

Extent of Illegal Harvesting of *Pterocarpus Chrysothrix* (Mukula) Species in Zambia, Case of Nyanganje Forest Reserve, Isoka District

Francis Mutale¹ and Weston Davy Sakala²

¹University of Zambia, Zambia
²Zambia Forestry College, Zambia

*Corresponding Author Email: francismutale98@yahoo.com

ABSTRACT

The study was conducted to determine the extent of illegal harvesting of *Pterocarpus chrysothrix* (*Mukula*) tree species in Nyanganje Forest Reserve of Isoka District in Muchinga Province. Data on the extent of illegal harvesting of *Pterocarpus chrysothrix* (*Mukula*) species was collected by socio-economic and ecological surveys. Ten (10) Villages were selected at random based on their closeness to the forest resources within these villages. A sample size of 150 individuals was targeted using purpose sampling and questionnaires were administered using semi structured interviews. The survey also targeted key informants in the area (i.e. village environmental committee and village leaders). The findings from the study indicate that the area has a total standing volume of 29,035.6 m³. This means that the area has great potential in timber production provided sustainable timber harvesting is practiced. The findings indicate that the mean annual quantity of wood harvested illegally was estimated to be 6.2 m³ per ha. This means that the tree species may be depleted if sustainable measures are not put in place to safeguard the tree species.

Keywords: Accessible terrain; Timber harvesting; Ecological surveys; Sustainable timber production.

1. INTRODUCTION

Illegal harvesting of *Pterocarpus chrysothrix*, locally known as *Mukula*, is dominant in the mountain ranges of Muchinga Province. Isoka district is at the centre of this illegal trade and is commonly referred to as ‘the capital of Mukula timber business. This tree specie is believed to be exploited for industrial purposes primarily for manufacturing gun butts, furniture and medicines in pharmaceutical industries (Lemmens, 2008). The specie is on high demand in the pharmaceutical industry due to its biochemical properties. *Pterocarpus chrysothrix* is used according to its three layers; the heartwood is used for making gun stocks and ornaments, the outer layer is used in the timber industry for furniture, and the bark is used in the pharmaceutical industry for making drugs (Lemmens, 2008).

This timber is exported raw, in the form of round logs, to China thereby undermining local industries and transferring most of its potential benefits. The extent and scourge of the indiscriminate harvesting is highly

immense causing the degradation of landscapes such as watersheds. Therefore, over-exploitation of this tree species has raised a number of concerns in the nation as this highly valued tree is being threatened. This study will look at the extent of illegal harvesting of *Pterocarpus Chrysothrix* in Chief Katetye's area of Isoka district

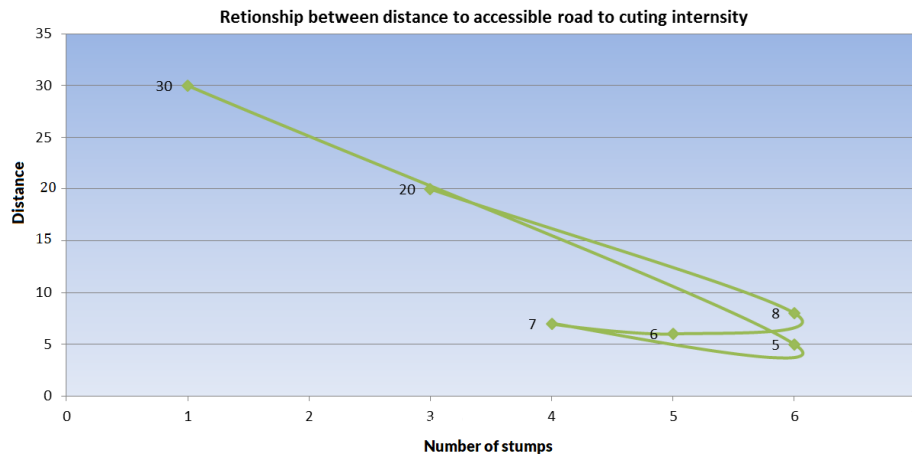


Figure 1: Relationship between distance and number of stumps

Figure 1 indicate the trend in the number of stumps in relation to the nearest accessible road. it shows that the further away the less the stumps and the closer the more the stumps. This reflect that most of the cutting is illegal because they have no documents to support the cutting of the tree species, basal diameter classes of stumps cut per hectare shown in table 1.

Table 1: the frequency of the exploited stems with basal diameter

Nu	Diameter Classes	Frequency
1	12-19	24
2	20-27	27
3	28-35	45
4	36-43	6

Table 1 shows the frequency of the exploited stems with basal diameter class 28-35 being dormant in the area.

2. MATERIALS AND METHODS

2.1 Study area

Isoka district is located in the mountainous countryside of the North –Eastern of Zambia and found in Muchinga Province. It is the third smallest district in the province with a total land area of 4839 square kilometres covering about 5.8% of the total land area of the province. The district shares borders with Nakonde in the north, chinsali in the west, Mafinga in the East and Chama in the south.

The study area is in Chief Katyetye's Customary Area located in Isoka District. It has a population of 4,900 (2010 Census of Population and Housing, Muchinga Province Analytical Report) Katyetye customary area is bordered by Chieftainess Waitwika and Chief Mwinempanza in the north, Chief Kafwimbi in the west, chiefs Chibale and Mulilo in the south, and chiefs Mwinempangala, Minechifungwe and Minewisi in the East as shown in figure 2.

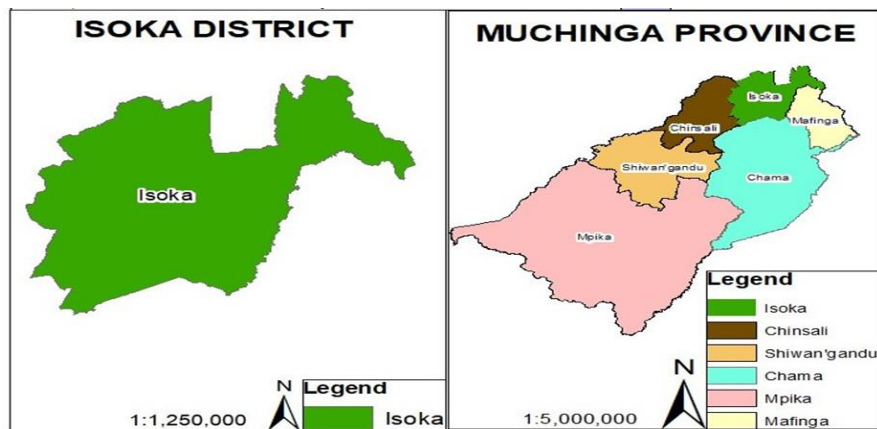


Figure 2: study area location

In order to find the volume of *Pterocarpus chrysothrix* which had been cut and removed from the reserve, the Basal Diameter (BD) of stumps were recorded and measured in each plot. The age of the individual stump was determined by looking at the freshness of exposed wood, colour of the wood and coppices where it was difficult to determine the age of the stump the destructive method of counting rings was used. Stumps with fresh exposed wood and colour and without coppices were one year, and stumps with older exposed wood and beginning to sprout were two years. In this study, individuals of 1 to > 15 cm dbh were defined as trees for timber. A total number of standing tree species were identified; Basal Diameter (BD cm), Diameter at Breast Height (DBH cm) and Height were measured to establish DBH/BD relationship. Other information collected in each plot was the distance from forest edge, distance from road, vegetation type and slope (steep/gentle).

2.1. Ecological data

Both descriptive and inferential statistical methods were used to analyse the quantitative data. Inferential data analysis was done using linear regression to analyse dependent variables. The dependent variables were DBH, Height (H) and Volume (V). The independent variable was BD of the stump. The Microsoft Excel software and forestry calca packages were used for the quantitative data analysis. The total volume of timber stock harvested illegally was calculated using the regression equation developed for miombo woodlands at Kitulanhalo Forest Reserve, Tanzania by Malimbwi *et al.* (1994) cited by Luoga *et al.* (2002). This equation was chosen because the vegetation type in the study area is also miombo woodland. DBH is the diameter of tree at breast height before the tree was felled and removed from the area, H is the height of tree before the tree was felled and removed from the forest. Since volume is the factor of DBH and H, DBH/BD and DBH/H relationships were developed using the sampled trees whose height were measured. These equations were used to estimate the DBH and H of trees that stumps only left; $DBH = 0.7255 + 0.848 BD$ (2) where BD (cm) is basal diameter of the remained stump. $H = 1.1761 \times DBH - 0.6928$ (3) The extent of illegal harvesting of *Pterocarpus chrysothrix* species per year was calculated by dividing the total volume of trees harvested illegally from the area by the period lapsed since the tree was cut; In order to find the volume of *Pterocarpus chrysothrix* which had been cut and removed from the reserve, the Basal Diameter (BD) of stumps were recorded and measured in each plot. The age of the individual stump was determined by looking at the freshness of exposed wood, colour of the wood and coppices where it was difficult to determine the age of the stump the destructive method of

counting rings was used. Stumps with fresh exposed wood and colour and without coppices were one year, and stumps with older exposed wood and beginning to sprout were two years. In this study, individuals of 1 to > 15 cm dbh were defined as trees for timber. A total number of standing tree species were identified; Basal Diameter (BD cm), Diameter at Breast Height (DBH cm) and Height were measured to establish DBH/BD relationship. Other information collected in each plot was the distance from forest edge, distance from road, vegetation type and slope (steep/gentle).

3. RESULTS AND DISCUSSION

An analysis of the cutting intensity to the distance to the accessible road showed a relation between these Variables. An increase from the accessible road showed a reduction on the intensity of cutting. The illegality is highly promoted where the timber can easily be accessed and loaded quickly for the market. The mountainous parts were highly not accessible hence intensity of cutting was low. Results should be presented with clearness and accuracy. The results, procedure should be written when describing the authors' analysis, theory test, investigation, and experimental outcomes. Previously published results should be written as in present events. Results should be explained fundamentally with its outcomes. The Discussion should interpret the findings in view of the results obtained in this and in past studies on this topic. State the conclusions in a few sentences at the end of the paper. The Results and Discussion sections can include subheadings, and when appropriate, both sections can be combined.

4. CONCLUSION

The purpose of this study was to investigate the extent of illegal harvesting of *Pterocarpus chrysothrix* in chief kateteye area. More specifically, that Isoka district has been the core area that has been supplying the tree specie to most of the market in the country because of the quality of the timber. There was a significant extent of illegality in the harvesting of *Pterocarpus chrysothrix* in Chief Kateteye area especially in the time lapse 3 and 4 years. The total volume standing of *Pterocarpus chrysothrix* was found to be 29,035.6 m³ in the chiefdom which was far much lower than the Volumes harvested illegal in time lapse 3 and 4 years and the total diameter class per hectare volume of 9.679 cm is very low hence the need to intensify the management practices such as fire management, enforcement, awareness meetings, strengthening community by-laws through the establishment of community forestry areas, promotion of alternative livelihoods such as beekeeping and livestock in this chiefdom.

5. REFERENCES

- Fujimaki, H., and K. Matsuba, (1997). Heterosis: Characteristics of hybrid trees species. In *Science of the Rice Plant*, T. Matsuo, Y. Futsuhara, F. Kikuchi, H. Yamaguchi, ed, pp607-619.
- Guyer, T., T. Ohnishi, T. Nakano, N. Ishida, H. Enoki, H. Hashimoto, K. Itoh, R. Terada, C. Wu, C. Miyazaki, T. Endo, S. Iida, and K. Shimamoto. (1998). Exploitation of tree species. *Plant Mol. Bio* 35, 291-229
- Kush, G.S., and T. Sasaki, (1998). A High-Density tree Genetic Linkage Map with 2275 Markers Using a Single F₂ Population. *Genetics* 148, 479-494.
- Riveros, F., and P. Figures, (2000). *Tree Breeding and Genetics: Research Priorities and Challenges*. Rice Breeding and Genetics, Research Priorities and Challenge. Science publisher Inc, pp1-8.
- Watanabe, W., Shimizu, I. Horiuchi, T. Matsumoto, Sasaki, (2002). An Automated Annotation System and Database for tree Genome Sequence. *Nucleic Acids Research* 30, 98-102.