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308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

The Role of Locust Bean and Ironwood Trees in Human Nutrition and Income in Nigeria

T.N. Tee¹, J.A. Ogwuche² and E.T. Ikyagba¹

¹Department of Social and Environmental Forestry, College of Forestry and Fisheries,
University of Agriculture, Makurdi, Benues State, Nigeria

²Department of Geography, Faculty of Social Sciences, Benue State University, Makurdi, Nigeria

Abstract: This study was conducted in North-Central Nigeria to access the role of African locust bean tree and Ironwood tree in the nutrition and income of the people in this area. Through focus group discussions with key informants and interviews held with 120 household heads, information on the contribution of the 2 tree species to households nutrition and income in the area were elicited between July, 2008 and February, 2009. Market survey of mean retail prices and operational costs of products from these trees were also recorded for analysis. Using Gross income and Total variable cost, Net incomes from each product was determined. The result revealed that both trees contributed significantly to the nutritional wellbeing of the people of North-Central Nigeria; and that their monthly net incomes from products of these trees compared favourably with the national minimum wage of N7500 (USD59 equivalence). Many of them were living above the national minimum wage. However, the sustainability of these benefits is threatened as these trees are being subjected to over exploitation and very limited efforts at establishing their plantations and maintaining their populations in the wild. The study therefore recommended improved harvesting and post-harvest techniques, intensive silvicultural research, and the establishment of plantations of these tree species in the area and beyond. Similarly, improved pricing policies and enhanced processing and marketing of products from these species for value addition are strongly recommended.

Key words: Locust bean, Ironwood, income, nutrition, North-Central Nigeria

INTRODUCTION

Non-Timber Forest Tree Resources (NTFTRs) have vital contribution to the wellbeing of the rural poor. They provide food, income sources and raw materials for cottage industries that have supplied life-sustaining strategies in the rural economies (Popoola and Maishanu, 1995). Consequently, agrarian communities directly or indirectly sustain their livelihoods on these resources.

In most of these agrarian communities, Nigeria inclusive, forest foods are essential dietary supplements especially during lean agricultural production periods or times of emergency. The Nigerian Study/Action Team (NEST, 1991) submitted that leaves, fruits, nuts and oils obtained from wild plants have provided food for humans, livestock and wildlife in many parts of the country. Kopell (1993) also reported that in India, the NTFTRs sector provided over 30 million jobs to people. Furthermore, in Pakistan, Latiff *et al.* (2002) reported that forest resources directly contributed up to 80% of the livelihoods of the people in that country living in extreme poverty. In a study on charcoal production in Ghana, Blay *et al.* (2007) reported that over 80% of respondents depended on charcoal production as the main sustainable source of livelihood. In North-eastern Nigeria, *Borassus aethiopum*, and *Adansonia digitata* provided food, income and employment to the people

(Tee and Popoola, 2007; Tella *et al.*, 2008; Tee and Verinumbe, 2007). Bread fruit (*Artocarpus altilis*), *Dacryodes edulis*, *Gnetum africana* and *Iringia gabonensis* have been identified in different locations in Nigeria as important NTFTRs providing carbohydrates, proteins, vitamins and minerals to mankind and animals (Oduro *et al.*, 2007; Popoola and Galaudu, 2000; Aju *et al.*, 2008). Socially, NTFTRs are known to play crucial role in reducing social tensions within rural households by providing cash incomes to cover basic needs; shelter, food, clothes, school and medical fees and transportation (Non-wood News, 2008). The NTFTRs therefore have comparable and in some cases superior nutritional qualities to domesticated breeds and varieties. They provide protein, energy, starch, vitamins and essential minerals to human diet. Above all, they also provide income and employment opportunities to rural and urban households.

In spite of all these benefits, large deposits of NTFTRs in Nigeria are still being managed and utilized sub-optimally (Popoola and Oluwalana, 2001; Tee and Amonum, 2008). It is therefore imperative that NTFTRs policies, regulations and management strategies are needed to foster economic, nutritional and cultural wellbeing of the people. This could only be achieved if information is available. According to Popoola and Oluwalana (2001), Nigeria forests contain over 600

species of plants used mainly as timber. However, it may be an under-estimation to submit that this number is barely a tenth of the number of non-timber species contained in Nigeria forest. The North central part of Nigeria is located within a transitional zone; between the tropical high rain forest of the Southern part of Nigeria and the Sahel savannah dry lands in the North. Thus, its climatic condition is adoptable to a variety of NTFTRs. Some common NTFTRs in the region are *Vitex doniana*, *Vitellaria paradoxa*, *Irvingia gabonensis*, *Dacryodes edulis*, *Annona senegalensis*, *Azelia africana* and *Ficus Species*. Others are *Parkia biglobosa*, *Prosopis africana*, *Acacia Species*, *Borassus aethiopum*, *Adansonia digitata* and *Tamirandus indica* to mention but few (Verinumbe, 1991). Over 90 species of NTFTRs have been identified in the region (Keay, 1989; Nwoboshi, 1982).

Although many of these NTFTRs are widely utilized in the Countryside in Nigerian, such uses are often not documented since they occur in anecdotal and at the informal sector level. Many of them also have non-use values that need to be developed and popularised. These situations make this study on the African locust bean [*Parkia biglobosa*(Jacq) Benth] and Iron wood [*Prosopis africana* (Guill and Perr) Taub] trees an imperative in North-central Nigeria. The trees are well known in the region for their nutritional and economic services. They make special spices in local relishes in the region and also serve economic (income, employment and trade) purposes. The paper is therefore a surveillance report through observation and review of the nutritional and economic values of African locust bean tree and Iron wood tree to mankind in North-central Nigeria. The motive was to bring home their importance and the need to manage them sustainably for enhanced livelihood in the region and beyond.

MATERIALS AND METHODS

The study population comprises mainly the producers, traders and consumers of the African locust bean tree and the Iron wood tree products. Primary data were collected with the aid of a pre-tested checklist administered on respondents during Focus Group Discussions (FGDs) and personal interviews in the area between July, 2008 and February, 2009. Within the same period, the mean market retail prices and operational costs of products per unit were also observed and recorded. Gross Incomes and Total variable costs were used in determining Incomes from products. This information was supplemented with secondary data from journals, books, conference proceedings and institutional documentaries.

RESULTS AND DISCUSSION

African locust bean tree: *Parkia biglobosa* (Jacq) Benth popularly known as the African locust bean tree has long

been widely recognized as an important indigenous fruit tree in Nigeria. It is known by different names among the ethnicities in North-Central Nigeria; however, the most popular names are Dawadawa or Dorowa (Hausa-speaking people), Igba (Yoruba), Ogirili (Igbo) and Nune (Tiv).

Distribution: The tree was found available throughout the Savannah lands of North-Central-Nigeria covering Benue, Kaduna, Kwara, Kogi, Nasarawa and Plateau States. It was particularly most common on farmlands. This finding conforms to the assertion by Dalziel (1963) and Keay (1989), which reported that the tree extends from Senegal to Sudan and its habitat is in the Savannah land as it is characteristic of the transition areas from the Sahelian to the Sudanian eco-zones locally on farmlands.

Utilization: Observations and survey on the utility potentials of the African locust bean tree revealed that the Tree serves essentially nutritional, economic and ecological purposes. Nutritionally, the seeds of the tree when processed were widely utilized in North-Central Nigeria as condiments. Women and Children from families in the region usually collect the matured fruits from the wild, and remove the seeds from the pulp covering the seeds. The removed seeds were usually sun-dried and kept for future use; however, some are processed immediately into fermented end product or condiments for family use. This fermented product is popularly known in North-Central Nigeria as Dawadawa or Dorowa, respectively. This finding corroborates the earlier ones by Fagbemi (2002) and Oyerinde and Daramola (2004) that the seeds of African locust bean tree are processed into a fermented food condiment known as Iru, Dawadawa and Ogiri in the Southern, Northern and Eastern parts of the country, respectively. The fermented *Parkia* constituted an important ingredient in most dishes, soups and stews made to accompany porridges, rice and cooked yams and cassava in the region. This means that the fermented food condiment is a crucial and widely consumed food of high nutritional value to millions of Nigerians both in rural and urban areas. The yellowish mealy sweet testing pulp covering the seeds in the pods are edible and children in the region enjoys it a lot. According to Campbell-Platt (1980), the yellow pulp is rich in protein, lipids and vitamin B. Oladele *et al.* (1995) noted that the yellow pulp contains 39-40% oil, 31-40% protein and 11.7- 15.4% carbohydrate. Because of its carbohydrate content, the pulp is also used in preparing stews, alcoholic beverages and sweeteners (Campbell-Platt, 1980). Another product of nutritional value to the people of North-Central Nigeria was the *Bunaea alcinoe*: An edible insect (Fig. 2), which is also a defoliator of the African locust bean tree. This is consumed in the region,

and particularly among the Tiv speaking people of Benue State, as snack with other foods like pear. The consumption of these insect provides cheap source of proteins to the rural poor who hardly afford the highly priced protein sources from beef, mutton, pork and chicken among others. It is cheap because it can be harvested readily from their farmlands during its production period between April and September yearly. The collected insects (*Bunaea alcinoe*) are dried and stored for use during and off production periods. According to Taylor (1975), insects contain a lot of protein, some being leaner than trimmed beef, while, others offer abundant fat calories. In terms of dry matter, over 60% of an edible caterpillar is protein (Ajayi and Adedire, 2007). It is further estimated that the consumption of 100 g of caterpillars by humans, provides about 76% of daily protein requirements and almost 100% of vitamins.

Economically, African locust bean tree provided income and employment to many household members in the region, and particularly women who were more involved in processing and marketing of the tree products. Trading activities in the raw seeds, the fermented food condiment (variously known as Iru, Dawadawa and Ogiri,) charcoal, and firewood among others provided reasonable income and employment. For instance, the weekly net income (Table 1) accruing to the people from sales of raw seeds, fuelwood and charcoal produced from African locust bean tree was N3780, N1120 and N720 respectively. These values are equivalent to USD30, USD9 and USD7, respectively. The result agrees with that of Breman and Kessler (1995). Fundamentally, net incomes from the above trading activities revealed that the people in these businesses were living above poverty line of \$370 per year (World Bank, 1990; Hauser and Pilgram, 1999). Trading in other small products like knife handles and those of hoes, axes and cutlasses also provided additional income sources. The result in Table 1 provides information on income from three products of African locust bean tree (Seeds, Charcoal and Fuelwood) in North-Central Nigeria.

Ecologically, African locust bean tree played a vital role in nutrients recycling and erosion control. As an integral component in traditional farming systems in the region and Nigeria generally, the tree acts as buffer against the effect of strong wind or water runoff that usually causes damage to the crops and soil in the area. Being a leguminous plant, it fixes nitrogen in the soil thereby enriching the soil's nutrients content. The species is widely used in North-central Nigeria as an agroforestry or land management species. The African locust bean tree also provides medicinal services and energy supply.

Iron wood tree: *Prosopis africana* (Guill and Perr) Taub is generally known as Iron wood Tree in Nigeria. It is a common tree of the savannah region; belonging to the family Mimosoaceae. It is variously called; Kiriya (Hausa), Ayan (Yoruba), Ubwa (Igbo) and Gbaaye or Kpaaye (Tiv). This list of names is however in-exhaustive, because in North-Central Nigeria the Iron wood tree is widely known and called differently by the many different ethnicities in the region.

Ecology/Distribution: The species is widely distributed in the Sahel region of Africa and is native to Africa; occurring from Senegal to Ethiopia throughout the Sudanian and Guinea eco-zones. It is a common deciduous savannah tree throughout West Africa. Like the African Locust bean tree; the Iron wood tree is widely distributed in Nigeria; A common characteristic distribution on farm-lands in North-central states of Nigeria namely Benue, Jos, Kaduna, Kogi, Kwara and Nasarawa States. However, their population in the wild is now threatened because of extended uses and particularly, of its wood for fuelwood and burnt bricks production.

Utilization: Iron wood tree is widely utilized in Nigeria and other African countries for consumption, source of income/employment as well as ecological services. The seeds of Ironwood tree are processed into a fermented food product (paste) and used as condiment

Table 1: Weekly net income generation by traders of products from african locust bean tree and iron wood tree in North-Central Nigeria

Products	No. of traders	Mean weekly sales	Unit selling price	Mean G.I. (2x1)	Purchase price/unit	Transport cost/unit	L&off cost/unit	LGA tax/unit	S.C.	T.V.C 1x(4+5+6+7+8)	N.I. (3-9)
	1	2	3	4	5	6	7	8	9	10	
African locust bean tree products											
Seeds	85	3	11000	33000	9100	200	40	350	50	29220	3780
Fuelwood	57	4	7000	28000	4500	1500	500	200	20	26880	1120
Charcoal	65	6	700	4200	350	100	60	50	20	3480	720
Iron wood tree products											
Seeds	79	2.5	13500	33750	10500	200	500	400	50	29125	4625
Fuelwood	69	5	9100	45500	6100	1500	600	350	30	42900	2600
Charcoal	48	14	900	12600	450	100	100	160	20	11620	980

Equivalent weight of 1 bag of African locust bean tree seeds = 136 Kg; Equivalent weight of 1 bag of Iron wood tree = 177 Kg; Equivalent weight of 1 bag of charcoal = 35 Kg; L&off = Loading and offloading. TVC represent Total Variable Cost; Prices, Costs and incomes are measured in Naira. One Naira = USD 128. N.I. = Net Income, T.V.C = Total variable cost, S.C. = Storage cost, G.I. Gross income



Fig. 1: (a): Firewood displayed on sale in North-Central Nigeria, (b): Charcoal displayed on sale in North-Central Nigeria, (c): Mortar displayed on sale in North-Central Nigeria, (d): Pestles displayed on sale in North-Central Nigeria



Fig. 2: Dried bunaea alcinoe larvae displayed for sale in wurukum market in Makurdi, Benue state

in traditional food relishes. This traditional spice competes favourably with its synthetic equivalent; a commercial meat extract preparation called Maggi cubes (Fagbemi, 2002), which the people can ill-afford at the country side in North-Central Nigeria. The edible insect; *Bunaea alcinoe*, which defoliates African locust bean

tree also defoliates Ironwood tree and is widely consumed in North-Central Nigeria as snack with other foods like pear. Furthermore, the leaves, the shoots and the pods also serve as fodder for livestock, which indirectly provide protein for mankind. In terms of ill health, the leaves, roots, bark and seeds of the tree are being utilized in the region for medicinal purposes. The roots and leaves grounded into paste serve physiotherapeutic purposes as well as curing of dislocations and fractures.

In addition to nutrition and medicinal services, the products of Iron wood tree; charcoal, mortar and pestle, mallet, seats and seat handles, stools and props among others are sold in the market and at homes, as the case may be, to generate income. Arts and craft work (carving) and trading offered employment services to many people in the region. The result in Table 1 provides information on the net income to the people of North-Central Nigeria from Seeds, Fuelwood and Charcoal produced from Iron wood tree. The result

showed that the weekly net incomes from raw seeds, fuelwood and charcoal stood at N4625, N2600 and N980 respectively. By extrapolation, dealers in this products smiles home with N18500, N10400 and N3920 respectively on a monthly basis. Many of the dealers were trading in all or at least two of the above products and so, at the end of the month were able to earn an income above the monthly National minimum wage of N7500 equivalent to USD59. Fig. 1a-d show some common Iron wood products that are being marketed in North-Central Nigeria to generate income. The products are being displayed on sale at homes, highways and market squares within the region and beyond and the money realised is utilized in financing family needs; health, education and food among others. The seeds of Iron wood tree attract a lot of income from the market because of its value as condiments and a significant component in traditional herbal medicine. Discussion with key informants and community members during Focus Group Meetings (FGMs) revealed that the tree enriches the soil under and around where it is found. This was indicative out of the peoples' reported experiences that crops planted under and around the Ironwood tree produces higher yield than crops further away from the Ironwood tree vicinity. The soil-enrichment ability also explained in part why the tree is left to grow extensively on farmlands in the area.

Conclusion: Africa locust bean and Iron wood trees play significant roles in the nutritional and income status of the people in North-central Nigeria. The seeds of African locust bean tree and those of the Iron wood are both processed into fermented food products used as condiments in traditional food relishes, stews and soups. Also the edible insect; *Bunaea alcinoe*, foliating on these tree species is widely processed and consumed in North-Central Nigeria as snack with other foods like pear. The leaves of both species are served to livestock as fodder and this indirectly provide protein to the people in North-Central Nigeria. The stem bark, roots and seeds of these trees are also used for medicinal purpose in the area. The study further revealed that Net Incomes accruing to the people from the sales of products from these trees compared favourably with the National Minimum wage of N7500 (USD 59 equivalent). The people of North-Central Nigeria also found these tree species useful for environmental amelioration, soil enrichment and many other services. However, the sustainability of these benefits is threatened as these trees are being subjected to over exploitation and very poor efforts at establishing their plantations and maintaining their populations in the wild. The study therefore recommends improved harvesting techniques and intensified silvicultural efforts at establishing plantations

of these trees in the area and beyond. Similarly, improved pricing policies and enhanced processing and marketing of products from these species for value addition are strongly recommended.

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