

**BINDURA UNIVERSITY OF SCIENCE EDUCATION
FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE
DEPARTMENT OF NATURAL RESOURCES**

**ASSESSING THE SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACTS OF
VELDFIRES ON SMALL-SCALE FARMERS IN WARD 4 OF MATEPATEPA
BINDURA MASHONALAND CENTRAL, ZIMBABWE**



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HONOURS DEGREE IN NATURAL RESOURCES MANAGEMENT.**

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DECLARATION**

I, Caroline P Mutsai registration number B223716B, do hereby attest that this work is entirely a product of my findings and has never existed or been presented in any part for evaluation or publication elsewhere. Any reference to previously published work has been indicated. This dissertation is suitable for submission to the Faculty and has been checked for conformity with Faculty guidelines.

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DEDICATION

I dedicate this research study to my family, my lovely mother Anna, my father Solomon, my sisters (Yvonne and Rutendo) and my brother (Tafadzwa).

ACKNOWLEDGEMENTS

I would like to thank my academic supervisor Mr. A Kundhlande for mentoring and supervising me at all stages during the research project. I would like to express my gratitude to my family for their support through prayers and financially during the research. I thank all respondents who participated in this research for their time and valuable contributions. Above all I thank the Almighty for guiding and protecting me during the course of the research.

ABSTRACT

Veldfires threaten small-scale farmers in rural Zimbabwe, yet their impacts remain poorly documented. This study examined the causes of veldfires, their effects on farmer livelihoods and the environment and the effectiveness of fire management strategies in Ward 4 of Matepatepa, Bindura District, Zimbabwe. A mixed-methods approach was used, collecting data from 60 farmers through questionnaires, interviews and direct observation. Quantitative data were analysed using Microsoft Excel, while qualitative data were analysed thematically. Residue burning was the primary cause of veldfires (26.8%), followed by lightning (23.2%), land clearing (17.9%), honey harvesting (16.5%) and hunting (10.7%). The most severe economic impacts were livestock losses (29.6%), fence damage (27.8%), and crop loss (25.9%). Environmental impacts included soil fertility loss (27.6%), vegetation loss (20.5%) and loss of grazing land and wildlife (19.0%). Fire prevention strategies were rated as ineffective by (48.3%) of respondents, primarily due to inadequate resources and limited community participation. The study concludes that veldfires remain a major threat to sustainable livelihoods in Matepatepa. There is need for strengthening community awareness, improving enforcement of veldfires regulations and promoting community participation in fire prevention planning.

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LIST OF ACRONYMS AND ABBREVIATIONS

EMA	Environmental Management Agency
SPSS	Statistical Package for Social Science
KIIs	Key Informant Interviews

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

During the dry season (April to October) biomass becomes extremely flammable Nyamadzawo et al., (2013), Veldfires are a periodic and alarming environmental threat in Zimbabwe. These fires are mainly anthropogenic caused by land preparation for agriculture, hunting, careless disposal of smoking butts and pasture management burning (Jakhar et al.,2023). The results are disastrous crops and livestock fodder, as well as forests, goods or even human lives can be destroyed. This signals net degradation, which erodes agricultural potential, shrinks' biodiversity and disintegrates livelihoods of rural communities that depend directly on natural resources Scherr, (2000).

The area characterized by a mainly agrarian economy based on small-scale farming Kufandirori (2015) include Matepatepa in Bindura, Mashonaland Central Province. Veldfire outbreaks in this community have been common, resulting in the loss of grazing land and organic matter that reduces soil fertility, as well as direct economic losses due to destroyed crops and infrastructure. Lovemore 25 July, 2021, After Math of Matepatepa fires leaves families homeless the fiendish flames creativity burnt down and destroyed properties worth millions of dollars whilst leaving one family homeless in Matepatepa, exposing how little firefighting capacity exists yet no life was lost. At national level, various interventions such as the Environmental Management Act (Chapter 20:27) and fire awareness campaigns by the EMA, incidence of veldfires has remained high Makananisa (2021). The puzzling nature of this continuous challenge calls for an in-depth, contextualised investigation into how and why the dynamics play out so in Matepatepa; this was the motivation behind this study.

1.2 PROBLEM STATEMENT

In Matepatepa, small-scale farmers face a persistent threat from veldfires which systematically erode their socio-economic and environmental base. Nationally, over one

million hectares of land are lost to veldfires annually, causing significant environmental degradation and compromising food security Mabaso et al., (2022). In Matepatepa, these fires destroy seasonal crops, perennial pastures, and woodland directly impacting farmers' income, food stores and livestock health.

There is a major gap between high-level policy measures and their effective implementation at the local level. This is because whilst you may have legislation and campaigns, they don't seem to quite work in Matepatepa as veldfires keep happening regularly. Difficulties in measuring the actual impact of existing management practices, as well as qualitative data on local perceptions of such measures that already exist and may require improved communications. It is in light of this that the study aims to address this gap by performing a detailed analysis of the impacts of veldfires, estimating available control mechanisms and identifying context-specific localised recommendations that enhance resilience and reduce fire risk in the Matepatepa community.

1.3 JUSTIFICATION

This study is important for three reasons

- It will help policymakers and agencies like AGRITEX by giving them information to make policies and programs.
- It will help the Matepatepa community by documenting their experiences and challenges. The suggested strategies will come from the community so they are more likely to work.
- It will add to knowledge about reducing disaster risk adapting to climate change and managing land in a way in African contexts.

1.4 AIM

The study seeks to determine the socio-economic and environmental effects of veldfires on smallholder farmers in Ward 4 Matepatepa, in terms of food security, income, agricultural land, agricultural livestock and grazing resources as well as to evaluate the existing veldfires management and prevention strategies.

1.5 OBJECTIVES

1. To assess the socio-economic impacts of veldfires on small-scale farmers in Ward 4, Matepatepa focusing on food security, income and livelihoods.
2. To evaluate the environmental impacts of veldfires on agricultural land, vegetation, soil quality and grazing resources used by small-scale farmers.
3. To examine the effectiveness of existing veldfires management and prevention strategies in reducing veldfires risks among small-scale farmers in Ward 4.

1.6 RESEARCH QUESTIONS

1. What are the predominant direct and underlying causes of veldfires ignition and spread in Ward 4 Matepatepa?
2. What are the perceived and quantified socio-economic and environmental consequences of veldfires on small-scale farming livelihoods?
3. To what extent are existing veldfires management strategies known to, accessed by and considered effective by the community?

CHAPTER 2

LITERATURE REVIEW

2.1 CONCEPTUALISATION OF VELDFIRES

Veldfires are uncontrolled fires that burn in grassland, forest or on agricultural land, especially during the dry grasslands of the dry season when fires can burn easily Steyn (2020). Veldfires are one of the most frequent environmental risks in Southern Africa, especially in rural communities where people's lives are heavily dependent on the natural environment Forsyth, Kruger et al (2010).

In Zimbabwe, most veldfires are anthropogenic fires Mashapa, (2014). Major causes of veldfires include human activity related to land clearance, hunting, burning of crop residues and discarding of cigarette butts by people, reports the Environmental Management Agency (EMA, 2022). The fires can be hard to control, as dry vegetation and strong winds can cause them to spread quickly (Gill & Allan, 2008).

Gandiwa et al., (2026) point out that, climate variability, population pressure on land and unsustainable land management practices have led to an increase in veldfires in Zimbabwe. These fires are a great threat for the agricultural production, biodiversity and surrounding livelihoods.

2.2 CAUSES OF VELDFIRES

In rural communities, there are direct and indirect causes of veldfires as cited by several studies. Direct causes are land use (as preparation for farming), hunting (fire use), smoking and vegetation burning (fallow land clearing).

Simorangkir (2007, states that the burning is a practice applied by farmers, which is not too expensive for cleaning the land for cultivation. However, fires, if not well managed, can encroach onto grazing lands, forests and adjacent fields.

Also, as stated by Hove et al., (2020 in rural Zimbabwe, hunting is done through the use of fire to flush wild animals. Such fires often get out of hands, engulfing vast acreage.

Indirect causes of veldfires are climate factors such as drought and high temperatures. Graham et al., (2023) state that dry vegetation fuel fires, making outbreaks of widespread veldfires more likely during a dry season.

Furthermore, lack of robust implementation of environmental laws helps to sustain veldfires. Although legislation is in place, including the Environmental Management Act, communities may not have the awareness or resources to effectively implement fire prevention measures, Mockrin, Fishler, & Stewart (2018) states.

2.3 SOCIO-ECONOMIC IMPACTS CAUSED BY VELDFIRES IN THE SMALL SCALE FARMING CONTEXT.

2.3.1 LOSS OF CROPS AND AGRICULTURAL PRODUCTIVITY

Loss of crops to veldfires regularly results in decreased productivity of the agricultural output and a shortage of food. But suggests Kpienbaareh, & Luginaah (2019), fire incidence in rural agriculture zones has a huge negative impact on agricultural output and the food security of households.

Seasonal production of crops has significant impact on the livelihood of small producers in terms of income and subsistence. Crop destruction, like maize, groundnuts and vegetables by fire, have severe economic consequences for households. Nyamadzawo et al., (2013) points out that recurrent fires can push farmers into a vicious circle of poverty as a result of diminishing productive assets.

2.3.2 LOSS OF LIVESTOCK GRAZING LAND

Veldfires also kill livestock grazing land. Livestock is an important part of rural livelihoods, as it can serve as a source of income, draught power and food. Mustafa (2021) indicated that fire destruction of pastures reduces the fodder availability which result to the malnourishment of livestock and reduction of their productivity.

The kill of grazing grounds can lead to early sale of stock or force the transportation of animal's over long distances looking for new pasture. This puts further strain on the livelihoods and economic security of farmers Akanwa et al., (2023).

2.3.3 DAMAGE TO PROPERTY AND INFRASTRUCTURE

Veldfires can kill homes, storage buildings and farm machinery in some instances. A study by Chinamatira et al., (2016) indicates that there is a high incidence of uncontrolled fires in rural communities in Zimbabwe which has resulted in great losses of property.

This may simultaneously further impoverish vulnerable households, as they may need to rebuild their houses or replace equipment, which they are unable to afford Dercon (2006).

2.4 ENVIRONMENTAL IMPACTS OF VELDFIRES

2.4.1 SOIL DEGRADATION

The Veldfires have a remarkable impact on soil fertility (Adom, Makananisa, & Simatele 2024). Zhang & Biswas (2017) has reported that fires destroy the organic matter and soil nutrient which is essential for the growth of plants. This contributes to low productivity of the soil and agricultural output.

Also, extreme fires may affect soil structure and increase its erosion potential. According to McLauchlan, (2006), soil nutrient and organic matter loss makes an agricultural land less sustainable.

2.4.2 LOSS OF VEGETATION AND BIODIVERSITY

Fires kill trees, grasses and shrubs, which are critical parts of the ecosystem. The effects of periodic fires in some ecosystems are well documented, although unchecked veldfires can result in substantial losses of vegetation and biodiversity as described by Mabaso et al., (2022).

In rural communities, vegetation is important for providing firewood, medicinal plants, and construction materials. Loss of these resources contributes to the loss of natural resources which communities depend on for their livelihoods.

2.4.3 AIR POLLUTION AND CLIMATE CHANGE

Veldfires also make a contribution to air pollution and greenhouse gas emissions. Levine (1990) reports that biomass burning emits carbon dioxide, methane and other gases that can lead to global warming.

The smoke from the veldfires can also have a negative impact on human health, especially in the vulnerable population of children and elderly.

2.5 VELDFIRES MANAGEMENT AND PREVENTION STRATEGIES

There are a number of strategies that have been put in place by governments and environmental agencies to minimize veldfires. In Zimbabwe, the Environmental Management Agency (EMA) has the mandate of coordinating the prevention programmes of veldfires.

The most common method has been the creation of strips of cleared land called fireguards to stop the spread of fires. Alexandar (2000)., farmers must have fireguards built around their farms and properties in advance of the fire season.

Community awareness campaigns are also a key component in the prevention of veldfires. Hällsten, & Trolltoft, (2023) underline the importance of educating communities with information about the risks for uncontrolled fires in order to reduce the incidence of veldfires.

Community involvement in fire management is another key approach. Krah et al., (2020) reports that by engaging members of the local community in monitoring and control fire management programmes, they are more effective.

Nevertheless, in many rural areas veldfires are common. This indicates that strategies in place are not necessarily fully effective or applied locally.

2.6 EMPIRICAL STUDIES ON VELDFIRES IN AFRICA

Veldfires cause wide-spread effects, as illustrated by studies in various African countries. A study conducted by Acheampong (2021) in Ghana revealed that bushfires greatly impacted agriculture productivity and livelihood of rural communities.

Likewise, Smith (2020) found that unmanaged fires led to degradation of the environment, loss of grazing land and loss of food security.

Mazanhi & Chirisa (2021) reported ecological effects of veldfires in protected areas and the adjacent communities in Zimbabwe. Their findings revealed that fires burned out vegetation and wildlife habitats. The studies show that veldfires are a significant environmental and socio-economic problem in Africa, especially in rural agricultural communities.

CHAPTER 3

METHODOLOGY

3.1 DESCRIPTION OF THE STUDY AREA

The study was conducted in Matepatepa, which is located in Bindura Rural District, within Mashonaland Central Province, Zimbabwe. Bindura lies in the north-eastern part of Zimbabwe, approximately 88 km north-east of Harare and situated about 22 km north of Bindura Sibanda (2012). The district experiences a warm climate with average temperatures ranging between 16°C and 25° C. The mean annual rainfall for Bindura is 850mm with the heavier rainfall in January Zireva (2025).

Matepatepa is predominantly an agricultural area where small-scale farmers practice subsistence farming Kufandirori (2015). Major crops grown include maize, groundnuts, and small grains, mainly for household consumption and local markets. The area has extensive grasslands and forests which become dry during the dry season, particularly between July and October. These conditions make the area highly prone to veldfires, which pose serious environmental and socio-economic challenges to small-scale farmers.

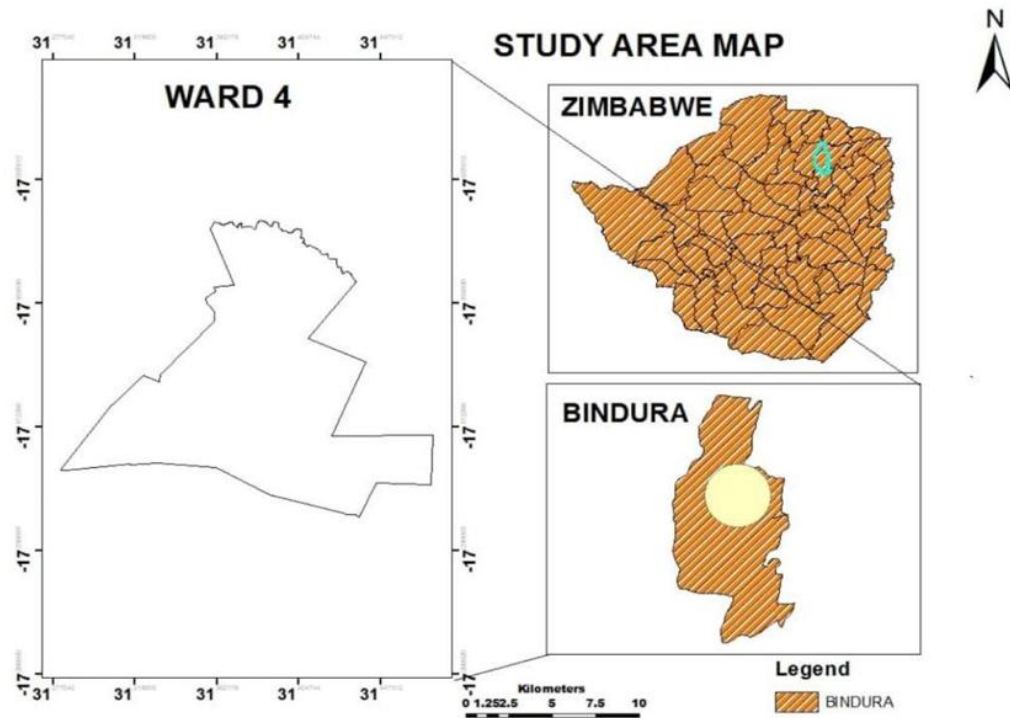


Figure 3.1A map showing location of Bindura and Matepatepa the study area

3.2 RESEARCH DESIGN

The study adopted a cross-sectional research design, where data were collected from different respondents at a single point in time. This design was suitable for assessing the current socio-economic and environmental impacts of veldfires on small-scale farmers without manipulating the study environment.

Both quantitative and qualitative research approaches were used. Quantitative data refers to information which deals particularly with numbers and statistics. While qualitative data refers to descriptive information and regards situations which can be observed but cannot be measured, for example language Blaikie (2003). In this research quantitative data helped in measuring the extent of socio-economic losses and environmental damage caused by veldfires, while qualitative data provided in-depth explanations of farmers' experiences and perceptions. The study was conducted before the peak veldfires season, to allow respondents to reflect on recent veldfires experiences.

3.3 DATA SOURCES

The study used both primary and secondary data sources.

Primary data were collected from a small-scale farmer of the study area using questionnaires and observing the farmers. Primary data is first-hand data that is collected from the source Ajayi (2023). The target respondents were farmers (both male and female) aged 18 years and above, actively engaged in the farming activities. The visible environmental effects (burnt fields, damaged farming infrastructure and damaged vegetation) were assessed using direct observation.

Secondary data are data that are readily available and accessible Kalu (2018). Secondary data was gathered from information available from journal articles on fire ecology, government publications and reports of the Environmental Management Agency (EMA) as well as from Zimbabwe environmental legislation that relates to veldfires management. These sources provided background information and assisted with the interpretation of the primary data.

3.4 SAMPLING METHOD

Simple random sampling was used and all small scale farmers in Matepatepa had the same probability of being selected. The method was selected to minimise bias and to get a fair representation of the farming community in the study area. Respondents (small-scale farmers) were randomly picked from various homesteads in Matepatepa. Easy to comprehend and execute.

3.5 SAMPLE SIZE

The formula which was used to determine the sample size:

Where:

- Sample size (n) = Population (N) × Sampling fraction (f)
- $n = 120 \times 0.5$
- $n = 60$

Using the formula, a sample size of 60 respondents was obtained. However, the final sample size was reduced by 60 respondents due to factors such as ineligibility of respondents below 18 years, absence of household heads during data collection, and voluntary non-participation.

3.6 QUESTIONNAIRE

A questionnaire is a research instrument that comprises of series of questions for the purpose of gathering information from respondents Srivastava (2024). In this study a structured questionnaire was used as the main data collection instrument. The questionnaire consisted of four sections: demographic information, socio-economic impacts, environmental impacts, and coping or mitigation strategies related to veldfires.

The questionnaire comprised 38 questions, with 12 close-ended questions and 26 open-ended questions. Close-ended questions allowed for easy quantification of responses, while open-ended questions provided respondents with the opportunity to express their views and experiences in detail.

The questionnaire contained four sections

1. Demographic information (age, gender, education, years of farming experience).
2. Direct and underlying causes of Veldfires ignition and spread related questions.
3. Socio-economic and Environmental impacts of veldfires.
4. Awareness, Access and Effectiveness of veldfires management strategies.

Questionnaire were chosen because they enable the collection of data from a relatively large number of respondents within a short period of time. They also allow respondents to answer question questions freely without pressure, thereby improving the reliability of responses.

3.7 KEY INFORMANT INTERVIEWS(KIIS)

Key informant interviews were also used as a data collection method in this study. Key informants are individuals who possess specialized knowledge or experience about a particular issue under study McKenna & Main (2013). A semi-structured interview guide was

utilised with stakeholders who have direct experience with veldfires management, prevention and response. These includes 2 EMA Officers, 2 AGRITEX Extension workers, 1 local leader ,2 Forestry Commission officer and 2 community fire-fighting team members and 1 traditional leader (Village Head). This approach enabled the researcher to ask uniform core questions to all participants one –on -one while also allowing flexibility to probe further where clarification or additional detail was required. Interviews focused on:

- Causes and frequency of veldfires in Matepatepa, Bindura.
- Community awareness and perception regarding veldfires prevention
- Institutional capacity and resources available for veldfires management
- Environmental and socio-economic impacts of veldfires on local communities
- Co-ordination between local authorities, Environmental agencies and community members in veldfires prevention and control.

Responses were documented through written notes and where permitted, audio recordings to ensure accuracy and reliability of data collected.

3.8 DIRECT OBSERVATION

There are many ways to collect data, one of which is direct observation (also called observational studies), in which the subject is observed from a distance in the place where it lives Kumar & Sharma (2023). Questionnaire information was complemented with direct observation. The researcher observed physical evidence pertaining to impacts of veldfires such as burnt crop fields, damaged grazing fields, damage to fences and reduction in vegetation cover and other environmental indicators associated with veldfires occurrences. This approach facilitated triangulation of the data given by the respondents and added to the trustworthiness of the research results.

The researcher was able to measure its extent from direct observation, and determine whether or not there were measures to prevent fire, such as fireguards. The method also identified community practices that could assist in the outbreaks of veldfires such as land clearing, cigarette stubs not being properly disposed of and burning of vegetation.

3.9 DATA ANALYSIS

SPSS 20 is statistical software package for social sciences which is used in statistical analysis of information Sun (2019). It offers a variety of functions for data management, analysis and

reporting. The data was analysed using Statistical Package for Social Sciences (SPSS) version 20 and MS Excel. Data entry, cleaning and pre-analysis were done in Ms. Excel. The data cleaned was then imported into SPSS computer software for additional analysis.

Quantitative data was presented through descriptive statistics which included frequencies, percentages, tables and graphs. The use of these statistical methods allowed the researcher to present the total responses of the respondents and show the trend between the causes, effects and management of veldfires in Matepatepa, Bindura District.

Thematic analysis using qualitative data, extracted through open-ended questions in a questionnaire, key informant interviews and field observations. This included detailed analysis of the data gathered and the development of themes and trends with regards to socio-economic and environmental effect of veldfires.

Both quantitative and qualitative methods of data analysis were integrated which gave a complete understanding of the dynamics of veldfires in the study area. The mixed approach allowed the researcher to triangle information from the various sources so that the findings were enhanced through the triangulation.

3.10 RESEARCH VARIABLES

Research variables are the elements that are studied in research Kaur & Mittal (2021). The socio-economic impacts (socio-economic variables), environmental impacts (environmental variables) and demographic variables were the main research variables. Socio-economic indicators were the loss of crops, livestock losses, property damage, food security and loss of income. Environmental variables that focussed on land degradation, vegetation loss, soil fertility loss and wildlife habitat loss. Demographic characteristics (age, gender, and educational level) were taken into account because they could impact how vulnerable farmers are and how they respond to veldfires Adom et al., (2024).

3.11 RESEARCH ETHICS

The ethical aspect was carefully followed during the study. These were informed consent, confidentiality, voluntary participation and non-maleficence. The participants were fully informed regarding the purposes of the study and they could withdraw from the study

whenever they wanted. The researcher ensured that the participants were not harmed and the information collected was only for research purposes Ramrathan et al., (2017). The chairperson in writing allowed to conduct a study.

CHAPTER 4

RESULTS

4.1 DEMOGRAPHIC DISTRIBUTION OF RESPONDENTS BY GENDER

The findings in figure 4.1 shows a higher proportion of female respondents with 60% compared to males with 40%. This is not merely a numerical outcome but reflects gender roles within rural households. Women are typically responsible for food production, firewood collection, and water sourcing. As a result, they experience the direct consequences of veldfires more intensely than men. Their dominance in the sample therefore strengthens the reliability of responses related to environmental and livelihood impacts. This also suggests that any veldfires management strategy that ignores women's participation is likely to be ineffective.

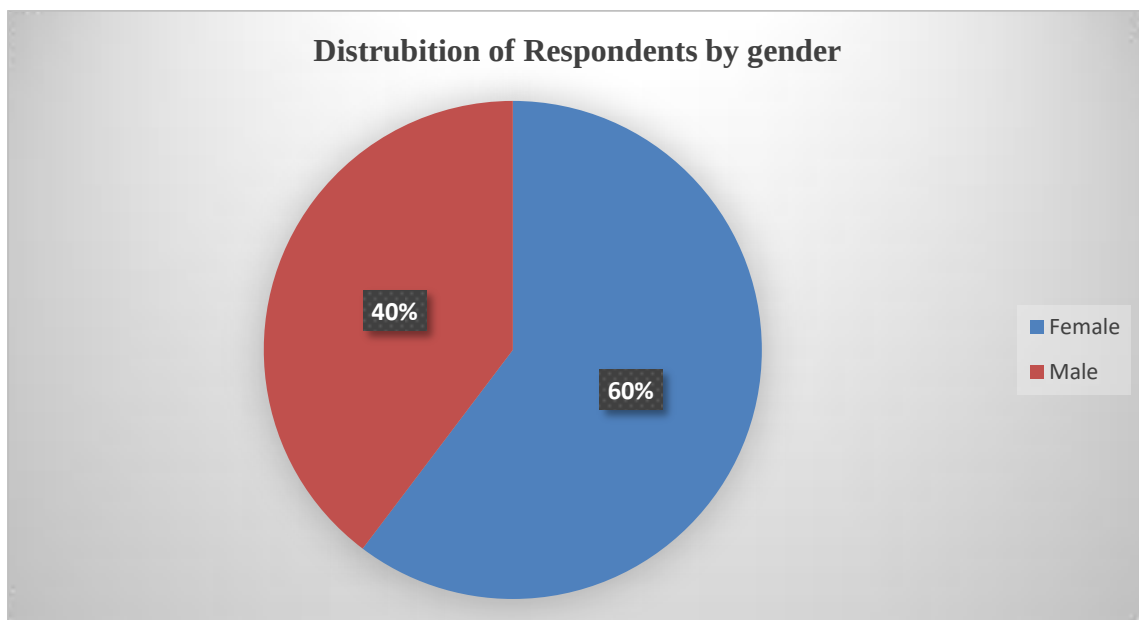


Figure 4.1 Demographic Respondents in Matepatepa, Bindura Rural District

4.2 SMALL-SCALE FARMERS' ACTIVITIES THAT CAUSE VELDFIRES

The study identified both human-induced and natural causes, with residue burning ranking highest with (26.8%). The dominance of residue burning points to a systemic issue rather than individual carelessness. Farmers rely on fire as a cheap and accessible land preparation method. This means wildfires are not just environmental accidents; they are tied to survival strategies for livelihoods. Lightning with (23.2%) is the second highest, as a natural cause confirms that veldfires cannot be completely eliminated. However, its impact can be minimized through preparedness measures, such as fire guards. Veldfires in the study area are best understood as a product of socio-economic pressure, limited alternatives and weak

regulation, rather than ignorance alone. Honey harvesting (16.5%) and hunting (10.7%) reflects the use of smoke in traditional beekeeping practices, which often leads to unintended ignition of surrounding dry vegetation. These findings point to livelihood-dependent activities of people in Matepatepa small-scale farming area that unintentionally heighten fire risks due to limited awareness or lack of safer alternatives. Cigarette disposal with (5.4%) becoming the least reflecting behavioral negligence, especially along roadsides and grazing areas.

Qualitative data from Key Informants strongly support this trend. EMA officers noted that wildfires are largely linked to careless burning, as he stated that:

“Veldfires are largely attributed to human activities, land clearing and careless burning”

Agritex officer added that:

“Farmers rely on fire because it is affordable and efficient”.

This demonstrates that wildfires are not simply due to negligence, but are structurally embedded in rural livelihoods. Fire is used as a coping strategy in the absence of an affordable alternative. The persistence of veldfires reflects a livelihood-environment trade-off rather than a knowledge gap alone.

Similarly, the study findings are consistent with Simorangkir, D. (2007) in chapter 2 who argue that farmers often use fire as a cheap land preparation method. The persistence of these practices in Matepatepa suggests that despite awareness campaigns, behavioral change remains limited at the community level.

Furthermore, the role of hunting using fire observed in this study aligns with Hove et al., (2020), who noted that fire is commonly used to flush out wild animals. This indicates that traditional livelihood practices continue to contribute significantly to veldfires outbreak.

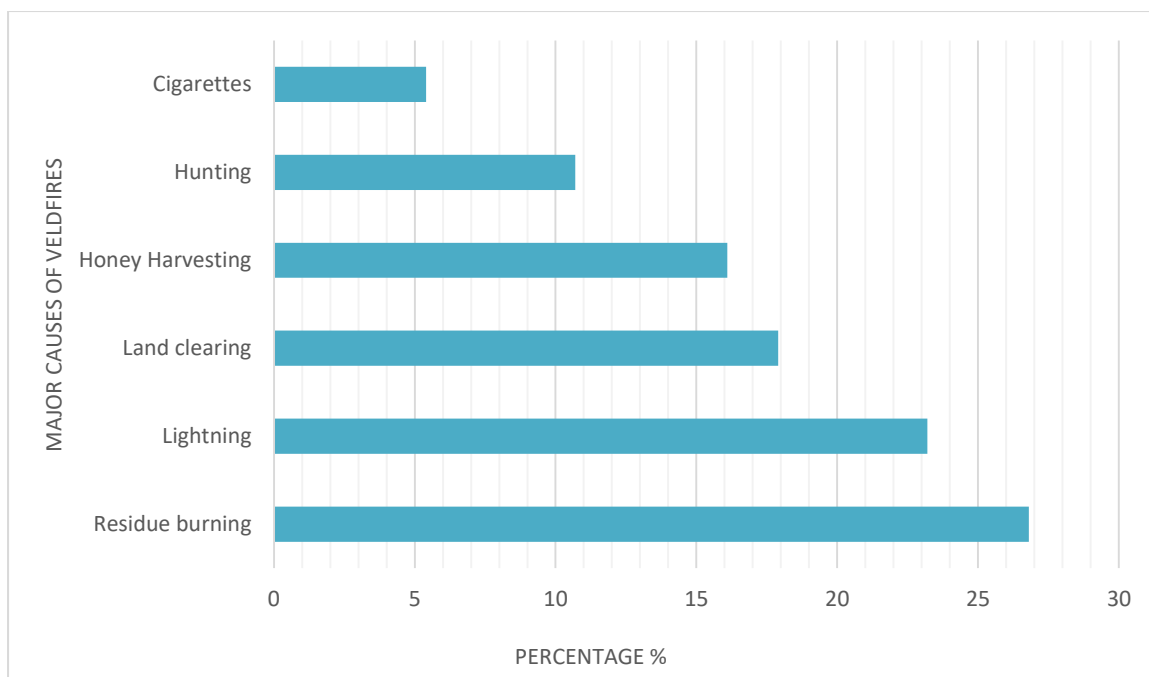


Figure 4.1 Small-scale farmers activities that cause veldfires

4.3 ENVIRONMENTAL IMPACTS OF VELDFIRES

The environmental effects experienced due to veldfires as perceived by the people in the field surveys made at Matepatepa Ward 4 is shown in table 4.3 and figure 4.3, where the perceived loss in soil fertility is the most severe (27.6%). This indicates that veldfires will not only damage the surface area but will affect soil nutrients and organic matter, and this will lower its production potential in the future. Fires are a possible source of nutrients via the ashes, but repeated burns result in loss of nutrients overall.

Loss of vegetation is frequent (20.5%) which underlines the seriousness of veldfires as vegetation is an important element in soil protection and ecosystem recovery. This can explain other impacts that are seen with its removal such as reduced grazing or soil erosion because without one, the other wouldn't be impacted. The impacts of reduced grazing are direct impacts on livestock production which are in turn directly connected to farmers' livelihoods.

There was an equal amount of wildlife loss reported at this level as for reduced grazing (19%), which indicates the overall environmental effects of veld fires, such as loss of habitat and biodiversity. Despite being the least reported (13.8%), soil erosion is considered to be critical as it is a long term and often “invisible” process of land degradation.

These impacts were confirmed by key informants. Agritex officer reported that:

‘Veldfires can destroy the fertility of the soil and lower crop productivity.’

The consequences of veldfires and environmental degradation are a self-reinforcing feedback with a loss of vegetation leading to further degradation of soil and consequently, a fall in productivity and a greater need for fire mediated land preparation.

It revealed that the environment was very poor, with loss of vegetation, loss of soil fertility and loss of biodiversity. The results align with those of Zhang & Biswas (2017), which states that the nutrients and organic matters vital to plants are being destroyed by fires.

In line with this, the decrease or loss of vegetation observed matches that of Mabaso et al., (2022) who note that uncontrolled fires lead to loss of biodiversity.

Table 4.3 Environmental Impacts Caused by Veldfires

Environmental Impact	Frequency	Percentage %
Soil fertility loss	16	27.6%
Vegetation loss	12	20.5%
Reduced grazing	11	19.0%
Wildlife loss	11	19.0%
Soil erosion	8	13.8%
Total	58	100%

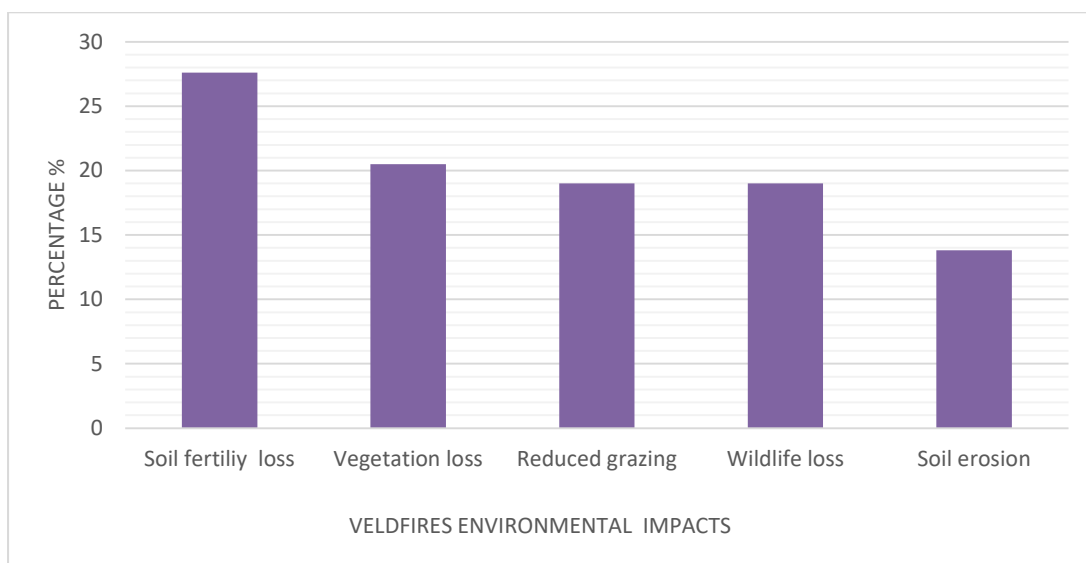


Figure 4.3 Environmental Impacts Caused by veldfires to the small-scale farmers

4.4 EVALUATION OF MANAGEMENT STRATEGIES

The results presented in figure 4.4 show a moderate to high level of dissatisfaction, with almost half of the respondents saying that the current strategies are not effective.

Most of the respondents indicated that the current strategies were “not effective” (48.3%).

This perception is based upon multiple challenges:

- Policy-practice gap: Regulations may be in place but the implementation of the policy is not.
- Resource limitations: Lack of equipment to protect communities like fire beaters, protective clothing and transport.
- Limited community involvement: Strategies are often top down.

The proportion of “not sure” with (17.2%) respondents is also significant. It suggests that some members of the community have a limited awareness of the interventions available, poor communication/outreach. The issue is not necessarily that the strategies are lacking, but rather so much with the lack in efficiency in implementing the strategies and in the community integration.

This is in keeping with the key informant that was achieved by interviews. A Forestry Commission officer commented that:

“In spite of the benefits in reducing damage, the enforcement mechanism is not robust”.

The fire-fighting team member also noted that:

“Community involvement in fire outbreaks is very low, we respond to the fires.”

This plainly illustrates a practice gap, where institutional systems are in place, but they do not have local proprietorship, implementation ability or community involvement. This makes it more of a support of Hallsten & Trolltoft (2023) who say that awareness alone is not enough in the absence of community cooperation.

However, this research validity exposes that institutional coordination is a gap between the agencies and communities, that affects the issue of control of wild fires. This reflects an important gap in the literature available, since much of it concentrates more on strategies than on the problems involved with implementing them. It recommends that better coordination and allocation of resources is an important element in making wildfire management better.



Figure 4.4 Evaluation of management strategies

4.5 SOCIO-ECONOMIC IMPACTS CAUSED BY VELDFIRES

As indicated on the figure below, the highest percentage of respondents who reported economic losses (29.6%) attributed it to losing livestock. This is followed by fence damage, (27.8%) and crop loss (25.9%), while income loss is (24.1%), property loss is (17.9%) and home destruction is the least with (15.2%). The results show that the tangible agricultural assets (infrastructure and livestock) are more directly affected by veld fires. This shows how small-scale farmers, whose livelihoods rely on these resources, are vulnerable.

Loss of livestock was central, reflecting its economic value both as an income source and as an asset to households' long-term wealth and well-being. Fences can also damage and add to repair costs and lack of livestock control. Crop loss, although slightly lower, is important as it is a direct threat to food security and household income.

Livestock loss was a significant feature, which reflects its economic value as in addition to income, it also reflects long-term household wealth. Financial losses also arise from fence damage and house damage, which also enable loss of control of animals. Crop loss is not so high but still important because it directly impacts on food security and household income.

This is supported by a Traditional Leader, as he commented that:

“Traditional knowledge is there, but it is not being transferred to the younger generation. Our traditional laws used to regulate veldfires, but now the people don't obey them, which results in the loss of much wildlife.”

It is evident that the veldfires create a loss in household capacity for coping and destroy productive resources, and hence, future production potential.

This result is a strong validation of that of Kpienbaareh & Luginaah (2019) that agricultural productivity declined due to fire outbreak and it jeopardizes household food security. This implies that veldfires do not only cause immediate shocks, but multiple impacts on livelihoods.

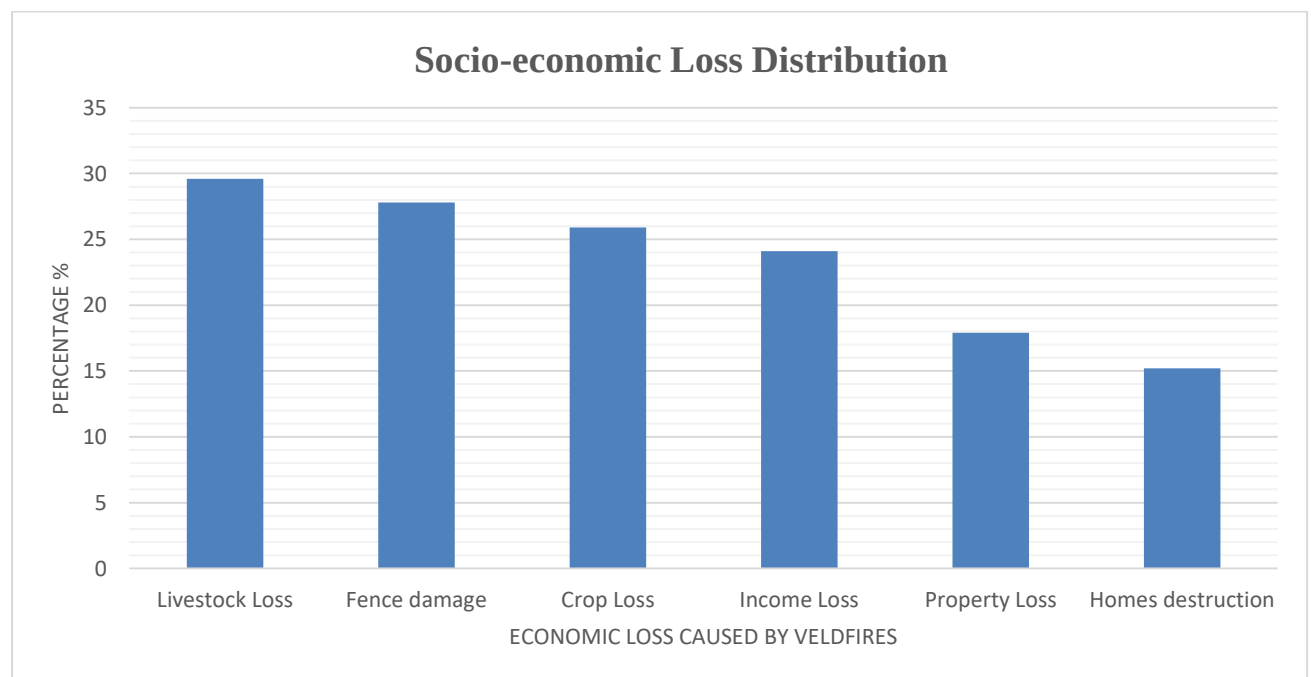


Figure 4.5 Socio-Economic Impacts Caused by Veldfires

CHAPTER 5

DISCUSSION

5.1 DEMOGRAPHIC CHARACTERISTICS

The demographic analysis showed that male respondents numbered only 40% to female respondents who numbered 60%, indicating a gender bias in the environmental problems facing the respondents. The findings are reliable due to the phenomenon of women's domination, who are directly related to agricultural production and the use of nature resources. This means that to be effective, veldfires management should be gender sensitive and inclusive.

5.2 SOCIO-ECONOMIC IMPACTS OF VELDFIRES

The study found that the socio-economic pressures are great on small-scale farmers in Matepatapa Ward 4 due to veldfires. Since livestock loss was the most severe impact (29.6%) and a vital source of income and household wealth, it was given special consideration. Fence damage (27.8%) and crop loss (25.9%) were the next most common occurrences as a testimony of the direct effect of veldfires on farming productivity and food security.

There was a loss in income of 24.1%, which shows that the economic disruption was not just on the physical assets, but also on income. Loss of property (17.9%) and destruction of home (15.2%) which are relatively low also have impact as an indicator of long-term livelihood instability.

These results indicate that the socio-economic impact of veldfires is not single, but multi-dimensional and is having the most significant impact on productive assets which support rural livelihood. The generally high scores in various categories indicate that veldfires do not only happen once, but occur again and again with cumulative impacts on household resilience and poverty levels.

5.3 ENVIRONMENTAL IMPACTS OF VELDFIRES

The results show that veldfires are important for environmental degradation in a very high percentage (27.6%) of soil fertility loss. This indicates the implications of veldfires on the sustainability of agriculture in the long-term since soil quality plays a pivotal role in the production of any type of crops.

Vegetation loss was also observed (20.5%) and confirmed the severity of the damage done to the ecosystem. This loss is associated with the reduction in grazing capacity (19.0%) as well

as reduction in the wildlife loss (19.0%) and hence, veldfires have a wide-spread impact both on agriculture and on the ecological systems. Soil erosion is the least reported (13.8%) but is critical because it is a slowly occurring, gradual and persistent degradation of land.

These percentages show an interconnection of the impacts on the environment, as evidenced in the distribution. Veldfires appear to have a long term effect as the percentage of soil fertility loss is much higher than that of the other variables, which are fairly even, indicating that environmental damage is pervasive.

5.4 CAUSES AND SPREAD OF VELDFIRES

The study concluded that human activities are mostly responsible for veldfires and that the most important human activity is residue burning (26.8%). This confirms the use of fire as an economic way of preparing land. The natural cause of lightning was responsible for (23.2%) and this would suggest that although this cannot be removed, it can be managed.

Other factors are land clearing (17.9 %), honey harvest (16.1 %) and hunting (10.7 %) which are also associated with livelihood activities. The smallest proportion (5.4%) were lost in cigarette disposal as this is not the main cause of veldfires.

This implies that the use of fire in the rural livelihoods system is embedded and the percentages of livelihood related activities show that use of fire was not optional.

5.5 THE EFFECTIVENESS OF VELDFIRES MANAGEMENT STRATEGIES

The study revealed that current veldfires management strategies have little success. widespread dissatisfaction with current strategies was seen in the significant proportion of respondents (48.3%) who perceived current strategies as “not effective”, only 22.4% found strategies to be effective and 12.1% found them very effective.

Importantly, 17.2% said they were ‘not sure’, indicating a lack of awareness and/or low levels of intervention engagement. this is an indication of a lack of communication, outreach and community involvement.

A significant gap between policy formulation and its actual implementation is pointed to by the dominance of negative perceptions (48.3%). the relatively low proportion of positive responses further highlights the need for better performance of existing strategies to tackle the risk of veldfires.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSION

The study concludes that Matepatepa ward 4 experienced a socio-economic, environmental, and institutional challenge with regards to veldfires.

The high losses of livestock (29.6%) and the damage to crops (25.9%) indicates that veldfires are a major threat to rural livelihoods and food security. From an environmental perspective, soil fertility loss (27.6%) was dominant, suggesting a chronic degradation that poses a threat to agricultural sustainability. Additionally, the large percentage of respondents who believe that management strategies have proven to be ineffective (48.3%) indicates that there are systemic weaknesses within the policy implementation and community engagement process.

In conclusion, it can be said that veldfires are not just occurrences of isolated environmental events, but are firmly entrenched in livelihood systems and institutional structures. Their solution can thus only be through integrated approaches that are specific to the context, and are community-led.

6.2 RECOMMENDATIONS

6.2.1 ENHANCING SOCIO-ECONOMIC RESILIENCE

- Promote alternative land preparation methods to reduce reliance on practices responsible for (26.8%) of veldfires (residue burning).
- Provide targeted support to protect key assets such as livestock, which accounts for (29.6%) of losses.
- Strengthen livelihood diversification programmes to reduce vulnerability to fire-related shocks.

6.2.2 PROMOTING ENVIRONMENTAL SUSTAINABILITY

- Encourage sustainable land management practices to address soil fertility loss (27.6%).
- Implement reforestation and vegetation restoration programmes to mitigate vegetation loss (20.5%).

6.2.3 STRENGTHENING VELDFIRES MANAGEMENT STRATEGIES

- Improve enforcement of regulations in response to the high dissatisfaction rate.
- Increase community awareness to address the (17.2%) uncertainty regarding management strategies.
- Enhance resource allocation and institutional coordination to improve effectiveness.

6.2.4 AREAS FOR FURTHER RESEARCH

- Climate change influences on wildfire frequency
- Adoption of alternative, non-fire-based farming techniques

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APPENDICES

APPENDIX 1: RESEARCH QUESTIONNAIRE

Section A: Socio-Demographic Information

1. Sex of respondent

☐ Male ☐ Female

2. Age group

☐ 18–25

☐ 26–35

☐ 36–41

☐ 42–49

☐ 50+

3. Highest level of education attained

☐ None ☐ Primary ☐ Secondary ☐ Tertiary

4. Household size (number of people): _____

5. Main source of livelihood

☐ Crop farming

☐ Livestock rearing

☐ Mixed farming

☐ Other (specify): _____

6. Years of farming experience

☐ Less than 5

☐ 5–10

☐ 11–20

☐ More than 20

Section B: Direct and Underlying Causes of Veldfire Ignition and Spread

7. Have veldfires occurred in Ward 4 during the past five years?

☐ Yes ☐ No

8. How frequently do veldfires occur in this area?

☐ Every year ☐ Occasionally ☐ Rarely

9. During which period do veldfires mostly occur?

☐ Dry season ☐ Rainy season

10. What are the main direct causes of veldfires in your area? (Tick all that apply)

☐ Land clearing for farming

☐ Hunting

☐ Honey harvesting

☐ Burning of crop residues

☐ Careless disposal of cigarettes

☐ Lightning

☐ Other (specify): _____

11. In your opinion, why do people start veldfires in this area?

—

12. Who is most often responsible for veldfires?

☐ Farmers

☐ Herd boys

☐ Hunters

☐ Children

☐ Outsiders

13. Are veldfires mostly accidental or deliberate?

☐ Accidental ☐ Deliberate ☐ Both

14. What social or economic pressures contribute to veldfires in your community?

—

15. Which factors encourage the spread of veldfires? (Tick all that apply)

☐ Dry vegetation

☐ Strong winds

☐ Poorly maintained fireguards

☐ Lack of firefighting equipment

☐ Weak enforcement of laws

16. Are fireguards/firebreaks adequately prepared and maintained in Ward 4?

☐ Yes ☐ No ☐ Not sure

17. Describe a veldfire incident you have witnessed in this area.

—

18. Do traditional or cultural practices contribute to veldfires?

☐ Yes ☐ No ☐ Not sure

—

Section C: Socio-Economic and Environmental Impacts of Veldfires

19. Have veldfires affected your household in any way?

☐ Yes ☐ No

20. How have veldfires affected your household livelihood?

—

21. What economic losses have you experienced due to veldfires? (Tick all that apply)

☐ Crop loss

☐ Livestock loss

☐ Damage to fences

☐ Loss of income

☐ None

22. Estimate crop losses due to veldfires in the last farming season

☐ Low ☐ Moderate ☐ High ☐ Very high

23. Have veldfires increased food insecurity in your household?

☐ Yes ☐ No

24. How do veldfires affect your ability to meet household needs (food, school fees, health)?

—

25. What environmental impacts have you observed? (Tick all that apply)

☐ Loss of vegetation

☐ Soil erosion

☐ Reduced soil fertility

☐ Loss of wildlife

☐ Reduced grazing land

26. Do veldfires affect livestock grazing availability?

☐ Yes ☐ No

27. Have veldfires affected water sources such as rivers or dams?

☐ Yes ☐ No ☐ Not sure

28. What long-term environmental changes have you noticed due to veldfires?

—

29. Overall, how severe are veldfire impacts on your livelihood?

☐ Low ☐ Moderate ☐ High ☐ Very high

—

Section D: Awareness, Access and Effectiveness of Veldfires Management Strategies

30. Are you aware of any veldfires management or prevention strategies in Ward 4?

☐ Yes ☐ No

31. Which veldfires management strategies do you know? (Tick all that apply)

☐ Fireguards

☐ Community fire-fighting teams

☐ Awareness campaigns

☐ Traditional by-laws

☐ Government regulations

32. How did you learn about these veldfires management strategies?

—

33. Have you ever participated in veldfire prevention or firefighting activities?

☐ Yes ☐ No

34. Are firefighting tools available and accessible in your community?

☐ Yes ☐ No ☐ Not sure

35. How effective are current veldfire management strategies?

☐ Very effective ☐ Effective ☐ Not effective ☐ Not sure

36. What challenges limit effective veldfire management in your area?

—

37. What role should the community play in preventing veldfires?

—

38. What recommendations would you give to reduce veldfires in Ward 4, Matepatepa?

—

