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Opportunities and challenges for sustainable management of miombo woodlands: the Zambian perspective

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Miombo woodland is the most widespread woodland type in Zambia. It is important for various uses namely charcoal, timber, fruits, medicines, mushrooms, etc. These different forms of utilization have varying impacts on both the miombo woodland ecosystem and the individual species. The variation in impacts calls for thorough understanding of the best management approach that has to be employed to ensure sustainability.

1 Introduction

Miombo woodland is one of the six ecoregion in Zambia, namely Zambezian flooded grassland, Western Zambezian grasslands, Cryptosepalum dry forests, Zambezian Baikiaea woodlands and Zambezian and Mopane woodlands (Fig. 1). It is the most extensive Zambian ecoregion covering about 65% of the Country. Miombo is further divided into Central Zambezian and Southern Miombo Woodlands. The central miombo woodland which is predominantly of *Isoberlinia angolensis*, *Brachystegia* spp. and *Julbernadia paniculata* is the dominant vegetation types in Northern, Luapula, North-Western and the northern part of Central Province and part of Kafue National park. However, in the southern miombo woodland, *Isoberlinia angolensis* is absent.

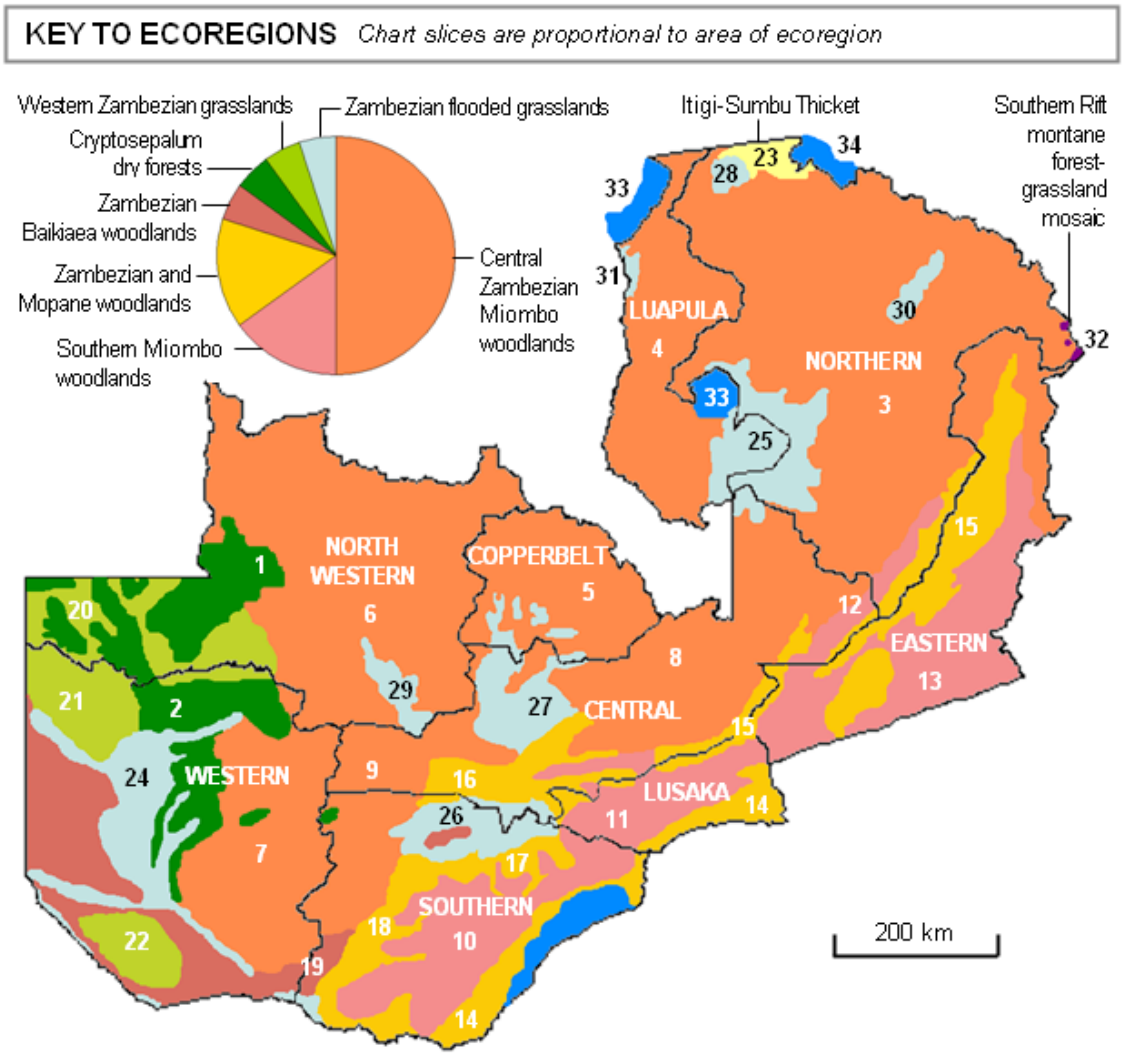

Figure 1. The major ecoregions of Zambia.

2 Miombo utilization

Miombo resources are central to livelihoods of urban and rural dwellers (Campbell et al. 1996, Syampungani 2008) for charcoal production, slash & burn agriculture, timber production and non-wood products.

2.1 Charcoal production

Woodfuel accounts for higher percentages of the total household energy requirements in the ecoregion (Syampungani et al. 2008). About 76% of the Zambian population depends on wood fuel energy (Chidumayo 1997). Woodfuel carter for a high national energy budget in the Country because of relatively high cost of electricity and petroleum based fuels and high poverty levels with low economic grow rates (Campbell et al. 2008). The trend in charcoal production and consumption will continue rising in Zambia (Table 1).

Table 1. Projected charcoal production and consumption.

Year	Wood used (million tonnes)	Yield (million tonnes)	Charcoal consumption (million tonnes)
1969	1.179	0.340	0.330
1980	2.196	0.505	0.490
1990	3.070	0.760	0.685
2000	4.056	0.933	0.905
2010	5.428	1.248	1.211

Charcoal production also saves as the source of cash income and employment for both the urban and rural dwellers. Charcoal is produced in rural areas for onward transportation to cities (Fig. 2).

The increased demand for charcoal entails massive clearing of land for charcoal production (Fig. 3).

Figure 2. Charcoal kiln and the truck loaded with charcoal for onward transportation.

Figure 3. Cleared area and kiln for charcoal production.

2.2 Slash and burn agriculture and timber harvesting

This has resulted in an increased pressure on the forest resources as some other activities such as agriculture is also mounting pressure on the already limited Zambian woodland resources. Timber harvesting of valuable species such as *Pterocarpus angolensis, Brachystegia floribunda, Afzelia quanzensis, Erythrophleum africanum, Pterocarpus rotundifolius, Dalbergia melanoxylon* and *Isoberlinia angolensis* is prominent. Timber harvesting takes form of single tree selection harvesting and as such the woodland appears to remain intact for some time. Lately the woodland is showing signs of opening up. This may be due to the fact that charcoal production is no longer restricted to the preferred species but even unlikely species such as fruit trees like *Uapaca kirkiana* are being cut down for charcoal production.

2.3 Non wood forest products

The non wood forest products from the Zambian miombo include medicinal plants, edible mushrooms, wild fruits etc. which are not only consumed but widely traded by both the rural and urban communities. Zambia has a number of edible mushroom species. *Termitomyces titanicus,* the world's largest and tastiest mushrooms also occurs in Zambia (Piearce 1987). These edible mushroom species exist symbiotically with most of the miombo woodland species. Fruit species include *Uapaca* spp., *Strychnos* spp., *Parinari curatellifolia* and *Anisophyllea boehmii.* These fruits are important dietary components of the rural dwellers in Zambia and they are also sold to meet specific cash requirements in case of crop failure (Akinnifesi et al. 2008). Several species are used in treating various ailments. Often parts of barks or roots are removed for medicinal purposes. This may result in dying of the affected plants.

3 Challenges and opportunities

Charcoal production and slash and burn agriculture are the most controversial uses of miombo woodlands in Zambia. This is because these are often associated with massive loss of biodiversity (fauna and flora) and some high productive ecosystems (Chidumayo 1987, Katsvanga et al. 2008). These are also perceived to contribute to massive global heritage loss and climate change (Forsyth 2003). This is because some authors (Stromgaard 1986) support the idea of non woodland recovery once it is cleared for the above purposes. Furthermore, other authors (e.g. Chidumayo 1992) suggest very low grow rates of miombo woodland species. However, recent studies (Geldenhuys 2005, Syampungani 2008) suggest higher productive miombo woodland ecosystems once disturbances cease. Additionally, other studies (Chidumayo 1988, 1993a, b, 2004) report the development of the woodland overtime.

Timber harvesting is perceived to have no serious negative impacts on the woodland in Zambia (Chidumayo 1987). Various studies in Zambia (Syampungani 2008) and other parts of the miombo ecoregion: Mozambique (Grundy and Cruz 2001), Zimbabwe (Mudenkwe 2006), Malawi (Makungwa and Kayambazinthu 1999) and Tanzania (Luoga et al. 2002) have reported the negative impact of single tree selection at population level. Such species have been reported to exhibit unstable populations. Most timber species are shade intolerant (Werren et al. 1995). Therefore, if not adequately exposed to light, they remain stunted and thus prolonging the period during which

they are susceptible to fires, water stress and herbivory (Chidumayo 1997). According to Syampungani (2008), this behavior of different miombo species leads us to the following questions:

- What is good for sustainable management of miombo woodland?
- Is it single tree selection harvesting of timber species that allows very little to no regeneration of the canopy species under the remaining canopy?
- Or is it slash and burn agriculture and charcoal production that result in maximum light intensities on root suckers/stumps and recruitments?
- Is it possible to integrate charcoal production/slash and burn agriculture/single tree selection into sustainable forest management programs?

Studies that compare the impacts of charcoal production slash and burn agriculture and single tree selection harvesting at both population and stand levels are required. The Zambia woodlands in which single tree selection, slash and burn agriculture and charcoal production offers an opportunity to understand and compare the influence of these forms of utilization at both population and stand levels.

Trends in food market are changing globally. There is a growing emphasis on variety and organic products (Akinnifesi et al. 2008). Miombo woodland NWFPs like fruits qualify as organic products and can gain market share and entrance in the niche market for natural products (Akinnifesi et al. 2008). For example, phytotrade estimates a potential regional value of US$3 billion from oil producing wild fruit species (Campbell et al. 2008). The abundance of miombo fruit trees in Zambia provides an opportunity for the Zambia people to take advantage of the wood food trend. However, such an action requires an effective understanding of the relationship between NWFPs extraction and changes in the woodland ecosystem and the ecophysiology of medicinal species. This entails carrying out ecological baseline studies for NWFPs, at both population and forest ecosystem levels. Their assessment requires techniques other than the traditional forest inventories.

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