

Perceived Health Effects of Charcoal Production among Rural Dwellers of Derived Savannah Zone of Nigeria

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Abstract

Charcoal Production (CP) has negative health consequences which include respiratory diseases, back pains among others. Despite this, the production of charcoal has increase in Nigeria. Information on perceived health effects of CP among rural dwellers are scanty. Therefore, perceived health effects of CP among rural dwellers in the derived savannah agro-ecological zone of Nigeria were investigated. One hundred and fifty nine respondents were selected through multi stage sampling technique. Data was collected through the use of structured interview schedule and focus group discussion (FGD). Data were analysed using both descriptive and inferential statistics. Descriptive analysis showed that the mean age was 44 years, 86.8% males, 93.7% married and 26.4% had no formal education. Majority (95.0%) of the respondents makes use of earth mound method of CP and 53.5% produced greater than 128,000kg of charcoal per annum. Respondents perceived that CP may cause skin and respiratory tract irritation/infection (70.4%); charcoal production is likely to lead to cut, crush and laceration of hand (66.7%); that CP may lead to burns (59.1%); back and muscle pains may be associated with CP (59.1%) and charcoal production is likely to cause body wounds (58.5%). Majority (73.9%) had negative perception of effects of CP on the health of rural dwellers. Marital status ($\beta = 0.110$) is positively significant to perceived health effects of CP. Level of charcoal production is positively significant related to perceived health effects of CP in the derived savannah zone ($r = 0.039$). Awareness campaign on health consequences of charcoal production should be promoted.

Keywords: Charcoal production, respiratory diseases, rural dwellers perception

Introduction

Globally, the use of energy in form of biomass and biofuel such as fire wood, charcoal, petroleum, kerosene and gas are becoming competitive depending on the level of development of each nation. For instance, in developing countries, the pressure on natural resources is more acute because nearly 70% of the populace are involved in subsistence-based ventures and live in the rural communities (World Bank, 2004). Also, half of the world's population use biomass fuels for cooking and heating and the world's production of fuelwood increased between 1970 and 1995 from 1362.4 million M³ to 1875.9 million M³ (Carney, 1998). In the late 1990s, it was estimated that biomass accounted for approximately 14 percent of final energy consumption, roughly at par with electricity (14 percent) (IEA, 1998). About 2.4 billion people rely on traditional biomass, mainly for cooking and heating (International Energy Agency (IEA), 2002).

However, China, France, and Italy, moved towards developing other sustainable means of getting energy and preserving their forests. Carney (1998) observed that fuelwood consumption in Africa is about 520 million M³ per year and Nigeria, Ethiopia, Democratic Republic of Congo, Kenya, Tanzania, Ghana, Sudan, Mozambique and Uganda account for 70% of these. Wood fuels have been growing in line with population growth, so that the annual growth in demand is between 3 and 4 percent depending on the country (Amous, 2000).

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The use of wood fuel as household cooking fuel and for any other form of domestic heating is thus very much relevant in sub-Saharan Africa (SSA) (Erakhrumen, Ogunsanwo and Ajewole, 2010). In the time past, rural dwellers only used the stumps and twigs collected from agricultural lands to produce little charcoal they could use in their households (DEAR, 2005). Within the last two decades, charcoal production has taken a new dimension, with increase in the number of producers and the quantity produced. In Nigeria, the need for rural energy development has been on the increase in the last two decades (Akinbami, 2001). Rural energy systems have been affected by charcoal production as a result of several factors such as population, increased poverty, unemployment, urban-rural migration, high cost of petroleum products and inadequate data. Eniola, Odebode, Ogunsanwo, & Ajewole (2012) opined selectivity of trees for charcoal production has reduced to between 11 and 15 species in the guinea savannah zone of Nigeria.

This implies that most African countries, especially Nigeria, still produce and use charcoal without developing modern and sustainable means of getting energy. It is also estimated that about 32 million cubic metres of wood converted to charcoal is consumed in the rural areas of Nigeria annually despite the health hazards (Federal Ministry of Environment, 2006). Several factors constitute to the health effects of charcoal production; charcoal is produced both traditionally and use of modern techniques, methods of producing charcoal require great effort by the producers, especially in the traditional way.

High dependence on the production and use of charcoal has resulted in various health hazards during production (Bailis, *et al* 2005). Many people suffer from one ailment or the other ranging from acute to chronic diseases such as head ache, respiratory diseases, cough, sputum production, dyspnea, and hemoptysis as a result of their involvement in charcoal production (UNDP, 2005). Charcoal production therefore creates serious concern for health, agricultural production, environmental sustainability and food security in the near future. It is therefore, pertinent to examine various issues of charcoal production and their effects on the health of charcoal producing communities.

Objectives of the Study

The general objective of the study is to assess the perceived health effects of charcoal production among the rural dwellers in derived savannah zone of Nigeria. The specific objectives are to: Identify the selected socio-economic characteristics of charcoal producers in the study area; determine the methods used in charcoal production in the study area; determine the level of charcoal production in the study area; and ascertain the perceived effects of charcoal production on the health of rural dwellers of the study area.

Methodology

The study area is the derived savannah zone of Nigeria. This zone was originally the drier part of the rainforest zone. But as a result of bush burning and overgrazing, cultivation and hunting activities over a long period in the zone, the zone is now replaced with a mixture of grasses and scattered trees. In the zone, the mean monthly temperature could go above 27 °C, while daily maximum temperatures can go between beyond 35 °C – 38 °C depending on the location with annual mean rainfall of 100-200cm (Iloje, 2001). Multi-stage sampling procedure was used to select respondents from the population of charcoal producers in derived savannah zone. From the six agro-ecological zones in Nigeria, derived savannah zone was purposively selected because of its potential for charcoal population. Major charcoal producing communities were identified and purposively selected. Fifty percent of rural communities in the zone were selected using simple random sampling technique. Thirty percent of the registered charcoal producers were selected from the population of all registered charcoal producers available in each of the selected communities using simple random sampling technique. A total of one hundred and fifty nine charcoal producers were used as respondents for this study. A Likert-type five point rating scale of “strongly agree” to “strongly disagree” (with scores 5-1 for positively worded statements and 1-5 for negatively worded statements respectively), respondents were requested to indicate their opinion on each of the 30 selected statements (15 positive, and 15 negative) about perceived health effects of charcoal production among rural dwellers in the study area Eniola, & Odebode, (2018).

Results and discussion

1.0 Socio-economic characteristics of respondents

Table 1.0 indicates that the modal age-range is between 35 and 44 years (49.1%) with a mean age of 44 years. This shows that they are in their productive ages. Sex is a vital variable on issues relating to livelihood strategies.

Majority (86.8%) of respondents were males. This result is in consonance with the study of Stockholm Environment Institute (SEI) (2002), which reported that charcoal production appears to be dominated by the active age-range of between 35 and 45 years with 70.0% as males. Majority (93.7%) of respondents were married while 26.4% of the respondents had no formal education. About 46.5% of respondents had more than 15 years of experience. In this zone, 69.8% had charcoal production as primary occupation. Mean annual income from charcoal production is ₦274,905.6 with SD of 99480.7.

Table 1.0: Socio-economic characteristics of charcoal producers

| Socio-economic characteristics | Freq. | Percentages |
|---|--------------------|--------------------|
| Ages (Years) | Age mean=44 SD=8.2 | |
| 25-34 | 8 | 5.0 |
| 35-44 | 78 | 49.1 |
| 45-54 | 51 | 32.8 |
| More than 54 | 22 | 13.8 |
| Sex | | |
| Male | 138 | 86.8 |
| Female | 21 | 13.2 |
| Educational Attainment | | |
| No formal educ. | 42 | 26.4 |
| Koranic school | 10 | 6.3 |
| Pry. School | 86 | 54.1 |
| Secondary s | 15 | 9.4 |
| OND and above | 6 | 3.8 |
| Marital status | | |
| Married | 149 | 93.7 |
| Single | 7 | 4.4 |
| Widow | 3 | 1.9 |
| Primary occupation | | |
| Crop farming | 25 | 15.7 |
| Charcoal production | 111 | 69.8 |
| Trading | 8 | 5.0 |
| Civil servant | 15 | 9.5 |
| Years of experience | | |
| less than 5 years | 17 | 10.7 |
| 6-10 years | 28 | 17.6 |
| 11-15 years | 40 | 25.2 |
| More than 15 years | 74 | 46.5 |
| Income from charcoal production (in Naira) | Mean= 274,905.6 | SD= 99.480.7 |
| 100.001-200.000.00 | 30 | 18.9 |
| 200.001-300.000.00 | 30 | 18.9 |
| 300.001-400.000.00 | 85 | 53.4 |
| >400.001.00 | 14 | 8.8 |
| Total | 159 | 100.0 |

2.0: Methods of charcoal production

Table 2.0 shows that 95.0% of respondents make use of earth mound method of charcoal production while 5.0% make use of the pit method. This suggests that earth mound is very prominent in zones. In a related study by Bada *et al* (2009), surface (earth mound) method was found to be the most commonly used method of charcoal production in many parts of Nigeria.

Table 2.0: Distribution of respondents based on methods of charcoal production

| Methods of charcoal production | Freq. | % |
|--------------------------------|-------|-------|
| Earth mound | 151 | 95.0 |
| Pit method | 8 | 5.0 |
| Total | 85 | 100.0 |

3.0: Respondents' annual output from charcoal production

Table 3.0 reveals that 53.5% of respondents produced more than 128,000kg of charcoal per annum. CHAPOSA (2002) inferred that the output from charcoal production depends on the season, availability of water, types of wood, vegetation and occupation of the producer

Table 3.0: Distribution of respondents based on the annual output from charcoal production

| Total quantity per annum in kilogram: 32kg= 1 bag | Freq. | % |
|---|-------|-------|
| 32032– 64000 | 6 | 3.8 |
| 64032– 96000 | 1 | 0.6 |
| 96032-128000 | 67 | 42.1 |
| More than 128000 | 85 | 53.5 |
| Total | 159 | 100.0 |

4.0: Perceived effects of charcoal production on the health of rural dwellers in the derived savannah zone

Table 4.0 shows that, majority (70.4%, 68.6% and 66.7%) of the respondents strongly agreed respectively that charcoal production might cause skin and respiratory tract irritation/infection; it is not hygienic for children to get near the charcoal kiln or store and charcoal production is likely to lead to cut, crush and laceration of hand. In addition, 59.1%, 59.1% and 58.5% strongly agreed respectively that charcoal production might lead to burns; back and muscle pains may be associated with charcoal production and charcoal production is likely to cause body wounds.

However, 61.0%, 53.5% and 51.6% of the respondents strongly disagreed respectively that children can play with charcoal during production without any harm, one's hand, foot or limb might not be affected during charcoal production and none of their family member has experienced any form of disease as a result of charcoal production. Averagely, 52.2% and 50.9% strongly disagreed respectively that charcoal production is not likely to cause boy irritation; and poisonous bite has nothing to do with charcoal production.

This implies that respondents perceived that charcoal production is likely to cause body wounds, respiratory diseases, spinal hernia, cut, crush and laceration of hand, back and muscle pains, frequent head ache, asthma, skin and respiratory track irritation/infection, body irritation, falling and slipping, burns, fatigue, eyes problem, poisonous bites, cold/flu, dizziness, tetanus, traffic accident, ill-health; not hygienic for children to get near charcoal kiln/store, dangerous for pregnant women; one's hand, foot or limbs may be affected during charcoal production and involvement in charcoal production requires regular medical checkup.

4.0: Distribution of respondents according to perceived effects of charcoal production on the health of respondents in the derived savannah zone

| S/N | N = 159 | Statements on health related problems | Derived savannah zone | | | | | | | | | | |
|-----|---------|--|-----------------------|------|----|------|----|------|----|------|----|------|------|
| | | | SA | | A | | U | | D | | SD | | MEAN |
| | | | F | % | F | % | F | % | F | % | F | % | |
| 1 | | Charcoal production is likely to cause body wounds. | 93 | 58.5 | 58 | 36.5 | - | - | 2 | 1.3 | 6 | 3.8 | 4.4 |
| 2 | | Charcoal producers may not experience sinusitis. | 58 | 36.5 | 14 | 8.8 | - | - | 43 | 27.0 | 44 | 27.7 | 3.0 |
| 3 | | Charcoal production may result to respiratory diseases. | 72 | 45.3 | 56 | 35.2 | 3 | 1.1 | 22 | 13.8 | 6 | 3.8 | 4.0 |
| 4 | | Charcoal producers may not necessarily experience spinal hernia. | 38 | 23.9 | 7 | 4.4 | - | - | 55 | 34.6 | 59 | 37.1 | 2.4 |
| 5 | | Charcoal production is likely to lead to cut, crush and laceration of hand. | 106 | 66.7 | 50 | 31.4 | - | - | 1 | .6 | 2 | 1.3 | 4.6 |
| 6 | | Back and muscle pains may be associated to charcoal production. | 94 | 59.1 | 65 | 50.9 | - | - | - | - | - | - | 4.6 |
| 7 | | Charcoal producers may likely experience frequent head ache. | 46 | 28.9 | 52 | 32.7 | 9 | 5.7 | 11 | 6.9 | 41 | 25.8 | 3.3 |
| 8 | | Dust from charcoal production cannot cause asthma. | 9 | 5.7 | 13 | 8.2 | 37 | 23.3 | 50 | 31.4 | 50 | 31.4 | 2.3 |
| 9 | | Charcoal production may cause skin and respiratory tract irritation/infection. | 112 | 70.4 | 33 | 20.8 | 2 | 1.3 | 2 | 1.3 | 10 | 6.3 | 2.3 |
| 10 | | Charcoal production is not likely to cause body irritation. | 21 | 13.2 | 8 | 5.0 | 10 | 6.3 | 37 | 23.3 | 83 | 52.2 | 4.5 |
| 11 | | Charcoal production may aids malaria attack. | 10 | 6.3 | 22 | 13.8 | 50 | 31.4 | 51 | 32.1 | 26 | 16.4 | 2.1 |
| 12 | | Falling and slipping are not common to charcoal producers. | 15 | 9.4 | 6 | 3.8 | 2 | 1.3 | 44 | 27.7 | 92 | 57.9 | 2.6 |
| 13 | | Charcoal production may lead to burns. | 94 | 59.1 | 37 | 23.3 | - | - | 5 | 3.1 | 23 | 14.5 | 1.8 |
| 14 | | Fatigue is not prominent to charcoal producers. | 33 | 20.8 | 16 | 10.1 | - | - | 31 | 19.5 | 79 | 49.7 | 4.1 |
| 15 | | Eyes problem may be frequently encountered through charcoal production. | 67 | 42.1 | 41 | 25.8 | - | - | 5 | 3.1 | 46 | 28.9 | 2.3 |
| 16 | | Poisonous bites have nothing to do with charcoal production. | 7 | 4.4 | 14 | 8.8 | - | - | 57 | 35.8 | 81 | 50.9 | 3.5 |
| 17 | | Tuberculosis may not be contacted through charcoal production. | 84 | 52.8 | 57 | 35.8 | - | - | 9 | 5.7 | 9 | 5.7 | 1.8 |
| 18 | | Charcoal producers may not experience cold/flu. | 38 | 23.9 | 1 | .6 | - | - | 64 | 40.3 | 56 | 33.3 | 4.2 |
| 19 | | Charcoal producers may not experience dizziness. | 37 | 23.3 | 6 | 3.8 | - | - | 63 | 39.6 | 53 | 33.3 | 2.4 |
| 20 | | Involvement in charcoal production may cause tetanus. | 77 | 48.4 | 57 | 35.8 | - | - | 17 | 10.7 | 8 | 5.0 | 3.4 |
| 21 | | Traffic accidents are common during charcoal production. | 50 | 31.4 | 44 | 27.7 | 2 | 1.3 | 43 | 27.0 | 20 | 12.6 | 3.4 |
| 22 | | Charcoal production is likely to cause ill health. | 65 | 40.9 | 66 | 41.5 | - | - | 19 | 11.9 | 9 | 5.7 | 4.0 |
| 23 | | One can still feel body pains with little involvement in charcoal production. | 37 | 23.3 | 19 | 11.9 | 1 | .6 | 53 | 33.3 | 49 | 30.8 | 2.6 |
| 24 | | None of my family members have experienced any form of disease as a result of charcoal production. | 29 | 18.2 | 26 | 16.4 | 7 | 4.4 | 15 | 9.4 | 82 | 51.6 | 2.4 |
| 25 | | It is not hygienic for children to get near the charcoal kiln or store. | 109 | 68.6 | 39 | 24.5 | 1 | .6 | 4 | 2.5 | 6 | 3.8 | 4.6 |
| 26 | | Fainting may not necessarily be associated to charcoal production. | 77 | 48.4 | 53 | 33.3 | - | - | 7 | 4.4 | 22 | 13.8 | 4.0 |
| 27 | | Pregnant women may be exposed to danger during charcoal production. | 68 | 42.8 | 54 | 34.0 | - | - | 17 | 10.7 | 20 | 12.6 | 3.8 |
| 28 | | One's hand, foot or limbs may not be affected during charcoal production. | 10 | 6.3 | 6 | 3.8 | - | - | 58 | 36.5 | 85 | 53.5 | 1.7 |
| 29 | | Children can play with charcoal during production without any harm. | 16 | 10.1 | 4 | 2.5 | - | - | 42 | 26.4 | 97 | 61.0 | 1.7 |
| 30 | | Involvement in charcoal production requires regular medical checkup. | 73 | 45.9 | 53 | 33.3 | 2 | 1.3 | 20 | 12.6 | 11 | 6.9 | 4.0 |

5.0: Level of respondents perceived effects of charcoal production on health of rural dwellers

Table 5.0 reveals that 73.9% in derived savannah zone had negative perception of effects of charcoal production on the health of rural dwellers. The implication is that respondents encounter several health problems when producing charcoal. Kato *et al.* (2005), Bailis *et al.* (2005) and WEC (2004) observed that health problems, ranging from mild to chronic problems, result from involvement in charcoal production. Charcoal producers experience backache, general exhaustion, chest pains, cough, burns, eye tearing, falling and slipping, cut, crush or lacerations of hand, feet or limbs, back and muscle pain. They also experience fatigue, spinal hernia, poisonous bites, eye and throat irritations, sinusitis, lung diseases, cold/flu, dizziness, fainting, respiratory tract irritation and lung diseases. From all the IDIs sessions, participants noted as follows: “.....Though we get good returns from charcoal production, we are exposed to more dangers but we cannot leave charcoal production for now. Charcoal production causes ill health, wounds, burns, fevers, eye problems and others.....”

Table 5.0: Perception of respondents on the effects of charcoal production on health of rural dwellers

| | | Derived savannah n=159 | |
|-------------------------|------------|------------------------|------|
| Health related problems | Scores | Mean score=93.7 | |
| | | Std. dev.=10.0 | |
| | | F | % |
| Positive effects | 30-95.4 | 42 | 26.4 |
| Negative effects | 95.5-150.0 | 117 | 73.9 |

6.0: Regression analysis showing the contribution of the selected socio-economic characteristics to perceived health effects of charcoal production in the derived zone of the study area

Table 6.0 shows that only marital status ($\beta = 0.110$) is positively significant to perceived health effects of charcoal production. This implies that the more married respondents produces charcoal, the higher the level of health hazards they perceived. To corroborate this, Kato *et al* (2005) and Ellegard (1994) observed that charcoal production has a lot of hazards such as spinal hernia and sinusitis on the health of charcoal producers.

Educational attainment ($\beta = -0.215$) is negatively significant to perceived health effects of charcoal production. This implies that the lesser the educational attainment of respondents, the greater their perceived health effects of charcoal production. The result shows an R^2 of 0.422 which implies that all the socio-economic characteristics considered for the study contribute 42.0% to perceived health effects of charcoal production.

Table 6.0: Regression analysis showing the contribution of the selected socio-economic characteristics to perceived health effects of charcoal production in the derived savannah zone

| Variables | B | β | t-ratio | Significant |
|---------------------------------|----------|---------|---------|-------------|
| (Constant) | 44.079 | - | 3.560 | 0.000 |
| Age | 0.147 | 0.100 | 1.221 | 0.104 |
| Sex | 2.043 | 0.069 | 0.877 | 0.382 |
| Marital status | 1.162 | 0.110* | 2.101 | 0.031 |
| Educational attainment | -1.396 | -0.215* | -2.221 | 0.000 |
| Primary occupation | -0.011 | -0.002 | -0.021 | 0.532 |
| Years of experience | 1.009 | 0.105 | 1.131 | 0.123 |
| Income from charcoal production | 3.052E-6 | 0.040 | 0.317 | 0.238 |

$R^2 = 0.422$

7.0: Table 7.0 reveals that the level of charcoal production is positively significant related to perceived health effects of charcoal production in the derived savannah zone ($r = 0.039$). That is, the greater the output from charcoal production, the greater the perceived health effects on rural dwellers. To corroborate this study, Kato *et al* (2005) and Ellegard (1994) observed that charcoal production has a lot of hazards on the health of the producers.

Table 7.0: Test of Relationship between level of charcoal production and perceived health effects of charcoal production in the study area

| Agro-ecological zone | N | r-value | p value | Decision |
|----------------------|-----|---------|---------|----------|
| Derived savannah | 159 | 0.030 | 0.039 | S |

Conclusion

Charcoal production is taken as primary occupation in the zone from which they produce larger quantity that leads to greater health hazards such as backache, general exhaustion, chest pains, cough, burns, eye tearing, falling and slipping, cut, crush or lacerations of hand, feet or limbs, back and muscle pain among others.

Recommendations

In view of the negative health perceived effects of charcoal production among the rural dwellers, awareness campaign on health consequences of charcoal production should be promoted. Alternative sources of income such as promotion of fish farming, snailery and vegetables production should be encouraged.

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