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Impact of Charcoal Production on the Sustainable Development of Asa Local Government Area, Kwara State, Nigeria

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Abstract

This study examines the impact of charcoal production on the sustainable development of Asa Local Government Area of Kwara State, Nigeria. Specifically, it examines the method of production of charcoal, identifies the basis for involvement in charcoal production; analyzes the socio-economic impact of charcoal on rural well-being and the perception of the inhabitants of the study area on the impact of charcoal production on the environment. One hundred and fifty copies of questionnaire were administered to obtain the opinions of the respondents on the impact of charcoal production on their welfare. Focus Group Discussions and interviews were conducted on the inhabitants and producers to explore their views on method of production and the effects on their health and environment respectively. Descriptive statistical techniques were employed to analyze the gathered data. The study revealed significant negative impact of charcoal production on the ecology of the study area. Legislation on afforestation and reforestation should be enforced on people both at the study area and the country at large.

Development of energy-saving meters and solar cookers should be encouraged. Furthermore, the society should be enlightened through media, visual display and jingles on the impacts of environmental degradation on human health and biodiversity.

Key words: Degradation, Climate Change, Ecosystem, Health and Environment

Introduction

In the last few years, economic hardship, poverty, unemployment and increase in the price of oil have necessitated the need for people to find alternative means of making a living in respect of domestic cooking energy in Nigeria. During the colonial periods, large number of people used firewood as domestic energy fuel, after the colonial era; there was a change in status quo, people embarked more on the use of electricity, fossil fuels such as kerosene and gas as cooking energy. At present, millions of households now use charcoal as domestic and outdoor recreational cooking energy as a result of epileptic power supply, scarcity and increase in the price of oil and gas. According to UNDP (2004), an estimate of 2.5 billion people lack access to modern energy services. This has constrained their opportunities for economic development and improved living standards. They rely on traditional biomass sources such as wood fuel, agricultural residues, and animal dung to meet their basic energy needs (WHO 2006).

The growth of towns and cities in most developing countries of Africa necessitated the need for more charcoal. The estimation therefore is for each 1% increase in urbanization, there is a 14% increase in charcoal consumption (Hosier et al. 1993). Charcoal is the primary energy source for cooking, as well as major source of income generation and environmental degradation in rural areas of most African countries including Nigeria (Kammen and Lew, 2005). Table 1 shows the projection of consumption of charcoal to 2030 in developing regions. In Africa, consumption of charcoal is estimated to increase to 46.1 million tons by the year 2030 (Table 1).

It should be noted that the urban population is increasing on daily basis than the rural areas to the extent that getting fuel energy to feed this population is a problem since most of these people are poor and cannot afford modern cooking fuel. One major means of domestic energy that this population relies on is charcoal. According to Chidumayo (1993), charcoal is predominantly

an urban fuel while firewood is the primary energy source in the rural areas. Charcoal is usually produced in the rural areas and transported to the urban areas for consumption. It has excellent cooking properties: it burns evenly, for a long time, and can be easily extinguished and reheated. Even in developed countries, such as the US, charcoal is desired for the flavors which it imparts to grilled food. Kalu and Izekor (2007) listed the main uses of charcoal to include cooking, roasting, blacksmithing and bronze casting.

High demand for charcoal in the urban areas of the country motivated a lot of people especially men both young and old in the rural areas into the business of charcoal production. However, in spite of its benefits, charcoal production has its adverse effects such as desertification, environmental degradation, global warming and climate change. The processes involved in the production of charcoal include; felling trees such as acacia and burning them. In the process of burning trees in an unsustainable way, green house gases are emitted. Also, high increase of carbon-dioxide is experienced in the atmosphere where these trees are being felled thereby causing global warming. Furthermore, at each stage of the life cycle of charcoal there are impacts on both the environment and human health. There should be a balance in the needs of society, the economy and the environment through sustainable development. Sustainable development is the ability to improve the quality of human life while living within the carrying capacity of supporting ecosystems. Hence, this study focused on the impact of charcoal production on the sustainable development of Asa Local Government Area, Kwara State, Nigeria.

Table 1: FAO projections of charcoal consumption to 2030 in the main developing regions (Million tons)

Country	1970	1980	1990	2000	2010	2020	2030	
South Asia		1.3	1.6	1.9	2.1	2.2	2.4	2.5
Southeast Asia		0.8	1.2	1.4	1.6	1.9	2.1	2.3
East Asia		2.1	2.3	2.3	2.2	2.1	2.0	1.8
Africa		8.1	11.0	16.1	23.0	30.2	38.4	46.1
South America		7.2	9.0	12.1	14.4	16.7	18.6	20.0

Source: (Broadhead et al. 2001)

Objectives

(i) Examine the method of production of charcoal and whether this method has any impact on the health of the producers.
(ii) Identify the basis of involvement in charcoal production in the study area.
(iii) Determine the impact of charcoal production on rural wellbeing.
(iv) Analyze the perception of the inhabitants of the study area on the impact of charcoal production on the environment.

Study area

The area under study is Asa Local Government Area of Kwara State, Nigeria. It is located on latitude $8^{o}00^{1}$ and $9^{o}10^{1}$ North of the Equator and longitude $2^{o}45^{1}$ and $4^{o}15^{1}$ East of the Greenwich Meridian (Fig 1). Asa Local Government Area has three (3) districts namely Afon, Owode and Onire. Asa LGA is one of the sixteen (16) LGAs of Kwara State. Afon is the headquarters of the Local Government Area and it is 27km away from Ilorin the State capital. It is about 1,525sqkm and it stretches from the peri-urban fringes of the city of Ilorin by Oyo State (Ajibade, 2006). It is bounded by Moro LGA to the north, Oyo State to the south, Ilorin West LGA to the East and Oyun LGA to the West.

The average annual rainfall is between 1,000m-1,500mm. The heaviest rainfall is often recorded between the months of June and early August. The LGA falls within the tropical hinterland with wet and dry climate. Trees found here are mainly deciduous that shed their leaves during the dry season so as to reduce moisture loss to transpiration, while they are fresh and luxuriant during rainy season. Grasses here are very good for grazing and therefore support cattle rearing. The vegetation of the area comprises of Guinea Savannah, derived savannah and rainforest. The population of the area as put forward by the National Population Commission is 126,435 comprising 64,982 males and 61,453 females (NPC, 2006).

Methodology

The methods employed in this study include the use of questionnaire administration to one hundred and fifty (150) inhabitants of three sampled settlements where charcoal production is prevalent in the study area. One settlement was picked from each of the three districts. These settlements

include Alapa, Lasoju and Aboto-oja all located in Asa L.G.A of Kwara State. Fifty copies of questionnaire were administered to respondents randomly in each of the three sampled settlements. Furthermore, Focus Group Discussions (FGDs) were organised with the inhabitants (both producers and non producers) of these sampled settlements to explore their minds on their knowledge and impact that charcoal production has on the environment. Interviews were also conducted on the producers in order to understand the method of production of charcoal and whether or not it has impact on the health of the producers. Records and minutes of meeting of charcoal producers were also collected as secondary data. Data gathered were subjected to simple percentages, tabulation and cross tabulation.

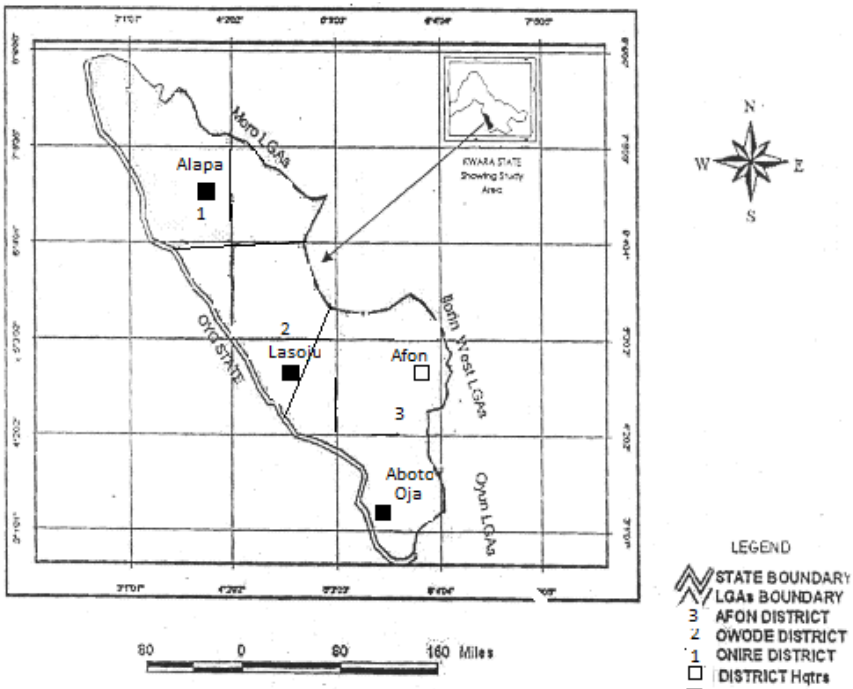

Fig 1 Map of the Study Area
Source: Ministry of Lands and Surveys, Ilorin 2013

Results and discussions

Characteristics of respondents

The socio-spatial and demographic characteristics of charcoal producers are summarized in this section. A total of 150 respondents were sampled. All of the sampled respondents were males; this is as a result of tedious nature of charcoal production. About 135 (90%) were married and larger percentage 112 (75%) were farmers while only 38 (25%) were full-time charcoal producers. The reason for larger population in farming is that farmers concentrate more on charcoal production as secondary occupation during dry or off farm season when they cannot cultivate crops. This is similar to a report from Asia that the practice serves as off farm occupation among farmers (Bhattarai, 1998). It was also discovered that none of them had formal education and most of them 120 (80%) are in their middle age of between 25 and 55years. This is an indication that sampled charcoal producers are illiterates but in the economic active age.

Method of charcoal production

Part of the objectives of this work is to examine the method of production of charcoal and to determine whether or not the method of production has impact on the health of the producers. Charcoal production according to the producers started fully in the study area some twenty-five years ago. According to them, most of these producers are farmers but engaging in charcoal production. Some, during dry season before another farming season sets in while, others are involved in it together with their farming operations. However, the methods of production are always constant over time. There are four processes involved in producing charcoal. The first process is to select and clear a location where the charcoal will be produced. The ground directly underneath the kiln (pile of trees covered with leaves, earth and mulch) must be loosened to about 12 inches below the surface. Secondly, trees such as Axlewood (*Anogeissus leiocarpus*), Burkea (*Burkea Africana*) Shearebutter (*Vitellaria paradoxa*), Hymenocardia (*Hymenocardia acida*) and Pericopsis *(Pericopsis laxiflora*) are cut into different sizes. According to Essiet (2009) Mangrove and *Pericopsis laxiflora* are used for charcoal production all over the world. Thirdly, the trees cut into woods are stacked into a kiln (fig. 2) leaving a hole where it will be lit and covered with a layer of grass and sand.

Fig. 2: Trees cut into woods stacked into a kiln

Fig. 3: A Kiln burning slowly

At the final process, the kiln is lit and left to burn slowly (fig. 3) for up to two weeks and at times four weeks depending on the type of trees cut. After this the charcoal is ready and all the sand and grass used to cover it are removed. Charcoal is then removed and bagged (fig 4) to be sold usually to the

charcoal merchants who transport them to the urban centres for prospective buyers or at times to individuals who are in need of it.

Impact of method of charcoal production on the health of the producers

When asked whether the method of production has any impact on the health of the producers, most of the respondents 140 (93.3%) indicated that charcoal production has its health risks. For example fumes exuding from the carbonized wet-wood are poisonous as well as irritating to the eyes. Other health impacts include irritation such as difficulty in breathing, coughing, tearing in the eyes, fatigue and body aches. According to Anon, (2011), health challenges such as lung, blood oxygen absorption problem and cancer can be caused by smoke. Also, they experience burns when picking burnt charcoal and the heat emanating from most of the kilns when picking burnt charcoal is over 1,000°F with little smoke just what was needed for metal work (Harris, 2012). This equally affects the environment by making the temperature to be very high when compared with other environment where charcoal is not being produced.

Fig 4: Charcoal packed in bags in Aboto-Oja

People's involvement in Charcoal Production

Of the 150 respondents, 89 (59%) claimed that they were involved in charcoal production in order to generate additional income to what they obtain from their main farming occupation. Twenty-four (16%) were involved in it as off-farm employment especially during dry season. Unemployment was the reason for the involvement of 21 (14%) of the respondents while 9 (6%) were involved because of the availability of good tree species. Furthermore, 7 (5%) claimed that they engage in charcoal production because of high demand for it in the market (Table 2). The study revealed that most charcoal producers were involved in it as diversified means of rural livelihood in order to supplement the insufficient income they realised from their main occupation. This in a way has really reduced the poverty level of the inhabitants. This is in support of Agyeman *et. a*l (2012) that charcoal industry play significant role in economic development of some communities in the Upper West Region.

Table 2: Basis of Involvement in Charcoal Production

Basis of Involvement	Frequency	Percentage	Cumulative %
Generate additional income	89	59	59
Off-farm employment	24	16	75
Unemployment	21	14	89
Availability of good tree species	9	6	95
High demand for charcoal	7	5	100
Total	150	100	

Source: Authors' Research, 2012

Impact of Charcoal Production on Rural Wellbeing

The study revealed that 133 (88.6%) of the respondents earned above ₦20, 000 monthly from charcoal production while only 17 (11.4%) earned less than ₦20, 000 (Table 3). This is usually during the dry season period when attention is fully on charcoal production. This is in support of Kammen and Lew (2005) findings that charcoal is a major source of income generation in the rural areas.

Table 3: Monthly Income from Charcoal Production

Amount/Month	Frequency	Percentage	Cumulative %
Below N5,000	-	-	-
N5,001-N10,000	2	1.3	1.3
N10001-N15,000	2	1.3	2.6
N15001-N20,000	13	8.8	11.4
Above 20,000	133	88.6	100
Total	150	100	

Source: Authors' Research, 2012

This is an indication that income realized from charcoal production is enough to take care of their families. Although income varies depending on tree species and the quantity of charcoal realized from the kiln but usually at least 50bags were usually realized from a kiln amounting to N30, 000. The price of charcoal is spatio-temporal i.e it varies over time and space. For instance, during the period of study (2012 dry season) a bag of charcoal from the producer was sold for N600, while it costs N900 from the retailer. Furthermore, during the wet season, producers concentrate more on farming than charcoal production since majority of the producers are farmers consequently, income from charcoal usually drops.

Table 4: Achievement with income from Sales of Charcoal

Income from Charcoal	Frequency	Percentage
Purchase food	120	80
Purchase truck/vehicle	15	10
Purchase motorcycle	90	60
Build houses	18	12
Invest in agriculture	105	70
Start another business	23	15.3
Purchase electronics	75	50
Pay children' school fees	80	53.3
Obtain health service	95	63.3
Save for future use	13	8.7
Others (Household items)	52	34.7

Source: Authors' Research, 2012
Note: Total not 150 because of multiple responses

All the respondents indicated that they use the income obtained from charcoal production for household items such as clothes, shoes, cooking utensils among others. About 120 (80%) claimed they use the income

realized to purchase food items, followed by investment in agriculture 105 (70%) (Table 4). Also, 95 (63.3%), 90 (60%) and 75 (50%) indicated that they use the income to obtain health services, purchase motorcycle/bicycle and purchase electronics respectively. This is an important aspect of the positive impact that charcoal production has on the lives of the producers since income realized is always used to improve their wellbeing and hence reduce their poverty situation.

Perception on the impact of charcoal production on the environment

On the perception of the respondents on the impact of charcoal production on the environment (Table 5), it was discovered that 116 (77.43%) of the respondents agreed that the weather of the area in which charcoal is produced is getting drier each day. About 101 (67%) of the respondents agreed that tree felling is affecting their environment negatively. The implication of this is that there will be high concentration of carbon in the atmosphere because trees that would absorb these carbons are chopped down; hence, this leads to global warming. Another impact is increase in the erosion process in the area because trees that are supposed to curb the washing away of the topmost soils had been removed. Sustainability of our environment is however crucial while finding cheaper means of cooking. About 89 (59%) of the respondents are in support of this. Furthermore, 107 (71%) of the respondents indicated that during the process of burning trees a lot of smoke in form of carbon monoxide is being released into the atmosphere hence, there will be increase in temperature which is a potential consequence of green house effect causing climate change. Also, 120 (80%) of the respondents agreed that there are no animals in the bush again as a result of tree felling. The implication of this is food insecurity. Only 5(3.3%) indicated no impact on the environment.

Table 5: Perception on the impact of Charcoal Production on the Environment

Perception	Frequency	Percentage
Weather is getting drier	116	77.43
Tree felling is affecting the environment	101	67
Increase in erosion process	89	59
Increase in temperature	107	71
No animals in the bush again	120	80
No impact	5	3.3

Source: Authors' Research, 2012

Note: Total not 150 because of multiple response

Furthermore, inhabitants were asked whether charcoal production has any effect on the surrounding environment during group discussions. It was gathered from them that they usually experience high temperature which is as a result of deforestation. Some of them did not agree with this opinion especially the producers. According to them they claimed that God does his things as he likes. One of them has this to say "Charcoal production has no effect on the surrounding environment but rather, the high temperature we are experiencing is as a result of God's handiwork"

When the issue of afforestation was raised, none of producers indicated the practice afforestation since they embarked the charcoal business. According to them, "we cut down only mature trees, so there is no need for reforestation and afforestation".

Deforestation without afforestation is an important aspect of climate change. When trees are cut down and not replanted there will be high concentration of carbon dioxide in the atmosphere since the plants that are supposed to take in carbon dioxide have been cut down, hence, there will be global warming. This is similar to a study carried out by Chidumayo and Gumbo (2012) that emissions of greenhouse gases from charcoal production in tropical ecosystems in 2009 are estimated at 71.2 million t for carbon dioxide and 1.3 million t for methane. Burning releases into the atmosphere carbon dioxide and carbon monoxide which reduce the ozone layer and act as blanket escape of ultraviolent rays from the atmosphere. This increases ambient temperature, reduces rate of vegetation, increases water loss and ultimately the tendency for desertification.

Conclusion and planning implications

Charcoal production in the rural areas of Nigeria is increasing on daily basis as a result of increase in the price of domestic fuel such as oil and gas. An average household especially in the urban areas finds it difficult to purchase oil and gas which are suppose to be common man cooking product as a result of increase in price. The situation is worsening going by the fact that the price of oil (kerosene) is even higher ₦150 than petrol ₦97 and so a lot of people could not afford these essential commodities. Hence, people particularly households rely on the use of charcoal as a source of fuel especially in the urban areas. It is very surprising to discover that most households in rural areas use firewood as domestic cooking fuel instead of charcoal simply because they cannot afford charcoal. In the study area, it was

discovered that charcoal merchants usually purchase charcoal in bags and transport to the urban areas where there is high demand for it. Some merchants also sell by the road side to interested travelers.

Constraints to the production of charcoal according to the producers include challenges from government officials in charge of forestry, increased temperature as a result of deforestation, high cost of transportation as a result of increase in fuel price and having to search for tree species good for charcoal.

From the study, it can be concluded that charcoal production has both positive and negative impact on the producers, inhabitants and the environment. However, in the opinion of the respondents they felt that the positive impact that charcoal production has on their wellbeing is more than the negative impact, although according to them if they have alternatives they will quit the job because of the difficulties they faced in the process of carrying out this action. The study recommends that local people as well as the society at large should be enlightened through proper awareness campaign such as training, drama, electronic media and visual display among others (Ajibade, 2011) on the impacts of environmental degradation on human health and biodiversity. Charcoal producers should be encouraged to practise afforestation and reforestation so as to reduce the effect of global warming in the environment and ensure sustainable rural development. Also, legislations on afforestation and reforestation should be enforced on people both at the study area and the country at large. Furthermore, cost of domestic energy such as kerosene, gas and electricity should be reduced for the poor to be able to afford. This at least will reduce the practice of deforestation for charcoal production in the country. Local people should be included in decision making concerning sustainable ecological and environmental management. Development of energy-saving meters and solar cookers should be encouraged so as dissuade the mind of people from cutting down trees for charcoal production. It will also reduce the demand and dependency on charcoal and firewood for their daily cooking. This will reverse the problem of desertification caused by charcoal production and improve family savings.

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