Charcoal Production and Miombo Woodland Degradation

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Outline

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- Rationale
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Background

- In Zambia, the extent of Miombo Woodlands Covers 72% of The entire forest standing stock.

- Natural forests/woodlands contribute immensely to livelihoods of 60% of rural households and 3.7% - 6.2% to GDP.

- Deforestation rates are estimated between 113,000 ha and 850,000 ha per annum.


NB. Charcoal & Firewood Accounts For About 70% Of The Total National Energy Demand (CSO, 2016).
Rationale

- **TRENDS:** Soaring demand and increased supply of charcoal in the country.

- **ALARM:** Deforestation has been raised to extraordinary levels.
  
  While figures vary, charcoal production was estimated to be responsible for an annual deforestation rate of about 62,000 ha/yr (Kalinda et al. 2008).

- **SUSTAINABILITY:** Economic sustainability versus Ecological sustainability.

Preparation for one of the largest kilns, 
Source: Author.
Objectives

- **SPECIES:** To list the different species in charcoal abandoned areas across three different vegetation types.

- **OCCURANCE/DENSITY:** To determine the relative frequency and relative density of different species.

- **YIELDS/CLEARED AREA:** To estimate the cut over area and the number of bags realized per cut-over area.

Charcoal packaged into bags ready for the market, *Source: Author.*
Study area:

The study was undertaken across three distinct vegetation types namely:

(i) Wet Miombo (Lufwanyama_Mwekera);
(ii) Dry Miombo (Rufunsa) and;
(iii) Hilly Miombo (Choma_Syamuleya).

Source: NFP (2014).
Figure 1: Location of study areas
Inventory of species

**SITES**-Charcoal regrowth sites that were between 1 and 3 years old since charcoal production ceased were selected.

**TRANSECTS**-On each site, plots were fixed along transects that ran across sites at every 50 m.

**PLOTS**-5 Circular sample plots, each with a radius of 10 m were established along the transects at every 50 m.

A forest inventory in progress,

*Source: NFP (2014).*

Indaba Agricultural Policy Research Institute
Estimation of cut over area and number of charcoal bags produced

SITES-Charcoal production sites around Katanino Forest Reserve were identified for estimating the cutover area (only).

CUT OVER AREA-The size of the cut over area was estimated using a Global Positioning System (GPS).

No. OF BAGS-The number of 90 kg bags produced per cut over area was calculated (with asst. of kiln owners).

NB. Additionally, there was visual observations on the cut-over areas in order to develop an understanding of the impact of charcoal production on the forest landscape.

<table>
<thead>
<tr>
<th>Package Material</th>
<th>Actual Charcoal Weight</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 kg-maize bag</td>
<td>29 – 57 kg</td>
<td>Chidumayo, 1979</td>
</tr>
<tr>
<td>50 kg-maize bag</td>
<td>33 kg</td>
<td>Gumbo et al., 2013</td>
</tr>
</tbody>
</table>
Data Analysis

- The number of bags was plotted against cut-over areas.
- Diversity in genera, families and species.
- Importance value index for species composition.
- Impact of charcoal production on forests.

NB. Importance value index of the species = the sum of its relative dominance, its relative density and its relative frequency (Marin, 2009)
Cut over area and charcoal bags output

-The analysis revealed strong correlation between the number of bags and the cut over area \( (r=0.7472; \ p< 0.01; \ \text{slope curve}= 0.97; \ n =20) \) (Figure 2).

(NB. A sign of uniform Age classes, DBH classes, Heights, Species composition: could be secondary forests).

-Approximately 109 bags (90kg) of charcoal are produced per ha of forest cut/destroyed.

Figure 2: Cut-over area versus number of charcoal bags produced
Species composition and diversity

Figure 3: Families and their relative species
Species dominance

IN RUFUNSA- *Ochna pulchra* (12.6%) dominated in terms of relative density and importance value index followed by *Brachystegia longifolia* (12.2%) and *Diplorynchus condylocarpon* (11.8%).

LUFWANYAMA_MWEKERA-was dominated by *Isoberlinia angolensis* (10.9%), *Julbernadia paniculata* (7.1%), *Diplorynchus condylocarpon* (6.3%), *Ochna pulchra* (4.1%) and *Pterocarpus angolensis* (4.3%).

CHOMA_SIAMULEYA-was mainly composed of *Brachystegia utilis* (29.6%) and *Brachystegia boehmii* (15.1%).

Source: Author.
Cut over area and number of charcoal bags produced:

- Strong correlation between cleared area and bags produced.
- High demand for charcoal in urban implies high deforestation.
- Degradation hot spots associated with urban centres.
Discussion

Species diversity and composition:

- Typical Miombo species in all sites.

- Charcoal production has a rehabilitation effect.

- Species had high value indices.

- Rapid regeneration, development and higher stocking.

**Figure 4:** Changed landscape due woodland clearing for charcoal production

**NB.** The results also revealed higher plant diversity in the regrowth stands of Wet miombo woodland (Lufwanyama_Mwekera) than the other two study sites. Wet miombo receives higher rainy fall than any of the two areas. This may be an indication of the influence of rainfall on species diversity.
Conclusions

- **CUT OVER AREA:** The study has demonstrated the direct correlation that exists between the quantities of charcoal produced and the cut-over area (even/uniform stands).

- **FOREST UTILIZATION:** Sustainable charcoal production is a form of forest utilization and may not necessarily result in biodiversity loss.

**NB.** However, in Zambia, the high intensities of harvesting for charcoal and firewood arising from increased demand for charcoal consumption may exert pressure beyond the critical point of the Miombo woodland.

- This implies that more forest and woodlands will be cleared for charcoal production.

A massive pile of felled timber, *Source: Author*

*Continuous loss of vital forest ecosystem functions and forest ecosystem goods and services.*
Policy recommendations

**ESSENTIAL:**
- Effective and efficient Implementation of the National Forest Policy (2014): e.g. Provisions under Section 6.6 Sustainable Production and Processing of Charcoal
- Adapting the NFP to location-specific circumstances is vital
- Scientific understanding of natural forests and woodlands (ecology and socio-economics) and contemporary SFM & GFG
- Recognition and revitalization of traditional forest management systems

**CRITICAL:**
- Enforcement of the Forests Act of 2015 (Part X Section 87, 88, 89)
  - Restrictions on manufacture of charcoal
  - Destruction of major forest produce
  - Illegal possession of forest produce
- Development and implementation of a Charcoal Production and Trade Framework (CIFOR-led and ongoing)
- Local Communities' participation in law enforcement is crucial

**OTHER:**
- Diversification of Energy sources (Energy efficiency) and/or Alternative livelihoods

This kiln is produced from an area to be cultivated afterwards, Source: Author.
THANK YOU FOR YOUR ATTENTION!!

For contributions or Further information:

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