



Case Study

The bio-physical impacts of mopane worm harvesting in Nhwali communal lands of Gwanda District in Zimbabwe

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Abstract

The main aim of the study was to investigate the bio-physical impacts of mopane worm harvesting in Nhwali communal area. A case study research design was adopted for this research because it is appropriate to the problem and the advantages it possess. The population of this study was confined to three hundred and ninety five households in Nhwali, the traditional leadership and staff of the Environmental Management Agency (EMA). The sample consisted of forty household heads, two EMA officers and five village heads. The study revealed that there was accelerated deforestation mainly caused by the cutting down of trees to access the worms from tall trees and the cutting down of trees to built temporary structures during harvesting. Trees were also being cut down so that they can be used as firewood for cooking and roasting the worms so as to preserve them. The study revealed that mopane worm harvesters were one of the greatest contributors to the incidence of outbreak of veldfires in Nhwali. Fires are mainly used for cooking and drying the worms for preservation. Water and land pollution was also established to be one of the major bio-physical impacts of mopane harvesting. According to the local community the quantity of the worm decreases every season due to over harvesting and harvesting the worm whilst it is immature.

Keywords: Bio-physical impacts, mopane worm harvesting, Nhwali

Introduction

Background to the study: Mopane worms (*Gonimbrasia belina*) are mainly common in Africa especially Southern Africa¹. This is mainly due to the fact that this part of Africa is richly endowed with the mopane tree (*Colophospermum mopane*) which these worms habitat and feed on. The principal producers of the worm are Botswana, Zimbabwe, South Africa (Limpopo and Mpumalanga provinces), Zambia, Democratic Republic of Congo and Namibia².

In the 1990s hundreds of tonnes of mopane worms were exported from Southern Africa each year³. These basically are an important source of protein for millions of indigenous Southern Africans. The harvesting and sale of mopane worms is a multi-million-rand industry in Southern Africa⁴. It is estimated that South Africa alone trades 1.6 million kilogrammes of mopane worm annually and that Botswana's involvement in this industry nets it roughly eight million dollars annually⁴.

Traditionally, mopane worms were harvested for subsistence purposes because of the seasonal nature of their occurrence. However, mopane worm harvesting is becoming more and more economically driven. In Zimbabwe, mopane worms are a staple part of the diet in rural areas and a delicacy in cities¹. These

worms are mostly common in Gwanda which is an arid and cattle ranching area in Zimbabwe. As mopane worms represent an important sector in the local rural economy, they attract large numbers who seek to cash in on the profits from selling the worm as food.

In the Nhwali communal lands, mopane worm harvesting is rife among women and children due to lack of employment opportunities, poverty, drought, food insecurity as well as economic depression. Due to the above situation, people within these communal lands tend to over harvest leading to local extinction of the worm, deforestation, water pollution and development of veld fires.

Statement of the Problem: The mopane worm harvesting process leads to serious bio-physical impacts. Harvesters, basically lead to environmental degradation as they cut down trees to access the worm and through some fires left alight as they preserve the worm. This basically leads to reduced biodiversity and soil erosion. Water within rivers is also polluted by the worm's waste dumped in them and the land is polluted by the materials they use as well as their waste. Very few studies have been carried out to assess the bio-physical impacts of mopane worm harvesting process in Gwanda.

Purpose of the study: The study aims at assessing the bio-physical impacts of mopane worm harvesting process in the Nhwali communal lands.

Objectives of the Study: i. To determine the impact of mopane worm harvesting on deforestation in the Nhwali communal lands. ii. To assess the impact of mopane worm harvesting on pollution in the Nhwali communal lands. iii. To determine the impact of mopane worm harvesting on veld fires. iv. To assess the impact mopane worm harvesting on local extinction of mopane worms.

Assumptions of the Study: The researchers assumed that the stakeholders in Nhwali would cooperate by giving correct information about the impact of mopane harvesting and that problems highlighted are general across the area under study. It was also assumed that the respondents would give correct and accurate information. The researchers also assumed that the recommendations of the study would help in reducing the negative impacts of mopane worm harvesting.

Significance (or Importance) of the Study: The study is of significant value to the various stakeholders interested in the sustainability of mopane worm harvesting and rural development in general. To the government it provides insights that they can incorporate in defining policy directions and resource allocation for sustainable mopane worm harvesting. Also, government agencies like the Environmental management agency, educators, and environmentalists should use the study to formulate awareness programmes for sustainable rural livelihoods through encouraging rural people to use natural resources sustainably. The study will also be a steppingstone to those who are in the research fraternity of this nature and it will help others to close the gap that has been left by other studies. The study of this nature will motivate locals or the community to use their resources wisely.

Scope (Delimitation) of the Study: The study is mainly concerned about the bio-physical impacts of mopane worm harvesting in the Nhwali communal lands. The study will be carried out in the Nhwali communal lands in the district of Gwanda in the Matabeleland South region. The communal lands have five villages namely Nhwali, Patana, Mkhalipe, Seboza, and Sithakeng. Thus, the locals of the five villages will be considered as the research participants.

Limitations of the Study: This was a case study and as such findings from the study may not necessarily apply to all situations in the country. The case study design like most qualitative research methods lack experimental and statistical controls which makes it hard to establish internal validity⁵. Even though it is also difficult to generalize findings of case studies to other cases such findings can be generalized to similar situations^{5,6}. The conditions in Nhwali communal area are similar to conditions in other communal areas in Zimbabwe therefore the findings can be generalised to those settings. The

study was also based on voluntary cooperation and lack of cooperation can weaken the study. The local leadership was skeptical of the motives of the researchers and some of the locals were illiterate. The researcher assisted the illiterate community members to fill in the questionnaire. The researchers managed to create good rapport with respondents and provided user friendly questionnaires which were unambiguous and easy to understand.

Ethical and Legal Considerations: The participants participated on an informed consent basis. The purposes of the research and potential reparations to the participants were made explicit to them in addition; people were told that they reserved the right to choose whether or not to participate. Anonymity, confidentiality and right to withdraw from the study were spelt out. The study was conducted in a way that made sure that the individual study participants did not experience any harm as a result of their participation in the research. The participants were also assured that the resulting research and publications would not be used in such a way that they may bring harm to the participants as a group.

Organisation of the Study: The first part of the paper outlined the background of the problem, highlighted the problem, generated the research questions and the objectives directing the study, the limitations of the study and the theoretical underpinnings of the study. This is followed by the research methodology which discusses the research design, the population and sample of the study, the instruments used, and finally data presentation and analysis procedures. Results and discussion then follow which covers data presentation, interpretation, analysis and discussion. The paper ends with a conclusion.

Methodology

Introduction: In this chapter, the researchers will focus on research design and the instruments and techniques that will be used in capturing the information on the bio-physical impacts of mopane worm harvesting in Nhwali. It will discuss the research instruments, data collection procedures and analysis procedures that will be used in the study. The section on data collection focuses on methods and instruments to be employed in collection of data. The last section on data analysis will describe how data will be captured, analysed and presented.

Research Design/plan: A research design is a plan for research that guides the researcher in data collection and analyzing data⁷. A research design has also been described as the structure of the research, which provides the cement that holds the research project together and include the various aspects of the methodology⁸. It has also been described as a plan showing in what way, when and where research is carried out⁹. A research design helps in getting answers to the questions under study. It is a plan for research that guides the collection of data and the method of analysis that are performed¹⁰.

Research design involves the description of the format and theoretical structure under which the study would be carried out. It involves the discussions of the steps to be taken in order to safeguard the validity and authenticity of the findings¹¹.

A case study research design was adopted for this research because it is appropriate to the problem and the advantages it possess. A case study is an example of a qualitative research design¹². A case study design is a strategy for doing research which involves an empirical investigation of particular contemporary phenomenon within its real life context using multiple sources of evidence¹⁰. Case studies are in depth investigations of a single person or group. In this research, a case study of the impacts of worm harvesting in Nhwali shall be done. The case study shall be enriched with documents, interviews, observations, and questionnaires.

Population and sample for the study: A population is any target group that has common characteristic that are of interest to the researcher¹³. The population of this study comprised of 395 households and a sample of 40 households, five traditional leaders and two staff members of EMA was used. Stratified random sampling was used to come up with the sample of forty households as shown in Table-1.

Table-1: Population and Sample of Nhwali Community.

Name of village	Number of households	Sample size (10%) of population
Sithakeng	60	6
Ngoma	62	6
Patana	53	5
Nhwali	150	15
Mkhalipe	70	7
Total	395	40

Research Instruments: Research instruments are data gathering tools, which are used for research¹⁵. The researcher chooses the most appropriate instruments that provide for collection and analysis of data upon which hypothesis may be tested¹³. The choice of these instruments depends on the study at hand and for this study the researchers used secondary data sources, observations, interviews, questionnaires and focus group discussions. Observations were used because they are a direct technique which depend on seen events and also lack the artificiality found in other techniques. They were used to validate the messages obtained in the interviews. Interviews were used because they provide a high level of flexibility and give a chance for further probing into interesting issues.

The interviews also gave the researchers a chance to explain unclear questions and observe hidden and non-verbal cues¹⁶. Questionnaires were used because of they give interviewees independence and freedom of response as they can be completed in the absence of the interviewer. They can also reduce travel costs since they can be transported in bulk and also reduce chances of subjectivity and bias since respondents have more time to respond¹⁷.

Data Presentation and Analysis Procedures: Data obtained from the study will be presented in tables and graphs in order to give an overview of findings to identify trends and to establish relationships between parts of the findings. Tables conserve space and present data in such a way that the narrative may be reduced and can also be self-explanatory.

Relationship among data in a table may be visualized and this process facilitates the process of data comparison. Tables make it easy to summarize data by putting it into individual cells. Comprehension of tabulated data is enhanced as it is easier to understand and remember such data. Graphs will also be used to offer good visual presentation of the results.

Results and Discussion

Introduction: This chapter gives a presentation, interpretation and analysis of the data collected and findings arrived at on the research problem. The presentation and discussion of findings shall be done through various thematic presentations broken down from the different questionnaires, supported by graphic illustrations where necessary. The discussion is centered on the following broad research objectives which are: i. To determine the impact of mopane worm harvesting on deforestation in the Nhwali communal lands. ii. To assess the impact of mopane worm harvesting on pollution in the Nhwali communal lands. iii. To determine the impact of mopane worm harvesting on veld fires. iv. To assess the impact mopane worm harvesting on local extinction of mopane worms.

Impacts of mopane worm harvesting on deforestation: Interviews with the five village heads revealed that they perceived that mopane worm harvesting has resulted in a lot of deforestation which is highest on the mopane trees as compared to other tree species. They said that the mopane worm harvesters usually cut down tall trees in order to access the mopane worms in the top branches. This was further collaborated by the local communities with all the interviewed community members saying that mopane worm harvesting is a major contributor to deforestation in the area. The different methods of accessing worms from the top branches of tall trees were listed as cutting down the tree, climbing up the trees, cutting the top branches and using long sticks to bring down the worms. When asked about the most common method of mopane harvesting the majority of the male young harvesters said it was cutting down the trees. The use of long sticks was only done by women and the elderly. Only 9 people (22.5%) said that they climb the trees to retrieve mopane worms from the taller trees.

The other major contributory factor to deforestation were the activities of worm harvesters who camp in the forest during the harvesting period. These harvesters usually cut down trees to built temporal structures and also for firewood used to cook meals. Some of the firewood is also used roast the worms so as to preserve them.

Observations on the harvesting sites revealed a lot of selective cutting of mopane trees with other tree species not affected to the same extent.

Impact of mopane worm harvesting on veld fires: Interviews with staff from the Environmental Management Agency (EMA) revealed that mopane worm harvesters were one of the greatest contributors to the incidence of outbreak of veld fires in Nhwali. Fires are mainly used for cooking and drying the worms for preservation. Most of the veld fire outbreaks are due to fires which are left unattended. The issue is that most of the worm harvesters do not put out fires after either cooking or roasting the worms. They leave the fires burning when going back to their homes in the evening and those who camp at the harvest site leave them burning when they go to sleep. The result of interviews with worm harvesters on whether they put off fires after cooking or roasting the worms are shown in Table-2.

Table-2: Management of Fires.

Village	Number of people who always	Number of people who do not
	Put off fires	always put off fires
Sithakeng	0	6
Ngoma	1	5
Patana	2	5
Nhwali	2	13
Mkhalipe	3	3
Total	8	32

As can be seen from Table-2 the majority of the mopane worm harvesters (80%) do not put off their fires. All the interviewed worm harvesters in Sithakeng do not put out their fires. Interviews with EMA officials revealed that the incidence of veld fires increased during the worm harvesting period and was most common around the mopane worm harvesting sites. A study done in Namibia also noted the increased incidence of fires around mopane worm harvesting sites¹⁸. The question on the number of veld fires in the different villages from 2013 to 2015 revealed the following (Table-3).

The incidence of veld fires increased from 11 in 2013 to 14 in 2014 and declined drastically in 2015 to 4. Interviews with local community members revealed that the drastic decrease in veld

fires was due to the fact that there were very few mopane worms in 2015 and therefore the harvesting time was very short and camping at harvest sites was limited. In addition, most of the worm harvesters carried their worms home and most of the roasting of the worms took place at the homes of the worm harvesters. Observations revealed that the stems and barks of trees and leaves were black as evidence of veld fires. Some trees had dried up with quite a number of them having black-brownish leaves.

Table-3: Incidence of veld fires (2013 to 2015).

Village	Number of Veldfires	Number of Veldfires	Number of Veldfires
	2013	2014	2015
Sithakeng	2	3	1
Ngoma	1	2	0
Patana	3	3	0
Nhwali	3	4	1
Mkhalipe	2	2	2
Total	11	14	4

Impact of mopane worm harvesting on water pollution: Fifty percent of the interviewed respondents especially those who are settled downstream expressed with worry the high rates of pollution along rivers. They pointed out that some harvesters prepare the worm in rivers to easily access water for washing their hands. In the process they pollute water through the worm’s thick greenish fluid. Thirty percent of the respondents revealed through questionnaires that they wash their bodies and clothes in rivers and in any stagnant water whilst they have camped in the forest for worm harvesting. Figure-1 below shows the number of worm harvesters per village who wash and bath in various water sources.

The bar graph above indicates that the worm harvesters in the five villages wash their bodies and clothes in rivers and in any stagnant waters in the forest. Nhwali village has the highest number of polluters. These harvesters contaminate water through the soap detergents they use for washing and bathing. The EMA officers raised concern over the rate at which water is polluted during the worm season in these communal lands through the worm’s waste and soap detergents that worm harvesters use as they wash themselves and clothes. They pointed out that this reduces water quality in the communal lands. This basically makes communities to face difficulties in sourcing clean water for domestic use. The youths pointed out through focus group discussions that some worm harvesters prepare the worm along rivers and as a result the greenish fluid squeezed out of the worms contaminate water.

A villager in the Sithakeng village indicated that as rivers are polluted there are forced to walk long distances to get water from a borehole. The researcher observed that water in the Nhwali communal lands and specifically in areas where the worm is harvested is heavily polluted with worm waste; it is greenish in colour and has an unpleasant smell. This makes it to be unfit for domestic use once it has been contaminated. Five percent of the respondents revealed through interviews that people should be taught on the sustainable use of resources and there should be strict legislation when it comes to mopane worm harvesting.

Impact of mopane worm harvesting on land pollution: Interviews with the village heads Environmental Management Agency (EMA) representatives revealed that there was a lot of land pollution due to mopane worm harvesting. This was supported by local community members who pointed out that most of the pollution was a result of people relieving themselves in the bush. Thirty five percent of the respondents admitted to relieving themselves in the bush. The researcher also observed

that most of the human waste is concentrated in the areas where there is mopane worm harvesting. Other pollutants observed were pieces of cloth, plastic gloves, sacks, buckets, plastic papers and worm waste. A study done in Manic land also observed a lot of pollution around mopane worm harvesting sites⁴.

Impact of mopane worm harvesting on local extinction of the worm: Forty-three percent of the respondents indicated through questionnaires that the mopane worm harvesting process has gradually led to local extinction of the worm. They pointed out that the quantity of the worm decreases every season due to over harvesting and harvesting the worm whilst it is immature.

The findings tally with those of a study done in Botswana which showed that most local community members will try and harvest as much as possible without due regard to the sustainability of the harvesting method¹⁹.

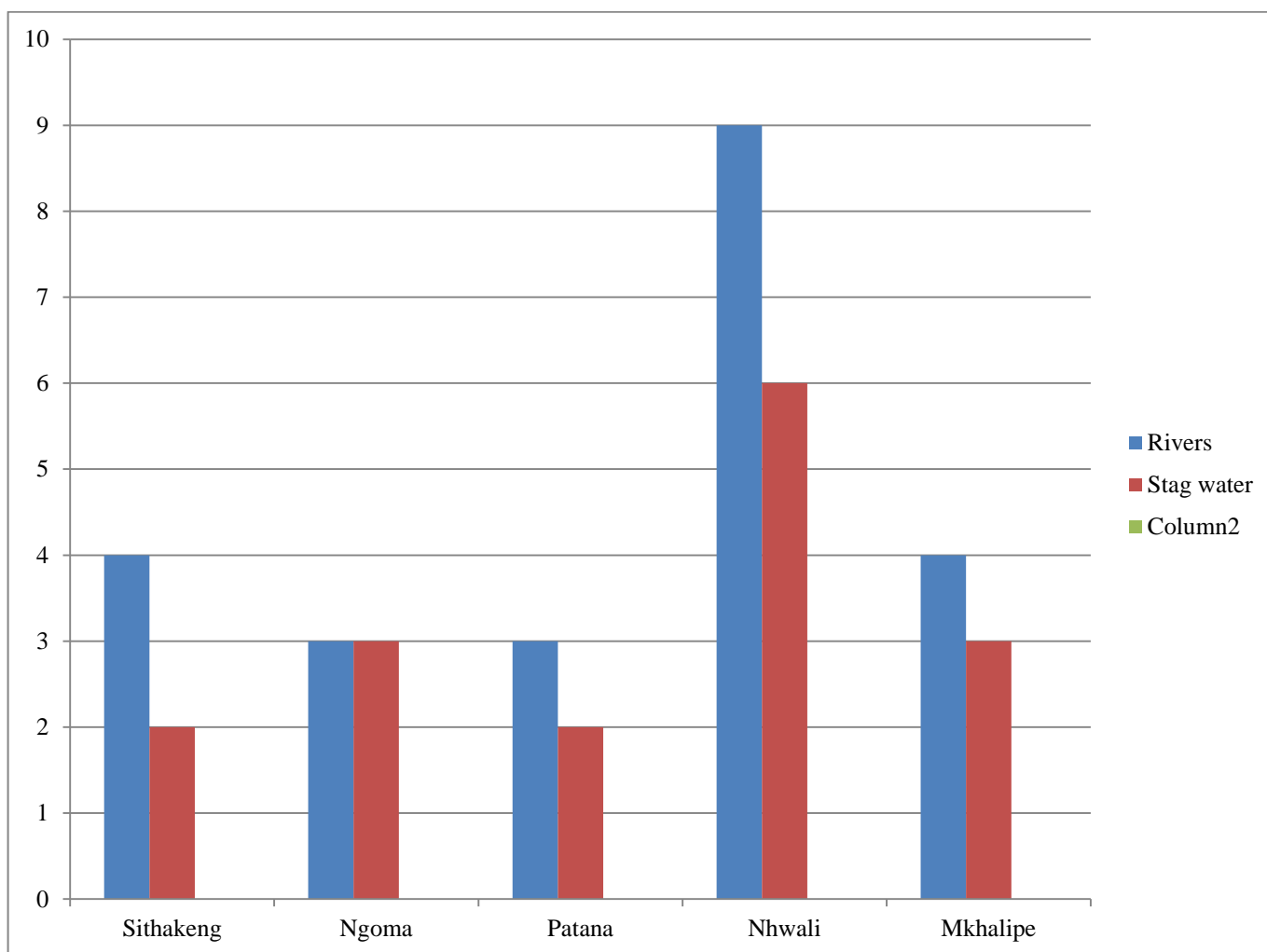


Figure-1: Total number of worm harvesters who wash in rivers and stagnant water per village.

Conclusion

The major impact of worm harvesting were accelerated deforestation, increased incidence of veld fires, water and land pollution, and local reduction of the worm population.

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