An Estimation of National Charcoal Production: A Case study of Ghana

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Introduction

- Charcoal remains an integral part of energy demand for sub-Saharan economies
- In Ghana, it provides domestic energy for cooking and heating to over 66 per cent of Ghana's households (HPC, 2010, cited in Energy Commission, 2014)
- Charcoal also provides energy for some commercial and light industrial activities
- It forms a key livelihood base for several rural households and key component of local government revenue e.g. Transition zone in Ghana

Introduction

- Actors: Producers, middlemen, transporters, market women/retailers and consumers
- The Ministry of Energy, assisted by the Energy Commission is responsible for policies and legislation covering charcoal (as a renewable fuel)
- The Forestry Commission (FC) is responsible for governing the production and harvesting of the wood raw material for charcoal production
- The FC has in since 2016 introduced a Charcoal Conveyance Certificate (CCC) that should accompany all vehicles transporting charcoal from production areas to the market

Introduction

- Environmental Protection Agency issues certificate confirming that the production is from a sustainable resource base (for Exporters)
- Local government institutions (District Assemblies) also charge local fees from producers within their jurisdiction
- Traditional authorities (chiefs) control rights over trees and charge fees to charcoal producers

Introduction

- In Ghana alone, it has been estimated that 400,000 people with over a million dependents are engaged in charcoal production in the northern and transitional zones of Ghana (Energy Commission, 2006)
- The trade is a source of revenue for public and traditional institutions (DEAR, 2005; Brobbey *et al.,* 2015)
- Frank *et al* (2019), for instance, estimated that in 2016, chiefs and landowners generated as much as US$2.7 million from the charcoal trade in Ghana.

Problem Statement

- Though an important commodity, the sub-sector remains poorly regulated
- Data on actual levels of production is thin (based on proxy indicators)
- Lack of information makes it challenging to make informed decisions for policy interventions and management practices
- More accurate estimates are needed to serve as basis for informed decisions
- Hence the need for a more cost-effective but reliable assessment methods

Objective

- Develop a cost-effective method for estimating national charcoal production
- Assess the national charcoal production
- Identify production hotspots
- Ascertain any seasonal variations in production

Methodology

- The study was carried out in 2016 and repeated in 2018
- Started from data on Charcoal Conveyance Certificates
- Validation of the data by 14 days 24x7 sentry monitoring of selected charcoal routes
- Estimation of charcoal produced outside the CCC system – (This 3rd component was done only for 2018)

Plate 1: Map of Ghana showing sentry stations

Estimating total charcoal production

TROPENBOS INTERNATIONAL Ghana

- The total annual charcoal production. P, of a forest district is calculated by the equation:

$$P = k * D + S \quad \text{..... (1)}$$

where:

- k is the correction factor (average ratio between quantities captured by sentry data and CCC data);
- D is charcoal production by a forest district, as captured by the CCC data;
- S is the estimated unrecorded charcoal production and consumption in the forest district, outside the CCC system.
- Similarly, the national annual charcoal production $P_{n,}$ is obtained from the summation from all the forest districts, and is expressed by equation (2):

$$P_n = k\{\sum_{n=1}^{n}(Dn)\} + S\text{n} \quad \text{..... (2)}$$

- n refers to the respective forest districts;
- (Dn) is the amount of charcoal recorded for forest district n, in the CCC database, and
- $S\text{n}$ is the aggregated charcoal production outside the CCC system

RESULTS

Table 1: Amounts of charcoal traversing the sampled check points as per CCC and sentry data for 2016

Name of checkpoint	Number of vehicles			Q'ties of Charcoal Recorded (tons)		
	Sentry data (A)	CCC data (B)	Ratio A:B	Sentry data (C)	CCC data (D)	Ratio C:D
Juansa	117	25	4.7	1,377	322	4.3
Walewale	101	80	3.4	21	12	1.6
Kintampo	334	206	1`.6	5,040	2,842	1.8
Mampong	267	125	2.1	2,388	982	2.4
Total	819	436	1.9	8,825	4,158	2.1

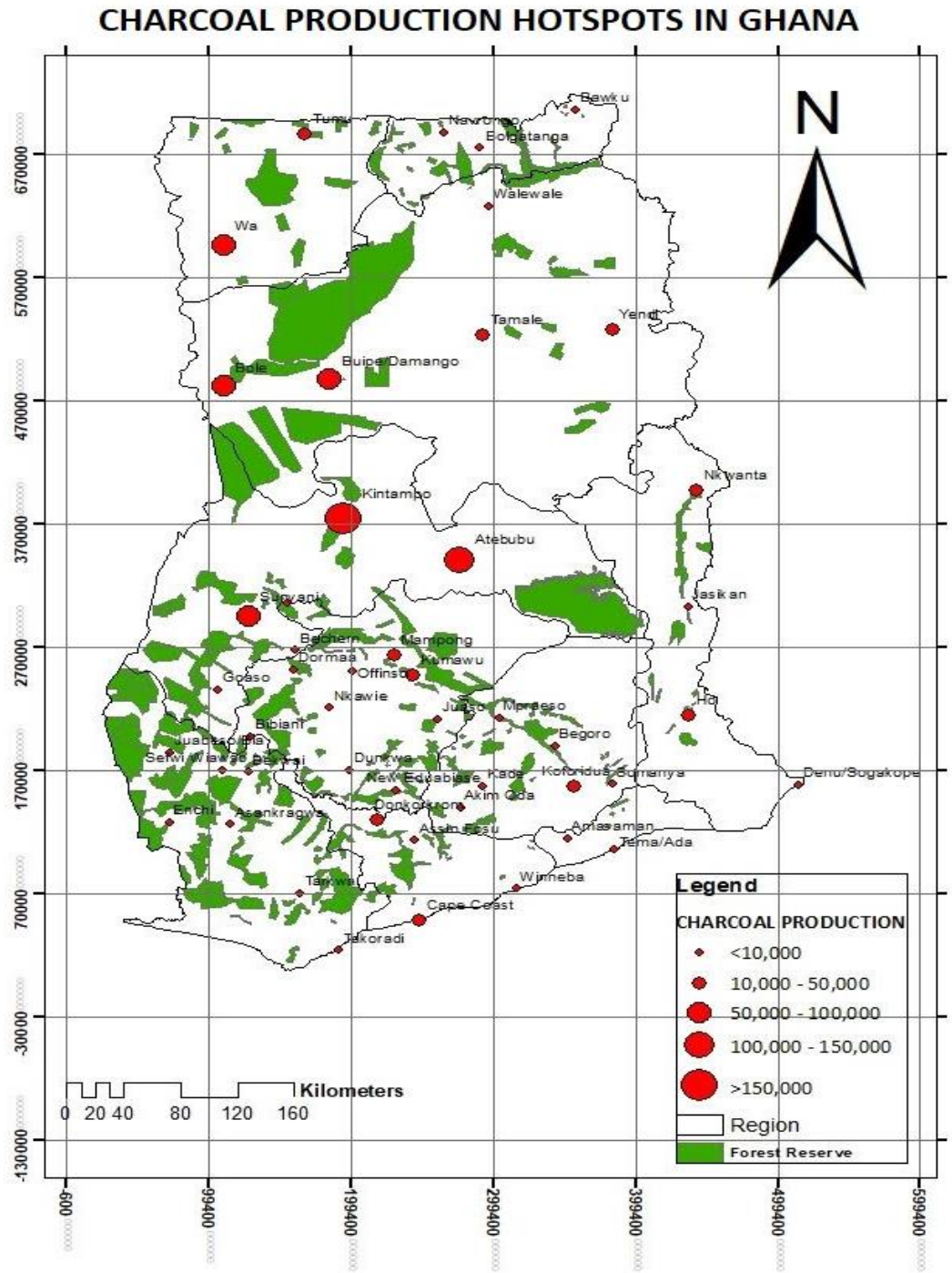
Table 2: Amounts of charcoal traversing the sampled checkpoints as per CCC and sentry data for 2018

Name of checkpoint	Number of vehicles			Q'ties of charcoal recorded (tons)		
	Sentry data (A)	CCC data (B)	Ratio A:B	Sentry data (C)	CCC data (D)	Ratio C:D
Juansa	157	17	9.2	1,893	223	8.5
Walewale	84	25	3.4	90	38	2.4
Kintampo	449	587	0.8	8,209	6,133	1.3
Mampong	457	106	4.3	4,735	785	6.0
Total	1,147	735	1.6	14,927	7,179	2.1

Results

- Comparison of the CCC data and that obtained from the sentry monitoring for the two separate years (2016 and 2018) showed that the sentry data was higher by a factor of 2.1

- Production outside the CCC system was estimated to be 164,000 tons


CHARCOAL PRODUCTION HOTSPOTS IN GHANA
N
Bawku
Tumu
Navrongo
Bolgatanga
Walewale
Wa
Yendi
Tamale
Buipe
Damango
Bole
Nkwanta
Kintampo
Atebubu
Jasikan
Sunyani
Berekum
Nkoranza
Dormaa
Kumawu
Goaso
Offinso
Nkawie
Ho
Juaso
Mpraeso
Bibiani
Begoro
Sefwi Wiawso
Bekwai
Dunkwa
Koforidua
Somanya
Denu/Sogakope
Kade
Akim Oda
Enchi
Asankragwa
Oda
Agona Swedru
Amasaman
Tema/Ada
Tarkwa
Winneba
Cape Coast
Takoradi
Legend
CHARCOAL PRODUCTION
<10,000
10,000 - 50,000
50,000 - 100,000
100,000 - 150,000
>150,000
Region
Forest Reserve
Kilometers
0 20 40 80 120 160
670000
570000
470000
370000
270000
170000
70000
-30000
-130000
-600
99400
199400
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399400
499400
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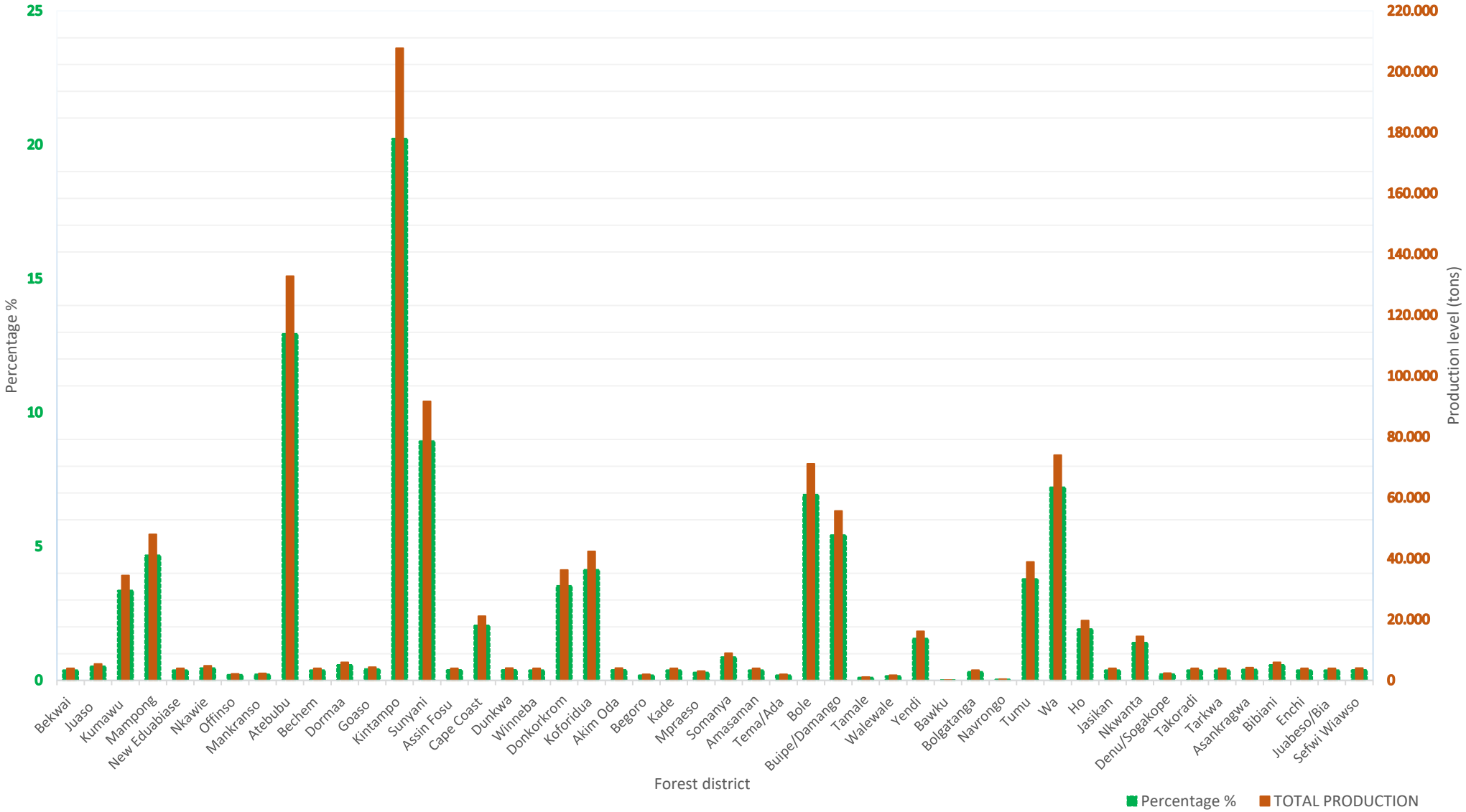


FIGURE 1: ***Annual Charcoal Production Per Forest District for 2018***

Estimated total national charcoal production

- The total national charcoal production is estimated using equation (2) as defined above, i.e.

$$P_n = k\{\sum_{n=1}^{n}(Dn)\} + Sn \text{ .... } (2)$$

- This comes to **One Million, one hundred thousand tons (1,100,000) tons.**

Fig. 2: Annual Charcoal Production Per Region

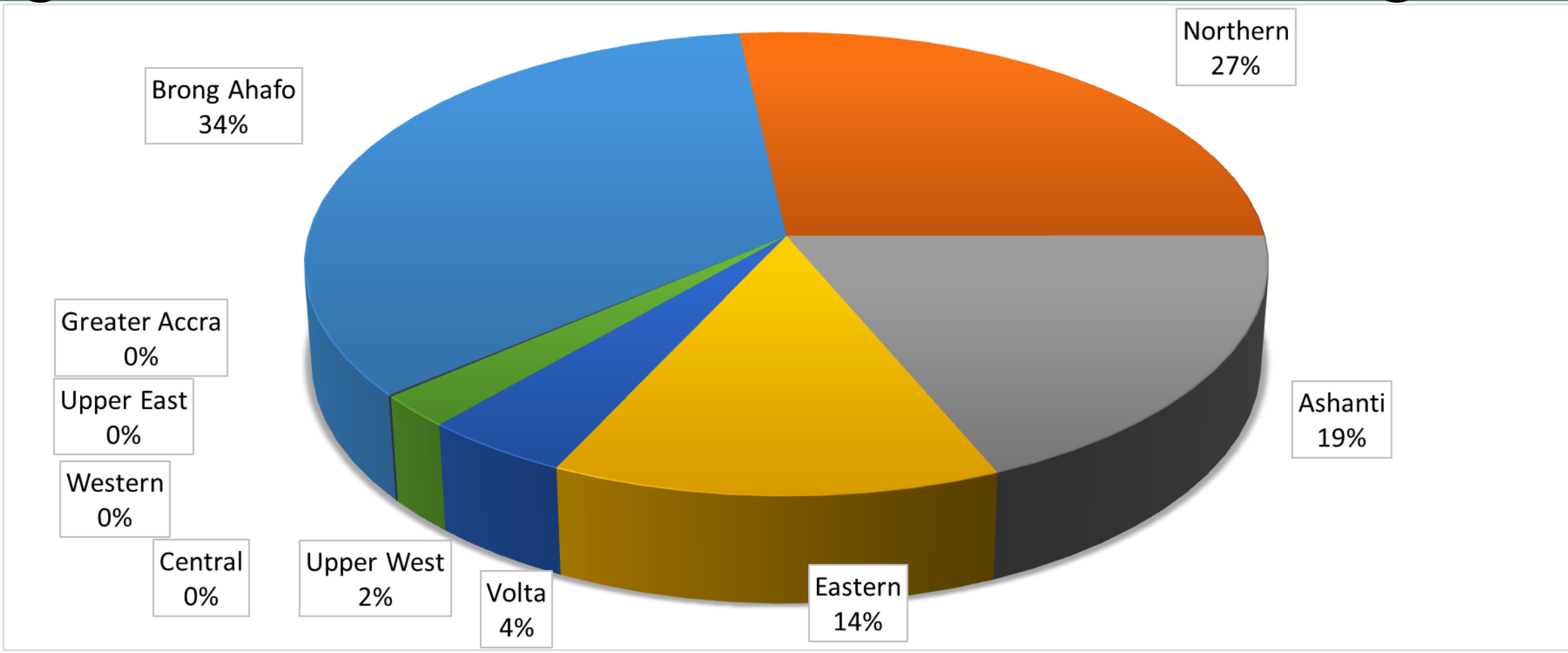
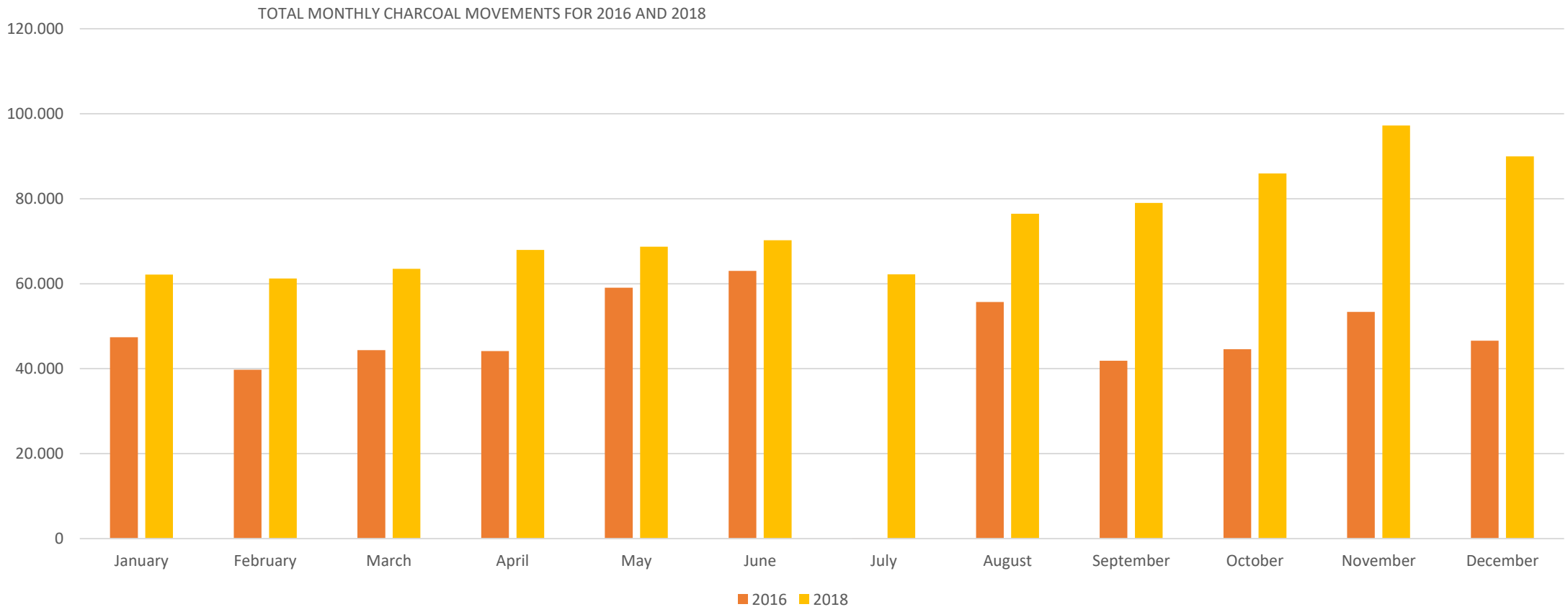


FIGURE 3*: Total monthly charcoal movements in 2016 and 2018*



DISCUSSION

- The current study estimated national annual production of charcoal (2018) at 1,100,000 tons
- The production estimates do not account for any charcoal imports, but may include exports
- It is therefore likely to be different from consumption figures
- C.f. Consumption figures may include some imports, this however, needs to be confirmed
- The 1,100,000 tons translate to 15.7 million m^3 RWE
- C.f. Official annual wood harvest is 2 million m^3

CONCLUSIONS AND RECOMMENDATIONS

- A method to estimate the national charcoal production in Ghana has been developed and tested
- The method takes point of departure in the official permit system to allow road transport of charcoal (the Charcoal Conveyance Certificate)
- Attempts have been made to capture road movement of charcoal without the permit through mounted checkpoints.
- A 3rd element of the method attempts to capture charcoal production consumed locally
- Using the method, the national annual (2018) charcoal production in Ghana is estimated at 1,100,000 tons which translates to 15.7 million m^3 round wood equivalent (RWE).

RECOMMENDATIONS

- A stronger institutional collaboration between the Ghana Forestry Commission and the Energy Commission is recommended to provide regular and cost-effective national charcoal statistics
- Periodic mounting of sentries can be done to validate the charcoal conveyance data collected by FC.
- The method demonstrated here can serve as inspiration beyond Ghana, in countries where national permit systems are being implemented, but only captures a share of the total production and movement.

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