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TOPIC:

Ethnobotanic Survey on *Cassia Tora* in Mbire district, ward 9

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To the School of Agroecology Department

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By

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DEDICATION

I would like to dedicate this project to my family, who has been my constant source of love, support and inspiration throughout my academic journey. Your unwavering encouragement and belief in my abilities have been invaluable, and I'm grateful for the sacrifices you have been made to help me pursue my dreams.

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ABSTRACT

This research assessed history, challenges and opportunities of invasive alien plants species *Cassia Tora*, locally known as ‘chimudzungu’ in Mushumbi Pools community in Ward 9 of Mbire district in Zimbabwe. The researcher used a questionnaire to collect data from the population. The sample size for this research had 30 farmers and the researcher used purposive sampling. The results indicate that farmers across ages and gender have limited knowledge about the invasive plant in their community. The farmers mainly involved in crop production indicated that the plant species affect their production process leading to low yields. Livestock farmers highlighted that the invasive plant species compete with native grasses in their grazing land resulting in low pastures for livestock. Farmers involved in apiculture highlighted that it is a source of bee forage. It can be recommended that the Government and responsible authorities should come up with policies regarding this type of plant species in Mushumbi Pools and other affected areas around Mbire. In addition, responsible authorities should not get rid *Cassia Tora* since it presents opportunities for apiculture farmers and also more can be explored on medicinal purposes associated with this plant.

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CHAPTER 1

INTRODUCTION

The exact native range of cassia tora is unclear, but thought to be an indigenous plant species in the India sub-continent i.e. India, Bhutan, Nepal, Southern China, South-eastern Asia etc. It is commonly found in wastes areas, roadsides, waterways, plantation crops and pastures in wetter tropical and sub-tropical environments. It is considered as an environmental weed in northern Queensland and the Northern Territory.

Since its establishment little is known about its impact to communities affected such as Mushumbi Pools. Socio-ecological impacts of this invasive species have become a subject of contention between crop and livestock as well as apiculture farmers in Mushumbi Pools. Apiculture farmers support the presence of Cassia Tora in the community since its nectars supplies nourishment to bees and also as an ethno-medicinal plant.

A survey conducted by WHO shows that 80% of about a 4billion population in developing countries rely on the use of traditional medicines which are derived from the plant material including cassia tora

On the other hand, Mushumbi Pools being an agro-based community though with diverse land use patterns, Crop and livestock farmers have raised complains on the encroachment and rapid establishment of Cassia Tora in various land uses including cropland, and grazing land among others. The community further reported yield losses related to Cassia Tora, increased labor and effort to control the invasive plant in cultivated lands and displacement of native vegetation in grazing lands reducing the potential of livestock production in the area.

PROBLEM STATEMENT

Cassia tora is a new, useful plant species with no known/ or potentially harmful effect(s) to the community and ecosystem in Mbire District. The eastern highlands of Zimbabwe is facing a threat of biological invasion of Cassia Tora. Since the establishment in the eastern highlands of Zimbabwe around

1997, there is limited information on the socio-ecological impacts of this invasive plant species at community level. Mushumbi Pools, Ward 9 of Mbire district is one of the communities affected by the invasive plant and its establishment in various land uses has become a subject of contention between farmers who are into apiculture, crop and livestock production. On the other hand, crop and livestock farmers have also raised complains on the encroachment and rapid establishment of Cassia Tora in various land uses including cropland and grazing land.

Therefore, this research will unpack the history, use and potential threat(s), if any, of a newly introduced plant species in Mbire

OBJECTIVES

Main objective

To assess the opportunities and challenges of a newly introduced invasive plant species, Cassia Tora for smallholder farmers, in Mushumbi Pools community, Ward 9, Mbire district.

Specific objectives

1. To explore the historical context and introduction of Cassia tora
2. To investigate the various traditional uses of Cassia Tora by local communities
3. To assess the potential threat(s), that Cassia Tora poses to the local environment and existing plant species

RESEARCH QUESTIONS

1. Is Cassia tora a new, introduced or native plant in Mbire District?
2. What uses do the locals put the plant or plant parts to, if any, or are potentially possible uses in future?
3. Are there any dangers are associated with this plant (to men, animals, environment, soil, biodiversity or other plants)?

HYPOTHESIS

1. Farmers in Mushumbi Pools are knowledgeable about the origin and establishment of Cassia Tora in their community.
2. The establishment of Cassia Tora in Mushumbi Pools is associated with opportunities and challenges for crop, livestock and apiculture farmers in Mushumbi Pools

JUSTIFICATION

The study is important because the researcher wants to determine position of plant species and assign significance to the plant species regarding local/ or national status on its utilization.

Implication: This is preliminary research which may prompt or trigger the responsible authorities (i.e. National Agricultural Research Departments and Universities) to start research on the plant's growing conditions, and production of technical guidelines or briefs on crop production and utilization. If it is a noxious weed or invasive plant, the attention of relevant authorities will become focused on the plant so that they take necessary action to prevent its entry into the country or further spread inland.

CHAPTER 2

LITETURE REVIEW

Introduction

Zimbabwe has diverse habitats and vegetation ecosystems defined by Eco regions within a subtropical climate, which support wide range of flora and fauna. Invasive plant species have affected indigenous biodiversity in almost every type of ecosystem throughout the country. As one of the greatest drivers of biodiversity loss, they cause threats to ecosystem integrity and function and, therefore, to human well-being. On the other note, invasive plant species also worsen poverty and jeopardize sustainable development through their impact on agriculture, forestry, fisheries, human health, and wild biodiversity, which are often the bases of livelihoods of people in developing countries. With regard to agriculture biodiversity, the biggest threat is the introduction of agricultural insect pests and foreign plant species which have resulted in reduced yields in major staple crops like cereals.

Details about Cassia Tora

According to M Thulin, cassia tora is an erect herb 0.6-2.5m high. Leaves 5-13cm long, with cylindrical gland between each of 1-2pairs of leaflets; stipules linear, leaflets 3 pairs, obovate, (-1)1.5-6×(0.5) 1-4cm, sub glabrous to pubescent. Flowers on generally very short axillary peduncles, sepals rounded at apex. Petals are yellow, obovate, 1-2cm long. Stamens; 3 lower ones longest with anthers narrowed into a neck towards their tips, 4 somewhat smaller and 3 very small. Pods linear, straight, or curved, slightly angular in section, seeds many longitudinally arranged, brown with very narrow areole on each face. It looks like cassia tora was introduced in Mbire through drought relief program. Cassia tora seeds were found in maize grains distributed by the government. Around 1967 cassia tora was noticed around the residential areas and it grew rapidly.

Effects of Cassia Tora on crop production and livestock production

It is one of the locally available resources that can be used for managing soil fertility which helps poor resource farmers in controlling weeds, soil fertility and crop improvement. Incorporating of cassia tora into the soil increases nutrients to the soil thereby improving water holding capacity, soil texture, soil structure, aeration and permeability. These factors influence crop growth and development therefore improving yield. Green manure of cassia tora (freshly crushed) can restore soil fertility there by improving the growth of plants in marginal soils, either with improved or local varieties of the crop they respond well to the application of green

manure (Usman M.I, 2019). The seeds from Cassia tora are used to make cassia tora meal which can be used as livestock feed. Cassia tora seed are highly nutritious and it is globally approved. It is suitable for making cattle feed, poultry feed and fish food (Agro gums, 2020). In various researches, it is said that cassia tora meal has rich nutritional content. Most importantly, it's a nitrogen free extract that will help in absorbing energy. Most studies have shown positive results when it is used correctly (Ahmedabad, 2020)

Challenges associated with Cassia Tora faced by crop and livestock farmers

In Zimbabwe, the spread of non-native plant species has been identified as a serious problem to rangeland biodiversity and ecosystem biodiversity. There is significant evidence that invasive species negatively impact biodiversity within rangelands. Cassia tora has the capacity to form dense population which will result in changes to the composition and structure of communities they inhabit. The potency of an invasive plant species could be driven by its competitive superiority for light, water, space and nutrients (Yvonne M, 2015)

Other facts about cassia tora

Cassia tora is an ethno-medicinal herb which is commonly used by rural and tribal people of the Satpura region. It is used for treating rheumatism, stomach aches, managing sprains, bronchitis, ringworm, itches, leprosy, dyspepsia, liver disorders, heart disorders and various skin disorders (A Mazumder, 2005)

CHAPTER 3

RESEARCH METHODOLOGY

Location of study area

Mbire district is located in the Zambezi valley approximately 200km north of Harare, Zimbabwe's capital. Mbire is home to some of the country's best kept tourism and heritage secrets. It is located between 30.60° and 31.20° East and 15.60° and 16.40° south and it covers an area of approximately 47000km². Mbire receives low rainfall of approximately 450mm year and is classified as one of the driest agro ecological regions of Zimbabwe. Average daily temperature ranges from 24°C to 32°C, with the highest temperatures recorded as 40°C to 50°C (Webster Gumindoga, 2018)

Research design

According to (Tochin, 2005) research design provides the glue that holds a research project together. Therefore, the study at hand includes primarily qualitative approach. Creswell (2013) provides a definition for the qualitative approach to research, which will aid in collecting and analyzing experiences. The researcher builds a complex, holistic picture, analyzes words, reports detailed views of informants, and conducts the study in a natural setting. The researcher used a questionnaire to collect data from the population because of its anonymity which gives the respondents the latitude to give responses without prejudice.

Sampling and sampling procedure

The sample size for this research had 30 farmers and the researcher used purposive sampling because it gives everyone an equal chance in participating in the research. According to (Evans, 2011) a sample is a portion of a population selected from observation and analysis. In this case, the researcher chose the members in the community who specialize in crop and livestock production. By asking the members who participate in this type of farming, the researcher then picked participants mothers from the population

Data analysis and interpretation

In this study, data was analyzed and presented in the form of pie charts, graphs and tables

CHAPTER 4

RESULTS

This chapter presents the results and analysis of the ethnobotanic survey conducted on *Cassia tora* in Mbire district, ward 9. The data collected through the questionnaire was analyzed to gain insights into the participants' knowledge, perceptions, and experiences related to *Cassia tora*. The chapter aims to address the research objectives and provide answers to the research questions.

1.1 Participants' Characteristics

Table 4.1: Percentage of participants by gender

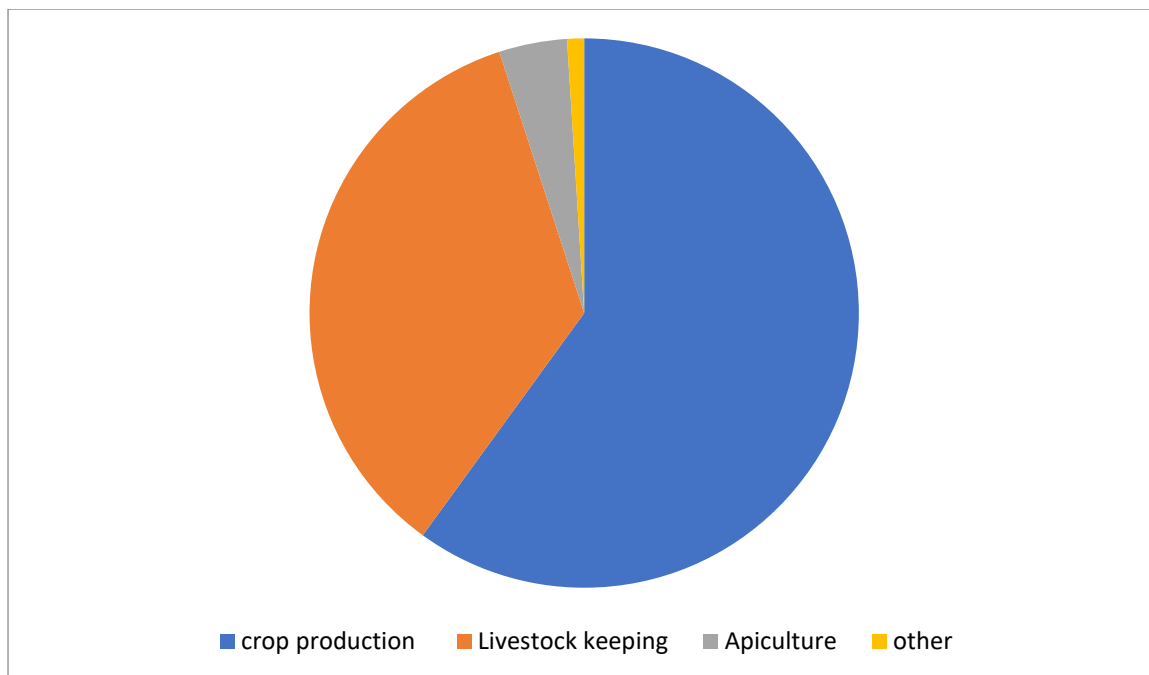
Sex	Percentage
Male	36%
Female	64%

The table provides an overview of the gender participation in the survey on *Cassia Tora*. This information helps in understanding the demographic composition of the survey participants.

4.2 Types of Agriculture Practices:

Table 4.2: Agriculture practices by farmers in Mbire

Agriculture Practice	Percentage
Crop production	60%
Livestock	35%
Apiculture	4%
Other	1%

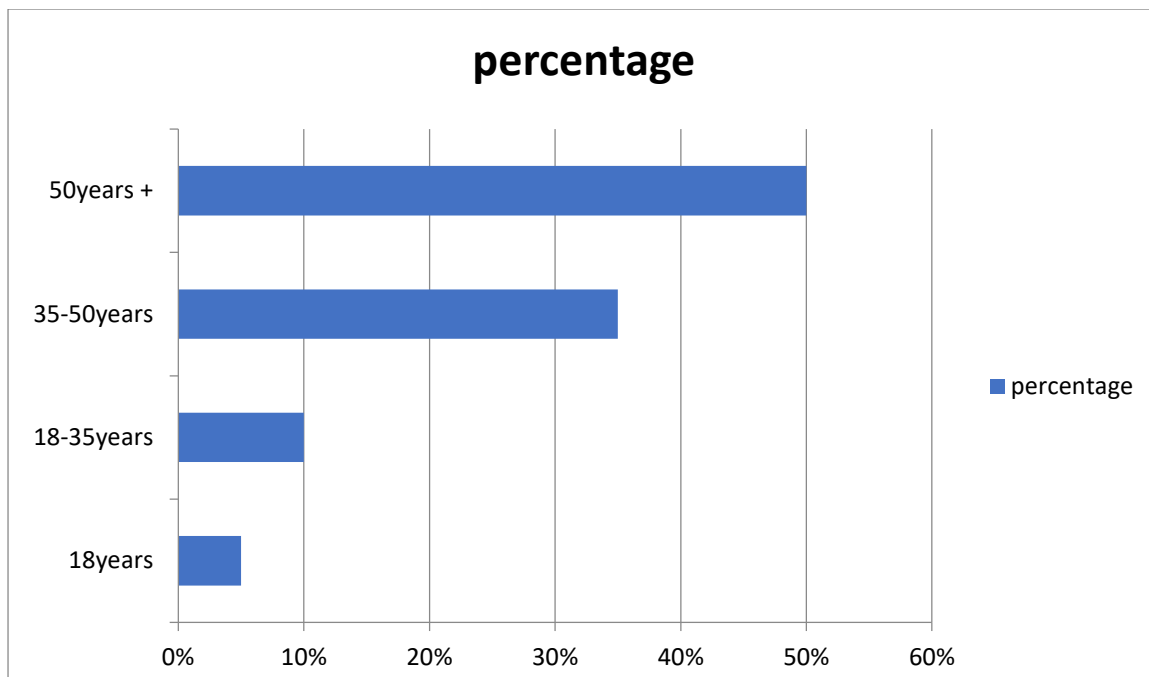


The table and pie chart illustrates the types of agriculture practices in which the participants are involved. The majority of participants (60%) are engaged in crop production, followed by livestock keeping (35%) and apiculture (4%). A small percentage (1%) reported being involved in other types of agriculture practices.

Knowledge and Perceptions of Cassia tora:

Table 4.3: Knowledge and Perceptions of Cassia tora

Table 4.3 presents the number of participants as a percentage on perceptions of Cassia tora.



The questions asked were related to information on indigenous/local names, areas of growth, other uses, and challenges with invasive species, effects on farming, associated dangers, and recommendations for managing *Cassia tora*.

CHAPTER 5

DISCUSSION

5.1 Knowledge and Perceptions of *Cassia tora*

The participants demonstrated varying levels of knowledge and perceptions regarding *Cassia tora*. Many participants identified *Cassia tora* as a plant with no use in their community. They also mentioned the introduction of *Cassia tora* to the district through drought relief programme. It is said that *Cassia Tora* seeds was in the maize that was distributed by the government. It started to spread rapidly because no any livestock graze it. Just a few participants identified it as a medicinal plant used for treating stomachaches, toothaches and sprains. This finding aligns with previous studies highlighting the medicinal properties of *Cassia tora* and its utilization in traditional medicine practices. Participants provided the indigenous/local name for *Cassia tora*, referred to as "Chimunzungu" in the local language. It was named chimunzungu because of its similarities with groundnut plant. Regarding the areas of growth, participants reported that *Cassia tora* predominantly grows in open fields and along riverbanks. This information can guide future research and conservation efforts targeting specific habitats where *Cassia tora* is likely to be found. Furthermore, participants mentioned that *Cassia tora* can be used as bee forage, indicating an additional economic and ecological value of the plant.

5.2 Challenges and Effects of *Cassia tora*:

A significant proportion of participants reported experiencing challenges with invasive species, including *Cassia tora*. They highlighted competition between invasive species and local crops for resources, which negatively impacts crop growth and yields. This finding aligns with the invasive nature of *Cassia tora*, which can out-compete indigenous plant species and affect agricultural productivity. Participants perceived that *Cassia tora* can have adverse effects on farming, such as competing with crops for nutrients and space. They indicated that invasive plant species affect native grasses in grazing lands, therefore affecting the growth of pastures. These findings emphasize the need for effective management strategies to minimize the negative impacts of *Cassia tora* on agricultural systems.

5.3 Comparison with Existing Literature

The findings of this survey align with previous studies on *Cassia tora* and invasive species management. The medicinal properties of *Cassia tora* and its introduction through drought relief programs have been documented in other regions as well. The challenges associated with invasive species and their effects on farming productivity are consistent with the broader literature on invasive species ecology and agriculture.

5.4 Implications and Future Research:

The findings of this research have several implications for policymakers, agricultural practitioners, and conservationists. The knowledge gained from this survey can contribute to the development of management strategies for *Cassia tora* and other invasive species in similar contexts. The recommendations provided by participants highlight the importance of community involvement and education in promoting sustainable farming practices. Future research could focus on studying the ecological impacts of *Cassia tora* on native plant species, investigating alternative uses and economic opportunities associated with the plant, and exploring effective management approaches for its control and eradication.

CHAPTER 6

RECOMMENDATIONS AND CONCLUSION

6.1 Recommendations

Based on the findings of the research, the following recommendations are proposed for the management and control of *Cassia tora* and other invasive species:

1. Initiate awareness programs to educate farmers and the local community about the ecological consequences of invasive species and promote sustainable practices. These programs should focus on the management and control of *Cassia tora* and other invasive species, providing information on identification, prevention, and appropriate management strategies.
2. Engage farmers and other stakeholders in decision-making processes related to invasive species management. Foster community involvement through workshops, training sessions, and collaborative initiatives. By involving the community, it will be possible to develop effective strategies and promote sustainable agricultural practices.
3. Conduct additional research to study the ecological impacts of *Cassia tora* on native plant species and ecosystems. This research should focus on understanding the extent of its invasiveness and its effects on local biodiversity. The findings will help in developing targeted management approaches and conservation strategies.
4. Conduct an experimental research on *Cassia Tora* on soil fertility management. Since it is a legume species it may help in scaling up Agroecology in Mbire district.

6.2 Conclusion:

In conclusion,

1. The study highlights the cultural significance and traditional knowledge associated with *Cassia tora* and emphasizes the need to consider these factors when formulating management strategies.
2. The findings also confirm the medicinal properties of *Cassia tora* and its potential value in traditional medicine practices. Additionally, the research highlights the ecological and economic value of *Cassia tora*, such as its use as bee forage.
3. The study underscores the negative impacts of invasive species on farming, including reduced crop growth. Therefore, effective management strategies are crucial to mitigate these impacts and protect agricultural systems.

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APPENDIX

Questionnaire for farmers in Mushumbi Pools, ward 9, Mbire Questionnaire

Research topic: Ethnobotanic Survey *on Cassia Tora* in Mbire district, ward 9

1. Sex Male ☐ Female ☐

2. Age

Below 18yrs ☐ 18-35yrs ☐ 35-50yrs ☐ +50yrs ☐

3. How long have you been in Mbire, ward 9

5-10years ☐ 10-15years ☐ 15-20 years ☐ 20+ years ☐

4. Which type of agriculture practice are you involved in?

Crop production ☐ livestock keeping ☐ Apiculture ☐

Other

(specify).....

5. What do you know about *Cassia Tora* and how was it introduced in your district?

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.....
.....

6. What is the indigenous/ local name for the plant?

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.....

7. In what area or type(s) of environment does it grow?

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.....
.....

8. State any other use for *Cassia Tora*

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.....
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.....

9. Have you ever experienced challenges with *Cassia Tora*?

yes ☐ No ☐

if yes explain

.....

.....

.....

10. What are the effects of *Cassia Tora* on farming?

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11. Are there any dangers associated with this plant species (to men, animals, environment, soil, biodiversity or other plants?)

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12. What would you recommend should be done to this plant in Mbire?

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