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THE EFFECTS OF PFUMVUDZA ON FOOD SECURITY: A CASE OF MAZOWE DISTRICT, WARD 9.

NGUNGUZALA ROFINA

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NAME OF AUTHOR: NGUNGUZALA ROFINA

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The undersigned certify that they have read and recommended to the Bindura University of Science Education for acceptance a dissertation entitled: **The effects of pfumvudza on food security: a case of Mazowe District, Ward 9.**

SUPERVISOR _____ Date _____

[Signature]

COORDINATOR _____ Date _____

[Signature]

CHAIRPERSON _____ Date _____

[Signature]

DECLARATION FORM

I, Rofina Ngunguzala, do hereby declare that this dissertation is my original work and has never been presented to this or any other university or institution in support of any academic award.

Student Signature _____ Date _____

DEDICATION

I wholeheartedly dedicate this project to my daughter and brother. Without a supportive brother, this study would have remained a dream. Rodrick my brother, you are awesome, you gave me all the support I needed financially, spiritually and morally. Audety my dearest daughter, you are wonderful child, you understood me when I could not give you the attention that you needed. I pray that you reach greater heights in life. May God richly bless you all.

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LIST OF ACRONYMS

ACTN-------- African Conservation Tillage Network

AGRITEX--- Agricultural Technical and Extension Services

CA ---------- Conservation agriculture

CIMMYT------ International Maize and Wheat Improvement Centre

CSA---------- Climate Smart Agriculture

DFID---------- Government Department for International Development

FAO---------- Food and Agriculture Organisation

LFSP---------- Livelihoods and Food Security Programme

SDG---------- Sustainable Development Goals

UN---------- United Nations

USAID--------- United States Agency for International Development

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ABSTRACT

A conservation farming method known as pfumvudza is one of the methods implemented by the Zimbabwean government to ensure food security at household level under these climate changing days. Pfumvudza is a concept of conservation agriculture (CA) that is designed to meet food security for an average household of six members over one year.

The purpose of this study was to explore the effects of pfumvudza on food security. The objectives of the research were to evaluate the level of pfumvudza, analyses the factors that had led to the adoption of pfumvudza, assess the impact of pfumvudza in food security and explore the challenges being faced by farmers practicing pfumvudza. The study was conducted in Mazowe district, ward 9. The population comprised of 2156 pfumvudza farmers and the sample selected using RASOFT software was 154 farmers. Purposive sampling was used when choosing sample farmers. Formal interview and questionnaire were used to collect data.

The results showed that the level of pfumvudza adoption were very high above 80% of the farmers in the ward were already into the concept. A large percentage of land was under maize with the off take of legumes being very slow. It was highlighted that farmers were into pfumvudza because of its high returns per unit area, free provision of inputs, successive droughts, and lack of draught power and shortage of income. Yield from pfumvudza was very high compared to conventional farming. Farmers who had all principles followed have enough maize grain to sustain them for the whole year. Challenges faced by farmers of pfumvudza were late delivery of inputs, failure to dig hard land, closure of holes by animals and lack of mulching materials. It was concluded that pfumvudza farming can improve food security if practiced well. The researcher recommends farmer to cut mulch soon after harvesting and store them, dug the planting holes early and keep watch of stray animals.

CHAPTER 1. INTRODUCTION

1.0 INTRODUCTION

The globe has been hit by severe climate change in recent years that had led to reduction in food production among other effects. Zimbabwe has not been spared by this climate change and the government had come out with a solution to curb hunger and poverty among its citizen. This chapter therefore provides information on the background of the study, statement of the problem, purpose and objectives of the study, research questions and significance of the study, delimitations of the study, limitations and definition of terms.

1.1 BACKGROUND TO THE STUDY

A rapidly growing global population and changing diets are driving the demand for increased food production. As levels of crop yields fell off in many parts of the world due to climate change, health declines, and natural resources including soils, water and biodiversity are stretched. Climate change's negative impacts are being felt in the form of increasing temperatures, diseases, floods, droughts, shifting agro-ecosystem boundaries, invasive plants, diseases and pests (ZCATF, 2009). According to the Food and Agricultural Organization (2020), crop yields in Southern Africa have been reduced by about 15% due to climate change effects as rainy seasons have become shorter and shorter resulting in many people needing food aid to survive. The food security challenge is become more difficult to manage as the world will need to produce about 70% more food by 2050 to feed an estimated 9 billion people (FAO et al., 2019). This is because climate change is very much difficult to plan and set a budget to deal with it since it is hard to predict how it can manifest

itself, it could be floods, drought or anything else. In Africa, 33% of small-scale farmers are already undernourished (FAO, 2020). This means that most farmers are unable to sustain themselves from the land that they are utilizing.

In 2006, Concern Worldwide introduced a version of CA (Conservation Agriculture) which is particularly suitable for farmers lacking draught power (Wagstaff and Harty, 2010). This is based on manually prepared Zai holes (planting pits, a technology adopted from farmers in the Sahel), in three semi-arid communal areas in low veld districts of Gokwe North, Gokwe South and Nyanga which had been neglected during the colonial and post-colonial periods. The CA component was part of a programme that also included food aid, seed, fertilisers and tool distributions and support for vegetable gardens, primarily funded by FAO (UN Food and Agriculture Organization) and DFID (UK Government Department for International Development) (Wagstaff and Harty, 2010). According to FAO (2007), CA is based on three principles: minimal soil disturbance, permanent soil cover and crop rotation. A research by CIMMYT (2016) also find out that the practice of CA holds potential for all farm sizes and varied ecological conditions, and it is seen as particularly useful for smallholder farmers, especially those with labour and input shortages in the drier tropics.

Veronica Gundu Jakarasi, the acting deputy director in the Ministry of Environment Water and Climate, says the government of Zimbabwe is worried by the impact of climate change on rural communities in particular hence its efforts to take remedial action. To mitigate the effects the government of Zimbabwe in 2015 has adopted a climate change adaptation program to reduce impact on communities as weather and climate patterns continue to change (Moyo, 2015). The acting deputy director in the Ministry of Environment, Water and Climate says the adaptation plan is meant to ensure food security is improved in affected districts of Zimbabwe. Under the plan, the government will encourage farmers to grow drought resilient crop varieties such as sorghum and

millet, and early maturing varieties. Farmers will also be taught how to harvest rainfall for irrigation purposes.

In 2019, the government introduced a special type of conservation agriculture known as the pfumvudza (Maseva, 2020). Pfumvudza is a crop production intensification approach under which farmers ensure the efficient use of resources on a small area of land in order to optimize its management

1.2: PROBLEM STATEMENT

In Zimbabwe farmers have been experiencing very low yield and have been facing food insecurity and malnutrition and this has led to poverty and poor living conditions mainly amongst communal communities as on farms, climate change is reducing crop yields, nutritional quality of major cereals and livestock productivity. Substantial investments in adaptation are required to increase crop production and improve food quality to meet the growing demand. Various efforts have been employed by the government and Non-Governmental Organization. These include but not limited to command agriculture, contact farming, food aid, presidential input support scheme, conservation farming. However all these methods to some extent failed due to continued havoc of climate change and the scale of operation? This has led to a new improved conservation farming known as pfumvudza that aims at reducing hunger at household level by producing food on a plot that is small to feed a family of six for year.

Various researches have been conducted on demonstration plots under strict monitoring and proved to be effective. However, it has not been assessed how the pfumvudza plots will perform when done by farmers in a normal farming condition. That's this research gap had influenced the researcher to look into the effectiveness of the pfumvudza concept in Mazowe district. There a key question that remains to be answered is as to what extent will Pfumvudza contribute towards

improving food security, adapting and mitigating climate change impacts on agriculture? This study therefore explores the potential role of the Pfumvudza concept in climate proofing and, and enhancing household food security amongst small-scale farmers in Mazowe district.

1.3 OBJECTIVES OF THE STUDY

Main objective

To assess the effectiveness of Pfumvudza in reducing hunger in Mazowe district ward 9

Specific objectives

1. To assess the level of pfumvudza in Mazowe district.
2. To determine factors that led to the adoption of pfumvudza in Mazowe district, ward 9.
3. To assess the effects of pfumvudza in food security in marginalized areas.
4. To outline the challenges faced by farmers practicing pfumvudza.

1.4 RESEARCH QUESTIONS

The following research questions will unearth answers which the study proposes to ascertain

1. What is the total area of land under pfumvudza in Mazowe district?
2. What are the factors contributing to the adoption of Pfumvudza?
3. What is the contribution brought by Pfumvudza towards food security?
4. What are the challenges being faced by farmers practicing Pfumvudza?

1.5 HYPOTHESIS OF THE STUDY

1) There is no significant relationship between Pfumvudza and food security

2) There is a significant relationship between Pfumvudza and food security

1.6 SIGNIFICANCE OF THE STUDY

This study will stand to investigate the effectiveness of Pfumvudza in improving household food security in Mazowe district, this study will aim to analyze previous yields received before Pfumvudza and after Pfumvudza. This is study will try to evaluate the contribution of the environmentally friendly farming practices towards food and environmental security in Mazowe district.

The study will help farmers to see the yield contribution of pfumvudza as well as income generation that will reduce hunger and poverty. The study will also review other benefits brought about by adopting the pfumvudza concept.

To the government, it enables them to assess the contribution of pfumvudza in alleviating hunger among its citizen and reduce the export grain bill. More so, the government will be able to determine areas where there is need to line up the concept of pfumvudza to farmer's needs.

1.7 DELIMITATION

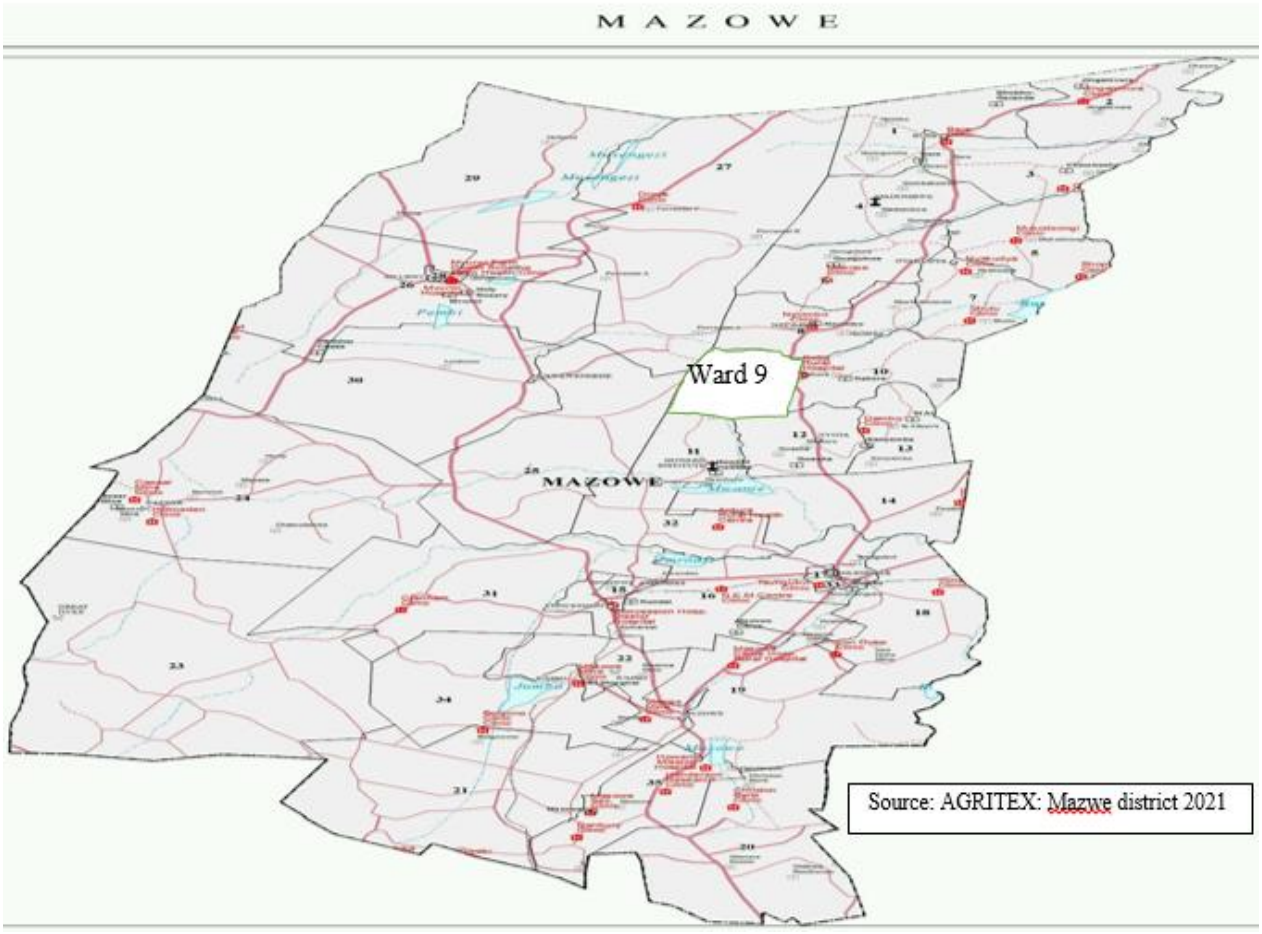
The main focus of the research was to assess the effectiveness of Pfumvudza in reducing hunger at household level for small scale farmers in Chiweshe communal areas. Specifically it dealt with ward 9. The researcher resides at the ward collection center and works as an AGRITEX officer for the ward hence it was very easy to obtain the required primary data. The research comprised of all the farmers who had adopted the pfumvudza concept.

The study was confined to Zimbabwe's Mashonaland Central Province. The research was undertaken in ward 9 of Mazowe district that lies in natural agro-ecological zone 2a at Negomo irrigation scheme under dry land farming. The area is due North East of Glendale growth point.

1.7.1 Location of the Study Area

Mazowe is a place in the region of Mashonaland central in Zimbabwe. Mashonaland Central's capital Bindura is approximately 51 km / 32 miles away from Mazowe. The distance from Chiweshe to Zimbabwe's capital Harare is approximately 105 km/ 65 miles. The area under study lies between 16°53'00.1"S and 31°07'21.0"E. Most of the area are covered by sandy loam soils that are well drained with some patches of clay loam soils.

Fig1:1 Mazowe district map



1.7.2 Rainfall records

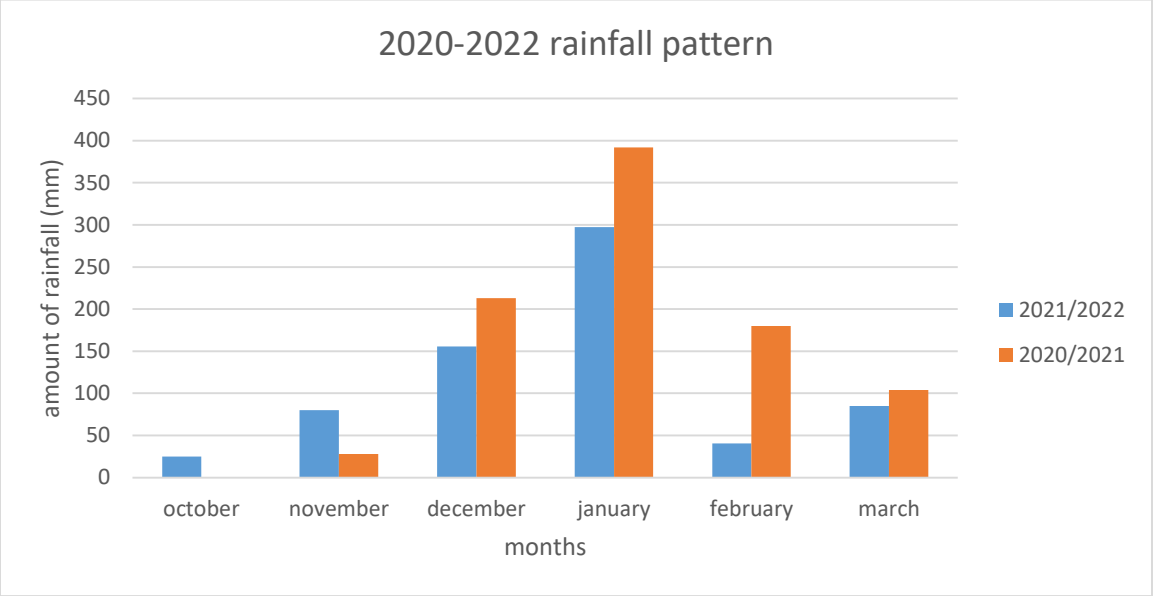


Fig 1.2 rainfall records for 2020/2021 and 2021/2022 season

The area under study received an average rainfall of 800.3mm in the past two season of 2020-2021 and 2021-2022 with the most rainfall received in January. The season stretches from October to March. Though the total amount seems to be favorable for crop growth, its distribution was poor resulting in mid-season droughts.

1.7.3 Vegetation.

Mazowe area is dominate by *julbernadia globiflora*, *brachystegia spp*, *accacia spp and combretum* spp. (Mapaura and Zimudzi, 2013).

1.8. SUMMARY

The chapter discussed the background to the study, statement of the problem, objectives and research questions and significance of the study. Key terms were defined. The delimitations of the study and limitations encountered in the study were also discussed. The next chapter will present a review of related literature.

CHAPTER 2: LITERATURE REVIEW

2.0 INTRODUCTION

This chapter provides a review of the relevant literature in the research study. The literature reviewed includes the climate smart agriculture, Pfumvudza, factors affecting adoption of climate smart agriculture and the challenges faced by farmers in Zimbabwe.

2.1. DEFINATION OF TERMS

2.1.1 Pfumvudza

Pfumvudza has been defined as a climate-proofing agricultural concept which emphasizes on the use of conservation farming techniques to make the most out of small pieces of land (Maseva, 2020)

2.1.2 Food security

USAID (2022) defines food security as having at all times, both physical and economic access to sufficient food to meet dietary needs for a productive and healthy life.

2.2 CLIMATE SMART AGRICULTURE

CSA is an integrated approach for sustainably managing farming landscapes; cropland, livestock, forests and fisheries. It aims at simultaneously increase productivity by producing more and better food to improve nutrition security and boost incomes especially of 75% of the world's poor who live in rural areas and rely mainly on agriculture for their livelihoods. Also, CSA enhances resilience by reducing vulnerability to drought, pests, diseases and other climate related risks and shocks. It improves capacity to adapt and grow food in the face of longer-term stresses like shortened seasons and erratic weather patterns; and, reduce emissions by avoid deforestation from agriculture and identify ways to absorb carbon out of the atmosphere (FAO et al., 2019).

Promotion of Climate Smart Agriculture is continuing and expanding globally, while little attention has been given towards addressing the sustainability challenges related to its adoption faced by many poor smallholder farmers. Particularly, pressing challenges are balancing productivity and resource uses and preventing the risks of large-scale environmental degradation. This is important in contributing to the achievement of the SDG 6 of the Agenda 2030 (FAO et al., 2020). In many countries, there is a need to build technical capacities among smallholder farmers to develop and implement sound policies and strengthen governance regimes at national, regional and local levels. For this, CSA can be a powerful tool to open new development perspectives and present attractive opportunities for coping with the looming threats of climate variability and change in agriculture. Variants of CSA practices include; conservation agriculture (defined by minimum soil disturbance, maintaining permanent soil organic cover or mulching, crop diversification and rotations), agroforestry, ecological agriculture, regenerative agriculture, organic farming and Pfumvudza.

2.3 CONSERVATION AGRICULTURE

Research showed that conservation agriculture was born out of the United States' dust bowl of the 1930s (Hobbs et al 2008) and is widely practised in large scale commercial agriculture in North America, Brazil, Australia, Argentina, Morocco, South Africa and Paraguay, and increasingly in Europe, China and India. Wagstaff and Harty (2010) found out that the current focus of research is on adapting CA to the needs of smallholder farmers in Africa, Asia and South America who lack the resources, particularly mechanisation, of large-scale commercial farmers.

2.4 PFUMVUDZA FARMING

Pfumvudza is a Zimbabwean vernacular language term literally referring to the blossoming of fresh leaves during the spring season signaling the beginning of a new farming season. Ideally, the

concept was developed by the Foundation of Farming, a local non-governmental organization in the country to meet cereal needs for an average household of six members over one year from a small piece of land. According to Mujere (2021) pfumvudza is based on three core underlying principles namely of minimum soil disturbance or tillage; digging holes for planting only, permanent soil cover by using organic mulch; crop rotations and intercropping cover crops with main crops. Household food security is expected to be realised when activities are done on time, at standard, without wastage, to the expected precision and with joy (Oldreive, 2006; 2011).

A Pfumvudza plot is a rectangular land measuring 16 m by 39 m, which represents 0.06 ha or 624 m2. The longer sides preferably extend down the slope (Figure 1). Three maize seeds are evenly placed in each of the 1,456 planting stations in the plot. Each of the 52 planting rows with 28 planting stations hold 2 maize plants after thinning at germination. Inter-row spacing is 75 cm and in row spacing of planting stations across the slope is 60 cm. The dimensions of each planting station are 15 cm deep, 15 cm wide and 15 cm long (Oldreive, 2006).

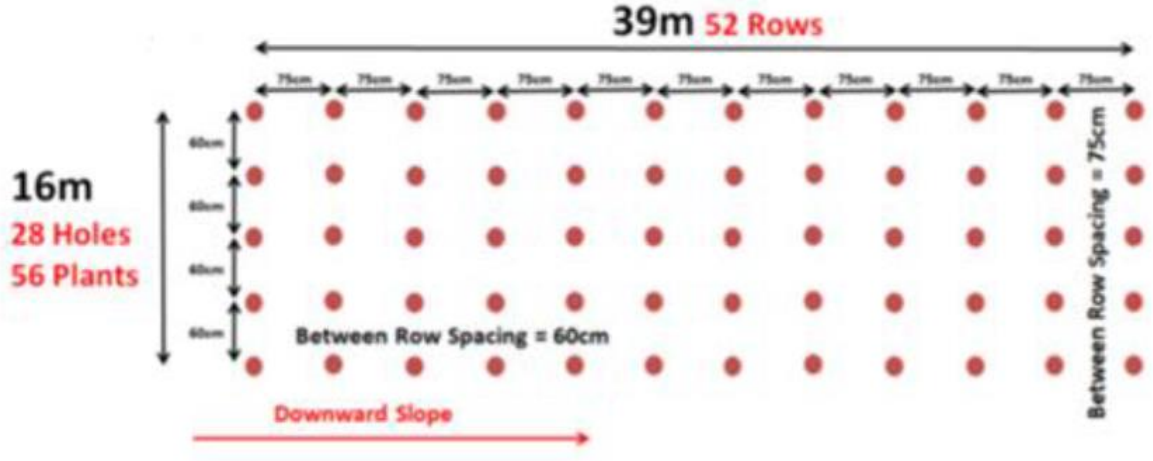


Figure 1. Layout of a *Pfumvudza* plot
Source: Edwards (2013:4)

Pfumvudza, farming as a low input sustainable agriculture, characterized by intensive maize crop production with less inputs on a small piece of land measuring launched by the Zimbabwe government in June 2020 when preparing for the country's cropping season that runs from October to March. Out of a target of 1.6 million vulnerable households, about 7,000,000 households were trained and provided with the maize seed and fertilizer inputs (FAO, 2020).

2.5 FOOD SECURITY

Food security means having, at all times, both physical and economic access to sufficient food to meet dietary needs for a productive and healthy life (USAID, 2022). A family is food secure when its members do not live in hunger or fear of hunger. Food security has four pillars which are food availability, access, utilization and stability. Food availability considers whether adequate food is ready at people's disposal, while food access *assesses* whether all households and individuals have adequate resources to obtain the food they need, either through production or purchase. Similarly, food utilization is about the human body's capacity to adequately ingest, digest, and metabolize the food. Lastly, stability is about the assurance of the continuation of the three aforementioned dimensions.

2.6: BENEFITS OF PFUMVUDZA

2.6.1: High yield

Pfumvudza farming improves yield by more than 100%. Agrinews (2020) report that a 700% increase in yield and enhanced household food security was achieved for communities that participated in the pfumvudza concept in the 2019/2020 season in Mashonaland, Midlands and Manicaland Provinces with support from FAO in Zimbabwe and livelihoods and food security programme (LFSP). Farmers who followed most of the recommended pfumvudza practices

achieved an average of 7.8t/ha in 2019/2020 season which was 700% higher than yields from conventional farming (1 tonne /ha), guaranteeing household food security for about 33 weeks.

2.6.2 Reduced cost

For the farmer, conservation agriculture is mostly attractive because it allows reduction in production cost, reduction of time and labour, particularly at times of peak demand such as land preparation and planting (FAO, 2021). Mugwara (2020) agrees that the concept also helps with minimising cost since all items needed for preparation are within everyone reach.

2.6.3. Labour saving

Soil tillage is among all farming operations the single most energy consuming. By not tilling the soil, farmers can save between 30 and 40% of time and labour.

2.6.4. Organic matter increases

The constant addition of crop residues leads to an increase in the organic matter content of the soil. In the beginning this is limited to the top layer of the soil, but with time this will extend to deeper soil layers. Organic matter plays an important role in the soil: fertilizer use efficiency, water holding capacity, soil aggregation, rooting environment and nutrient retention, all depend on organic matter. According to Mugwara (2020), using the decomposed manure will help to promote the improvement of soil structure while providing the required nutrients to the plant.

2.6.5. Moisture and soil conservation

Residues on the soil surface reduce the splash-effect of the raindrops, and once the energy of the raindrops has dissipated the drops proceed to the soil without any harmful effect. This results in higher infiltration and reduced runoff, leading to less erosion. The residues also form a physical

barrier that reduces the speed of water and wind over the surface. Reduction of wind speed reduces evaporation of soil moisture. (Donovan, 2020). Mugwara (2020) concurs that the use of mulch helps to conserve moisture and to supress weeds during the summer season. Thierfelder et al (2013) suggest that mulch moderates soil temperature which is important for all the microorganisms and microorganisms required to promote good soil. Thus the effects of reduced moisture during seasonal and mid-season droughts are mitigated

2.6.6. Improves food security

A research by Mujere (2021) shows that, compared to conventional farming, Pfumvudza has great potential to contribute towards household food security and reducing carbon emissions if implemented following the stipulated recommendations.

2.6.7. The plots can be irrigated

Mugwara (2020) adds that utilizing small land size ensures that the farmers is able to provide supplementary irrigation during the dry spells.

2.6.8 Enables early planting

Pfumvudza farming technique will enable early planting by all farmers regardless of having oxen as land is prepare well before the rain season and when the rains comes, everyone will be ready.

2.6.9. Suppression of weeds

Thierfelder and Wall (2009) find out that mulching reduces direct sunlight and temperature on soil thus reducing the growth of weeds underneath. Also, the growth of weeds is reduced due the winter weeding that is done under pfumvudza farming.

2.6.10. Improves nutritional diet

Inter-cropping and crop rotations involving cereal and legumes under Pfumvudza helps to improve soil fertility, reduces pest infestations and diseases, and minimises total crop loss during severe weather occurrences. Legumes also provide a protein source to complement cereals (Thierfelder and Wall, 2009). Thus, farmers spread risks associated with climate change and variabilities. If one crop fails, then the other is likely to reach maturity and be harvested

2.7. CHALLENGES

2.7.1. Shortage of mulching materials

Donovan (2020) reports that when crop residues are limited, farmers tend to use them for fodder first, so there might not be enough residues for the soil cover. Farmers have many uses for crop residues: as fodder, fencing, roofing and fuel. Livestock keepers let their animals graze on stubble. In drier areas, it is impossible to grow a cover crop in the dry season, and crop residues are a vital source of animal feed. (African Conservation Tillage Network (ACT), 2019).

2.7.2. **Digging the hard ground**

A research by Wagstaff and Harty (2010) in the low-veld district of Zimbabwe showed that most of the farmers were finding it hard to dig planting holes during the winter period to give enough time for the applied manure as basal dressing to decompose. These farmers end up digging the holes with the first effective rains when the soil is moistened.

2.7.3. Shortage of organic manure

Farmers who adopted conservation farming had no such animals as cattle, sheep, goats or poultry in large amount to provide enough manure to fertilize their plots and some ought to under apply the available fertilizers.

2.7.4. Stray animals closing dug holes

Dry land farming is mostly done in open lands that are not protected by any kind of fence. Farmers who dug their planting holes during the wither period had to face a problem of stray cattle, poultry, sheep or goat destroying or closing up the holes as they roam around in search of food. Also even the mulch was consumed by these animals.

2.8. INCOME GENERATING ACTIVITIES IN MAZOWE DISTRICT

2.8.1. Mining

Mazowe area is dominated by gold mines which took most of the energetic age group. The area near the research site was surrounded by illegal gold miners which reap their fortune in a split of second. This had lead farming to be for older and those with chronically illness.

2.8.2. Growing horticultural crops

The area under study had an irrigation scheme known as Negomo which covers 357ha of arable land and another 88.9ha which is under citrus. The scheme had 296 farmers each with 1.2ha of arable land and a portion of citrus fruits. This farmers are all from the nearby surrounding areas. Each farmer in the scheme has the capacity to produce food and income enough to sustain the whole family for the year from sales of citrus and horticultural crops (green maize, commercial maize, sweet potatoes, cabbages, tomatoes, onions etc.) grown throughout the year.

2.8.3. Vending

A sizeable population on Mazowe inhabitants relies on venting as a way of generating income to sustain them and have been doing these for years excelling. That area had good selling point along the highway and at shops such as Nzvimbo growth point, Rosa shopping center, Gweshe and

Glendale business center and many designated vending areas. Theses had given people enough income for their survival with their families.

2.9. SUMMARY

The literature review highlighted the in depth what pfumvudza farming is all about, reasons for its adoption, impact on food security and other benefits as well as challenges which farmers are facing in implementation of the farming practices. More so, factors hindering 100% adoption were sited. From the literature reviewed it has been observed that no proper research and documentation has been carried and published in Zimbabwe so far in relation to pfumvudza farming in natural region 2. Therefore, this study sought to fill this knowledge gap. The next chapter presents the research methodology which was adopted in this study

CHAPTER 3: RESEARCH METHODOLOGY

3.0 INTRODUCTION

This chapter focuses on the research design and a justification of the use of the qualitative approach in this study which sought to investigate the effectiveness of pfumvudza in alleviating hunger at household level in Chiweshe communal area. The chapter will also describe in detail how the research was carried out, methods of collecting data and data analysis procedures follows.

3.1 RESEARCH DESIGN

Kothari (2004) defines a research design as a conceptual structure for the collection, measurement and analysis of data which combines relevance and economy. A research design also encompasses the methodology and procedures employed to conduct scientific research (Cresswell, 2012). Kothari (2004) went on to say that a research design gives a guideline within which a choice about data collection methods has to be made as well as a framework for planning, implementation and analysis of a research.

The researcher used the case study research design. A case study according to Gerring (2004), is an intensive description and analysis of a single individual or sometimes a group. Kothari, (2004) adds that a case study focuses on gaining an in-depth (rather than broad) understanding of a particular entity or event at a specific time and answers the why and how questions. It is qualitative in nature. A qualitative research uses a realistic approach that seeks to understand occurrences in context specific setting such as real world setting where the researcher does not attempt to influence the phenomena of interest (Patton, 2001). The researcher had deemed relevant to use a case study as she wanted to gather more on the effectiveness of pfumvudza in alleviating hunger.

A qualitative research according to Denzin and Lincoln (2000) involves an interpretive and naturalistic approach. This means that the researcher study things in their natural settings, trying to make sense of, or to deduce phenomena in terms of meanings people bring to them. Use of qualitative research has an advantage that the scholar obtains actual information directly from participants (Miles and Huberman, 2003). The qualitative approach was chosen because the research in question is a social phenomenon and an important aspect of the lives of individuals.

Although the qualitative approach has strengths in research of social phenomenon, it has its limitations. According to Hughes (2006) in Mhonyiwa (2014), the main drawback of the qualitative approach is insufficient validity and reliability. To ease this criticism, triangulation was used by the researcher. Interviews and questionnaires were used to foster the credibility of the data.

3.2 POPULATION AND SAMPLE

3.2.1 Population

According to Bush and Burn (2010), population is the total number of people in a certain place where the sample must be selected. Hassan (2014) also defines a population as a collection of all elements under study where conclusions will be drawn from. In this study, the researcher's target population comprised of two thousand one hundred and fifty six (2156) farmers who had practiced pfumvudza in ward 9 during the in Mazowe district during 2019-2020. These farmers includes widows, elderly and youth of different sex.

3.2.2 Sample and sample size

A sample is a subset of the population where the characteristics of the population will be drawn (Kitambara, 2013). The researcher offer to ascertain the effectives of the pfumvudza conservation farming method in alleviating hunger at household level in Mazowe district by studying a much

smaller number of farmers. In this study, a sample of 154 farmers were used and the sample was calculated using RAOSFT software sample calculator online with 10% margin of error and 99% confidence level.

The sample size n and margin of error E are given by:

$$x = Z(c/100)^2 r(100-r)$$
$$n = Nx/((N-1)E^2 + x)$$
$$E = \mathrm{Sqrt}[(N-n)x/n(N-1)]$$

Where N is the population size, r is the fraction of responses that you are interested in, and $Z(c/100)$ is the critical value for the confidence level c. (Raosoft, 2004).

3.2.3 Sampling procedure

The researcher used purposive sampling method. Purposive sampling was defined by Oliver and Jupp (2006) as a non-probability sampling method in which the decisions regarding the individuals to be included in the sample are taken by the researcher based on a variety of criteria which may include specialist knowledge of the research issue or capacity or willingness to participate in the research. The researcher chooses the sample based on who they think would be appropriate for the study. Purposive sampling method was used on the merit that it is economical, it saves time due to ease of access and one can select appropriate subjects with the desired characteristics (Kothari, 2004). Contrariwise, purposive sampling is subject to a lot of prejudice and can be biased (Kothari, 2004).

The researcher chose the sample because of its convenience and proximity to the researcher. The researcher was residing at the ward center and collection point at the same time, she worked in the

same ward under study and hence she had seen that the selected populace had first-hand information and have done the *pfumvudza* accordingly and are willing to share their experiences. Different age groups and vulnerability had been selected to see the impact across the whole population.

3.3 RESEARCH INSTRUMENTS

In carrying out the study, interviews and questionnaires were used by the researcher to collect required data. The researcher designed the research instruments in order to collect data to answer the research questions. The researcher used two instruments in this research since a single method ever adequately solves a research problem. The use of several instruments is referred to as triangulation according to Trochim (2006). Triangulation leads to better validity and reliability of data because unfairness inherent in a particular method would be neutralized when in concurrence with other methods (Trochim, 2006).

3.3.1 Interviews

An interview according to Copper and Schindler (2013) refers to the direct conversation between the interviewee and interviewer where the interviewer is guided by a number of questions which can help to answer the research questions. An interview can be formal or informal. Formal interviews are scheduled and booked for allowing the participants to prepare for the interview while informal are not scheduled and are done when the interview bump into the interviewee. No preparations are done by the interviewee in informal interview. The researcher used a formal interview to obtain more accuracy results as the interviewee will be ready for the session.

Semi structured question were used by the researcher. Kothari (2004) alludes that semi- structured interviews are characterized by open ended questions to enable participants to express their views towards a certain aspect. The questions were posed in a neutral manner to participants. The

researcher hang on courteously to responses given by participants and took note of the responses. Follow up questions and probes were thrown back to participants based on their responses to give other opinions apart from those prescribed.

When done decorously, interviews are useful to obtain detailed information about a person's feelings, perceptions and opinions (Journal of Social Service Research in Mhonyiwa, 2014). The interviews which were directed to the elderly enabled the participants to express their attitudes, experiences and beliefs in their own words.

3.3.2 Questionnaires

Borg and Gall (1996) in Shumbayaonda (2011) define a questionnaire as a document that asks questions to all individuals in a sample as a way of gathering information and the respondents answer questions on their own. The questionnaires enabled the researcher to gather necessary information without any bias. The researcher used the questionnaire because they are free from bias of the researcher, answers are in respondents' own words and the respondents can give well thought out answers since they complete the questionnaires during their own time (Kothari, 2004).

Questionnaires had a big disadvantages that it can only be used where respondents are educated according to Kothari (2004). Kothari (2004) alleged that another weakness of questionnaires is the low rate of return of the duly filled in questionnaires by some participants who deliberately fail to submit the questionnaires. To curtail this challenge, participants were given two days to complete the questionnaire and then the researcher had to collect the questionnaires from each and every participant at their homes. With this strictness all the administered questioners were returned back. The designed questionnaires were administered to the youth and widows who participated in the study.

3.4 DATA COLLECTION PROCEDURE.

Data collection according to Most (2003), is the process of gathering and measuring information on variables of interest in an established and systematic manner that enables one to answer the stated research questions and evaluate outcomes. The procedure comprises of the steps that are involved in collecting data. At first the researcher obtained a letter from the chairperson of the Department of Economics to carry out a research on the effectiveness of *pfumvudza* concept in reducing hunger at household level in Mazowe district. The letter confirms that the researcher was a student in the Faculty of Agricultural Extension Services at Bindura University of Science Education. The researcher took the letter and proceeded to the Provincial AGRITEX Extension Officer to sought permission to carry out the research in their jurisdiction area. The researcher proceeded to the District AGRITEX Extension Officer for approval. The researcher also sought for permission to carry out the research from her supervisor in the area.

When permission was granted she proceeded to carry out the study by collecting relevant data. Questionnaires and interviews were used to collect data. The questionnaires which were used comprised of simplified questions which were easily understood by participants. Participants were issued with the questionnaires which they were requested to complete within two days and immediately after completion, the researcher collected them, sorted them and analysed the data.

The researcher interviewed the elderly as she wanted to obtain more from them from their past experience with other farming methods. She encouraged the participants to feel free to disclose whatever information they had since it was strictly confidential. A record of each interview session held was recorded and after holding the last interview session data was analyzed.

3.5 DATA PRESENTATION AND ANALYSIS PLAN

Data presentation was defined by Gioia, *et al*. (2013) as the cordiality of results and data of a study. Marshall and Rossman (1999) in Mhonyiwa (2014) defines data analysis as the process of data reduction and interpretation. Data analysis is the process of developing answers to questions through examination and interpretation of data (Chambers and Skinner, 2003). According to Marshall and Rossman (1999) in Mhonyiwa (2014), data reduction means bringing down amounts of collected data into manageable units while interpretation is the process of attaching meaning and insight to the words and acts of the participants in the study. Data was presented under the research questions.

Bar graphs, pie charts and tables were used to present data. Tables were uses as they condense large masses of data and bring out patterns in data enabling comparisons to be easily made among classes of data (Adedayo, 2000).The researcher used tables because they are the simplest way to summarize data. According to Chambers and Skinner (2003), both pie charts and bar graphs are simple, easy and quick to construct, they can clearly show categories dominating and have a visual impact which tables lack. Adedayo (2000) went on to say that pie charts can easily show how different categories relate to the whole and bar graphs have the ability to represent two or more data sets thus enabling trends to be easily highlighted. Explanatory notes were used to explain data presented in the form of graphs, pie charts and tables.

The data was analysed by means of descriptive statistics which organized data in tables, frequencies, and percentages. An analytical technique known as the thematic system were used to analyze qualitative data such as the textural material generated in interviews. The findings were then narrated by using tables and graphs. Boyatzis (1998) defines thematic analysis as the process of encoding qualitative information. Braun and Clarke (2006) add on that thematic analysis is a

method for identifying, analysing and reporting patterns (themes) within data. Thematic analysis were done to qualitative data because it is flexible and it offers an accessible and theoretical approach to analyzing qualitative data (Braun and Clarke, 2006). Boyatzis (1998) says thematic analysis enables researchers to develop a deeper appreciation for the group or situation they are researching.

3.6 ETHICAL CONSIDERATIONS

An ethical environment was ensured by the researcher throughout the research. An ethical environment according to Udell (2012) refers to the place of freedom where everyone is respected. The highlighted ethics below were religiously followed by the researcher.

3.6.1 Informed consent

Informed consent means that prospective research participants must be fully informed about the procedures and risks involved in research and must give their consent to participate (McMillan and Schumacher, 2006). The participant were fully informed by the researcher that she was a student at Bindura State University and gave them full details about the research and its purpose and how important it was to her. The participants asked questions and were given clear answers. All the farmers that participated, willingly decided to take part in the research and no one was coerced.

3.6.2. Free from harm

Trochim (2006) states that researchers are required not to put participants in situations where they might be at risk of harm as a result of their participation in the research. Participants need to be fully protected from harm. Protection from harm refers to the ways that must be used so as to avoid frightening or offending participants but rather protect them from mental and physical distress

(Udell, 2012). According to Bryman and Bell (2011), harm causes a number of facets such as physical harm, harm to participants' self- esteem and inducing subjects to perform reprehensible acts. Trochim (2006) suggests that secrecy and confidentiality are ways that can be used to ensure that participants are free from harm. The researcher took all the necessary measures necessary to ensure that all participants were protected from all forms of harm during the research.

3.6.3. Confidentiality

According to Trochim (2006) participants are in confidence when they are assured that identifying information will not be made available to anyone who is not directly involved in the study. To assure participants of confidentiality, no names were required on the questioner or in interviews. The researcher guaranteed the participants that information gathered were to be used for academic purposes only and no favor were to be obtained in the sight of the researcher.

3.7 SUMMARY

In this chapter, determination was made to give an outline of the research design and research instruments used to collect data. A highlight of the sampling events and the data collection procedure used by the researcher were given. Data presentation and analysis were also discussed where the researcher highlighted and justified the techniques used in presenting data. The last aspect outlined were the ethics which were considered by the researcher during the study. The next chapter will present and analyse data generated by the researcher using interviews and questionnaires.

CHAPTER 4: DATA PRESENTATION AND DISCUSSION

4.0: INTRODUCTION

This chapter centers on data presentation, analysis, interpretation and discussion of research outcomes with respects to the effects of pfumvudza on food security in marginalized area: a case of Ward 9, Mazowe district. The data were collected using questionnaires and interviews. Pfumvudza farmers in Mazowe District, ward 9 were the respondents. The names of the participants were not disclosed for ethical reasons. Qualitative data analysis were used in analyzing the data. The data are presented and analyzed under the different themes found by the researcher. Tables, bar graphs and pie charts are used to present the data. The last part of the chapter will be a general discussion of the research findings under the different research questions of the study.

4.1. RESPONSE RATE.

Questionnaires were administered to the literate farmers. The questionnaires were completed and returned to the researcher. The table below shows the response rate. Table 4.1 shows that 134 questionnaires were administered to pfumvudza farmers in ward 9 in Mazowe district and only 124 questionnaires were completed and returned by the respondents. There was 92.5% response rate.

Table 4.1: Questionnaire response rate

	Administered	Returned	Response rate %
Questionnaires for widows	58	51	87.9
Questionnaires for married	58	55	94.8
Questionnaires for orphans	18	18	100
Total questionnaires	134	124	**92.5**

4.2: FARMERS' BIOGRAPHY

4.2.1 Marital status

As shown in figure 4.1 above; 31, 104, 18 and 1 of the participants were widowed, married, orphaned and single parent respectively.

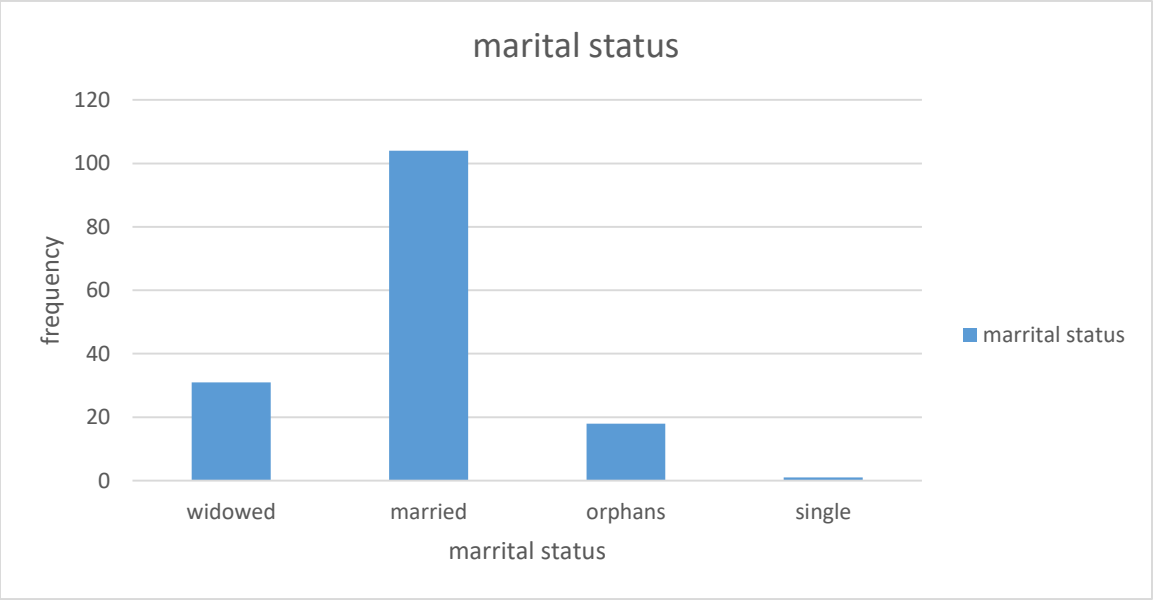


Fig 4.1: marital status of participants

4.2.2 Gender and age

Table 4.2 shows that, out of 154 sampled farmers, 112 were female which represents 72.7.6% of the sample. Male headed farmers were 42 which represent 27.3% of the sample. Out of the 42 female headed farmers captured in the sample, 3 (7.1%) were aged below 19, had adopted CA while 18 (26.5%) had not. On the other hand, out of the 75 male headed households included in the sample, only 20 (26.7%) had adopted CA while 55 (73.3%) had not.

Table 4.2. Gender and age

Age of participants	gender		Grand totals
	Male	female	
≥19 years	3	4	7
20 ≤ 39 years	13	47	60
40≤ 59 years	22	56	78
≤60 years	4	5	9
Grand totals	42	112	154

4.3. LEVEL OF PFUMVUDZA

An average of 0.2ha of maize was grown using the pfumvudza farming technique by every farmer under study area giving a total of 441.2ha of land on maize. The area under study (ward 9) had a total of 2586 farmers of which 2156 were pfumvudza farmers. 40.9% of pfumvudza farmers had either grown soyabeans, cowpeas or groundnuts as a legume crop to supplement their diet. The total area under legumes was 134.86ha with each farmer having an average plot size of 0.1ha. Farmers have vowed to increase their total land for maize with a margin of 50%. Fig 4.2 below summarizes the findings on level of pfumvudza in ward 9 of Mazowe district.

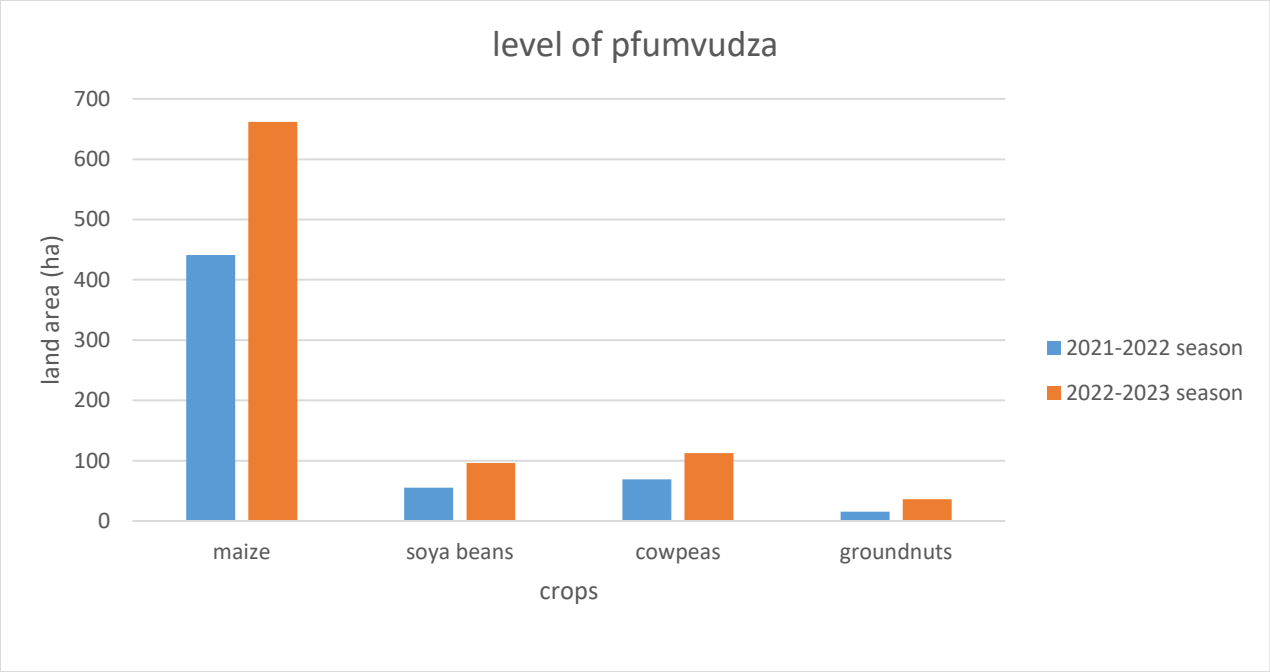


Fig 4.2. Level of pfumvudza

Around 10% of the farmers managed to grow a single pfumvudza plot of groundnuts giving a total of 15ha with each having an average of 0.1ha plot. A total area of 69.3ha were under cowpeas which were grown by 1110 farmers each having an average of 0.0624ha (single pfumvudza plot). 886 farmers managed to plant one pfumvudza plot of soyabeans giving a total of 55.3ha. Farmers have declared to increase their cropping land under groundnuts by 240% to a total of 36ha while cowpeas and soyabeans were projected to increase by 162.5% (43.3ha) and 173.6% (40.7ha) respectively.

4.4 ADOPTION OF PFUMVUDZA

4.4.1 Factors that had contributed to the adoption of pfumvudza farming

The following graph shows the responses given by farmers in relation to what had led them to adopt the pfumvudza concept. Fig 4.3 showed that shortage of rainfall (draught) and provision of free inputs by the government had caused all the participants (100%) to adopt the pfumvudza

farming. 92.4% of the farmers said that they do not have draught animals for land preparation and 86.6% do not have the money to hire tractors or other people's draught power. More so; 41.0%, 59.7%, 54.2%, and 38.9% of the participants were lured to adopt pfumvudza because of its high returns per unit area, high yield, soil fertility improvement, and moisture conservation respectively.

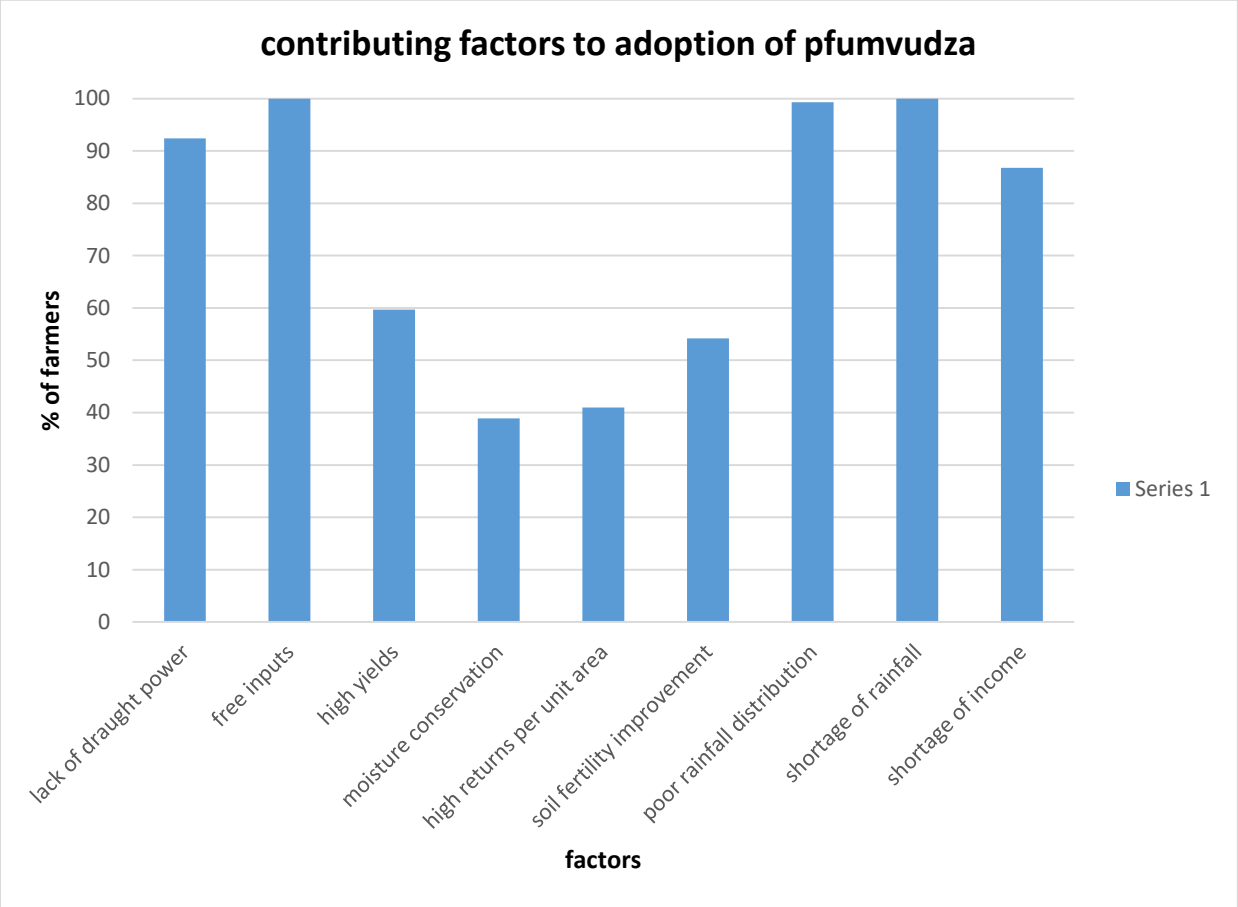


Fig 4.3. Factors leading to adoption of pfumvudza

4.4.2 Factors hindering 100% adoption of pfumvudza farming

Farmers had highlighted that other people who are not into the pfumvudza have other better income projects like being involved in illegal mining, vending as well as have enough from the irrigation scheme.

4.5 CONTRIBUTION OF PFUMVUDZA TO FOOD SECURITY

4.5.1. Yield

The table 4.3 shows yield of maize, groundnuts, cowpeas and soyabeans for the past 2 seasons.

Table 4.3. Average yield in 2020-2021 season

Crop	Maize (0.2ha)	Soyabeans (0.1ha)	Cowpeas (0.1ha)	Groundnuts (0.1ha)
Pfumvudza farming	950kg	150kg	150kg	200kg
Conventional farming	450kg	------	50kg	125kg
Percentage difference	+211.1%		+300%	+160%

The collected data in table 4.4 showed that yield of maize varies from 600kg to 1050kg per 0.2ha of maize giving an average of 950kg on pfumvudza plots and an average of 450kg on conventional plots. Yield of maize on pfumvudza was higher by a margin of 211.1% than on conventional same plot size. More so, cowpeas had 300% and groundnuts 160% improved performance under pfumvudza. On the other hand, farmers started to grow soyabeans in the area when pfumvudza was introduced and it showed a potential of giving high yields. The above information proved that pfumvudza farming technique improved yield by a margin of above 130% on average.

4.6 CHALLENGES

This section was intended to establish the challenges being face by farmers who are practicing the pfumvudza farming concept by looking at a case of ward 9 of Mazowe district. The respondents were asked to identify challenges they were facing in the course of implementation of pfumvudza.

4.6.1. Shortage of mulching material

The respondents highlighted that it was difficult for them to keep the maize crop residue to use as mulching material as the maize stalks also serve as fire wood to them. Also the issue of using grass was not possible as the area suffers shortage of thatching grass hence the use of the few grass to mulch I outcompeted by the need for thatching.

4.6.2. Failure to dig the hard dry ground

60% of the farmers stressed out that the major problem they had faced in using the pfumvudza farming technique was on land preparation. The holes were to be dug during the winter period up to end of September when the land is very dry and hard to dig hence they could not manage to do it but wait for the rains. Also a portion of other farmers added the issue of their healthy condition which could not allow them to be involved in hard work.

4.6.3. Early dug holes being closed by animals

The few farmers who could have dug the planting holes on stipulated time had challenge of these planting holes being closed by animals that will be roaming around in their fields in search of stover as food. Also chickens scratch out the applied manure or compost forcing the farmers to redo the digging and application of second batch of manure which is tiresome. These farmers had highlighted that they were now shunning the issue of early land preparation.

4.6.4. Late supply of inputs

23% of the respondents had to say that the government delays to give them inputs such as ammonium nitrate to the extent that when the inputs were distributed it will be late to apply it. Others farmers also took the concept of pfumvudza as government or AGRITEX programme such that even if they had opportunities to source fertilizer they could not apply on pfumvudza plot waiting to be given the full package of inputs from the government.

4.7 DISCUSSION OF THE FINDINGS

4.7.1. Level of pfumvudza

Pfumvudza is a conservation farming technique based on reduced tillage, crop rotation and soil cover (mulching) done on a small area with the capacity to reduce hunger as one plot is sufficient to feed a family of six for the whole year. The initiative is meant to reduce hunger and poverty at household level. Table 4.2 showed that 83.37% of the total farmer in ward 9 were trained on pfumvudza farming technology and had two seasons growing their crops using the new concept. Every trained farmer had one or more plots of maize and only a few had an extra plot of a legume. Such large number of farmers adopting the concept is a result of government's initiative to have every low income households in low rainfall areas being trained. This was supported by the research by FAO (2020) who concluded that 7,000,000 households were trained and provided with the maize seed and fertilizer inputs by August 2020. More so, farmers had pledged to increase their cropping land by 50% and those that failed to plant their legumes because of late supply of the inputs also said they will do planting the next season. This showed that the level of pfumvudza implementation in the district is very high such that in the next two season every farmer will be on board.

4.7.2. factors which led to high adoption of pfumvudza

4.7.2.1 Climate change

Persistent droughts (rising temperature and reduced rainfall) are negatively affecting the agricultural sector due to its high dependence on rain fed crop production. Mujere (2021) finds out that prolonged dry seasons and reduction in cropping seasons have severe negative direct and indirect effects on agricultural productivity, food and nutrition security and these have forced farmers to adopt the new farming practice in Zimbabwe. In addition Mazodze (2013) determine that climate change that is being experienced throughout the world is threatening the food security situation especially for the vulnerable poor communal people, and Mazowe district is not spared. Fig 1.2 showed that the area received a total of 917mm and 683.6mm from October to March during the 2020-2021 and 2021-2022 season respectively. Because if this erratic, unreliable and uneven distribution of rainfall resulting in severe mid - season drought like experienced during the 2021-2022 season, farmers have to adopt pfumvudza to ensure food security. This was supported by Mazodze (2013) in his article 'Determinants of Conservation Agriculture by Communal Farmers in Masvingo District,' who said that adaptation measures to climate change must be taken as main concern in Zimbabwe for ensuring the food security of communal residents whose income is mainly from agriculture. In this regard, conservation agriculture (pfumvudza) were adopted to combat the adverse impact of climate change.

4.7.2.2. Free inputs and reduced income

As illustrated in fig 4.3, most farmer were lured to grow crops using pfumvudza due to free provision of inputs by the government. These results were similar with the findings by Zenda (2020) who concludes that the agriculture sector in Zimbabwe is besieged by a number of issues ranging from poor or reduced productivity due to poor access to inputs, technologies, predominance of poorly resourced smallholder farmers, uncoordinated value chain systems and non-supportive policy environment. Thus to cope the availability of inputs farmers were forced to adopt anything which comes their way with inputs for free because what they want is inputs most not the practices.

4.7.2.3. Lack of draught power

Pfumvudza farming system has been introduced mainly to carter for the low income household with no aces to draught power because of poverty. Results from fig 4.3 proved that the majority of the farmers do not have draught power and enough income to purchase the inputs and the only option were to go for pfumvudza. This concurs with findings by Steve Twomlow and Levis (2006) that conservation agriculture offers an opportunity for poor vulnerable households with no access to draught power to produce more grain per unit area than households with full draught power and even if rainfall is below normal, farmers will be better off.

4.7.2.4. Improved yield and food security

Another factor highlighted by farmers (fig 1.2) which made large numbers of farmers implement pfumvudza is the issue of improved yield or high yield return on a small area that is capable to feed a family of six people for the whole year ensuring food security. According to FAO (2008), referencing to national statistics over a three year farming period (2005 to 2007 inclusive) for which data is available from a national wide system of 0.2 hectare plots, the statistics showed that

conservation agriculture yields had consistently increased by an average of 15 to 300% in more than 15 000 farm households, with the yield increase varying by rainfall regime, soil type and soil fertility. In 2020, FAO made an assessment that on sandy clay loam, an average yield of 1.0 t/ha and 7.8 t/ha is harvested on tilled and zero tiled land respectively. More so, farmers who practiced the recommended Pfumvudza practices of full mulch cover, fertilizer application levels, timely crop planting, crop spacing, optimal plant populations, pest and disease management achieved almost 800% more yields as compared to conventional farming using ox-drawn ploughs (FAO, 2020). Thus these literature used by AGRITEX in their teachings guarantee household cereal security which lured farmer into pfumvudza so as to also have high returns on small area.

4.7.3 Contribution of pfumvudza to food security

Pfumvudza is a concept of conservation agriculture (CA) that is intended to meet food security for an average household of six members over one year if practiced to recommendations. The results in table 4.3 revealed that yield of maize was higher by an average margin of 211.1% when grown using pfumvudza as compared to conventional methods. The margin was not as high as 800% (FAO, 2020) due to failure to implement all the recommendation with some farmers failing to fully mulch the land, late land preparations, reduced plant populations and reduced fertilizer application levels. However, the least number of 50ks bags (12) harvested from the 0.2ha plot from a pfumvudza farmer who did not apply all the recommended practices were enough to feed a family of six for one year guaranteeing food security. On the other hand, those farmers that fully implement all the recommendations managed to produce maize in excess of their annual requirement by 1 tonne which they may sell to improve their income.

It came into light from interviews that less yield was also contributed by having other cobs being consumed as green mealies. The point was supported by Mujere (2021) who conclude that the

concept assumes that the crops will reach maturity and harvest without losses due to pests, diseases and weather. The assumptions are too simplistic because a significant proportion of maize crop is also consumed as green mealies thus, reducing harvests. It is also important to note that maize varieties have different grain yields per cob. Therefore, Pfumvudza can be considered as being too theoretical with lots of unrealistic assumptions.

4.8 Challenges faced by pfumvudza farmers

Pfumvudza farming is practiced by farmers of all age groups with different capabilities. It has been shown in table 4.2 that a large population comprised of females (72.2%) and elderly people constitute 5.8%. a large population comprised of females because their male counterpart that were still energetic were occupied in illegal gold mining that was one of the major income earning opportunity in the area. This leaves farming to female. These women and elderly find it difficult to dig the planting holes during winter when the soil is very dry because of age and high energy demands of the work. Thus farmers will do the land preparation with the early rains. The findings were similar with Wagstaff and Harty (2010) research in the low-veld district of Zimbabwe that showed that most of the farmers were finding it hard to dig planting holes during the winter period to give enough time for the applied manure as basal dressing to decompose.

One of the challenge noted was shortage of mulching materials. Information gathered reviewed that maize stalks were used as firewood during winter and other crop residues were left in the field and consumed bay stray animals. Also the area does not have enough grass to cut as mulch due to high competition of grass for other purposes. This concurs with the findings by Donovan (2020) who reports that farmers have many uses for crop residues: as fodder, fencing, roofing and fuel, and when crop residues are limited, farmers tend to use them for fodder first, so there might not

be enough residues for the soil cover. In this scenario, farmers will lose benefits of moisture conservation leading to reduced yield than expected.

Some of the respondents highlighted that they have managed to dug other plots early as recommended and applied manure but to their surprise they noted out that late in the winter when there were about to apply lime, all the dug holes were closed by animals. Hence the farmers had to resort to dug the hole when they wanted to plant because the holes need to be redone when dug early. Therefore, as most rural farmers' fields are not fenced, having the holes dug early in winter will remain unfeasible.

4.9 SUMMARY

The chapter focused on data presentation, analysis and the discussion of the data generated on the on the effectiveness of pfumvudza farming system on food security. The researcher found that the farmers had done their best the as per recommendation but the challenges of mulching materials, digging the hard land and late distribution of inputs had hindered them from reaping maximum benefits from the concept. The next chapter will provide a summary of the study, conclusions and outline the recommendations of the study. The conclusions and recommendations will be based on the research findings.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 INTRODUCTION

This chapter presents a summary of the study, conclusions and recommendations. To summarize the study, the researcher will briefly highlight the aim of the study, the research design, the population of the study, the sample and the sampling techniques, data collection methods and research findings. Secondly the researcher will draw conclusions based on the research findings. Finally, the researcher will suggest his recommendations for action to be taken and for further study on pfumvudza in different regions.

5.1 SUMMARY OF THE STUDY

The study aimed at assessing the effects of pfumvudza on food security. The purpose of the study was:

1. To assess the level of pfumvudza in Mazowe district.
2. To determine factors that led to the adoption of pfumvudza in Mazowe district, ward 9.
3. To assess the effects of pfumvudza in food security.
4. To outline the challenges faced by farmers practicing pfumvudza.

The study was carried out in one of the wards in Mazowe district of the Mashonaland Central Province. Throughout the study the researcher relied on information gathered from pfumvudza farmers. For ethical reasons the name of the participants was not disclosed.

The researcher used the case study research design which is a qualitative approach. This research design was used so as to get an in-depth understanding and assessment on the effects of pfumvudza on food security. The adopted research approach enabled the researcher to study the cases in a real world setting without any manipulations. Data was collected directly from the persons concerned.

To collect data, the researcher issued out questionnaires which were completed by literate farmers and elderly together with few young generations were formally interviewed using semi structured interviews.

The target population comprised of 2156 pfumvudza farmers registered for the 2021-2022 season in ward 9 of Mazowe district. Due to limitations beyond the researcher's control, the researcher could not study the whole population but rather a sample was selected. The researcher used purposive sampling which is a non - probability sampling technique to select the sample. The sample was selected because of its convenience and proximity to the researcher. A total of 154 farmers were sampled and the number was determined by RAOFT software.

The literature review has shown that the world was hit by climate change which has resulted in successive droughts, floods, high temperature and invasion of new pest and disease with all these affecting agriculture negatively. It has been noted that various efforts has already been made to curb the effects of climate change by adopting smart agriculture and conservation agriculture. Most of the conservation agriculture methods involved the use of large portion of land with reduced tillage, crop rotation and soil cover.

The literature also showed that in 2020 the government of Zimbabwe has introduced another version of conservation agriculture known as pfumvudza aimed at ensuring food security at household level. The pfumvudza concept involved farming on a small piece of land but producing a high yield that sustain a family of six for the whole year with surplus for sale.

To check the effectiveness of pfumvudza, various research were made mainly on drought prone areas. The results proved that pfumvudza is an effective method of reducing hunger and ensuring food security at household level if done according to recommendation. However, farmers faced

challenges of mulching material, digging the hard ground and having their dug holes closed by animals.

From the study, the researcher found that the level of pfumvudza implementation is very high (more than 80%) within the ward with high chances of increasing in the next season. The land area under pfumvudza was also high considering that every farmer had a portion of Pfumvudza maize plot. However, crops such as soyabeans, groundnuts, or cowpeas were very low comparing to maize. This was facilitated by late supply of the seeds and other related inputs. Farmers were into pfumvudza because of free supply of inputs, lack of draught power, shortage of income to hire draught power or tractors, not into the irrigation scheme and climate change. Those farmers that fully implement all the pfumvudza principle had a good harvest that sustain them for the whole year hence food secure. However, farmers who could not follow all the principles had their harvest improved compared to conventional methods but could not sustain them for the whole year.

Farmers who own limited land sizes as well as women can effectively be involved in cultivating small land pieces. By simply farming at high standards, it is possible to feed a family from such small areas of land. However, it requires training to ensure success. The availability of the input packs from the state and other locally available inputs (manure, compost, OPVs) is an encouragement for farmers. Pfumvudza a starting point into enhancing food security in smallholder sector and can be applied not only to maize but to other crops.

It was found out that pfumvudza farmers had challenges of having enough mulching material, digging hard ground and closing of dug holes by stray animals during winter. This results in only very few farmers practicing pfumvudza as endorsed hence the need to device other strategies to reduce the effect of such challenges.

5.2 CONCLUSIONS

The following conclusions were derived from the findings of the study:

5.2.1. A significant number of farmers were trained on pfumvudza and were knowledgeable on the farming practice

5.2.2 Farmers have adopted the pfumvudza farming methods because of free availability of inputs, insufficient income, lack of draught power, high occurrence of drought as well as increased yield on a small area.

5.2.3 If pfumvudza is practices well, it has the capacity to sustain a family for the whole year.

5.2.4 If the government were to stop the provision of inputs, the farming system cease as well due to the depend syndrome of farmers.

5.2.5 Hard labour required in land preparation and the closure of holes during winter forced farmers to prepare their land after the first effective rainfall.

5.2.6 Despite the program's efforts to promote the use of mulch, its availability remained a challenge for most farmers.

5.3 RECOMMENDATIONS

The researcher suggests the following recommendations

5.3.1 Dedicated promotion of the Pfumvudza concept in its entirety, with full attention to detail for household food security

5.3.2 Emphasize to farmers in extension messaging that the desired results can only be achieved if the full basket of prescribed Pfumvudza technologies is embraced

5.3.3 Work with and support farmers to ensure that they attain the potential yield from each Pfumvudza plot to ensure household food security for a year, based on proven productivity levels

5.3.4 Mulching is a key and critical success factor and game changer and so should be prioritized. Various mulching practices should be promoted for uptake by farmers. Farmers need to take advantage of the abundant vegetative matter following the late good rains received during the 2021/22 season and store mulching material for the coming season

5.3.5 Prepare land on time and keep watch of the stray animals.

5.3.6 Promote use of organic and bio-fertilizers to replace inorganic fertilizers. Use of organic fertilizers should be accompanied with farmer training on proper fertilizers treatment to enhance quality

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APPENDICES

APPENDIX 1: Questionnaire for pfumvudza farmers

My name is Rofina Ngunguzala. I am a part 3 (final year) student at Bindura University of Science Education studying for a Bachelor of Science Degree in Agricultural Economics and management. I am currently carrying out a research **on the effects of pfumvudza on food security.** I have selected your ward and you to freely respond to the following questions. The information you will provide will be used for academic purposes only and is confidential. Your cooperation is greatly appreciated.

Please tick in the boxes provided or complete the spaces provided as appropriate.

1. Sex ☐ male female ☐

2. Age

≥19yrs	20≤ 39yrs	40≤59yrs	≤60yrs

3. Marital status

Married	Widowed	Divorced	Single father/ mother	Not married

4. How many years have you been in farming? ……..……

5. If so, when did you start growing crops using the pfumvudza concept? .....

6. What crops did you grow under Pfumvudza? ……

……..…….

7. Can you highlight on the approximate area for each crop grown before and under pfumvudza

Crop ……area before pfumvudza…… area on pfumvudza……

Crop ……area before pfumvudza…… area on pfumvudza……

Crop ……area before pfumvudza……area on pfumvudza……

Crop ……area before pfumvudza……area on pfumvudza……

8. What was the yield of the following crops grown before pfumvudza and under Pfumvudza?

Maize | Yield before pfumvudza | …… | Yield under pfumvudza | ……..…….

Groundnuts/ soya bean | Yield before pfumvudza | …….. | Yield under pfumvudza | ……...

9. Name the variety of maize planted on pfumvudza……..

10. Are you able to dig the planting holes on time? Yes Or No

11. If the answer above is NO, give reasons

……..

12. Are you able to mulch the fields or plots? Yes Or No

13. If the respond from the above question is NO, give reasons for failing to mulch

……
……

14. Since you started practicing, is there anywhere you can access food in times of drought?

Yes or No

If the answer is yes, Where?.....

15. What are other benefits which you are ripping directly from practicing the Pfumvudza?

……
……
……

16. From your experience on pfumvudza farming, are you thinking of improving or reducing the hectarage and by what level? Improving/ reducing By …… ha.

17. Can you suggest reasons why other farmers are not practicing pfumvudza farming?

……
……
……

18. What are the challenges you are facing as a pfumvudza farmer that prevent you from having maximum benefits of the farming practice?

……
……
……

16. Are the crops under pfumvudza being able to cover your nutritional requirements? Yes or No

17. What factors had led you to adopt pfumvudza? ……

,……
……
……

APPENDIX: 2: Interview guide for elderly pfumvudza farmers

My name is Rofina Ngunguzala. I am a part 3 (final year) student at Bindura University of Science Education studying for a Bachelor of Science Degree in Agricultural Economics and management. I am currently carrying out a research **on the effects of pfumvudza on food security.** I am pleading for your time to respond to the few questions I have prepared.

The information you provide will be used for academic purposes only and is confidential.

1. For how long have you been in farming?
2. When did you start growing crops using the pfumvudza farming concept?
3. What crops did you grow/
4. Can you highlight more on the varieties you are using in pfumvudza?
5. I understand you have been growing crops for many years now, what have made you adopt this new method of farming called pfumvudza?
6. What can you say about the yield from pfumvudza?
7. When do you start digging planting holes?
8. How are you managing mulching of the plots?
9. Have you ever had a challenge of holed being closed by animals, if so, how did you manage it?
10. Can you comment on pfumvudza towards ensuring food security at household level?

APPENDIX 3: Requisition letter to AGRITEX

AGRITEX Office

Negomo Irrigation Scheme

Bag 3023

PA Nzvimbo

15 March 2022

The DAEO

Concession AGRITEX

Box 62 Concession

Dear Sir/Madam

RE: REQUEST FOR PERMISSION TO CARRY OUT A RESEARCH TASK IN YOUR DISTRICT

I kindly request for permission to carry out a research task in your area (Mazowe, ward 9). I am currently registered to Bindura university of Science Education Studying Bachelors of Science Degree honors in Agriculture Economics and Management level.

The research is on the **effectiveness of pfumvudza on food security.** I confined the research to a case study of ward 9. My research will focus on:

1. Level of pfumvudza in the ward
2. Factors that had led to the adoption of pfumvudza
3. Effects of pfumvudza on food security
4. Challenges faced by pfumvudza farmers

In the research, I wish to involve only pfumvudza farmers. I will take responsibility to explain the research task to the participants who would have volunteered to participate and to ensure their confidentiality in their responses.

The research findings will only be used for this academic purposes only.

I thank you in anticipating for a positive response.

Yours sincerely

Ngunguzala Rofina

B1851552

APPENDIX 4: Informed consent form.

Thank you for agreeing to participate in this study that will take place in your ward. This form outlines description of your involvement and rights as a participant. The purpose of this study is to assess the effectiveness of pfumvudza on food security: a case of ward 9 in Mazowe district.

- I voluntarily agree to participate in a research project conducted by Ngunguzala Rofina, an undergraduate student at Bindura Univeristy of Science Education.
- I understand the study is entitled: an assessment on the effectiveness of pfumvudza on food security: a case of ward 9, Mazowe district.
- I understand that my anonymity will be maintained and the information I provide will be kept confidential.
- I am informed that there are no anticipated risks or no benefits to me. Further, the information gained from this study can be used to assist the government and other stakeholders on the current state of pfumvudza implementation in region II.
- I understand that I have the right to withdraw from participating in the research at any time without possibility of a penalty.
- I understand that in the event that I have a question or require additional information regarding the research, I may freely contact the researcher Ngunguzala Rofina at Rosa (Negomo Irrigation Scheme) AGRITEX offices or contact her on cell No. 0773546589.

Participant's signature…….date……..

Researcher's signature……date……..