Short Research Article

IMPACTS OF CHARCOAL PRODUCTION ON ENVIRONMENT AND SPECIES PREFERENCE IN YAQSHID DISTRICT MOGADISHU, SOMALIA.

ABSTRACT

Charcoal is a common home fuel, and earnings from its commerce. Its production has resulted in deforestation and environmental deterioration. The objective of this was to determine the Impacts of charcoal production on the environment and identification of plant species utilized in charcoal production in charcoal trade Yaqshid district, Mogadishu Somalia. Methods: The study design was a descriptive study, specifically a cross-sectional study, the sample size was seventy (70) copies of questionnaire, were purposively distributed the charcoal traders, and the Data analyzed using SPSS (version 20), for Descriptive statistics tools were used to analyze the variables and excel 2013 © Microsoft were used for charts. Results: 32.9 percent of respondents agreed, charcoal production is one of the leading causes of deforestation in the environment, with average mean 1.51 and Standard deviation of 0.959 out of 5. Land degradation caused by charcoal production in the environment, according to 34.3% of respondents who strongly agreed and 34.3% that agreed with average mean 1.89 and Standard deviation of 0.956 out of 5. Although 28.6% of respondents agreed that charcoal production results in the loss of Plants and animal biodiversity. Acacia bussei (Galool), Acacia tortilis (Qurac), Acacia nilotica (Tugaar), Acacia Senegal (Cadaad), Terminalia prunioides (Hareeri), and Prosopis Julifora (Ali gorob, Geed gaal, garanwaa) are the most commonly used trees for charcoal production. Conclusion: Due to a lack of availability and the high cost of cooking gas, demand for charcoal is usually strong. As a result, the government should provide a steady supply of cooking gas at a low cost. This will ensure that households had access to cooking gas while also reducing the impact on forest Plants.

Keywords: Charcoal, Environment, Species, preference, Somalia.

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I. INTRODUCTION

Charcoal is a reliable, accessible, and inexpensive source of energy for many urban poor communities. Even if electricity and gas are the most preferred cooking fuels in metropolitan areas, most impoverished households cannot afford both the energy resources and the devices needed to use them. As a result, many homes resort to burning kerosene or charcoal. Charcoal is a common home fuel, and earnings from its commerce. Its production has resulted in deforestation and environmental deterioration. The removal of the protective tree layer, for example, increases the vulnerability of the underlying soil to erosion by exposing it to agents such as desiccating winds and strong rains [1].

Charcoal production hastens desertification by reducing the quantity of land available for cultivation or grazing, as well as driving inhabitants out of regions that have become uninhabitable after charcoal producers have cut down all the trees. Deforestation also reduces biodiversity because species that rely on tree groves are unable to live in the absence of them. Rangelands have been degraded in Somalia as a result of tree removal to supply the rising demand for charcoal. Acacia plant species are losing 5% of their population each year, according to a new FAOSWALIM report in Puntland state Somalia. Another SWALIM study anticipated a 3.3 percent decline in plant cover in the Jilib Area, middle Juba, within a short period (2011-2013), a trend that is seen throughout Somalia [2].

As a result, this research was carried out to determine the effect of charcoal production on the environment and identification of plant species utilized in charcoal production, for charcoal traders in the Yaqshid region of Mogadishu, Somalia.

II. LITERATURE REVIEW

Charcoal is a soft, fragile, lightweight, black, and porous substance that mimics coal, according to FAO (2017) [3]. Burning charcoal is one of the oldest chemical processes known to man. From a policy aspect, challenges connected to household energy choice and transitions are crucial for a number of developing countries, including Somalia. Many of these countries call for efforts to encourage households to adopt alternatives that will result in more efficient energy consumption and less negative environmental, social, and health consequences.

Efforts are still being made to improve the efficacy of charcoal morphological analysis for identifying fuel types and reconstructing fire regimes. By incinerating known plant materials sourced from American prairie, tropical, and Arctic ecosystems in the laboratory, Umbanhowar and McGrath (1998), Crawford and Belcher (2014), and Pereboom et al. (2020) [4][5][6] conducted morphology measurements of the length, aspect ratio (length / width), and size distribution of charcoal particles. Longer fragments are graminoids, whereas shorter fragments come from wood, bushes, and leaves, according to the researchers.

As a result of the deforestation and lack of replanting, the Acacia bussei was added to the Red List of vulnerable species maintained by the International Union for Conservation of Nature. Pastoralists have relied on this evergreen, drought-tolerant indigenous tree for fodder and drought resistance for years. The Acacia bussei, on the other hand, is becoming an unfeasible source of feed as demand for charcoal rises. Many pastoralists' livelihoods have been compromised as a result of this. The losses incurred as a result of such recurrent droughts will only grow in the future. Somalia was placed 7th out of 233 countries and regions in a global evaluation of climate change risk [7].

In Nigeria, Adeniji, et al. (2015) they found traditional method of charcoal production (earth mound kiln and earth pit kiln) is used in the study area [8]. (22) 65% of the producers use earth mound kiln method while (12) 35% use earth pit kiln method. The most prominent among the two methods is earth mound kiln (65%). **charcoal production** in Brazil using traditional “hot-tail” **kilns** and higher-yielding metal “container” **kilns (**Bailis, et al. 2013) [9]

In Somalia, charcoal is made in 'kilns,' which are ovens. The felled trees are stacked, coated in iron sheets, and buried in sand. The sand and sheets are removed after the oven has burned for up to a week. The wood is subsequently processed into charcoal, which is then packed into bags/sacks for export or home usage (typically using rails and 'dhows,' Indian Ocean lateen-rigged ships with one or two masts). Despite a UN ban on charcoal export, large amounts are transported to the Arabian Peninsula each year. (FAO, 2017)[3]

III. METHODS

3.1. Study design

The study design was a descriptive study, specifically a cross-sectional study, which was concerned with measuring the outcome or effects, as well as the exposures or causal factors, in the study participants, so that we could measure environmental changes and charcoal use for selected respondents in a short period of time.

3.2. Study Area

The study was carried out in Yaqshid District, Mogadishu, Somalia. Yaqshid District is located in southern Benadir region of Somalia, it has latitude 2° 3' 27.381"N and longitude 45° 20' 50.1512"E. It

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is neighbored by Dayniile District to the west. It is also bordered to the east by Karan District and to the north by Hilawa District. Towfiq market, is the largest collection of charcoal vendors, dealers, and purchasers were all present, is located in this district.

3.3. Sampling methods

Purposive sampling technique was used in the study sample. Charcoal sellers were visited in Yaqshid district; the Towfiq market selected for sites where charcoal traders are more dominant. The sample size was seventy (70) copies of questionnaire, were purposively distributed the charcoal traders. Researchers listed the Names of Plants in Somalia language they have selected multiple answers, and identified the scientific equivalents.

3.4. Data Analysis

The analyzed data were including first Variables sex, age, educational status, and marital status. The second variables were include Impacts of charcoal making on environments and third variables were includes listing common trees used in charcoal making and methods of making charcoal production. Data analyzed using SPSS (version 20) for Descriptive statistics tools were used to analyze the variables and excel 2013 © Microsoft were used for charts.

IV. RESULTS

4.1. Demographic characteristics of respondents

The demographic characteristics of the seventy (70) respondents are shown in Table 1. The majority of the respondents, 59 (84.3 percent), are Female, which is the outcome of non-randomly selected respondents using standard purposive sampling. 55 (78.6%) of the respondents are between the ages of 36 - 45 (44.3%), and ages of 26-35 (34.4%). The respondents have 60 % are married and 40% are Single. 94.3% of respondents have obtained Secondary education, while 5.7% have completed Primary school.

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And justify the selection of the study area. What necessitated the selection of this area for the study

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Justify the use of purposive sampling

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Common trees in the study area were also presented.

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Table 1. Demographic data

Sex				
		Frequency	Percent	Cumulative percent
Valid	Female	59	84.3	84.3
	Male	11	15.7	100.0
	Total	70	100.0	
Age				
		Frequency	Percent	Cumulative percent
Valid	Age 15 – 25	15	21.4	44.3
	Age 26-35	24	34.3	78.6
	Age 36 – 45	31	44.3	100.0
	Total	70	100.0	
Marital				
		Frequency	Percent	Cumulative percent
Valid	Married	42	60.0	40.0
	Single	28	40.0	100.0
	Total	70	100.0	
Education				
		Frequency	Percent	Cumulative percent
Valid	Primary education	4	5.7	5.7
	Secondary education	66	94.3	100.0
	Total	70	100.0	

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Like mean age, number of years of charcoal production, number of bags produced per season.

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4.2. Impacts of charcoal production on environmental

As illustrated in Figure 1, the effects of charcoal production in general can include deforestation and erosion. According to 32.9 percent of respondents agreed, charcoal production is one of the leading causes of deforestation in the environment, with average mean 1.51 and Standard deviation of 0.959 out of 5. And 35.7 percent strongly agreed that charcoal production causes soil erosion after deforestation, and 28.6% agreed that soil erosion can happen after deforestation with average mean 2.00, and standard deviation of 1.142 out 5. Soil color became darkened, soil-surface temperature increased and higher infiltration rates were measured on charcoal-site soils, as mentioned Oguntunde et al., in Ghana [10]

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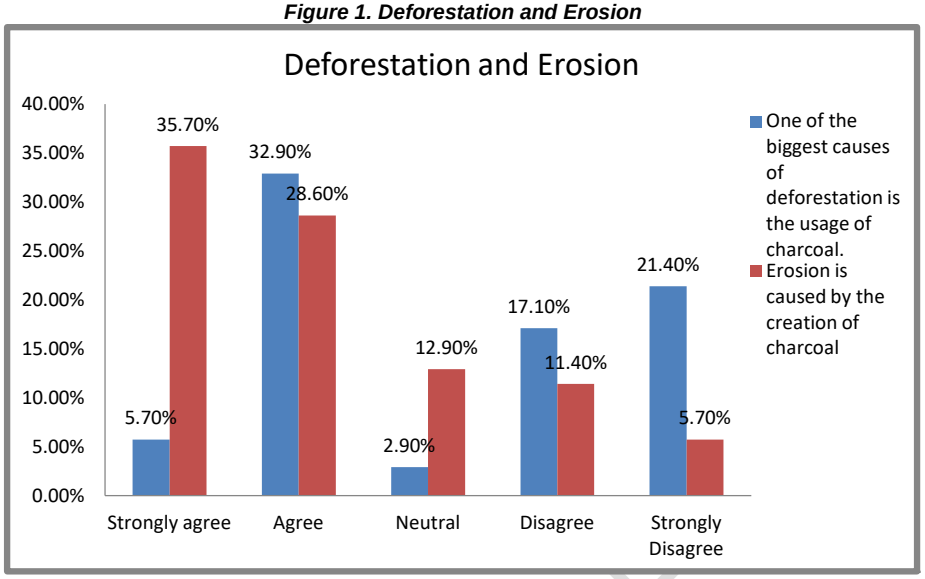
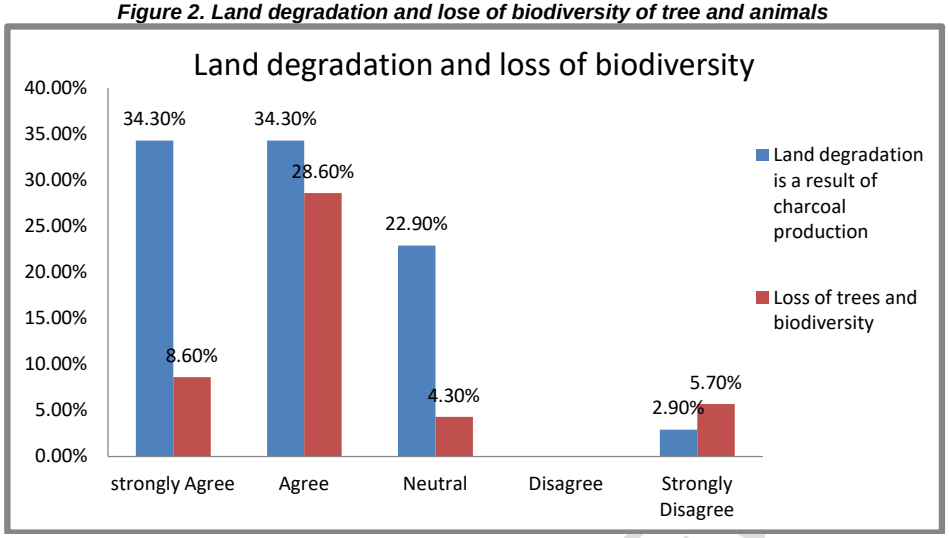
Figure 1. Deforestation and Erosion



Deforestation and erosion are two impacts of charcoal production in general, as seen in Figure 2. Land degradation caused by charcoal production in the environment, according to 34.3% of respondents who strongly agreed and 34.3% that agreed with average mean 1.89 and Standard deviation of 0.956 out of 5. Although 28.6% of respondents agreed that charcoal production results in the loss of Plants and animal biodiversity, 22.9% of respondents neutral with average mean 1.59 and Standard deviation of 0.825 out of 4..

Figure 2. Land degradation and lose of biodiversity of tree and animals



We ask respondents to determine their perceptions of charcoal control measures, as shown in **Figure 3,** to ensure the sustainability of the charcoal-using environment. According to 20% of respondents who strongly disagreed and 17.1% who disagreed, replacing trees is an unnecessary strategy to protect the environment with average of mean of 2.70, and Standard deviation of 1.526 out 5. This shows that only a small percentage of the respondents were aware of the environmental sustainability benefits of replanting trees. Despite the fact that 27% of respondents strongly thought that tree replanting is unnecessary.

Figure 3. Replanting trees is unnecessary

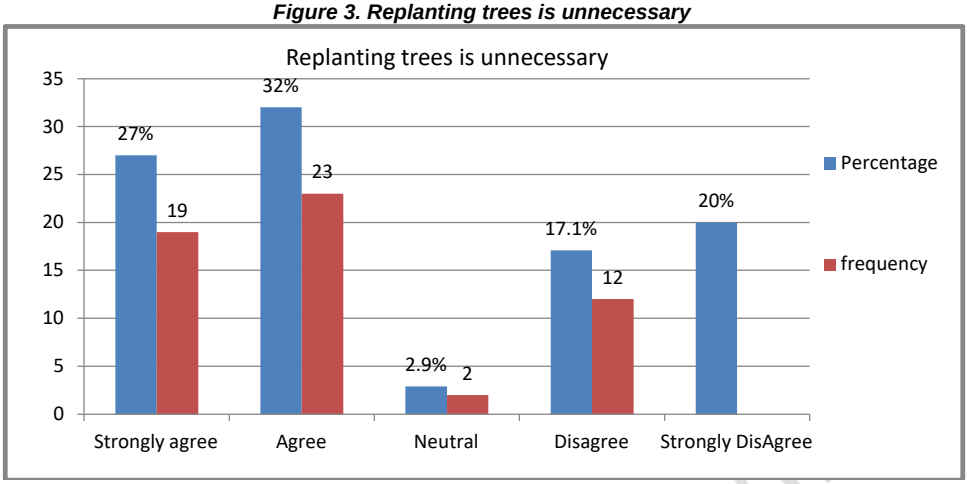
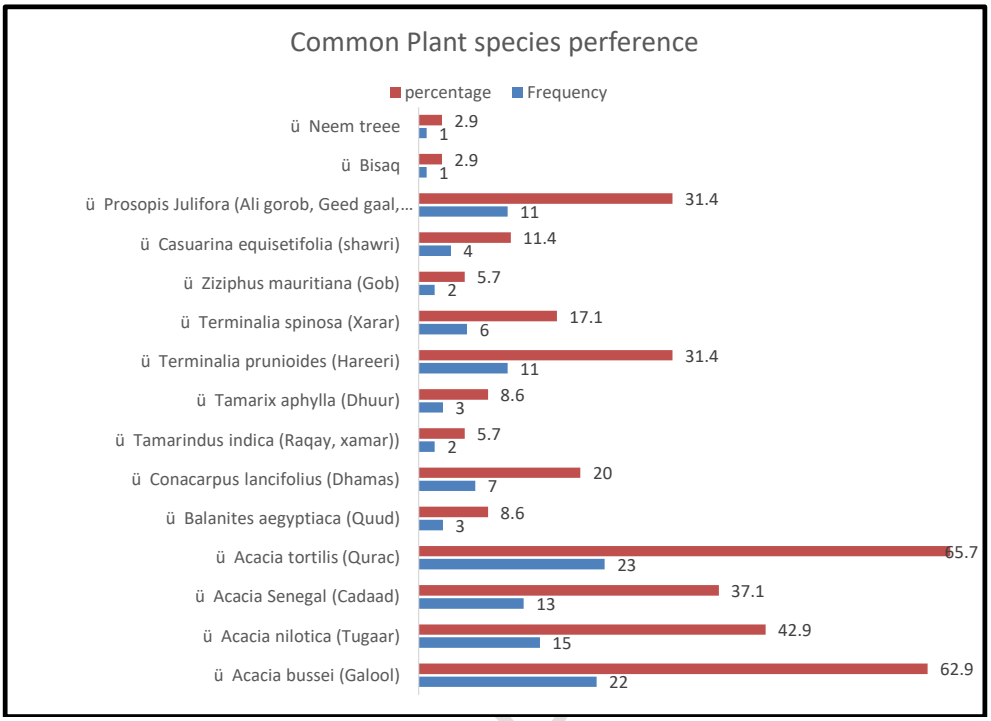


Table 2. Descriptive statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
One of the biggest causes of deforestation is the usage of charcoal.	70	1	5	1.51	.959
Erosion is caused by the creation of charcoal.	70	1	5	2.00	1.142
Land degradation is a result of charcoal production	70	1	5	1.89	.956
Charcoal production can cause loss of Biodiversity of trees and animals	70	1	4	1.59	.825
Replanting trees is unnecessary because forests can regenerate on their own.	70	1	5	2.70	1.526
Valid N (list wise)	70				

Figure 4. Common plant Species preferences


Common Plant species perference
percentage
Frequency
ü Neem treee
2.9
1
ü Bisaq
2.9
1
ü Prosopis Julifora (Ali gorob, Geed gaal,...
31.4
11
ü Casuarina equisetifolia (shawri)
11.4
4
ü Ziziphus mauritiana (Gob)
5.7
2
ü Terminalia spinosa (Xarar)
17.1
6
ü Terminalia prunioides (Hareeri)
31.4
11
ü Tamarix aphylla (Dhuur)
8.6
3
ü Tamarindus indica (Raqay, xamar))
5.7
2
ü Conacarpus lancifolius (Dhamas)
20
7
ü Balanites aegyptiaca (Quud)
8.6
3
ü Acacia tortilis (Qurac)
65.7
23
ü Acacia Senegal (Cadaad)
37.1
13
ü Acacia nilotica (Tugaar)
42.9
15
ü Acacia bussei (Galool)
62.9
22

A list of tree species employed for charcoal production in the study area is shown in Figure 4. Acacia bussei (Galool), Acacia tortilis (Qurac), Acacia nilotica (Tugaar), Acacia Senegal (Cadaad), Terminalia prunioides (Hareeri), and Prosopis Julifora (Ali gorob, Geed gaal, garanwaa) are the most commonly used trees for charcoal production. and Other species like Conacarpus lancifolius (Dhamas), Terminalia spinosa (Xarar), Casuarina equisetifolia (shawri), Tamarix aphylla (Dhuur), Balanites aegyptiaca (Quud), Tamarindus indica (Raqay, xamar), Ziziphus mauritiana (Gob), Terminalia Orbicularis (Bisiq), and Azadirachta Indica (neem tree) are only utilized to varying degrees.
Figure 4 shows that 22 (62.7%) of respondents listed Acacia tortilis (Qurac) as one of the tree species used for charcoal production, 23 (65.7%) listed Acacia bussei (Galool), 15 (42.9%) listed Acacia nilotica (Tugaar), 13 (37.1%) listed Acacia Senegal (Cadaad), and Terminalia prunioides (Hareeri) and Prosopis Julifora (Ali gorob, Geed gaal, garanwaa), have 11 (31.4%), were listed in two equal percentages.

V. DISCUSSION AND CONCLUSION

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The study lacks comprehensive discussion

This study shows that charcoal production is now widespread in many regions of Somalia, particularly in Mogadishu, following intense pressure from Al Shabab in 2016. They fled and began charcoal production in and around Mogadishu, Somalia's capital city. The research began with a survey to determine community perceptions of charcoal production's environmental impacts.
The respondents' preference for charcoal as a cooking fuel was strong, and they believed that charcoal had a low environmental impact, resulting in a high demand for charcoal use and production. With an average mean of 1.51 and a standard deviation of 0.959 out of 5, 32.9 percent of respondents agreed that charcoal production is one of the leading causes of deforestation in the environment. 35.7 percent strongly agreed that charcoal production causes soil erosion after deforestation with average mean 2.00, and standard deviation of 1.142 out 5.The both have figure 1 of which have major impacts on charcoal production that the respondents knew very well
Figure 2 illustrates Land degradation caused by charcoal extraction in the environment has been witnessed by the respondents, who have seen trees cut down and land used for charcoal production. So, when compared to other sites, 34.3 percent of respondents strongly agreed and 34.3 percent agreed that charcoal producing areas have substantial soil degradation. Although 28.6% of respondents believed that charcoal manufacturing reduces tree and animal biodiversity, this suggests they have little clue how soil moves when trees are taken down.

Figure 3 shows that replanting trees is an unneeded way to safeguard the environment, with 20% strongly disagreeing and 17.1 percent disagreeing. With an average of 2.70 and a standard deviation of 1.526 out of 5, this indicates that only a tiny percentage of the respondents were aware of the environmental sustainability benefits of replanting trees. In figure 4. The commonest plant species that respondents mentioned are includes Acacia bussei (Galool), Acacia tortilis (Qurac), Acacia nilotica (Tugaar), Acacia Senegal (Cadaad), Terminalia prunioides (Hareeri), and Prosopis Julifora (Ali gorob, Geed gaal, garanwaa). That other minor plant species used in charcoal production that the respondents agreed were includes Conacarpus lancifolius (Dhamas), Terminalia spinosa (Xarar), Casuarina equisetifolia (shawri), Tamarix aphylla (Dhuur), Balanites aegyptiaca (Quud), Tamarindus indica (Raqay, xamar), Ziziphus mauritiana (Gob), Terminalia Orbicularis (Bisiq) and Azadirachta Indica (Neem tree or Geed Talaal).

In conclusion, they respondents have more knowledge about deforestation, soil erosion, and land degradation, but less knowledge about how charcoal can lead to a loss of biodiversity in trees and animals, as well as a strategy for tree management that involves replanting trees and giving them time to recover and grow more vigorously. Due to a lack of availability and

the high cost of cooking gas, demand for charcoal is usually strong. As a result, the government should provide a steady supply of cooking gas at a low cost. This will ensure that households had access to cooking gas while also reducing the impact on forest Plants [11]. To ensure their survival, the government should start providing alternative businesses to charcoal sellers. Woodland management, unregulated tree harvesting without replacement, and making policies and strategic plant vast tree plantings should all be addressed.

Comment [R40]: Mention national policies that support such an initiative and seek to strenthen it.

VII. REFERENCE

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[1] FAO (Food and Agriculture Organization). (2007). State of the world's forests 2007.

[2] Faoswalim (2013), The Charcoal Scourge, Monitoring Charcoal Production Sites In Southern Somalia, Through Satellite Imagery, https://www.faoswalim.org/article/charcoal-scourge.

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APPENDIX

Table 3. **Replanting trees is unnecessary because forests can regenerate on their own.**

Replanting trees is unnecessary because forests can regenerate on their own.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	19	27.1	27.1	27.1
	Agree	23	32.9	32.9	60.0
	Neutral	2	2.9	2.9	62.9
	Disagree	12	17.1	17.1	80.0
	Strongly Disagree	14	20.0	20.0	100.0
	Total	70	100.0	100.0	

Table 4. **Erosion is caused by the creation of charcoal.**

Erosion is caused by the creation of charcoal.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	31	44.3	44.3	44.3
	Agree	20	28.6	28.6	72.9
	Neutral	9	12.9	12.9	85.7
	Disagree	8	11.4	11.4	97.1
	Strongly Disagree	2	2.9	2.9	100.0
	Total	70	100.0	100.0	

Table 5. **Land degradation is a result of charcoal production**

Land degradation is a result of charcoal production					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	30	42.9	42.9	42.9
	Agree	22	31.4	31.4	74.3
	Neutral	16	22.9	22.9	97.1

	Strongly Disagree	2	2.9	2.9	100.0
	Total	70	100.0	100.0	

Table 6. **Charcoal production had double effects loss of plant and animals**

Charcoal production had double effects loss of plant and animals					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	41	58.6	58.6	58.6
	Agree	20	28.6	28.6	87.1
	Neutral	6	8.6	8.6	95.7
	Disagree	3	4.3	4.3	100.0
	Total	70	100.0	100.0	

Table 7. **One of the biggest causes of deforestation is the usage of charcoal.**

One of the biggest causes of deforestation is the usage of charcoal.					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	49	70.0	70.0	70.0
	Agree	12	17.1	17.1	87.1
	Neutral	5	7.1	7.1	94.3
	Disagree	2	2.9	2.9	97.1
	Strongly Disagree	2	2.9	2.9	100.0
	Total	70	100.0	100.0	

Table 8. Species preference for charcoal production

Tree species	Local (names)	Frequency	Percentage
Acacia bussei	Galool	22	62.90%
Acacia nilotica	Tugaar	15	42.90%
Acacia Senegal	Cadaad	13	37.10%
Acacia tortilis	Qurac	23	65.70%
Balanitesaegyptiaca	Quud	3	8.60%
Conacarpuslancifolius	Dhamas	7	20%
Tamarindusindica	Raqay, xamar	2	5.70%
Tamarixaphylla	Dhuur	3	8.60%
Terminaliaprunioides	Hareeri	11	31.40%
Terminaliaspinosa	Xarar	6	17.10%
Ziziphusmauritiana	Gob	2	5.70%
Casuarinaequisetifolia	shawri	4	11.40%
ProsopisJulifora	Ali gorob, Geed gaal, garanwaa	11	31.40%
Bisaq	Bisaq	1	2.90%
Azadirachta Indica *(Neem tree)*	Geed talaal	1	2.90%