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Research Article

## Assessment of Charcoal Production and its Impact on the Livelihood of the People of Gbonyin Local Government Area, Ekiti State, Nigeria

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**Abstract:** The impact of wood fuel and its derivative (charcoal) on the energy requirements of developing nations cannot be underscored. This study examined the production of charcoal in Gbonyin Local Government Area of Ekiti State. A multistage purposive sampling technique was used for the study. Five villages viz; Ijan-Ekiti, Iluomoba-Ekiti, Aisegba-Ekiti, Agbado-Ekiti, and Imesi-Ekiti, where charcoal production is prevalent, were selected. A semi-structured questionnaire was administered to twenty (20) respondents from each of the selected communities. Data collected were analysed using descriptive statistics, including frequency tables, percentage distribution, and charts. The result revealed that married men of middle-aged dominated charcoal production in the study area. The study revealed that fifteen trees with a preference for species such as *Anogeissus leiocarpus*, *Gliricidia sepium*, *Gmelina aborea*, *Tectona grandis* and *Albizia coriaria* were used for charcoal production in the study area. The result also revealed 46.0 % of the respondents produce between 51-100 bags of charcoal per annum. The effect of charcoal production on the environment revealed that deforestation accounted for 30.2 %. The challenges encountered by the respondents on charcoal production show that the shortage of wood accounted for 45.5 %. The study also reveals that only about 12% of the respondents made more than ₦500,000 per annum. Consequent to the result obtained in this study, it is recommended that the government, through the extension department of the state forestry commission, organise a workshop for charcoal producers on how to plant trees to mitigate the deforestation caused by charcoal production in the study area.

**Keywords:** Assessment, Charcoal Production, Livelihood, Gbonyin, Ekiti State

## Introduction

The impact of wood fuel and its derivative (charcoal) on the energy requirements of developing nations cannot be underscored. Fuelwood supplies about 95% of the domestic and commercial cooking energy needs in developing countries [1]. Charcoal production and marketing have been one of the most important enterprises in the world [2]. Sub-Saharan Africans are responsible for 65% of the total world's charcoal production, with its market estimated to be over \$1.8 billion per annum [3]. The role of charcoal production in Sub-sahara Africa cannot be overemphasised as it has been accepted globally as a source of energy [4].

Firewood and charcoal have always been the major traditional sources of energy for most rural and urban dwellers in many states in Nigeria. The high cost of cooking fuels, coupled with the continued scarcity of the product, makes it important to provide an alternative means of energy for people's sustenance. Charcoal enterprise has been adopted to meet some socio-economic benefits and people's energy needs [5]. Income from charcoal production can be used to buy foodstuffs and other household commodities [6].

Charcoal is primarily produced in forested areas surrounding urban centers. Wood is harvested from these areas through clear felling, selective cutting, or from purposely grown plantations. Charcoal is a solid residue derived from controlled combustion of a wide range of materials under conditions of limited oxygen supply [7]. The resulting object is a black, charred material with a distinct texture and appearance. It is used mainly for cooking, heating, or generating energy through direct combustion [8].

Production and marketing of charcoal are profitable businesses in Nigeria [9]. Due to the large availability of land and favourable climatic conditions, Nigeria has an edge over other Sub-Saharan African countries in terms of production and, hence, exports to other African countries [10]. There have been various debates about charcoal production and its effects on forest degradation, while some argue that it causes environmental degradation [11,12].

It is observed that the increasing use of firewood and charcoal is an indication that the general welfare of the people is yet to improve substantially. However, the use of firewood and charcoal has adverse effects on the environment, as most of the activities associated with charcoal production are carried out without the knowledge of its consequences, which may include its environmental cost, health implications, environmental degradation, decline in environmental productivity, loss of biodiversity, increase in evaporation and transpiration, disruption of hydrological cycle and accumulation of greenhouse gases which heighten unsustainable environment [13].

In Nigeria, the perceived increase in the use of charcoal and firewood for fuel indicates that there is a proportional increase in the level of poverty in the country as most people would not have resorted to the use of these substances if they could afford other means of fuelling such as petroleum, kerosene and gas. In most developing countries, Nigeria inclusive, the problem of poverty and increased demand has made the use of charcoal a popular phenomenon. The use of charcoal is preferred in the sense that it produces little or no flame; it is portable and has better energy efficiency [14]. This study aims to evaluate the impacts of charcoal production on the livelihood of people in Gbonyin Local Government Area of Ekiti State.

## Methodology

### Study Area

The study was carried out at Gbonyin Local Government Area in Ekiti State. Ekiti State is located in Southwest Nigeria. It lies south of Kwara and Kogi State. It is bounded in the west by Osun State and in the east and south by Ondo State. It is located between Longitude  $4^{\circ} 51'$  and  $5^{\circ} 45'$  East of the Greenwich meridian and Latitude  $7^{\circ} 51'$  and  $8^{\circ} 51'$  North of the Equator. The climate of the study area is of West Africa monsoon type with dry and wet seasons. The wet or rainy season normally starts from late March to October, with occasional strong wind and thunderstorms, usually at the onset and the end of the season. The dry season normally starts from November to March, and Harmattan's cold wind characterises it. The topography is hilly, with a large number of hills of various sizes surrounding most of the towns and villages. The annual rainfall ranged from 1,200 mm to 1,500 mm. Temperature ranges from  $21^{\circ}\text{C}$  to  $32^{\circ}\text{C}$  throughout the year. Annual average relative humidity is about 90 % at 7.00 am and 65 % at 4.00 pm.

### Sampling Techniques

The study used a multistage sampling technique. Purposive sampling was used to select five villages, viz: Ijan-Ekiti, Iluomoba-Ekiti, Aisegba-Ekiti, Agbado-Ekiti, and Imesi-Ekiti, where charcoal making is prevalent. Simple random sampling was used to select twenty (20) respondents from each of the selected communities. Consequently, a total of 100 respondents were sampled and used for the study (Table 1).

Table 1: Distribution of Respondents in the Study Area

Local Government	Towns	No of Respondents
Gbonyin	Ijan-Ekiti	20
	Iluomoba-Ekiti	20
	Aisegba-Ekiti	20
	Agbado-Ekiti	20
	Imesi-Ekiti	20
<b>1</b>	<b>5</b>	<b>100</b>

## Method of Data Collection and Analysis

Respondents were surveyed using a structured and pre-tested questionnaire designed and administered to collect data on their socio-economic characteristics, common tree species used for the production of charcoal, marketing, utilisation, and challenges. The data were analysed using descriptive statistics, including frequency tables and percentage distribution.

## Results

### Demographic Information of the Respondents

The demographic information of the respondents is presented in Table 2. The result revealed that 68.0 % and 32.0 % of the respondents were male and female respectively. Age distribution revealed that 18.0 % of the respondents are below or equal to 30 years, 52.0 % are between 31-50 years, and 30.0 % are between 51-70 years. The result further showed that 79.0 % of the respondents were married, while 14.0 % and 7.0 % were single and widows, respectively. The household size distribution revealed that 51.0 % of the respondents had between 4-7 members, 27.0 % had eight and above members, and 22.0 % had less than or equal to 3 members. The educational qualifications of the respondents revealed that 61.0 % had secondary education, 20.0 % had tertiary education and 19.0 % had primary education.

Table 2: Demographic Information of the Respondents

Sex	Frequency	Percentage (%)
Male	68	68.0
Female	32	32.0
Total	100	100
<b>Age</b>		
≤30	18	18.0
31-50	52	52.0
51-70	30	30.0
Total	100	100
<b>Marital Status</b>		
Single	14	14.0
Married	79	79.0
Widow	7	7.0
Total	100	100
<b>Household Size</b>		
≤3	22	22.0
4-7	51	51.0
≥8	27	27.0
Total	100	100
<b>Educational Qualification</b>		
Primary	19	19.0
Secondary	61	61.0
Tertiary	20	20.0
Total	100	100

### Charcoal production

Table 3 shows that most (67.0 %) of the respondents operate on a part-time basis while 33.0 % are on full-time. The result on respondents' experience shows that 11.0 % have been in the business for more than 15 years, while 56.0 % had 6-10 years of production experience. The result also shows that 46.0 % of the respondents produce 51-100 bags of charcoal per annum, while 5 % produce <25 bags per annum. The result on the production period (Table 4) shows that 79.4 % of the respondents produced charcoal during the dry season, 16.7 % during the rainy season, and 3.9 % produced it throughout the year. Figure 1 shows that 27.8 % of the respondents source their wood from the wild, 26.7 % from farmland and 24.1 % from sawn mill offcuts, while plantation and wastes from sawn mills and construction/furniture sites accounted for 12.5 % and 8.9 % respectively.

The study revealed that a total of fifteen (15) tree species were used by the respondents for charcoal production in the study area (Table 5). The first five (5) species in the order of ranking were *Anogeissus leiocarpus*, *Gliricidia sepium*, *Gmelina aborea*, *Tectona grandis* and *Albizia coriaria*. Figure 2 shows that 43.6 % of the respondents are involved in charcoal production for income generation, 33.0 % as a source of employment, 14.3 % inherited the trade from their parents and 9.1 % engaged in charcoal production for personal interest.

Table 3: Charcoal production by the respondents

Production Status	Frequency	Percentage (%)
Full-time	33	33.0
Part-time	67	67.0
Total	100	100
<b>Year of experience</b>		
1-5 years	20	20.0
6-10 years	56	56.0
11-15 years	13	13.0
>15 years	11	11.0
Total	100	100
<b>Quantity produced per annum (bags)</b>		
<25	5	5.0
25-50	12	12.0
51-100	46	46.0
101-150	26	26.0
>150	11	11.0
Total	100	100

Table 4: Distribution of respondents by period of production

Production period	Frequency	Percentage (%)
Dry season	100	79.4
Rainy season	21	16.7
Throughout the year	5	3.9
Total	126*	100

\*Multiple responses

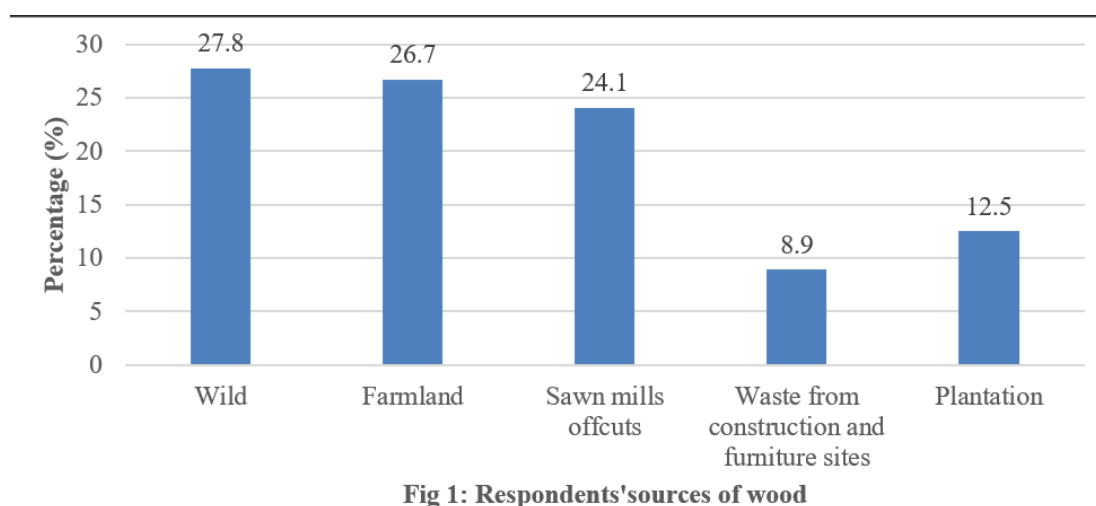
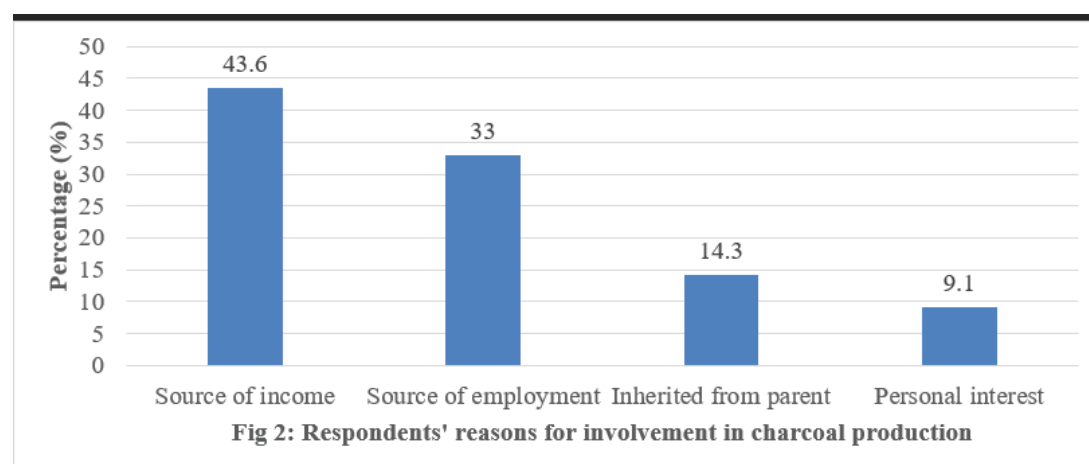


Fig 1: Respondents' sources of wood

Table 5: Distribution of tree species by ranking

Local name	Scientific name	Frequency	Rank
Ayin	Anogeissus leiocarpus	100	1st
Agunmaniye	Gliricidia sepium	86	2nd
Cassia	Senna siamea	64	9th
Teak	Tectona grandis	77	4th
Gmelina	Gmelina aborea	78	3rd
Awewe	Margaritaria discoideus	66	8th
Ita	Celtis zenkeri	53	12th
Oganwo	Khaya ivorensis	55	11th
Mango	Mangifera indica	34	14th
Dongoyaro	Azadirachta indica	43	13th
Iroko	Melicia excels	58	10th
Ayunre	Albizia coriaria	75	5th
Idigbo	Terminalia ivorensis	68	6th
Oriro	Antiaris Africana	26	15th
Afara	Terminalia superba	67	8th



### Effect of charcoal production on the people's livelihood in the study area

The result in Figure 3 shows the effects of charcoal production on the environment. Deforestation accounted for 30.2 %, loss of biodiversity (29.8 %), and soil erosion (18.0 %), while pollution and soil degradation accounted for 6.4 % and 15.6 %, respectively. Figure 4 shows that shortage of wood accounted for 45.5 % of the respondents' challenges, followed by the high cost of transportation (35.5%), shortage of labour (11.4%), and injury (7.6%) respectively.

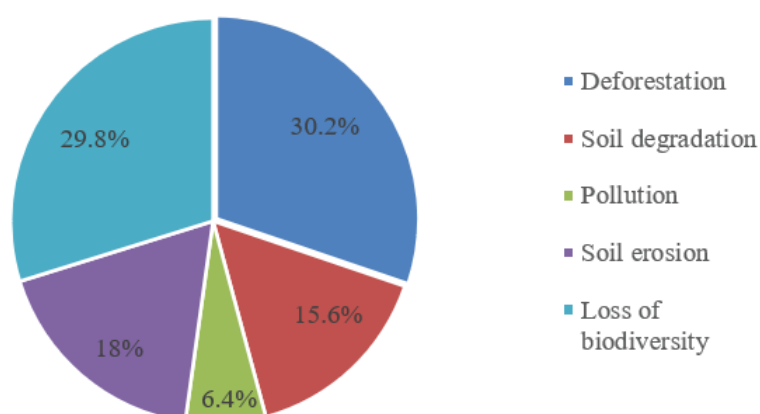


Fig. 3: Effects of charcoal production on the environment

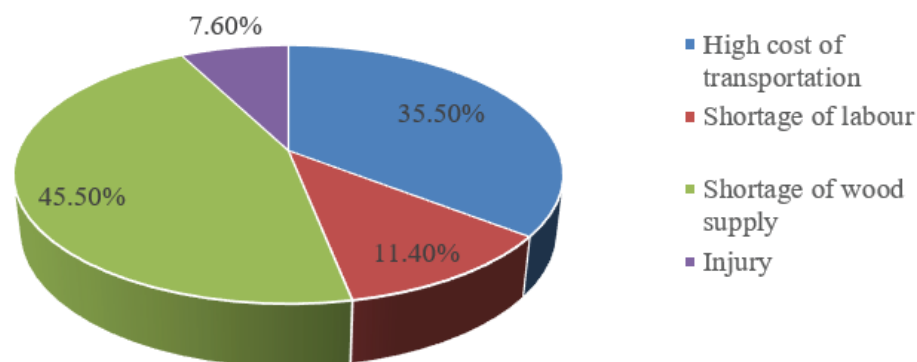


Fig 4 : Challenges of charcoal production

### Respondents' marketing operations

The result on the respondents' mode of selling (Table 6) shows that 35.9 % of the respondents sell in bags, 28.1 % sell in bits and 4.3 % use scale. The result reveals that 40 % of the respondents sell their products at the village market, 33.6 % at the city market and 26.4 % take their products to the neighbouring state (Table 7). The result on the average annual income from the sale of charcoal (Table 8) shows that 41.0 % of the respondents generate ₦100,000-₦200,000 annually, 27.0 % made <₦100,000, 20.0 % made ₦201,000-500,000 while only 12.0 % of the respondents made more than ₦500,000 per annum.

Table 6: Distribution of respondents by mode of selling

Mode of Selling	Frequency	Percentage (%)
Bags	100	35.9
Bit	78	28.1
Using scale	12	4.3
All of the above	88	31.7
Total	278*	100

\*Multiple responses

Table 7: Distribution of respondent's selling point

Selling point	Frequency	Percentage (%)
Village market	100	40.0
City market	84	33.6
Other state	66	26.4
Total	250*	100

\*Multiple responses

Table 8: Distribution of respondents by average annual income from product sales

Average annual income (₦)	Frequency	Percentage (%)
<100,000	27	27.0
100,000-200,000	41	41.0
201,000-500,000	20	20.0
>500,000	12	12.0
Total	100	100



## Discussion

The observed greater involvement of middle-aged men in charcoal production in the study area could be attributed to the fact that charcoal production is tedious work that requires strong and hefty men. Omoyeni has reported a similar observation [15]. Also, stages involved in charcoal production require more hands, which could be responsible for the involvement of households with fairly large family sizes. It was observed that charcoal production is an aged-long business in the study area. However, the majority of the respondents who are graduates have ventured into the business in the last 6-10 years. This influx of graduates into the business in recent times could be linked to the high level of unemployment in the secular sector of the economy. The part-time status of the majority of the respondents attests to the fact that this group of people took up the business as a side hustle.

The preference for species such as *Anogeissus leiocarpus* and *Albizia coriaria*, which are usually sourced from the wild, could probably be due to the quality of the wood, while species such as *Gliricidia sepium*, *Gmelina aborea* and *Tectona grandis* which are agroforestry species tree could easily be sourced from farmland and plantations. This assertion agrees with Njenga et al [16], who reported a preference for some of these species in their study. Charcoal production is a lucrative business that thrives very well during the dry season in the study area, with the majority producing over 50 bags per annum. The majority of the respondents sell their products in bags and bits at the village or city markets. In this case, buyers come from far and near to make purchases in large quantities. The influx of people to the study area during the production season boosted the economy of the respondents and improved their social life as the majority of the respondents made nothing less than ₦100,000 annually.

This huge amount of money generated by the respondents in the trade further attests to the fact that the charcoal production in Gbonyin local government has contributed immensely to household livelihood in terms of income generation and provision of employment opportunities. However, due to the non-perishable nature of the product, some producers store their product to be sold out of season. During this period, they transport their product to the city or other neighbouring states for sale. The reasons for this could be due to the high demand for the product by urban dwellers. Another reason could be that the product sells fast, even at higher prices in the urban area than in the local market.

The study also identifies some devastating effects of charcoal production on the environment in the study area, including large-scale deforestation, loss of biodiversity, and erosion, among others. This observation further confirms the respondents' position on the problem they are facing, where the shortage of wood accounted for 45.5 % of the challenges encountered in the production of charcoal.

## Conclusion

Results from this study revealed that fifteen (15) different tree species were mainly used for charcoal production by the respondents in the study area. Moreover, the study also revealed that the majority of the respondents produce between 50-100 bags per annum and generate ₦100,000 to over ₦500,000 annually. The study identifies the major effects of charcoal production on the environment, including deforestation, loss of biodiversity, soil erosion, and pollution. The challenges faced by respondents in the study area include shortage of wood, high cost of production, and high cost of transportation, among others.

Based on the above observations, it is recommended that the government, through the extension department of the state forestry commission, organise a workshop for charcoal producers on how to embark on massive tree planting, especially the preferred species, to mitigate the deforestation caused by charcoal production in the study area.

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