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SOCIO-ECONOMIC IMPACT OF CHARCOAL EXPLOITATION, TRADE AND UTILIZATION IN OGUN STATE, NIGERIA

ASAMU, Y. I.
ABIALA, A. A.
Department of Agricultural Economics and Extension,
Tai Solarin University of Education, Ijagun, Ogun State, Nigeria.

OLAWUMI, A. T.
BANJO, O. S.
Department of Ecotourism and Hospitality Management,
Tai Solarin University of Education, Ijagun, Ogun State, Nigeria.

JOLAYEMI, J. O.
AKINNAGBE, O. S.
OSIPITAN, A. O.
Department of Agricultural Economics and Extension,
Tai Solarin University of Education, Ijagun, Ogun State, Nigeria.

Abstract
Among the factors threatening charcoal exploitation, trade and utilisation are deforestation, soil degradation and poor marketing. Therefore, this study assessed the socio-economic impact of charcoal, exploitation, trade and utilisation among farm families in Ogun State, Nigeria. Survey research design was adopted for this study where multi-stage sampling technique was used to select 250 respondents in the study area, and data were obtained using well-structured questionnaire and analyzed using descriptive and inferential statistics. The results suggested that majority of the respondents (62.3%) were male, 61.4% were aged 46-60 years old, 92.1% were married and 72.6% had formal education. The mean and standard deviation of the household size were 13+5 persons and monthly income were ₦650,500+₦150,500 respectively. Chi-square results showed that there was significant relationship between respondents' age ($x^2 = 2.29$, $p = 0.04$), year of experience ($x^2 = 3.11$, $p = 0.03$) and socio-economic impact of charcoal exploitation, trade and utilisation. A significant correlation existed between charcoal exploitation, trade and utilisation ($r = -0.66$, $p = 0.01$). It was concluded that the socio-economic impact of charcoal exploitation, trade and utilisation was positive and increasingly higher for the respondents with higher education, more years of experience, increased monthly income and smaller household size with regards to deforestation. The study recommended that afforestation, reforestation programmes and enlightenment campaign be encouraged. Forestry policies and penalties should be reviewed and prices of other fuels should be reduced in order to minimize the increasing demand for charcoal and to achieve a friendly environment.

Keywords: Charcoal, exploitation, impact, deforestation

Introduction

Household fuels constitute energy sources used for domestic cooking, heating and lighting, but, according to Energy Sector Management Assistance Programme (ESMAP, 2022) this excludes fuels for transportation. Different types of household fuels used in developing countries are traditional which includes animals' dung and agricultural residues, as well as wood fuel. Wood fuel in the view of world resources, comprises of charcoal, firewood and other wood derived fuel and also constitutes the most important form of non-fossil energy used in household (Oke, *et al*., 2022). The rural household sector experiences the most pronounced changes in its pattern of fuel use over time which resulted to a wide selection of household fuels and equipment for use of all. In Africa over 90% of the wood taken

from forest is wood fuel (Amours, 2022), this majority is consumed directly as fuel, and substantial amount of this wood is transformed into charcoal processing.

Nigeria currently ranks second to Brazil in the production of charcoal. The western countries particularly prefer Nigeria's charcoal, as the country is rich in tropical hardwood, which burns slower and is hotter. Nigeria currently exports 380,000 metric tonnes of charcoal annually. This study examined the financial viability or otherwise of packaging and exporting hardwood charcoal from Nigeria. Charcoal business involves transportation of charcoal from a region of rich coal production to regions with high demand for the product for different important reasons. Statistically, in 2022, total imported coal to some countries rolled in billions of dollars (National Charcoal Producers, Dealers and Exporters' Association of Nigeria, 2023). Brazil is the world's largest charcoal producer, using managed eucalyptus plantations and trees from its Amazon rainforest (Yusuf et. al., 2020). Charcoal is a lightweight black carbon residue produced by strongly heating wood (or other animal and plant materials) in minimal oxygen to remove all water and volatile constituents. The traditional version of charcoal production called charcoal burning, is often done by forming a charcoal kiln, in which heat is supplied by burning part of the starting material itself, with a limited supply of oxygen. The material can also be heated in a closed retort. Modern "charcoal" briquettes used for outdoor cooking may contain many other additives, e.g. coal. Ahmed, *et al.* (2022) claimed that more than 80% of people in the rural area make use of charcoal and it is the most important source of household energy in most African cities. It is projected that approximately 2.5 billion people in developing countries depend on biomass fuels to meet their household energy needs. For many of these countries, over 90% of total household fuel is biomass and will increase to about one third of the world's population because of growth (World Energy Council (WEC), 2020). Charcoal is conveyed in different sizes of vehicle ranging from small cars to heavy truck, in most cases conveyed from Southwestern States to Northern States and Southeastern States and to other neighboring countries. Daniel (2021) supportedly submitted that charcoal enterprise has been adopted to meet some socio-economic benefits and energy of the people. Even in developed countries, there is increasing demand for charcoal barbecue fuel. This heavy reliance on charcoal which characterizes energy consumption in much of the rural household in developing countries like Nigeria, seems to be tied to socio–economic characteristics of the households and as well as some factors that propel its choice.

Charcoal trading is in two categories (exporting and importing) and it cuts across countries. Nigeria exported $51.6M in wood charcoal. The main destinations of Nigeria exports on wood charcoal were Kuwait ($10.8M), United Arab Emirates ($7.24M), South Korea ($6.17M), Lebanon ($5.68M), and Portugal ($4.52M). The world's largest importers of this commodity group in 2022; China - 10.9% of the world imports ($181 million), Japan - 7.34% ($121 million), Korea - 7.28% ($120 million), USA - 6.33% ($105 million) and Germany - 6.16% ($102 million). Indeed, the charcoal industry is a multibillion-dollar global industry. According to the Food and Agricultural Organization (FAO) of the United Nations, over 40million metric tonnes of charcoal are consumed globally and approximately 2.4billion people rely on wood and charcoal for their daily fuel (FAO, 2021).

A synthesis of socio–economic study on household energy supply and demand in developing countries shows that increase in population, family size, economic activities in household, often lead to increase in the use of fuel (Adeloju, *et al*., 2020). Growth in population and income of the household stimulates the socio–economic transformation that moves household to more diverse and intensive use of household fuel (Energy Sector Management Assistance Programme, 2022). This shows that as people move up the

income ladder, they adopt energy – intensive lifestyles. For instance, Daramola and Ayeni (2021) claimed that the choice between firewood and charcoal among rural families seems to be dictated to a large extent by poverty, with charcoal having the highest figures. Despite a major shift in the use of household energy, many households rely solely on charcoal as their primary source of cooking energy, especially in rural areas. The popularity of the transition to charcoal was brought into force following the acute scarcity of firewood and kerosene as well as their exorbitant prices (Daniel, 2021), hence the invention of 'Abacha coal pot' - a locally made stove that use charcoal over the years, thus, the cooking technology of the coal pot became widely adopted and acceptable. It is therefore, reasonable to infer that biomass (mainly charcoal) will remain key source of energy for most of the population in Sub-Sahara African continent for several decades to come. This observation is shared by various institutions including the World Energy Council (WEC) (2020) and Food and Agricultural Organization (FAO) (2021) which showed that households and restaurants that had bid goodbye to firewood and charcoal usage have begun to embrace them again. Although the Federal Government of Nigeria has declared 2021 to 2030 a decade of gas, with the Central Bank of Nigeria (CBN) setting up a ₦250 billion fund to expand the usage of the product across the country, the cost of cooking gas is fast rising beyond the reach of the common man. Daramola and Ayeni (2021) revealed that people now use gas and charcoal, but more of charcoal as it is cheaper and cooks very fast. Though, charcoal is also becoming too expensive.

However, the state of insecurity in Nigeria is affecting charcoal supply and bandits have taken over the bushes in the rural areas where wood for charcoal is being sourced. Despite its high socioeconomic contribution, charcoal production is considered the main cause of forest degradation, mainly because of the various illegal production, marketing, and/or trade activities by various bodies (Yusuf, *et al*., 2020). There is abundance of evidence to that effect while canvassing and reorienting the people to engage in reforestation and encouraging more people to plant trees (Daniel, 2021). There are beliefs that charcoal is an energy source primarily for the poor, that charcoal use for cooking will decrease automatically as a country becomes more developed, that charcoal production causes deforestation, that the charcoal sector is economically irrelevant, and that improved charcoal cook stoves mitigate deforestation (Alemayehu, *et al*., 2023). Thus, this study investigated the socio-economic impact of charcoal exploitation, trade and utilisation among farm families in Ogun State, Nigeria.

Purpose of the Study

This study determined the socio-economic impact of charcoal exploitation, trade and utilization among farm families in Ogun State, Nigeria. The research specifically:

i. described the socio-economic characteristics of the respondents in the study area;
ii. identified various methods of exploiting charcoal by the respondents in the study area;
iii. determined the differences in respondents' monthly income and expenditure in the study area;
iv. determined the socio-economic contributions of charcoal exploitation, trade and utilisation in the study area; and
v. identified the consequences of exploiting charcoal on deforestation in the study area.

Research Questions

1. What are the socio-economic characteristics of the respondents in Ogun State?
2. What are the various methods of exploiting charcoal by the respondents in Ogun State?

3. What are the differences in respondents' monthly income and expenditure in Ogun State?
4. What is the socio-economic impact of charcoal exploitation, trade and utilisation in Ogun State?
5. What are the consequences of exploiting charcoal on deforestation in Ogun State?

Hypotheses

The following hypotheses were tested in the study:

$H_{01:}$ There is no significant relationship between socio-economic characteristics of the respondents and socio-economic impact of charcoal in Ogun State.

$H_{02:}$ There is no significant relationship between charcoal exploitation and utilization in the study area.

Methodology

The study was conducted in Ogun State. The State is located in South Western Nigeria; Ogun State covers 6,762 square kilometres. It borders Lagos State to the south, Oyo and Osun states to the North, Ondo State to the east and the Republic of Benin to the west. Agriculture is one of the primary occupations of the people in the State. Ogun State is endowed with natural resources which include an extensive fertile soil suitable for agriculture and mineral deposits. Charcoal can be sourced in a few locations in Imeko-Afon, Odeda, Yewa North and Ogbere Local Government Areas in Ogun State. The climate and soil of the state are suitable for the cultivation of a wide range of food crops which include rice, maize, cassava, yam and banana and cash crops which include cocoa, kolanut, rubber, palm oil and palm kernels. Ogun State is one of the largest producers of kolanut, timber, rubber and ofada rice on a large scale. There are twenty (20) Local Government Areas (LGAs) in the State and Ogun State Agricultural Development Project (OGADEP) is sub-divided into four (4) agricultural zones namely Abeokuta, Ijebu-Ode, Ikenne and Ilaro (Ogun State Diary, 2024).

A survey research design was adopted for this study in form of well-structured questionnaire and oral interviews were used to elicit information from charcoal producers and traders in Ogun State. The structured questionnaire was known as Socio-economic Impact of Charcoal Exploitation, Trade and Utilisation Questionnaire (SICETUQ) and was divided into five parts, A to E. The instrument was face validated by three experts, made up of two lecturers from the Department of Agricultural Economics and Extension, Tai Solarin University of Education, Ijagun, Ogun State and one lecturer from the Department of Renewable Resources, University of Ibadan, Oyo State. The reliability of the instrument was determined by administering the questionnaire to charcoal producers and traders in Ibadan, Oyo State which was outside the study area, but has climatic and environmental conditions ideal for charcoal production. The data generated was analyzed using the Cronbach alpha reliability test which yielded a reliability coefficient of 0.75. A multi-stage sampling technique was used to select 250 respondents. Firstly, the State was stratified into its four Agricultural Development Project zones. The second stage involved the purposive selection of four LGAs notable for charcoal production based on reconnaissance survey information. Imeko-Afon, Yewa North, Odeda and Ijebu East LGAs were selected. In the third stage, proportionate sampling technique was employed to select 30% respondents each from the lists of registered charcoal producers and traders in four sampled LGAs.

Data were analyzed using descriptive statistics such as frequency counts, percentage, mean and standard deviation to describe the socio-economic characteristics of charcoal exploiters, traders and utilisers, various methods of exploiting charcoal. Level of socio-economic impact was measured using their mean scores, values above the mean is high and below the mean is low. Consequences of exploiting charcoal on deforestation were measured on a three

Likert scale of Severe (2), Mild (1) and Not a consequence (0) and individual mean scores were used for ranking and decision making. While inferential statistics such as Chi-square and Pearson Product Moment Correlation (PPMC) were used to test the hypotheses of the study.

Results

Table 1

Socio-Economic Characteristics of the Respondents

Variables	Frequency	Percentage	Mean	SD
Age (years)			35	15
20 - 29	36	14.4		
30 - 39	60	24.0		
40 - 49	100	40.0		
50 – 59	40	16.0		
> 60 years	14	5.6		
Sex				
Male	156	62.4		
Female	94	37.6		
Marital Status				
Single	9	3.6		
Married	231	92.4		
Divorced	5	2.0		
Widowed	5	2.0		
Educational Status (Years)			9	4
No Formal	69	27.6		
1-6	41	16.4		
7-12	120	48.0		
> 13	20	8.0		
Household Size (Persons)			13	5
0 - 5	50	20.0		
6 - 10	145	58.0		
11 - 15	55	22.0		
Years of Experience			9	4
1 - 9 yrs	44	17.6		
10 – 19 yrs	157	62.8		
> 20 yrs	49	19.6		
Charcoal Output (kg)			29,930	9,930
1,000 - 15,000	26	10.4		
15,001 - 30,000	102	40.8		
30,001 – 45,000	100	40.0		
> 45,001	22	8.8		
Monthly Income (₦)			650,500	150,500
< 250,000	18	7.2		
250,001 - 500,000	42	16.8		
500,001 - 750,000	66	26.4		
750,001 – 1,000,000	70	28.0		
> 1,000,001	54	21.6		
Monthly Expenditure (₦)			260,542	49,542
< 250,000	52	20.8		
250,001 - 500,000	91	36.4		
500,001 - 750,000	49	19.6		
750,001 – 1,000,000	53	21.2		
> 1,000,001	5	2. 0		

Membership of cooperative				
Yes	223	89.2		
No	27	10.8		
Contact with Forestry Agents			6	2
1 – 5 times monthly	131	52.4		
6 – 10 times monthly	104	41.6		
> 10 times monthly	15	6.0		

Source: Field Survey (2024)

Table 1 presents the socio-economic characteristics of the charcoal exploiters, traders and utilisers of which the average age was 35±15 years and majority (62.4%) were males. A good number of respondents were married (92.4%) and the mean values for years of educational status was 9±4, household size was 13±5 members, experience was 9±4 years, output was 29,930±9,930 kg and monthly income and expenditure were ₦650,500±150,500 and ₦260,542±49,542 respectively. The mean vale for contact with forestry agents was 6±2 times per month and this implies that forestry agents were also used to monitor the activities of charcoal exploiters and provided them with necessary information on the consequences of deforestation and need for more tree production. This implies that there is an improvement in their charcoal production which may be linked to higher demand for charcoal since prices of gas and kerosene are skyrocketing daily. The income and expenditure clearly showed that the respondents made more profit from charcoal businesses. Charcoal production has tremendously contributed to the socio-economic status and standard of living of the respondents in the study area. It was noted that majority (89.2%) were members of cooperative societies while 10.8% did not belong to cooperative societies but belonged to other social associations in order to have access to credits and to be recognized by the government and other international bodies in charcoal businesses.

Table 2

Mean Ratings of the Respondents on the Methods of Charcoal Exploitation

Items	Mean	SD	Rank
Earth mound kiln	2.113	0.70	1st
Earth pit kiln	1.654	0.69	2nd
Metal kiln	1.638	0.60	3rd
Use of drum	1.560	0.63	4th
Improved kiln	1.549	0.58	5th
Charcoal making machines	1.500	0.56	6th

Source: Field Survey (2024)

Table 2 shows the various methods adopted by the respondents for exploiting charcoal in the study area and were rated and ranked according to their mean values. They include earth mound kiln (1st), earth pit kiln (2nd), metal kiln (3rd), use of drum (4th), improved kiln (5th) and charcoal making machines (6th). This is indication that majority of the respondents in the study area still use earth mound and earth pit more than improved kiln and charcoal producing machines thus implying that these traditional methods caused more harm to the environment and human health when compared to modern methods which reduce environmental pollution.

Table 3
Differences in Respondents' Monthly Income and Expenditure

	Income		Expenditure	
Income	**Frequency**	**Percentage**	**Frequency**	**Percentage**
<₦250,000	18	7.2	52	20.8
₦250,001 - ₦500,000	42	16.8	91	36.4
₦500,001 - ₦750,000	66	26.4	49	19.6
₦750,001 – ₦1,000,000	70	28.0	53	21.2
>₦1,000,001	54	21.6	5	2. 0
Total	250	100.0	250	100.0
Min	<₦150,234		<₦49,121	
Max	>₦1,500,521		>₦1,000,976	
Mean	650,500		260,542	
SD	150,500		49,542	

Source: Field Survey (2024)

Table 3 summarizes the differences in the monthly income and expenditure of the respondents in the study. A good number of the respondents (28.0%) earned between ₦750,001 – ₦1,000,000 as monthly income while 21.2% of respondents spent such amount of money as monthly expenditure. Majority of the respondents (21.6%) earned above ₦1,000,001 as monthly income and 2.0% of respondents spent such amount of money as monthly expenditure. These figures indicate most of the respondents in the study area made huge profits and lesser expenditure in charcoal businesses. Respondents with higher expenditures are attributable to larger household size and other expenses paid to labourers and transportation cost.

Hypothesis One
There is no significant relationship between socio-economic characteristics of the respondents and socio-economic impact of charcoal in the study area.

Table 4
Chi-Square Analysis of Selected Socio-Economic Characteristics of the Respondents

Variables	**χ^2 value**	**p value**	**Decision**
Age	2.29	0.040	Significant
Educational status	2.01	0.031	Significant
Household size	-2.97	0.026	Significant
Years of experience	3.11	0.039	Significant
Monthly income	5.32	0.034	Significant
Monthly expenditure	2.08	0.062	Not Significant
Cooperative membership	3.00	0.065	Not Significant
Charcoal Output	5.11	0.050	Significant

Source: Field Survey (2024)
Significant at $p<0.05$

The result of chi-square analysis presented in Table 4 showed that a significant relationship existed between respondents' age (χ^2=2.29, $p<0.04$), educational status (χ^2=2.01, $p<0.03$), household size (χ^2=-2.29, $p<0.02$), years of experience (χ^2=3.11, $p<0.03$), monthly income (χ^2=5.32, $p<0.03$), charcoal output (χ^2=5.11, $p<0.05$) and socio-economic impact of charcoal in the study area. While, there was no significant relationship between respondents' monthly expenditure (χ^2=2.08, $p<0.06$), membership of cooperative (χ^2=3.00, $p<0.06$) and socio-economic impact of charcoal in the study area. This indicates that respondents' age, educational status, household size, years of

experience, monthly income and output are significantly and positively related in the study area.

Hypothesis Two

There is no significant relationship between charcoal exploitation, trade and utilisation in the study area.

Table 5

Correlation Results Among Charcoal Exploitation, Trade and Utilization

Variables	r value	p value	Decision
Charcoal exploitation	-0.660	0.030	Significant
Charcoal Trade	2.418	0.019	Significant
Charcoal Utilization	3.010	0.028	Significant

Source: Field Survey (2024)

Significant at $p<0.05$

The result of correlation analysis presented in Table 5 showed that a significant correlation existed among respondents' responses on charcoal exploitation ($r=-0.660$, $p<0.03$), charcoal trade ($r=2.418$, $p<0.01$), charcoal utilisation ($r=3.010$, $p<0.02$) and socio-economic impact of charcoal in the study area. This implies that charcoal exploitation, trade and utilisation is significantly and positively correlated in the study area. It can further be explained that charcoal businesses are very profitable and lucrative in the study area.

Table 6

Level of Socio-Economic Impact of Charcoal Business on Respondents

Level	Frequency	Percentage	Minimum	Maximum	Mean	SD
Low (10-62.4)	66	26.4	10	125	62.5	12.5
High (62.5-125)	184	73.6				
Total	250	100.0				

Source: Field Survey (2024)

The results of categorization on the level socio-economic impact of charcoal production in Table 6 revealed that few respondents were lowly impacted (26.4%) compared to 73.6% of the respondents who were highly impacted in the study area. Low socio-economic impact of charcoal business was linked to respondents who still used traditional method because of its partial combustion of wood material and low efficiency may result in low income. It was noted that charcoal business had greatly and positively impacted the socio-economic status of the respondents in the study area.

Table 7
Mean Ranking of the Consequences of Exploiting Charcoal on Deforestation

Items	Mean	SD	Rank
Loss of biodiversity	3.529	0.74	1st
Climate change	3.221	0.64	2nd
Soil erosion	3.176	0.66	3rd
Land degradation	3.098	0.59	4th
Loss of wildlife	3.003	0.62	5th
Desert encroachment	2.981	0.54	6th
Environmental pollution	2.802	0.69	7th
Air pollution (Smoke from kiln)	2.664	0.62	8th
Hazard to human health	2.480	0.61	9th
Threat to nature	2.093	0.60	10th

Source: Field Survey (2024)
Note: Severe (2), Mild (1) and Not a consequence (0)

Table 7 presents that consequences of exploiting charcoal on deforestation were rated and ranked; Loss of biodiversity (1st), Climate change (2nd), soil erosion (3rd), land degradation (4th), loss of wildlife (5th), desert encroachment (6th), environmental pollution (7th), air pollution (8th), hazard to human health (9th) and threat to nature (10th).

Discussion of Findings

Findings on the socio-economic characteristics of the charcoal producers supports the findings of Olawumi, *et al.* (2021) that more male farmers engage in forest timber products compared to more female farmers that engage in non-forest timber products. Obadimu and Oluwalana (2018) found out that age was positively related to being a full-time charcoal producer whereas, educational level of the spouse, participation in tree planting, income per annum from other sources, accessibility to credit and educational levels of the producer were negatively related to being a full-time charcoal producer. Charcoal producers in the study area were literate, had bigger household size and more years of experience in charcoal production and this agrees with the finding of Olawumi, *et al.* (2013) that many farming households earn their income and livelihood activities through chewing stick business. Similarly, Oke, *et al*. (2022) found that rural household with higher education background, years of farming experience and smaller household are more successful than other rural household with larger household size. This result is contrary to the findings of Adeloju, *et al.* (2020) that farmers with larger household size will have enough household members to assist them in their farming activities. Charcoal production has greatly impacted the socio-economic status and standard of living of the respondents in the study area and this corroborates with the findings of Alemayehu, *et al.* (2023) that standard of living is expected to improve when income increases and profit increases. Ahmed, *et al.* (2022) found that belonging to farmers' association or social associations are an easiest way to benefit from credits and subsidies from the associations, governments and non-governmental organizations. Charcoal exploiters needed to be provided with necessary information on the consequences of deforestation and need for more tree production and conforms with the findings of Yusuf, *et al.* (2020) that proper implementation of forestry policies could only be guaranteed by forest guards and other government representatives.

The findings on the various methods adopted by the respondents for exploiting charcoal in the study area revealed that majority of the respondents still use earth mound and earth pit compared to improved kiln and charcoal producing machines which were modern methods which reduce environmental pollution and this supports the

findings of Ihinmikaiye, *et al.* (2022) that earth mound and pit kilns are mostly used in local charcoal production and they cause environment pollution while improved kiln and charcoal making machines have been adopted for industrial charcoal production with lesser effect on the environment. The findings on the differences in the monthly income and expenditure of the respondents in the study revealed that a good number of the respondents made huge profits and lesser expenditure in charcoal businesses and this agrees with the findings of Adebayo, *et al*. (2019) that charcoal producer who uses improved kilns and machines make more profits even with lesser number of labourers because improved kilns are faster, save time and reduce environmental pollution.

A significant relationship existed between respondents' age, educational status, household size, years of experience, monthly income, output except monthly expenditure and cooperative membership in the study area and this corroborates with the findings of Daniel (2021) that positive correlations have always been existing among farmers' education, years of experience, farm size and income with regards to intervention programmes. A significant correlation existed among respondents' responses on charcoal exploitation, charcoal trade, charcoal utilisation and socio-economic impact of charcoal business in the study area and this agrees with the findings of Obadimu and Oluwalana (2018) that charcoal producers who were in their active age and engaged in both production and trading made more profits in charcoal businesses than those who engaged in charcoal production only. Findings showed that the level socio-economic impact of charcoal production was high on the majority of the respondents in the study area and this conforms with the findings of Eniola, *et al.* (2018) that every part of charcoal business is profitable, either production alone or trading or utilisation. Findings revealed that loss of biodiversity, climate change, soil erosion, land degradation, loss of wildlife, desert encroachment, environmental pollution were the consequences of exploiting charcoal in the study area and this supports the findings of Alemayehu, *et al.* (2023) that strong disadvantage of charcoal production is the huge quantity of emissions that are harmful to human health and the environment (emissions of unburnt methane). This finding also supports the findings of World Energy Council (2020) that as profitable as charcoal businesses are, there is need to tackle deforestation and land degradation.

Conclusion

On the basis of the findings, it was concluded that charcoal businesses are very profitable, lucrative and greatly impacted the socio-economic status of majority of the charcoal producers in the study area but also have some negative impact on the environment. Charcoal producers with younger ages, higher education, smaller household size, years of experience, monthly income, output who adopted modern method of exploitation made more profits than others.

Recommendations

On the basis of the discussion of findings and conclusion, it was recommended that;

1. Afforestation, reforestation programs and enlightenment campaigns be encouraged.
2. Forestry policies and penalties should be reviewed and properly implemented.
3. Prices of other fuels should be reduced in order to minimize the increasing demand for charcoal to achieve a friendly environment.

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