## Level Evaluation of Charcoal Policies Compliance in Benue State, Nigeria

**Abstract**

Charcoal is becoming one of the most common types of wood energy in Nigeria and Benue State in particular. However, the concern about charcoal production and usage is because of the unsustainable practices that heralded the activities along the charcoal value chain (CVC). To contribute to the current debate, this study investigated the level of awareness of, and compliance with charcoal policies among key actors of the CVC in Benue State, Nigeria. Using a multistage sampling procedure, seven dominant charcoal-producing local government areas were purposively selected. Further, two prominent communities in each LGA were selected (14 communities) and the population of actors in the CVC were profiled into producers, off-takers, transporters and consumers. Yamane’s formula was employed to select appropriate samples at each node: 157 producers, 63 transporters, 114 off-takers and 399 consumers as well as the regulators from the available pools, while Bowley’s proportional allocation formula was used to select appropriate sample sizes at each stratum. Data was elicited from respondents using digital questionnaires (Kobotoolbox) and analyzed with the aid of IBM Statistical Package for Social Sciences 23® and FAO VCA-tool 3.2. The result of the awareness of charcoal production policies showed that the actors in the CVC were majorly ignorant of the extant policies regulating charcoal activities, except for the regulators in Benue State. Actors identified three policy structures: the ban on charcoal production (65.28%), sustainable production (23.34%) and market regulation (11.40%) which were majorly (79.38%) by the DFOs. The levels of compliance and the effectiveness of the policies were generally poor across all value chain nodes. Further, the majority of the CVC actors operated without any registration or payment of royalties. The study thus, highlights the need for increased awareness, education, and enforcement of charcoal policies to ensure sustainable charcoal production to mitigate the attendant environmental degradation arising from charcoal production in Benue State.

**Keywords**: Policies, Charcoal, Value chain, Evaluation, Benue State.

**1.0 Introduction**

African countries confront a critical challenge in the global drive to attain SDG 7 (Branch *et al.*, 2022). This difficulty is how to address wood fuel's key place in the continent's energy mix and, in particular, the growing reliance on charcoal for cooking (Chiteculo *et al.* 2018, FAO, 2019, Njenga *et al*., 2024). In sub-Saharan Africa, the use of charcoal and firewood could account for up to 90% of household energy use in some towns and cities (German Development Institute, 2016, FAO, 2017, Doggart *et al*., 2020). According to estimates, the production of charcoal is growing at a rate of 3% per year as a result of both increased urbanisation and growing rural use as people move away from firewood, the other common wood fuel (Liyama *et al.,* 2014; UNEP, 2019; Mwampamba *et al.,* 2023). FAO, (2020) submitted that charcoal is the fastest-growing type of wood energy which grew by 66% between 2000 and 2018. The consumption of charcoal is anticipated to rise further until 2030 as a result of population expansion and existing urbanisation trends (Chiteculo *et al.,* 2018; IEA, 2019). Millions of individuals in Africa's informal economy depend on the production, transportation, and sale of charcoal for their livelihoods (Mwampamba *et al*., 2013; Jones *et al.,* 2016).

Many African countries are concerned about charcoal production and usage because it is based on unsustainable practices (FAO, 2019), as the industry is often associated with environmental degradation, deforestation, and social concerns (FAO, 2017; Kiruki *et al*., 2017). To safeguard forests and ensure the ecological and ethical production of charcoal, African governments have responded by establishing laws and policies relating to charcoal production (Zulu, 2009; Doggart and Meshack, 2017; FAO, 2017). However, the majority of African nations do not have robust policies and regulatory frameworks that specifically manage their charcoal sector, despite their substantial reliance on charcoal ((Mwampamba *et al.,* 2023). The most common charcoal policy tool they often use is the straight ban on charcoal production and trading (Neufeldt *et al.,* 2015; Branch *et al.,* 2022). This is the case in Benue State where the policy tool used to regulate charcoal production is the straight ban on charcoal production and trading.

This absence of articulate policies has made the charcoal industry remain informal and unregulated, especially in Benue State. Similarly, despite the existence of a straight ban on charcoal production and trading as a charcoal policy in Benue State, widespread charcoal production across the State persists (Ekhuemelo *et al*., 2017, 2019). Ineffective adherence to the Benue State's charcoal policy by key actors in the value chain poses threats to the environment and economy, including deforestation, soil erosion, climate change, adverse effects on livelihoods, and wasteful use of resources. Environmental harm can be reduced when authorities assess policy compliance to see if sustainable methods are being used (Niambe *et al*., 2024, FGN, 2014). Initiatives for replanting, resource protection for forests, and a decrease in illicit logging are all supported by this assessment. Charcoal manufacturers follow rules intended to strike a balance between commercial gains and sustainable resource management, thanks to the process of evaluating policy compliance. A sector's carbon footprint can be lowered by adhering to regulations that support energy efficiency and greener industrial techniques (Nwokolo *et al*., 2023). This complements more general initiatives to mitigate climate change. By preventing the exploitation of disadvantaged groups and promoting fair work practices, ensuring policy compliance can result in a more equitable distribution of benefits. Whether producers are profiting from initiatives and assistance programs meant to enhance their livelihoods sustainably will be made clear by policy compliance. The study will help in detecting weaknesses in governance frameworks and policy enforcement. It will show if regulatory frameworks have flaws or whether current regulations are being appropriately applied and enforced. This can help with the formation of governance frameworks, capacity-building programs, and policies that will be more successful.

**2.0 METHODOLOGY**

**2.1 Study Area**

The study area is Benue State, Nigeria. The State is located within the Middle Belt of Nigeria on Longitude 7o47'E and 100.00’’E and between Latitudes 6025'N and 802510'N and has a land mass of 33,955km2 (Hula, and Ukpong, 2013). Benue State shares a boundary with Taraba State in the Northeast, Nassarawa State in the North. Down south the state shared boundary with Enugu and Ebonyi in the Southwest, Cross River State in the southeast. In the west, the state is bounded by Kogi State. The State also have an international Boundary with Cameroon around Kwande Local government axis (Fig. 1). The State has a population of approximately 5 million by 2009 estimate/projection based on a 2.8% growth rate (NPC 2006). Benue State has 23 Local Government areas. The State is located in the southern Guinea zone (Hula, 2010). The area is characterized by two distinct seasons; wet and dry season with mean annual rainfall of between 1200mm-2000mm (Hula, and Ukpong, 2013). The average annual temperature ranges between 28oc to 32oc with a relative humidity of between 60% and 80%. Benue State is located in the Guinea savanna zone of the country (Dagba *et al*., 2016). The vegetation of Benue state is characterized by fewer trees, more shrubs and predominantly tall grasses up to 2m tall (Dagba *et al*., 2016), riparian forests are found in lowland areas and river banks. Some of the species found in the area include: *Khaya senegalensis* *Daniella oliveri*, *Isoberlina doka*, *Parkia biglobosa,* Prosopsis *Africana,* *Vitellaria paradoxa* *Burkea Africana*, *pterocarpus erinaceus*, *Afzelia Africana, Borassus aethiopum, Bombax costatum, Anogeissus leiocarpa Irvingia gabonensis* (Adagba *et al.* 2016; Dagba *et al*., 2016, Shomkegh *et al.,*2016).

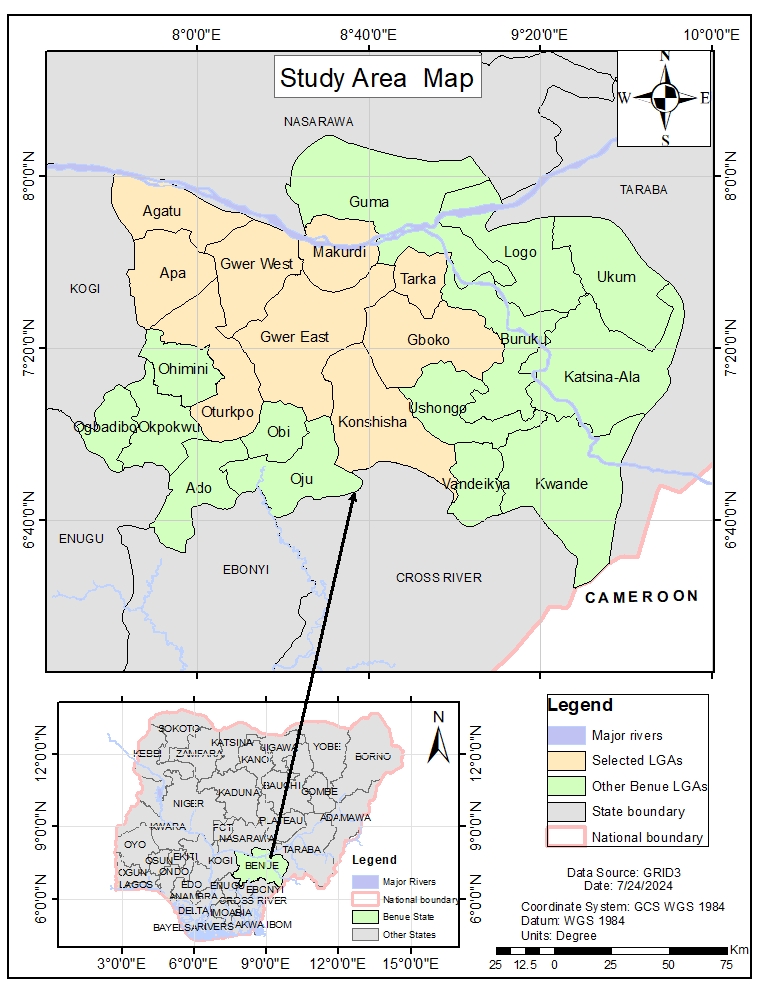


Fig 1. Map of Benue State showing the study area

**Source:** Ministry of Lands and Survey Makurdi (2015).

**2.2 Population for the Study and Sampling Procedure and Sample Size**

The population for the study was made up of all key players (producers, transporters, intermediary buyers/aggregators, consumers and regulatory bodies) in the Charcoal value chain in Benue State. A multistage sampling procedure was used to select the diverse key actors in the charcoal value chain in Benue State. The sampling procedure was based on the outcome of the reconnaissance survey across the State to obtain information about all the actors in the value chain as a guide for sample size selection. The reconnaissance survey was to delineate the charcoal production areas from non-charcoal producing areas in an attempt to identify and profile key players in the charcoal value chain across the State. Firstly, seven dominant charcoal production local government areas (LGAs) in the State were purposively selected (Konshisha, Gwer East, Gwer West, Tarka, Apa, Agatu and Otukpo LGAs), using the volume and prominence of charcoal production as the bass for the selection. Further, 14 communities (two per LGA) were selected based on the dominance of charcoal production across the selected LGAs and the population was accordingly profiled into diverse actors (producers, off-takers, transporters, consumers and regulators). Then, Yamane’s formula (Yamane, 1967) was used to estimate the appropriate sample size in the selected communities at a 95% confidence level and 5% margin of error. Thus, a sample size of 157 charcoal producers from a sample frame of 258 registered producers, 63 charcoal transporters (from a pool of 73 registered transporters), and 114 off-takers (out of a pool of 159 operators) were selected. Additionally, 399 charcoal consumers from a pool of 152,395 charcoal users in the selected areas were sampled alongside seven Divisional Forest Officers. The Bowley’s proportional allocation formula was applied to select the appropriate sample size at each stratum (Arnab, 2017).

Yamane’s formula for determining sample size is expressed as:

Where:

n= Sample Size

N= Population of the study

e= Margin of error (5%)

The Bowley’s proportional allocation formula is expressed as:

Where:

ni = Sample size for the ith stratum

n= Total sample size

Ni= Population for the ith stratum

N= Total population

**2.3 Method of Data Collection**

Data for the study were collected using different sets of questionnaires, designed with respect to each of the key player in the charcoal value chain - charcoal producers, charcoal transporters, charcoal intermediary buyers/aggregators, charcoal consumers. The study used digital questionnaires (Kobotoolbox.org) where distinctive questionnaires were administered to the proposed 739 respondents across the diverse value chain actors. Data for the study were analysed using descriptive statistics and Likert point scale rating. Data analysis were performed basically with the use of two analytical software: The Statistical Package for Social Sciences (IBM SPSS) Statistics 23® and FAO Value Chain Analysis Tool (FAO VCA-Tool) version 3.2. A Five-point Likert scale rating format was used to determine the perception of policy makers on the natural resources depletion due to activities of charcoal actors for positive contribution during policy dialogue. The weighting scale was derived from the following values with respect to perception of policy makers on the natural resources depletion due to activities of charcoal actors for positive contribution during policy dialogue; seriously Agree (SA) = 5, Agree (A) = 4, Undecided (UD) = 3, Disagree (D) = 2, Seriously Disagree (SD) =1.

The Likert rating Mean Score (MS) of the perception in knowledge and awareness of policy implication of charcoal exploration on environment will be expressed as:

Where:

= the mean score of a five-point Likert scale,

= Summation of the five-point rating scale and

n = Number of points

The Likert Weighted Mean Score (WMS) of perception of knowledge and awareness will be expressed as:

……………………………………………………………………(Eq.4)

Where:

f = frequency of respondent

x = Likert scale point

N= Total Number of respondents

Using the interval scale of 0.05, the Upper Limit (UL) cut-off will be MS+0.05 (3.0+0.05 = 3.05). The Lower Limit (LL) cut-off will be MS - 0.05 (3.0-0.05 = 2.95). Based on these two extreme limits, any variable with WMS below 2.95 (WMS<2.95) will be considered ‘Disagree’. Variable with MWS between 2.95 and 3.05, ‘Undecided’ and any variable with MWS greater than or equal to 3.05 (MWS≥3.05), ‘Agree’.

**3.0 RESULTS AND DISCUSSION**

**3.1 Awareness of Charcoal Policies in Benue State**

The result of the awareness of policy framework regarding the charcoal value chain (Table 1) in Benue State revealed that the majority (83.97%) of the producers, off-takers (84.20%), transporters (76.19%) and 81.45% of consumers were not aware of any policy regulations on charcoal production none utilization in Benue State. However, 100% of the regulators (the Divisional Forest Officers, Police and traditional rulers) expressed awareness of regulatory policies on charcoal in Benue State. These findings imply that there was poor understating and awareness of the existence of charcoal policies in Benue State by CVC actors. The assertion of the smaller proportion of the value chain actors precludes the notion of the non-existence of policy framework in the charcoal value chain.

The findings of this study agree with the fact that charcoal production has continued to be carried out in an informal way in most African countries, including Nigeria and Benue State in Particular (Obiri *et al.,* 2014, Jones, 2016, van T Veen *et al.,* 2022, Niambe et al., 2024). This may be due to poor attention given to the charcoal sector in Nigeria, despite its enormous contributions to the energy and financial needs of millions of people both in rural and urban centres. This is evidenced by the negligence of the charcoal policy in the recent Nigerian National Forest Policy of 2020. The policy only briefly talks about fuel wood without anything, not even the name of charcoal mentioned. This agrees with the submission by Bekele and Kemal (2022) that over the years’ charcoal has remained ignored by policymakers in sub-Saharan Africa. The government has not given the needed attention to the charcoal sector, as many of the regulators prefer charcoal to be informal and this is working in favour of CVC actors since they are not paying any formal royalty (Jones, 2016, Yeboah-Assiamah *et al.,* 2017). This is another source of revenue leak for the State government. This could be linked to the corruption that has eaten deep in every sector in Nigeria. The assertion of the regulators to the awareness of the existence of charcoal policy guidelines could be attributed their privy knowledge of the extant policies as agents of government, and not necessarily, due to its operational effectiveness.

**3.2 Charcoal Policies in Benue State**

The result of charcoal policies as presented in Table 1 revealed that three policies regarding charcoal production and marketing viz; ban on production, market regulation and sustainable production, were listed by key actors in CVC in Benue State. Detail analysis depicted that 84.00% of the proportion of charcoal producers that expressed awareness of the charcoal policy in Benue State affirmed awareness of the policy on the ban on production, 38.89% and 61.11% of off-takers expressed awareness of policies on charcoal market regulation and sustainability of its production, respectively. Likewise, 100% of the proportion of transporters were fully aware of the ban of charcoal production in Benue State. Further, 77.03% of consumers were aware of the ban of charcoal production while 20.27% of the 74 consumers that expressed awareness of charcoal policies attested that they were aware of the ban on charcoal production and sustainable production of charcoal in the State. Like many other parts of Africa, the charcoal policy in Benue State was largely the ban on production. This agreed with the submission by Doggart *et al.* (2020) that, a charcoal ban on production and consumption was the policy tool used by many countries in Africa. In spite of the awareness of the ban on charcoal production policy, some of the CVC actors still operate freely given that even regulators turn a blind eye on the operation of CVC actors in Benue State allowing them to carry out their businesses as if there were no regulation. This is obvious by the 100% awareness of the regulators of charcoal value chain in the State.

**3.3 Agencies responsible for Policy enforcement in Benue State**

The results of the enforcement of the policies on charcoal in Table 1 showed that, majority of the producers (75.76%), off-takers (86.87%), consumers (79.73%) and regulators (100%) agreed that the regulators and enforcers of charcoal policies were the Divisional Forest Officers (DFOs). However, more than half (54.54%) of transporters indicated the DFOs were responsible for the enforcement of the policies while 31.62% and 13.64% were of the opinion that the task of enforcement of the policies was the prerogatives of the traditional rulers and police, respectively. Evidently, the enforcement of Forestry laws and policies including the charcoal policy in Benue State is the responsibility of the Department of Forestry in the Ministry of Environment and Water Resources. However, other security agencies like the police try to enforce the ban but end up in their packet. This is in line with the submission that, fraud happens once regulations, laws and rules are not obeyed, as well as those on forest use, that can result in forest degradation and deforestation in many countries (van - Veen *et al.,* 2022).

**Table 1:** **Charcoal Production and Marking Policies in Benue State**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Production Policy** | **Producers** | **Off-takers** | | | **Transporters\*** | | | | **Consumers** | | **Regulators\*** | | | **Pooled %** | | |
| **Awareness of charcoal policy** | | | | | |  | |  | | | |  | | |  | | |
| Yes | 25 (16.03) | 18 (15.80) | | | 15 (23.81) | | | | 74 (18.55) | | 7 (100) | | | 34.84 | | |
| No | 131 (83.97) | 96 (84.20) | | | 48 (76.19) | | | | 325 (81.45) | | 0 | | | 65.16 | | |
| **Charcoal policy** | | |  |  | | |  | | |  | | |  | | |
| Ban on Production | 21 (84.00) | 0 | | | 8 (100) | | | | 57 (77.03) | | 7 (100) | | | 65.26 | | |
| Market regulation | 1 (4.00) | 7 (38.89) | | | 0 | | | | 2 (2.70) | | 7 (100) | | | 11.40 | | |
| Sustainable production | 3 (12.00) | 11 (61.11) | | | 0 | | | | 15 (20.27) | | 7 (100) | | | 23.34 | | |
| **Policy enforcement** | | |  |  | | |  | | |  | | |  | | |
| DFOs | 50 (75.76) | 26 (86.87) | | | 24 (54.54) | | | | 59 (79.73) | | 7 (100) | | | 79.38 | | |
| Police | 4 (6.06) | 1 (3.33) | | | 14 (31.82) | | | | 2 (2.70) | | 0 | | | 8.78 | | |
| Traditional rulers | 12 (18.18) | 3 (10.00) | | | 6 (13.64) | | | | 13 (17.57) | | 0 | | | 11.84 | | |

NB: The values in parenthesis represent percentages and \*multiple responses.

Source: Field Work, 2023.

**3.4 Level of Charcoal Policies Compliance in Benue State**

The result of the level of compliance with the policy regulations showed that there was a consensus agreement on poor compliance levels among the key actors in CVC in Benue State. As depicted in Table 2, the levels of compliance of producers (WMS=1.52), off-takers (WMS=1.39), transporters (WMS=1.20), consumers (WMS=1.26) and regulators (WMS=1.43) all fell below the threshold of compliance (MWS = 2.0). Thus, the consensus among the key actors in CVC in Benue State on the level of charcoal policy compliance was very poor. This confirmed the submission by (Maes and Verbist, 2012) that charcoal bans in several nations have had partial accomplishment. World Agroforestry, ICRAF (2019) asserted that attempts aimed at the ban on charcoal production have largely pushed the charcoal business more into informal means of operating. This is also consistent with the conclusion of Aderogba and Adeniyi (2019) who averred that the absence of proper enforcement of charcoal laws by charcoal actors often resulted in an unchallenged operation of the key actors.

**Table 2: Level of Charcoal Policy Compliance in Benue State**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Wholly | Partially | Not at All | N | WS | WMS | Decision |
| Producers | 1 (3) | 11(22) | 13 (13) | 25 | 38 | 1.52 | Poor Level of Compliance |
| Off Taker | 0 (0) | 7 (14) | 11(11) | 18 | 25 | 1.39 | Poor Level of Compliance |
| Transporters | 0 (0) | 3(6) | 12(12) | 15 | 18 | 1.20 | Poor Level of Compliance |
| Consumers | 1(3) | 17(34) | 56(56) | 74 | 93 | 1.26 | Poor Level of Compliance |
| DFOs | 0 (0) | 3(6) | 4(4) | 7 | 10 | 1.43 | Poor Level of Compliance |

Note: N= Number of Respondents, WS= Weighted Score, WMS= Weighted Mean Score. Threshold: WMS = 2.0

**3.5 Performance of Policies Compliance in Benue State**

The result on the performance of policies compliance in Benue State indicates that all key actors in CVC in Benue State, producers (WMS=2.08), off-takers (WMS=2.11), transporters (WMS = 2.27) and consumers (WMS = 2.20) agreed that the performance charcoal policy in Benue State was poor. However, regulators/DFOs WMS=2.00 reported that the performance of charcoal policies in Benue State was very poor (Table 3). Charcoal value chain actors in Benue State thought that the performance of charcoal ban policy compliance in Benue State was poor. This means that the policy is not recognized and obeyed by the actors. This is evidenced by the high volume of charcoal that is produced in the state and displaced on the streets and roads all over the state indicating that the policy is not in force.

**Table 3: Performance of Charcoal Policy Compliance in Benue State**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Very Effective | Effective | UD | Weak | Very Weak | N | WS | WMS | Decision |
| Producers | 0 (0) | 3(12) | 0 (0)) | 18(36) | 4(4) | 25 | 52 | 2.08 | Weak |
| Off-takers | 0 (0) | 1 (4) | 5(15) | 7(14) | 5 (5) | 18 | 38 | 2.11 | Weak |
| Transporters | 0 (0) | 0 (0) | 6(18) | 7(14) | 2(2) | 15 | 34 | 2.27 | Weak |
| Consumers | 0 (0) | 1(4) | 29(87) | 28(56) | 16(16) | 74 | 163 | 2.20 | Weak |
| DFOs | 0 (0) | 1(4) | 1(3) | 2(4) | 3(3) | 7 | 14 | 2.00 | Very Weak |

Note: N= Number of Respondents, WS= Weighted Score, WMS= Weighted Mean Score

Threshold: WMS = 3.0

**3.6 Effectiveness of Charcoal Policies Compliance in Benue State**

The result on effectiveness of policy compliance in Benue State indicates that, producers (WMS=1.80), off-takers (WMS=1.72) and transporters (WMS=1.67) were of the opinion that the policies regarding charcoal production and use in State were very weak. Equally, consumers (WMS=2.38) and regulators/DFOs (WMS=2.14) agreed that the charcoal policies in Benue State were weak (Table 4). This is not surprising because, it was clear from the response of the respondents that the policies themselves were very weak in the first instance, hence the non-effectiveness of regulation of charcoal production in Benue State. In reality, the effectiveness of charcoal policy depends to a large extent, on the political will of the government and other regulatory authorities. The sad reality could be attributed to the fact a score of political officer holders and policy-makers that would have enforced the policies do not want to get involved in issues that will make them unpopular since they cannot provide other alternative sources of energy. The question of alternative energy sources as averred by Doggart et al. (2022) are well beyond the reach of many families, hence the continual in effective operation and compliance of CVC to the extant policy framework. The popular opinion amidst the absence of any alternative for the actors to rely on implies that, enforcing the ban on charcoal production and use means you do not want the actors to live, hence they will go against such government.

**Table 4: Effectiveness of Charcoal Policy Compliance in Benue State**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variable | Very Effective | Effective | UD | Weak | Very Weak | N | WS | WMS | Decision |
| Producers | 0 (0) | 1(8) | 3 (9)) | 11(22) | 10(10) | 25 | 45 | 1.80 | Very Weak |
| Off Taker | 0 (0) | 0 (0) | 2(6) | 9(18) | 7 (7) | 18 | 31 | 1.72 | Very Weak |
| Transporters | 0 (0) | 0 (0) | 0 (0) | 10(20) | 5(5) | 15 | 25 | 1.67 | Very Weak |
| Consumers | 0 (0) | 0 (0) | 34(102) | 23(46) | 17(17) | 74 | 165 | 2.23 | Weak |
| DFOs | 0 (0) | 1(4) | 1(3) | 3(6) | 2(2) | 7 | 15 | 2.14 | Weak |

Note: N= Number of Respondents, WS= Weighted Score, WMS= Weighted Mean Score

Threshold: WMS = 3.0

**3.7 Charcoal Business Registration**

Table 5 showed the results of charcoal business registration among the key actors in Benue State. It can be observed that majority of charcoal producers (94.23%), off-takers (83.33%) and transporters (84.13%) had no evidence of business registration with the designated authorities: Benue State Department of Forestry, Ministry of Water Resources, Benue State Board of Internal Revenue none the State Chambers of Commerce. Thus, it can be inferred that any activities that pertain charcoal production without express permission of the assigned bodies rendered such operations invalid and illegal. As depicted in the Table, it can be seen that charcoal production was carried out both officially and unofficially by the actors involved in CVC in Benue State. This suggestion is in line with the opinions of Obiri *et al.* (2014), Kazimoto (2015) and Jones (2017) that charcoal production in Africa is done in an informal way without recurse to the relevant registration agencies. According to Schuure *et al*. (2013) the majority of people involved in charcoal business are doing it in an unofficial way, which means they are not registered and do not pay royalties to the government. Due to royalty avoidance, it can be inferred that a large proportion of government revenue is lost, and the annual production of charcoal is not well documented (Nyamoga and Solberg, 2019, Marandu, 2021). However, attempts to effectively checkmate the activities of CVC actors, Marandu (2021) opined that, established charcoal businesses by CVC actors should register their enterprises and endeavor to pay the requisite government prescribed fees.

**3.8 Payment of Royalty**

It was established from the study that, 67.31% of producers did not pay any kind of royalty to government or community. Furthermore, 57.89% of Off-takers said they did not pay royalty while 42.11% agreed that they paid some kind of royalty. Additionally, 61.90% of transporters did not pay royalty while only 38.10% did pay, however, 100% of regulators stated that actors in CVC in Benue State did not pay royalty (Table 5). Three kinds of royalty were listed by respondents, they were Permit, license, tax and levies. For those producers who said the normally paid royalty, especially permit, 100% of these producers stated that they pay N 1000/ tree stand. Both producers and off-takers who agreed that they paid royalty, all of them said they paid N6000 to collect licenses for operation per year. For taxes and levies it was recorded that only Off-takers and transporters that pay for them. Majority 63.16% of those Off-takers who reported to be paying royalty, reported that they paid N200 per each bag of charcoal purchased, while 36.84% said they paid N500 per each bag of charcoal. In the same vein 66.67% of transporters, they paid N 200/bag of charcoal conveyed while 33.33% said they paid N 500/bag. It was established from the study that, producers in Benue state did not any form formal royalty to government or community. Even though Forestry law of Benue Sate as gazette in 2015 listed all royalties and fees to be pay be all the actors. This poor payment of charcoal royalties and levies by charcoal value chain actors was reported by other scholars (Obri *et al.,* 2014; Ndegwa *et al.* 2021; Marandu; 2021; Mensah *et al.,* 2024). This implied government is losing a lot of revenue in the charcoal sector.

Table 5: **Charcoal Business Registration and Royalty payment**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Production policy and Sustainability** | **Items** | **Producers** | | **Off-takers** | | **Transporters** | |
| Freq | % | Freq | % | Freq | % |
| Registration of Charcoal Business | Yes | 9 | 5.77 | 19 | 16.67 | 10 | 15.87 |
| No | 147 | 94.23 | 95 | 83.33 | 53 | 84.13 |
| Amount paid for Registration of Charcoal Business | N 6000/yr | 9 | 100 | 19 | 100 | - | - |
| Payment of Royalty | Yes | 51 | 32.69 | 48 | 42.11 | 24 | 38.10 |
| No | 105 | 67.31 | 66 | 57.89 | 39 | 61.90 |
| Kind of royalty paid and Amount paid | | | |  |  |  |  |
| Permit | N6000/tree | 9 | 100 | - | - | - | - |
| License | N6000 | 9 | 100 | 19 | 100 | - | - |
| Tax and levies | N200/bag | - | - | 12 | 63.16 | 16 | 66.67 |
| N500/bag |  |  | 7 | 36.84 | 8 | 33.33 |

Sources: Field Work 2023

**4.1 Conclusion**

The study reveals a significant lack of awareness and poor compliance with charcoal policies among key actors in the charcoal value chain in Benue State, Nigeria. The majority of producers, off-takers, transporters, and consumers are unaware of charcoal policies, while regulators are fully aware. The study highlights the need for increased awareness, education, and enforcement of charcoal policies to ensure sustainable charcoal production and mitigate environmental degradation. The findings suggest that the current charcoal production practices in Benue State are unsustainable, with significant environmental implications. Therefore, there is a need for stakeholders to collaborate and develop effective strategies for sustainable charcoal production and environmental conservation in the region. This can be achieved by:Increasing awareness and education on charcoal policies among key actors**,** strengthening policy enforcement and compliance monitoring**,** encouraging registration and royalty payment among actorsand promoting sustainable charcoal production practices. By addressing these gaps, the study contributes to the development of effective strategies for sustainable charcoal production and environmental conservation in Benue State, Nigeria.

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Details of the AI usage are given below:

1. R discovery

2. Scispace

3. Metal AI

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