between 200 and more than 1000 fruits were produced by trees of the species (Figure 3).

Table 3: Educational Status (%) of traders of *C. albidum* fruits in the rainforest and derived savanna ecological zones of Ondo State.

	Rainforest		Derived Savanna	
	Rural Market	Urban Market	Rural Market	Urban Market
No Formal Education	50.0	53.3	42.9	70.0
Pry Education	20.0	6.7	42.9	0.0
Sec. Education	30.0	26.7	14.2	20.0
Post Sec. Education	0.0	13.3	0.0	10.0

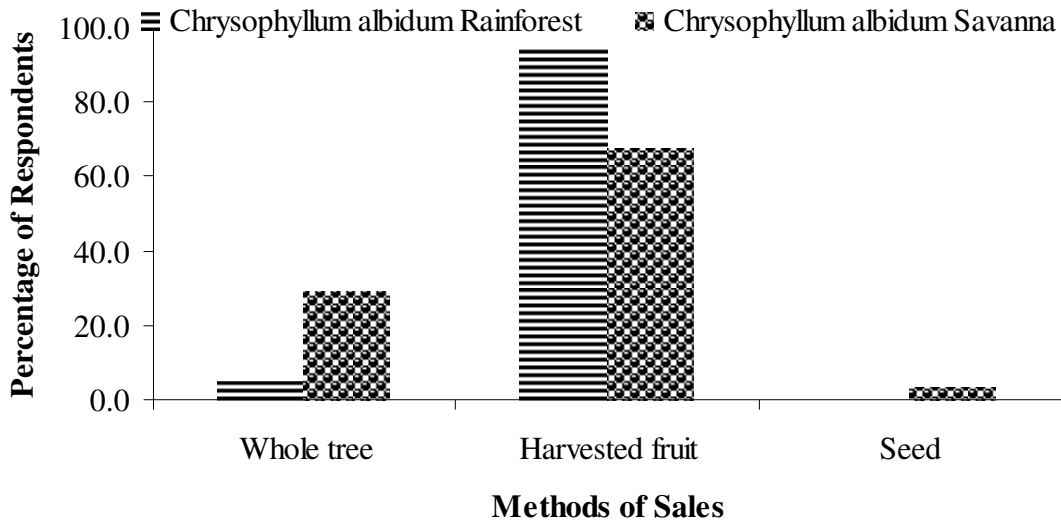


Figure 2: Methods of sales of *C. albidum* fruits

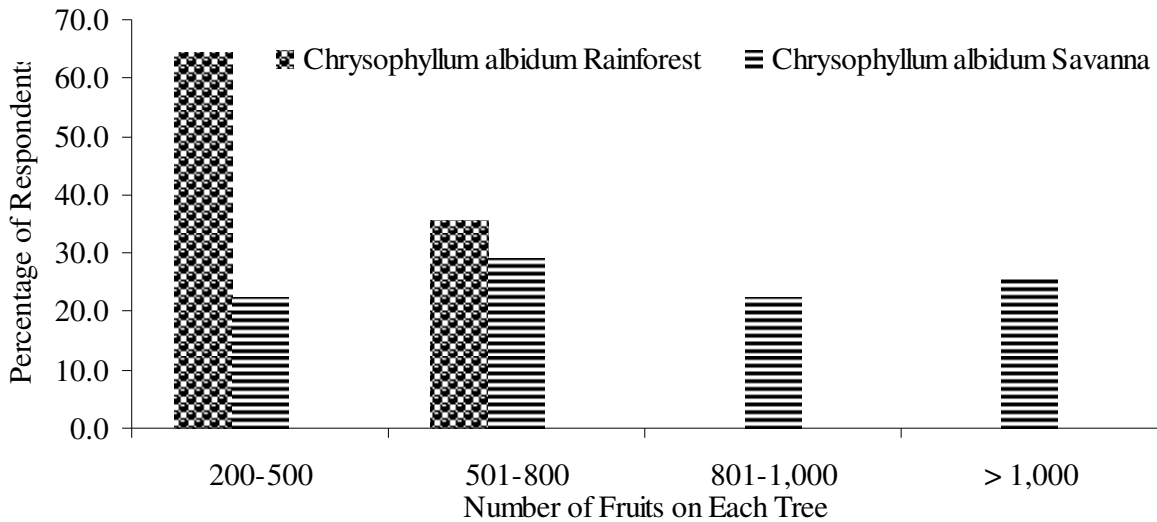


Figure 3: Approximate Numbers of Fruits produced by individual *C. albidum* trees

The result of the study indicated that *C. albidum* fruits were being used for various purposes such as food, nutritional supplements, income generation, and medicinal, etc (Figure 4). A High percentage (64.5% and 90.5%) of respondents within the two ecological zones indicated that *C. albidum* was used for food, medicinal and economic purposes (e.g. income generation). However, there was indication that food supplement and income generation were the main motivating factors for conserving and

or planting this species. The producers (farmers) of the forest fruit species generated less income than the traders across the two ecological zones. The result of income generation shows that 3.2% of the farmers in the two ecological zones generated annual income of less than ₦50,000 Naira (₦) (Figure 5). Higher percentage of farmer (between 23.1% and 76.9%) had annual income of between ₦50,000 to ₦150,000 Naira (₦) from the sale of the fruits in the two ecological zones.

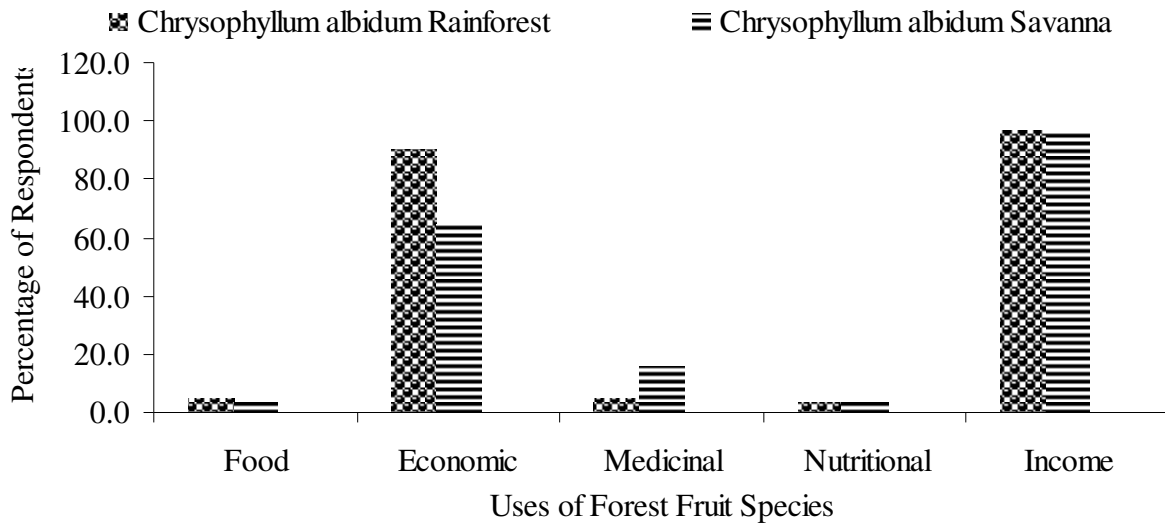


Figure 4: Uses of *C. albidum* fruits in the rainforest and derived savanna ecological zones

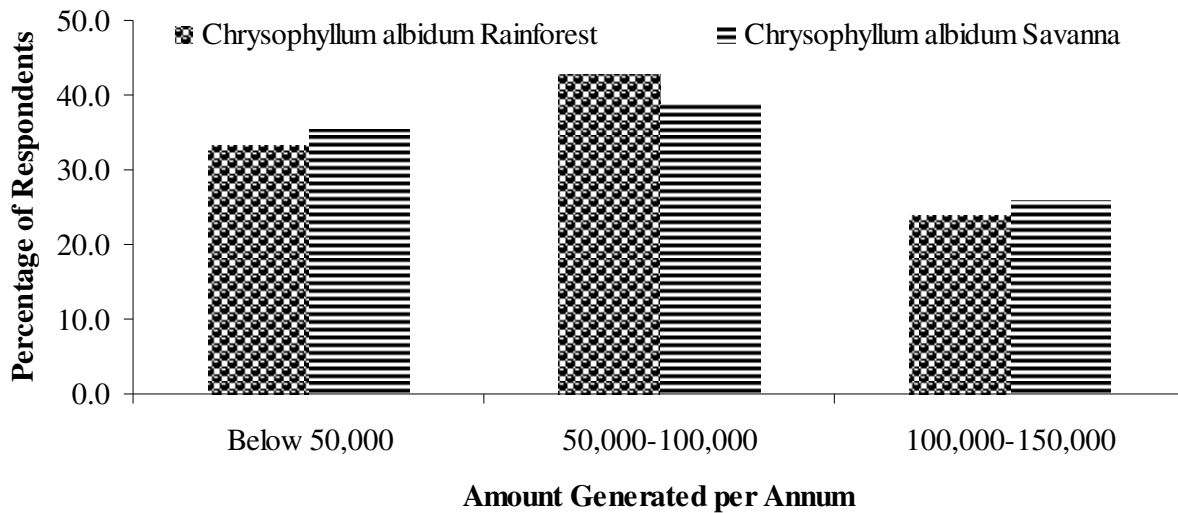


Figure 5: Farmers income generated (in Naira) from sale of *C. albidum* fruits in the two Ecological zones

Annual income generated from sale of *C. albidum* fruits ranged from $\text{N}50,000.00$ to >math>\text{N}200,000.00</math> in the derived savanna ecosystem and >math>\text{N} 50,000.00</math> to >math>\text{N} 200,000.00</math> in the rainforest ecosystem. Generally, higher income was generated from the sale of the species by the marketer in urban markets than rural markets as indicated in Table 4. For example while between 53.3 and 70% of traders in urban markets in the rainforest ecosystem generated over >math>\text{N}200,000.00</math> per annum, only between 27.3 and 31.6% of traders in rural markets generated as much. In the derived savanna majority of urban market traders earned between >math>\text{N}100,000.00</math> and >math>\text{N}200,000.00</math> while in rural markets, majority earned between $\text{N}50,000.00$ to >math>\text{N}100,000.00</math>. The result indicated that a high percentage (up to 71.4%) of

traders in the derived savanna ecosystem generated low annual income of >math>\text{N}50,000</math> Naira (>math>\text{N}</math>) (Table 4).

The results of Analysis of variance indicated that there are significant differences between the average annual incomes generated from the sale of the fruit and the production of the fruit within the two ecological zones, as well as between the annual incomes from the various market types. Average annual income generated at urban markets in the rainforest ecosystem was >math>\text{N}245,635.00</math>, while it was only >math>\text{N}76,967.00</math> at farm gate, a difference of over 180% (Table 5). The difference in annual income generation at urban markets (>math>\text{N}175,470.00</math>) and farm gates (>math>\text{N}97,030.00</math>) in derived savanna ecosystem was about 300%. Annual income generated from rural

markets in the two ecological zones was significantly higher than that of on-farm (farm gate) income generation, which is the least and

less than ₦100, 000.00 Naira per annum within the two ecological zones.

Table 4: Annual income generated (in Naira) from sale of *C. albidum* fruits in the rainforest and derived savannah ecological zones

	Rainforest		Derived Savanna	
	Rural Market	Urban Market	Rural Market	Urban Market
< 50,000	10.0	0.0	71.4	0.0
50,001-100,000	20.0	0.0	20.0	10.0
100,001-150,000	10.0	20.0	20.6	60.0
150,001-200,000	60.0	20.0	0.0	20.0
> 200,000	0.0	60.0	0.0	10.0

Table 5: Results of analysis of variance for mean annual income (in Naira) generated from the sale of *C. albidum* fruits in the two ecological zones and the three market types

Ecological zones	On-farm	Rural Market	Urban Market
Rainforest	76,967 ^b	129,450 ^a	245,635 ^a
Derived savanna	97,030 ^a	118,658 ^b	175,470 ^b

Means on the same row with the same superscripts are not significantly different from each other at 0.05 level of significance.

Discussion

Results indicated that majority (between 70 and 90%) of the farmer involved in the production of *C. albidum* fruits were elderly people (between 51 and over 60 years), which implies that the population involved in the production of the species is aging. Unlike the population involved in the production of the species, majority of the population involved in marketing of the fruits of the species in rural and urban markets in the two ecological zones could be categorized as middle aged (between 31-50). The high percentage of middle aged (i.e. working-age adults) found in the markets within the two ecological zones is an indication that they have high tendency to generate higher income from the sales of fruits as observed by Falconer, (1995), which is also similar to the view of Ajibefun *et al.* (2006). Results show that about 85.7% and 51.6% of farmers of *C. albidum* in the rainforest and derived savanna ecosystem respectively had no formal education, thus indicating that majority of those involved in the production and sale of the species do not have formal education. 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 (2003) 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). Thus, the lack of formal education among *C. albidum* farmer and traders may hinder their ability to adopt modern market strategies as well as modern farming technologies such as biotechnology, genetic engineering, etc.

Occupation structure reflects the nature of local economy and various commercial and employment opportunity of the people of the area. All respondents involved in the production of the species had farming as their major occupation while all those involved in the sale of the fruits had trading as their major livelihood sustenance. This finding agrees with those of Bada (1997) and Adekunle *et al.* (1999). The indication from this research is that the contributions of forest food tree species to rural livelihood could range from food, medicinal to economic purposes. 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). Based on the fact that a high percentage of traders generated high annual income of between ₦100,000.00 to over ₦200,000.00 from the sale of the fruits, it can be opined that marketing of the fruits is rewarding business. The study also shows that higher income is generated from the sales of the fruits in the rainforest than the derived savanna ecosystem. The high annual income recorded in this study is supported by the study conducted in Kwara and Ekiti States by Adedayo (2002) and Bada (1997), who reported that large number of rural dwellers in Kwara and Ekiti States earn 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.

Bearing in mind that the fruits of the species are usually available at a critical period in the year (January to April) makes it nutritionally and socio-economically important for livelihood sustainability. The period November to April, is the so-called “hungry season” because it the period of planting of agricultural crops, making the agricultural crops unavailable for food. Thus, the availability of the fruits at this critical period makes it to contribute immensely to food security and livelihood sustainability of the people. In many cases, the income obtained from the sale of the fruits at this time of the year is particularly important at times of economic need such as payment of school fees, medical bills and other basic expenses. In addition it enables rural households to purchase consumable goods or provides seasonal income when agricultural labour needs are low, particularly in the rainy season (Sunderland *et al.*, 2004).

Conclusion

The production, collection and marketing of *C. albidum* fruits contribute to the socio-economics and livelihood sustenance of the people in the rainforest and derived savanna ecosystem of Ondo State. The people depend on the fruit for medicinal, food and economic purposes. Thus, it can serve as safety net particularly during shortfall in agricultural production and thus fill the gap of food shortage and reduce malnutrition. Most of those involved in the marketing of the species were women

with little or no formal education. Prices of the fruit were highest at the urban market and lowest at farm gate. There was poor market access and infrastructures in the different market visited, thus improving the existing market infrastructures will address the problems that limit the development of the market potential of the fruit. Establishment of cottage industries to process the fruit and thus attract higher prices should be encouraged. Also storage facilities should be provided to preserve the fruit to reduce wastage and generated higher income, especially during offseason period. Domestication of this forest fruit species in the household-operated marginal lands and home gardens should be encouraged to increase its potentials to contribute to rural income generation.

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