The contribution of small grain production to food security in drought prone areas. The case of Zvishavane (2000-2014)

By

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A dissertation submitted in partial fulfilment of the requirements of the degree of Master of Arts in Developmental Studies of the Midlands State University

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May 2014

DECLARATION

I, Tendai Nciizah, declare that the thesis hereby submitted for the degree of Master of Arts (MA) at the Midlands State University is my work and has not been previously submitted to another University.

Signature:……

Date……

Place: Midlands State University

ACKNOWLEDGEMENTS

Firstly I thank God Almighty in Jesus Christ for the strength, knowledge and wisdom he gave me for this project.

This dissertation would not have been successful had the following people not been instrumental from its drafting stages to the end. To Mr Munemo, thank you for your supervision, support, guidance and motivation. I am grateful for all the valuable comments and input that culminated in this project. It would have been impossible to produce this project had you not provided your guidance. Thank you

Most importantly I thank my family who directly and indirectly contributed to the completion of this project. My Dad, Mum, brothers Alfred, Adornis, sister Elinah thank you for your support.

This dissertation would also not have been possible without the support from the AREX staff in Zvishavane. To Mr Shumba and Mr Baison thank you for the information you provided.

DEDICATION

To my parents, my brothers Alfred and Adornis and my sister Elinah. Thank you for your unreserved moral support.

ACCRONYMS

FAO	-Food and Agricultural Organisation
HIV/AIDS	- Human Immune Virus/Acquired Immune Deficiency Syndrome
ESAP	-Economic Structural Adjustment Program
FTLRP	-Fast Track Land Reform Program
FEWSNET	- Famine Early Warning Systems Network
UNFCCC	- United Nations framework Convention on Climate Change
USAID	- United States Agency for International Development

ABSTRACT

The study examines the role of small grain production in promoting food security with particular reference to Zvishavane District in Zimbabwe. Successive droughts, in Zimbabwe compounded by other economic shocks in recent years have resulted in decreased maize productivity amongst the communal farmers most of whom reside in regions IV and V which are considered semi-arid. This has resulted to the prevalence of food insecurity particularly to these semi-arid regions as unreliable rainfall has undermined subsistence farming. The environment in Zvishavane is no longer conducive for maize production due to unfavourable weather patterns. This has given rise to the need to find alternative food crops, which may be suitable for these areas. Generally, research in the world indicates that sorghum and millet have the potential to end chronic food insecurity in semi-arid areas because of their drought resistance. The study argues that there is need to incorporate small grains in semi-arid areas like Zvishavane. The study shows how small grains have been adopted in Zvishavane and the impact that small grains have on food security as they can enhance food accessibility, utilization, stability and availability. Small grain production can be the way forward in the provision of food security in drought prone areas like Zvishavane rural.

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INTRODUCTION

A food-secure world, where all people have access to safe, nutritious and affordable food that provides the foundation for active and healthy lives is a desirable one. However, this has become more of a fantasy as food security has continued to elude many countries in this 21st century especially in the Less Economically Developed Countries (LEDCs). Food security has more effects on people than human health and welfare. In addition, it also contributes to economic and political instability. The United Nations estimates that about 870 million people, equating to just over 15 percent of the world's population, are undernourished today (FAO, 2013). The majority of these people live in developing countries, with the largest numbers of undernourished people in China and India, and the highest prevalence of undernourishment in sub-Saharan Africa (*Ibid)*. Every day, almost 16 000 children die from hunger related causes the ratio being one child every five seconds (*Ibid*).

Food security is a developmental concern that requires collection action from development practitioners to eradicate. It needs to be highlighted that development is a multidimensional process that includes a positive change in political, economic, socio-cultural and environmental factors. Food security is one factor that determine if a country is developed or not as it is a basic need for every individual. It is a major sign that underdevelopment is prevailing in a country and if not addressed it can lead to political instability, economic decline, increase the levels of HIV/AIDS, food riots, high infant mortality and deaths in a country. It affects the most vulnerable in countries and it can incapacitate large numbers of people affecting economic development. One can cite an example of the 2007 and 2008 riots that took place in several countries when prices of staples peaked. For example in 2010, hundreds of protestors took to the streets in Mozambique after wheat prices went up by 25% due to global wheat shortage (Munang *et al* 2014). This shows the chaos that can be linked to

food insecurity and underdevelopment. Therefore, there is a need to address food security if development is to be realised.

The complex challenge of improving food security involves an interdependent and interconnected set of issues, including agriculture, energy, the environment, government policy and trade (Sharma *et al*, 2002). In a country where agriculture is the dominant source of livelihood, responding to climate change should be a priority. There have been a myriad of solutions suggested by scientists and development practitioners which have not yielded much success. However, one way that can promote food security is small grain production. Small grain production has become widespread in dry areas with promise of enhancing food security if planted on a larger scale.

The study argues that food security and agricultural production are interconnected and the best way of tackling this is to focus on adaptation means and the correct crops to grow. Small grains like sorghum and millet provides the breakthrough to Africa in this 21st century of climate change and drought. They have been noted by experts to be better performers in drought-prone areas and are considered to have better nutritional value than maize, which is viewed as an unsuitable crop in these agricultural regions. This has led to their adoption as staple food grains in many semi-arid and tropic areas of the world, particularly in Sub-Saharan Africa because of their good adaptation to hard environments and their good yield of production (Dicko *et al*., 2005). Taylor *et al*. (2006) expands on these findings by describing sorghum and millet as generally the most drought-tolerant cereal grain crops that require little input during growth and with increasing world populations and decreasing water supplies, represent important crops for future human use.

Limited rainfall, dry spells and drought have significantly reduced agricultural yields especially in semi-arid regions in rural areas leading to food insecurity. The semi-arid areas

are characterized by unpredictable weather, limited and erratic rainfall and nutrient-poor soils and suffer from a host of other agricultural constraints (Maqbool *et al*., 2001). In addition, Sharma *et al* (2002) highlighted that there is an urgent need to focus on improving crops relevant to the smallholder farmers and poor consumers in the semi-arid areas of the developing countries. As highlighted earlier, this can be achieved through the development and use of crops that are adaptable to these environments. Small grain production could be the response needed to address the effects of food security in Zvishavane. These crops could be the panacea to the problems of food insecurity posed by drought. Research has shown that in these regions small grains have the potential of stabilizing household food security.

Background to the study

One of the aims of the 1996 World Food Summit is to halve the current number of undernourished people by 2015. However, food security levels have continued to increase with food insecurity being on the increase making it difficult for this goal to be achieved. Food insecurity is still widespread in the world and it is still a critical problem for international development. Starvation, food shortages, and lack of safe foods remain significant global problems. Eradication of hunger tops the list of Millennium Development Goals and globally, it is estimated that there are approximately 850 million people who are undernourished (United Nations, 2012). Furthermore, it is estimated that there are 1.4 billion poor people living on less than US$1.25 a day in the whole world (*Ibid)*. One billion of them live in rural areas where agriculture is their main source of livelihood. Noteworthy is that the trends at the regional, sub regional and country levels have been far more variable. For example, in Asia and the Pacific, the number of hungry people began rising in early 2000, mainly because of poor performances by some countries in South Asia. This has led to Latin America committing itself to end hunger by 2025 (FAO, 2011).

Africa as a region has been greatly impacted by food security and it has not shown great improvements in tackling the crisis instead the failures have been continuous. Since the early 2000s, the number of undernourished people in sub-Saharan Africa hovered around 215 million, but the price shock of 2008 increased this number to nearly 240 million (FAO, 2011). Between 2003 and 2005 about 30 percent of the population in sub-Saharan Africa was undernourished (FAO, 2008). It is also estimated that about 45 percent of those undernourished are less than 15 years old and "that 39 and 29 percent of children of less than 5 years were stunted and underweight, respectively" (FAO, 2008). Recently in 2013, United States Agency for International Development (USAID) provided more than $75 million in humanitarian assistance to aid more than 3 million food-insecure people in Southern Africa (USAID, 2013). The main cause of food insecurity in the region has been blamed on the delayed and erratic rainfall during the 2012/2013 agricultural season in parts of the region which resulted in decreased cereal production for the second year in a row, leaving the regional food security situation precarious. Famine Early Warning Systems Network (FEWS NET) anticipates that the reduced harvests may constrain Southern Africa's overall food supply for the 2013/2014 consumption season (*Ibid*). Based on mid-2013 assessments, as many as 10.4 million people in the region may be at risk of food insecurity during the season between October 2013 and March 2014—an increase of nearly 90 percent from the 2012/2013 lean season, when approximately 5.5 million people were food-insecure (*Ibid)*.

One can give an example of Angola whereby intermittent and below-normal rainfall across the country in early 2012 contributed to reduced agricultural production, increased food insecurity levels, and a rise in the prevalence of acute malnutrition, particularly in the southern provinces of Cunene, Huíla, and Kuando Kubango (FAO, 2013). By late 2012, drought conditions had affected nearly 1.8 million people and placed more than 533,000

children under the age of five at risk of acute malnutrition, according to the Government of the Republic of Angola and the U.N (*Ibid*). This is also the case in Lesotho, whereby late rains and an early frost shortened the 2012 agricultural season, reducing cereal production to the lowest level in 10 years (USAID, 2013). The cereal shortfalls and consequent food price increases resulted in more than 725,000 people, approximately 40 percent of Lesotho's population, requiring humanitarian assistance by late August 2012 (*Ibid)*.

Zimbabwe has not been exempted from these problems, Food security has remained an aspiration that is still far reaching. According to a number of scholars, food security began to become a real challenge in the early 21st century. Makuwa (2005) argues that in 2002-03, Zimbabwe was the epicentre of the so-called Southern Africa 'food crisis', which the World food Program considered to be one of the most severe in decades, with more than 12 million people in six countries "facing the threat of starvation. Half of this figure, over six million people out of a population of around twelve million were declared in need of emergency food aid for Zimbabwe alone (*Ibid*). These figures alone show the severity of the situation in the country with the 2008 price shocks and food shortages worsening an already dire situation.

This has continued until now, with food insecurity still a challenge in the country. According to FEWS NET (2013), in 2012, unfavourable agricultural conditions reduced Zimbabwe's overall cereal harvest by one-third. The resultant high food prices led to localized acute food insecurity, particularly in the southern provinces of Midlands, Masvingo, Matabeleland North, and Matabeleland South, where vulnerable households depleted their food stocks earlier than normal but had limited resources to access goods available in local markets. By May 2012, an estimated 1.7 million Zimbabweans were facing food insecurity (ZimVac

2013). Parts of Zimbabwe continued to experience unfavourable weather conditions in 2013. As of July 2013, the country had a cereal deficit of approximately 1.62 million MT, an increase of 160,000 MT relative to the previous year, according to SADC (2013). As a result, the national vulnerability assessment in 2013 found approximately 2.2 million Zimbabweans at risk of food insecurity, a 32-percent increase compared to the 2012 estimate (ZimVac 2013).

The main cause of these high increase in food insecurity in Africa have been contributed by climate change which has worsened agricultural production in these countries. It should be noted that the world at large depends on agricultural production for its food, hence an effect to the field is likely to cause food insecurity. The most affected countries are the developing countries who have a large population of about 70% that depend on agriculture production. What makes it worse is that most of these livelihoods depend on rain-fed agriculture as they are too poor to install irrigation systems. It is therefore imperative to realise the importance of agriculture in enhancing food security as it is a sector that the rural poor are most dependent on as a means of survival. According to Tafirenyika (2014) leaders should treat agriculture not only as a solution to end poverty and hunger but also as a major contributor to economic development deserving of public investment is a tall order.

Climate change and variability have in most cases impacted heavily upon agricultural production in several developing countries. Many of these countries depend on rain-fed agriculture, which makes it worrisome if agriculture will remain a sustainable form of livelihood to those people who depend on it. Climatic conditions and their effects like drought have stood to be environmental issues that have impeded against growth and development in Africa. The frequent occurrences of drought have contributed to food

insecurity leaving the ordinary people vulnerable and depending on fozod aid. There is therefore a need for the realisation that environmental issues are part and parcel of development, which require a holistic approach to address. Drought as a problem posed by climatic conditions should not be restricted to geography and environmental studies alone for it heavily affects the livelihoods of people, increases poverty and undermines development which are all important aspects in development studies as a discipline (Benson *et al,* 2004).

Agriculture plays an important role in the development of the Zimbabwean economy through its impact on the overall economic growth, households' income generation and food security (Mlambo and Zitsanza, 2001). According to Juana and Mabugu (2005), it offers income and employment to about 70% of the population, 60% of the raw materials required by the industrial sector and is the largest export earning sector contributing about 45% of total exports in most years. As such, the sector creates employment opportunities for about 25% of the total work force in formal employment and contributes an estimated 17% of Gross Domestic Product (GDP) (Tekere and Hurungo, 2003). In comparison, other sectors such as mining, manufacturing, electricity, construction and services contribute five percent, twenty seven percent, three percent, three percent and 47 percent, respectively to the GDP (Juana and Mabugu, 2005).

From the above figures it can be noted that agriculture is the mainstay of development in Zimbabwe hence policies should be central to this major practice. Notably, the Zimbabwean government views access to land by the majority as the basis for eradicating poverty and increasing food security (Mudzonga *et al,* 2009). Therefore, to address the food insecurity in

the country, strategies should be closely linked to this practice as it is the main means of production for the majority of the rural poor. Small grains emerge as the more viable and sustainable livelihood strategy that can bring about food security in the country. It should be noted that small grain production is not a new thing in Zimbabwe. Small grains have long been produced in Africa with grains like finger millet and sorghum having originated on this continent. These crops were once farmed in dry regions and managed to sustain livelihoods for generations up until the colonisation era brought maize production which resulted in a shift from the once suitable grains to the unsuitable crop in dry regions. Climate change effects have resulted in dry regions to become drier making the maize crop to be no longer suitable in semi-arid and arid areas. This is the same case with Zimbabwe where climate change has increased drought occurrence which have become a feature in the country affecting millions who reside in drought prone areas for example Zvishavane the area under study. Small grains are more suitable to this climate as they are not affected by high temperatures. They can reproduce significant yield in hot dry humid areas and they also are cheaper to grow. This study is going to concentrate on small grain production as the viable way in enhancing food security in the drought prone areas of Zimbabwe.

Statement of the problem

Food security issues have become a major concern in many countries in general and in Zimbabwe in particular. In Zimbabwe, rural farmers in the semi-arid regions are chronically food insecure (Rukuni *et al*., 2006) and this is mainly contributed by drought which has rendered agriculture production unsustainable. The country has an agricultural economy that depends on maize production for farmers. However, maize production yields in semi-arid areas have deteriorated in recent years due to drought. This has hindered food security especially in semi-arid areas where they are regarded as non-maize growing areas. However,

small grains, sorghum and millet are known to be adaptable to semi-arid conditions. The research emphasises the need to move away from maize production paving way for small grain production bearing in mind that small grains are drought resistant and have higher chances of fostering food security. Agricultural production is at the centre of food production in Zimbabwe and is much central in rural areas. A negative impact in agricultural production is likely to lead to food insecurity a factor which is still very paramount in rural areas of the country. The main areas that are affected are the semi-arid and arid areas in Zimbabwe mainly because of their climate which is no longer conducive to other main staple crops like maize. Droughts and dry spells have worsened with the years greatly affecting the agricultural yields which is the source of food and income for rural households. This negative effect on agriculture has led to the four pillars of food security to be elusive in rural areas as food is no longer available, no longer accessible and stable. Food insecurity has become common in Zimbabwe's semi-arid areas and this has affected many lives of the poor people thereby negatively impacting development at large. As food production is greatly linked to agriculture production in the rural areas of Zimbabwe there is need to address the issues that lead to poor yields and try to come up with a viable solution in enhancing food security. In this regard there is need to incorporate ways that can curb the effects posed by drought. Small grain production appears to be a way that can lead to food security in many respects.

Conceptual framework

Food security is important for development to take place. Food security issues have been tropical since the end of the Second World War with the creation in the 1940s, of the Food and Agriculture Organization (FAO), with the purpose of organizing and strengthening international efforts in food-related matters. In 1974, the organization convened the first World Food Conference, where leaders agreed to collaborate and intensify efforts aimed at

eradicating world hunger (Barraclough, 1991). During that time, the common definition adopted for food security was, “Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices” (FAO 2006). During this conference, world leaders proclaimed that "every man, woman and child has the inalienable right to be free from hunger and malnutrition in order to develop their physical and mental faculties” (World Food Conference, 1974).

From that time, food security definition and line of thinking has evolved with many definitions being brought forward. According to Carr (2006), quoted in Ncube “food security is a dynamic idea that has undergone significant transformations in its conceptual lifetime. Perhaps the most significant of these transformations is the shift from an initial view of food security as a product of reliable supplies of food to the growing contemporary emphasis on food as a single input in diffuse local livelihood strategies”. Food security has been defined by many different scholars with Maxwell (1996) pointing out that there are close to 200 definitions of food security. The 1996 World Food Summit defines food security as situation in which ‘…….all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life’ (FAO, 1996). The World Bank report on “Poverty and Hunger in 1986 defined food security as “access of all people at all times to enough food for an active and healthy life” (*Ibid*). However, earlier Maxwell and Frankenberger (1992) had commented that the many definitions of household food security, “all agree that the key defining characteristic of household food security is secure access at all times to sufficient food”. Kidane *et al* (2005) mention that, the current working definition of food security emphasizes the availability, access, and utilization of food.

There are four pillars of food security which are availability, accessibility, stability and utilization. These pillars are the ones that are mainly used to determine if a household is not getting the required amount of food. According to Wiesmann et al (2002) following the 1974 World Food Conference, the 1990 World Summit for Children and the 1996 World Food Summit (WFS), there has been extensive research and progress in identifying relevant food and nutrition indicators, sometimes also leading to uncoordinated and overlapping information systems. Furthermore, Wiesmann *et al. (*2002) pointed out that there has been a long lasting debate about indicators, their measurement error and limited reliability (Svedberg 1998, Bardhan and Klasen 1999). Although this might be the case, indicators are still imperative and are needed to monitor progress in achieving the set goals of food and nutrition security. Habicht and Pelletier (1990) argue that, "the choice of indicators, their measurements, analyses, and the need for other data can be very different for inferences from research, for making public policy, or for planning or evaluating programs. There is no best indicator, best measure of an indicator, or best analysis of an indicator in a generic sense. The definition of "best" depends ultimately on what is most appropriate for the decision that must be made". An indicator should reflect a given situation or an underlying reality, which is difficult to quantify directly, and usually gives an order of magnitude on a given scale. Masters (2005) points out that the first and second indicators are food stability and availability and they mainly focuses on stability of food price and supply.

According to USAID (1995), achieving food security requires that the aggregate availability of physical supplies of food is sufficient, that households have adequate access to those food supplies through their own production, through the market or through other sources, and that the utilization of those food supplies is appropriate to meet the specific dietary needs of

individuals. If this is covered, then food is said to be secure in a household and the country at large. In its narrow definition, availability is a measure of the amount of food that is and will be physically available in a population during a certain period of time (*Ibid)*. It is most likely related with production and market availability. Two factors that are taken into consideration are household food production and food crop diversity, whereby the issues like gender are mainly considered. The scale of measurement is the household and community levels of food.

The third indicator is food access, it mainly looks at sufficiency of household food consumption, percentage household expenditure on food, number of meals taken in a day and this is important to determine whether/how these change over time or throughout a given year/agricultural cycle and then household dietary diversity (Masters 2005). In simpler words the indicator is the percentage of food expenditure to total household expenditures. The access tool is the monitoring of household consumption survey and the scale is household and community levels (*Ibid*). The continual maize production in Zvishavane has led to poor food accessibility which is affected by the drought in the area which results in poor yields. Small grains will increase food accessibility because of its many uses that include beer brewing, barter trading etc.

The fourth indicator is food utilisation, which examines the degree of access to utilities and services, for example water, energy, health and sanitation. It needs to be noted that access may be gendered. The tools that are used to measure food utilisation include water, health and sanitation survey on access to services, including female education and infrastructure, access to energy. The indicator is the degree of access to utilities, services and it is mainly done on household and community levels. In Zvishavane the main indicator that show that food utilization is limited are the high numbers of malnutrition in children and anaemic

pregnant mothers. Small grains will reduce all these disease mainly because of their nutrients which are high in iron, calcium to mention a few. These indicators are therefore used to show if there is food insecurity although there are not always accurate. Droughts have become a common feature in semi-arid and arid areas. They have become a threat to food security in those areas that depend on agriculture for their food. Palmer (1965), a noted authority in the study of droughts, wrote that drought means various things to various people depending on their specific interest. Simply put drought can be understood as scarcity of water, which adversely affects various sectors of human society, e.g. agriculture, hydropower generation, water supply, industry (Panu et al, 2002). A combination of droughts or sequence of droughts, and human activities may lead to desertification of vulnerable arid, semiarid and dry sub humid areas whereby soil structure and soil fertility are degraded and bio-productive resources decrease or disappear (Kundzewicz, 1997).

For instance, climate change and its risk factors like drought and floods have immensely impacted on agricultural production in many African countries leading to food security concerns. Drought should be comprehended as a typical, cyclical component of climate, which often is pervasive in almost all climatic systems (Wilhite, 2000). It has been considered as a consequence of a natural decrease in the amount of rainfall received over a prolonged period, usually a season or more in length. Its ramifications gradually accumulate and are spatially far reaching than damages that emanate from other natural hazards. A serious drought or a series of consecutive droughts can be a disaster-triggering agent that exacerbates social and economic problems, and reduces the overall livelihood security of a society (Ibid). These problems are most severe where economies are least diversified and virtually everyone depends either directly or indirectly on agriculture. Extended periods of

drought in these areas can have devastating effects on the already marginal levels of production, placing subsistence farming in jeopardy.

Drought has types and these include meteorological, agricultural, and hydrological drought. Meteorological drought is defined based on the degree of dryness (in comparison to some "normal" or average) and the duration of the dry period (http://droughtreporter.unl.edu/). Drought commencement generally occurs with a meteorological drought. The second type is agricultural drought. Agricultural drought links various characteristics of meteorological or hydrological drought to agricultural impacts, focusing on precipitation shortages, soil water deficits, reduced ground water or reservoir levels needed for irrigation, and so forth (*Ibid)*. Hydrological drought usually occurs following periods of extended precipitation shortfalls that impact water supply (i.e., stream flow, reservoir and lake levels, and ground water), potentially resulting in significant societal impacts (*Ibid)*. Agricultural drought is the one most common in Zimbabwe which is affecting the agricultural production of maize making them no longer conducive to drought prone areas hence the need for small grain production. Considering the fact that in Zimbabwe drought has been and still is a recurrent phenomenon, the enactment of strategic remedies and drought management programs is not only an option, but, a recommendation if the proliferation of the impacts of drought is to be averted (Benson, 2004). Drought in Zimbabwe's semi-arid areas, like Zvishavane, the case that will be studied, has grossly affected all the dimensions of food security.

Theoretical framework

This research made use of the sustainable livelihoods framework to explore the contribution of smallholder production to food security in Zvishavane district.

Sustainable rural livelihood has been defined by Chambers and Conway in 1992 as:

"A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term".

Ian Scoones (1998) proposed a modified definition of Sustainable Livelihoods:

"A livelihood comprises the capabilities, assets (including both material and social resources and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base."

From these meanings, one can derive that the sustainable livelihoods approach, work with people, supporting them to build upon their own strengths and realise their potential, while at the same time acknowledging the effects of policies and institutions, external shocks and trends. The aim is to do away with pre-conceptions about what exactly rural people are seeking and how they are most likely to achieve their goals, and to develop an accurate and dynamic picture of them in their environment.

Scholars like Chambers (1989) and Maxwell and Smith (1992) note that food security is but one element of livelihood security. Young (2001) notes that food insecurity may cause irreparable damage to livelihoods, thereby reducing self-sufficiency. It is therefore part of the process leading to malnutrition, morbidity and mortality. In addition, the state of being food insecure directly contributes to destitution and damaged livelihoods in the long term. In other words, if there is acute food insecurity, there is a nutritional risk. About two thirds of Africa's

population depend for their livelihood on primary crops. There is therefore the need to focus on food security at local level down to household and individuals. Noting that many of the world's hungry are smallholder farmers, it is clear that food insecurity is closely linked to the livelihood strategies of these farm households. It needs to be highlighted that food security, or rather insecurity, is at the heart of food crises and food-related emergencies. It is an underlying cause of malnutrition and mortality, and a significant factor in longer term livelihood security (Neefjes, 2000). As previous studies have shown, food insecurity is linked to livelihood assets, strong institutional support and a favourable external environment. In particular, the research puts across the fact that food security depends on cereal output, budgetary support to agriculture, agricultural value added and poverty – all variables strongly linked to the sustainable livelihoods framework (*Ibid*). Since most poor rural households rely on agricultural production for a significant share of their household income, increasing agricultural productivity is critical to increase food security and reduce rural poverty. The key to sustainable rural development is legally-secure entitlement to assets – land, water, credit, information and technology – on the part of the poor (DFID, 1991A). Without secure property rights, farmers lack the incentive to invest in land management.

The main premise of the sustainable livelihoods is poverty elimination and bringing in food security at all times. The emphasis is on understanding the lives of the poor and the importance of their institution to their lives. Its overriding priority should be addressing human needs, particularly those of the world's poor (Moyo et.al, 1991). One conspicuous feature of sustainable livelihoods is its enormous variability can be noticed over time, locality and region as well as population and families (Brand, 2002). According to FSC (2012), a sustainable livelihood has the following feature:

a. Ability to cope with and recover from shocks and stresses.

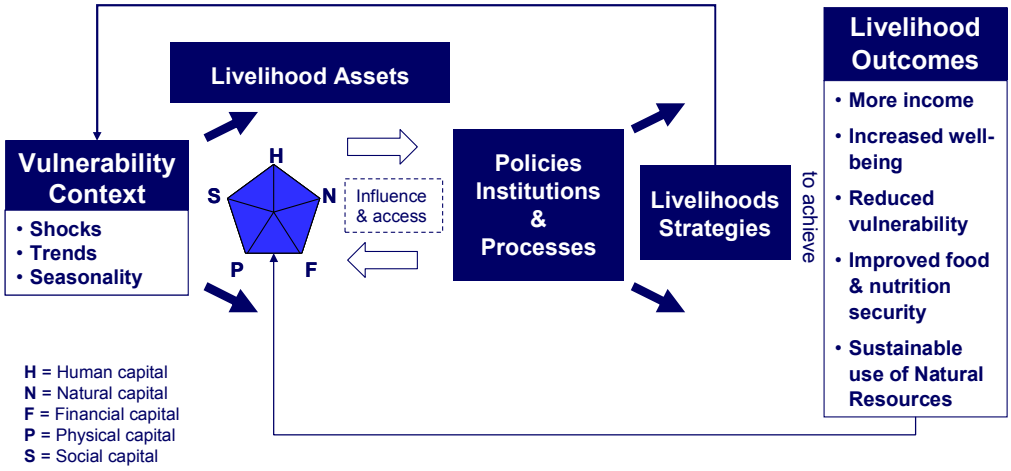
b. Economic effectiveness or use of minimal inputs to generate a given output.

c. Ecological integrity, ensuring that livelihood activities do not irreversibly degrade natural resource within a given ecosystem.

d. Social equity, which suggests that promotion of livelihood opportunity for one group does not effectively foreclose option. For other groups or undermine livelihoods of option open to others.

e. Maintain the long term productivity of natural resources. Another important feature of sustainable livelihoods is the issue of agenda setting. The poor should be at the centre of this process. They should be given chance to identify projects that are of importance to the poverty alleviation process as defined by the poor.

Figure 1



Source: Food Security Cluster, 2012

The approach helps in understanding how households derive their livelihoods by drawing on their capabilities and assets to develop livelihood strategies composed of a range of activities (Chitongo, 2013). Livelihood strategies are pursued to meet desirable livelihood outcomes. Desired livelihood outcomes include more incomes, increased wellbeing, reduced vulnerability, improved food security, improved social equity and improved sustainability of

natural resources (Neefjes, 2000). For example the call for small grain production in Zvishavane will result in increased income as it can brew beer which can be sold and increase cash flow. Furthermore small grains like finger have a long storage life of up to 5 years hence they increase food availability.

It is imperative to point out that livelihood strategies are closely linked to livelihood resources. Livelihood resources are defined as the vital capitals that one needs to achieve a sustainable livelihood (Herbinck and Bourdillion, 2001). These include human capital, natural capital, and physical capital, financial and social capital. In development sustainability should result among other things inequity, democracy and social justice alongside economic development (*Ibid)*. It also incorporates a moral obligation on the part of the existing generation where their way of living should not compromise standard of future through environmental depletion. One can point out that rural livelihoods can be taught conservation agriculture as a way of conserving the environment. The most important and fundamental element of sustainable livelihood is seeing the weaker members of the society improving their situation through accessing improved social services and enabling them to acquire assets (Clark, 1991).The nutritional element of small grains will address the vulnerable suffering from diseases like HIV/AIDS.

The essence of sustainable livelihoods is that it is people centred. It works effectively by starting with the people, analysing their livelihoods and see how these can be changed. People who are the beneficiaries of the development initiative should be involved and their views respected (Stern, 2002). There is great need to promote the agenda of the poor and external support should work to support people in a way that is congruent with their current livelihood strategy (DFID, 1999). People's livelihoods are dynamic. They vary with gender

age, ethnicity and geographical location. This then calls for shaping institutions according to the needs and circumstances of the beneficiaries. One can point out that in Zvishavane small grain production is being encouraged mainly because of its location in the dry regions of the country which are prone to droughts leading to high food insecurity levels. In addition the call for small grain as a way of tackling with food insecurity is a strategy that is involving the people at large and at the end of the day make them to be in charge of their own lives. The result is that by the end of the day households will be capable of taking care of themselves. By carrying out these farming activities households will have availability of food and accessibility which in turn will lead them to acquire new assets for themselves.

OVERALL OBJECTIVES

To examine the contribution of small grain production to food security in drought prone areas.

Specific Objectives

1. To assess the determinants of food security.

2. To examine the nexus between food security and small grain production.

3. To determine other factors that can contribute to food security.

Research questions

1. What is the impact of small grain production on food security in drought prone areas?

2. What are the determinants of food security?

3. Is there a nexus between food security and small grain production in drought prone areas?

4. What other factors impact on food security in drought prone areas?

LITERATURE REVIEW

Environmental factors have become topical in the contemporary world due to the rampant effects that they pose on individuals and the surrounding environment. In this regard there is diverse literature on issues pertaining to environment and climate change. The risk factors of climate change like drought and floods require much attention due to the dire effects they pose on food security. Much of the literature focuses mostly on food security issues. In most cases food security has been used as an independent variable alongside different dependent variables. This research took food security as a dependent variable with small grain production as the independent variable. As much as the researcher acknowledges that there is plenty of literature on food security it cannot be denied that much concentration has been on the most regarded to be dry areas like the Sahel region. In Zimbabwe concentration has been on Masvingo living other areas like Zvishavane neglected or simply forgotten. The research thus took Zvishavane as a case study that can bring to light some problems that are posed by drought in this semi-arid area.

Food security or rather insecurity, however, is at the heart of food crisis and food related emergencies (Young H et al 2001). Many scholars have written on food security and its challenges. According to Mwaniki (2005) achieving food security in its totality continues to be a challenge not only for the developing nations, but also for the developed world. The difference lies in the magnitude of the problem in terms of its severity and proportion of the population affected. In developed nations the problem is alleviated by providing targeted food security interventions, including food aid in the form of direct food relief, food stamps, or indirectly through subsidized food production. These efforts have significantly reduced

food insecurity in these regions. Similar approaches are employed in developing countries but with less success.

Food security; a situation in which all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active healthy life; is affected by a complexity of factors. These include unstable social and political environments that preclude sustainable economic growth, war and civil strife, macroeconomic imbalances in trade, natural resource constraints, poor human resource base, gender inequality, inadequate education, poor health, and natural disasters, such as floods and locust infestation, and the absence of good governance. All these factors contribute to either insufficient national food availability. As much as this is true it is crucial for the researcher to note that the challenges posed by food insecurity are much diversified and require responses that try to curb this problem.

This research concurs with other researches which view the impact of food security on agricultural production. The major challenge to food security in Africa is its underdeveloped agricultural sector that is characterized by over-reliance on primary agriculture, low fertility soils, minimal use of external farm inputs, environmental degradation, significant food crop loss both pre- and post- harvest, minimal value addition and product differentiation, and inadequate food storage an preservation that result in significant commodity price fluctuation (Ibid). Ninety five percent of the food in Sub-Saharan Africa is grown under rain fed agriculture. Hence food production is vulnerable to adverse weather conditions.

According to FAO (2009), despite increased world food production in the last few decades, the global effort to meet the Millennium Development Goal of reducing hunger by half by

2015 now appears beyond reach. As a matter of fact, the number of people suffering from chronic hunger has increased from under 800 million in 1996 to over one billion recently. The intensity of food insecurity and the challenges posed by this phenomena calls for attention from the academia, development practitioners and the farmers as well. Responses are required to address this situation so that people become secure. The production of maize in Zimbabwe as a staple food has raised a lot of questions as to its viability in drought prone areas. About 70% of people in Zimbabwe depend on agricultural production with maize the most widely grown. Due to the vulnerability of maize to drought it is crucial that other alternatives be promoted. This study will highlight the importance of small grain production as a way of promoting food security. The adaptability posed by small grains to climate change factors like drought has made them significant in Zimbabwe.

The severe impact of food security is on livelihoods particularly of those in agro-based zones. According to United Nations there are 1.4 billion poor people living on less than US$1.25 a day. One billion of them live in rural areas where agriculture is their main source of livelihood. Buckland (1993) concurs this, "in most of the national economies in SADC, about 70% of the population derives a livelihood from agriculture and if rainfall varies from the norm, both in terms of total precipitation and in timing, food security is affected".

Agriculture plays an important role in the development of the Zimbabwean economy through its impact on the overall economic growth, households' income generation and food security (Mlambo and Zitsanza, 2001). According to Juana and Mabugu (2005), it offers income and employment to about 70% of the population, 60% of the raw materials required by the industrial sector and is the largest export earning sector contributing about 45% of total exports in most years. As such, the sector creates employment opportunities for about 25% of the total work force in formal employment and contributes an estimated 17% of Gross

Domestic Product (GDP) (Tekere and Hurungo, 2003). In comparison other sectors such as mining, manufacturing, electricity, construction and services contribute five percent, twenty seven percent, three percent, three percent and 47 percent respectively to the GDP (Juana and Mabugu, 2005).

However the prevalence of drought has undermined agricultural production in Zimbabwe. Juana and Mabugu (2005) indicate a situation where in Zimbabwe, between 1960 and 1992, average annual rainfall was 662.3 mm and maize yields fluctuated widely at that time, ranging from 2.4 tonnes per hectare (2.4 t/ha) in 1986 to as low as 0.4 t/ha in 1992. Brown *et al* (2012) alleges that in 2007, only 45 per cent of national cereal requirements were produced in the country leaving a deficit of over 610,000 metric tonnes to be covered by imports and cattle population declined from approximately 6.1 million in 2000 to 5 million in 2011, while dairy production dropped from over 100,000 cows in 2000 to approximately 22,000 cows in 2010. In this regard rural livelihoods are negatively affected as there is a higher dependence on agriculture.

Brown *et al* allege that rising temperatures and increasing rainfall variability, notably drought, are also expected to exacerbate declining agricultural outputs, further compromising economic growth and stability, employment levels, food insecurity, demand for other goods, and poverty reduction. IPCC (2007) propounds that climate change is expected to lead to the expansion of marginal lands, which is already beginning to occur in Zimbabwe. It is alleged that if changing climatic conditions continue to expand, traditional agricultural systems will become increasingly unsustainable to such an extent that even diversified livelihood systems with a livestock component are expected to become more vulnerable (Brown *et al*, 2012).

Brown *et al* (2012) report that Zimbabwe's water supply is deteriorating as a result of persistent drought that severely strain surface and ground water systems. Surface water from mostly rivers and dams is the major source of water in Zimbabwe accounting for 90 per cent of supply while the potential to use ground water has not yet been realised mainly due to the unaffordability of the required technology (Brown *et al*, 2012). They allege that surface water is prone to high loses due to evaporation caused by high temperatures, where for example, in 2007, evaporation led to extremely low water levels in most of Zimbabwe's dams, causing many to be decommissioned and the situation becomes worse with climate change where evaporation is predicted to increase by between 4-25 per cent in the river basins and runoff is also projected to decline by up to 40 per cent, with the Zambezi Basin worst affected (Brown *et al*, 2012). Annual rainfall levels based on the 1961–90 average are also projected to decline between 5–20 per cent by 2080 in all of the country's major river basins and these projections will worsen the existing deficiency of water resources, particularly in the agro ecological zones IV and V (Ibid). In this regard this research proposes that responses like small grain production should be promoted as the way forward. Small grains are resistant to drought and diseases as well. In addition, the research will give an enhanced insight through the qualitative approach. Most researches done on drought and food security have tended to be quantitative. A qualitative approach will be used as a way of confirmation and as a way of bringing new results in the field of drought and small grain production.

JUSTIFICATION OF THE STUDY

Food insecurity has hampered development and worsened underdevelopment. Many rural areas have continued to face food shortages and the problem is worsening especially in drier regions in Zimbabwe and particularly in Zvishavane. Although at the 1974 World Food Conference, government leaders proclaimed that "every man, woman and child has the

inalienable right to be free from hunger and malnutrition" (FAO, 1996), notably three decades later hunger is still apparent with millions of people facing starvation. Food shortages have actually worsened in some countries whereby food availability has greatly reduced. This is the scenario in most African countries with Zimbabwe in particular. Food insecurity has continued to grip the African continent and this has been worsened by climate change that is taking place at a faster pace. Global Leadership for Climate Action (2009) points out that climate change is a serious threat to food security in many developing countries, adversely affecting food availability, access to food, stability of food supplies and food utilization. It asserts that the impacts of climate change on food security will differ across regions and over time and, most importantly, will depend on the level of socio-economic development that a country has reached as the effects of climate change set in. Considering that most African countries are still underdeveloped a bleak picture is therefore painted to the continent in terms of food security. For this to change there is therefore the need to carry out a research that will combat food insecurity and find new ways that can bring about food security.

In addition the poorest communities are reported to have the least capacity to adapt to the impacts of climate change and drought. Hence in the vulnerable communities, it could erase the gains from many years of development efforts, causing repeated food crises, threatening large populations with chronic hunger and disease, and leading to environmental refugees as well as civil strife in already unstable regions. Considering that 70 percent of the world's poorest people live in rural areas, particularly in Asia and Africa, where subsistence farmers depend on rain for their harvests, effective adaptation to climate change is crucial if not a prerequisite. There is thus the need to carry out a research and look for the necessary adaptation methods that will assist these small holder farmers and avoid food insecurity.

In addition one can point out the fact that many rural farmers are against change to the extent of resisting some adaptation methods. Despite being very vulnerable, small farmers can be stubbornly resistant to change. This can be attributed to the fact that research on these crops has been lagging behind in Africa because they suffer something of an image problem and there often tends to be a preference for maize as the premier crop (Taylor, 2003).This calls for the need to carry out the research and come out with concrete and valid information and evidence for the grassroots people of whether small grain production will be able to promote food security or not. Going on the ground and conversing with the rural grassroots people in Zvishavane will also allow the researcher to understand the challenges that they are facing and also discuss how to address food security.

Furthermore, Zimbabwe was once a nation that overflowed with food and was deemed the bread basket of Africa. Food was secure and was abundant particularly to active farmers. Agricultural products were produced on a continental level and sometimes international level with excess food being exported to other needy countries. All in all food in the country was secure and was adequate to feed the whole nation. To be pointed out is the fact that during this era the impacts of drought were not largely felt as there were easily managed and covered. This is now a different scenario as the country is now facing challenges in managing drought periods and starvation is now on high levels. Also production of the main staple foods in the country has been declining since the early 1990sgreatly compromising household food security (Jayne *et al.,* 2006). This is supported by the UN, (2009) which stated that close to half of Zimbabwe's population – about 6 million people − are currently food and nutrition insecure (UN, 2009). Considering this, there calls for a need to carry out a research on how to bring again back the much needed food and come with ways that can stop malnutrition and

starvation. In addition the fact that maize production yields have greatly declined due to a change in climate change means that new methods have to be used. In this research the understudy crops are mainly sorghum and millet which are small grains that can possibly eliminate food insecurity. The increased levels of food insecurity calls for a study to bring back the country to be the bread basket of Africa it once was.

According to Mukarumbwa (2009) the research in the world indicates that sorghum and millet have the potential to end chronic food insecurity in semi-arid areas because of their drought tolerance. That being the case Food and Agriculture Organization (FAO) and International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) (1996) agree that sorghum and millet have got the potential to contribute towards the food security of many of the world's poorest and most food-insecure agro-ecological zones. This can be achieved through increasing production and productivity of these crops in such agro ecological zones. These conclusions concur with those of Taylor (2003) that sorghum and millets have the potential to improve household food security in semi-arid regions because of their adaptability to such environments. There is the need to study and to find out if these small grains can hamper food insecurity on the same scale that maize once did.

From these points it therefore becomes apparent that there is the need to carry out the research. The study is significant in that it will be able to study the situation that is on the ground, food insecurity that the grassroots people are facing and come up with ways that can bring about food security. There is the need to realise that the poor themselves have to seize responsibility, as agents of change, for their own development

The research tried to justify the choice for small grains and why other factors that could contribute food security were left out. The study took into consideration that small grain production is not the only livelihood strategy that is being practised in Zvishavane. There are other coping strategies like gold panning, vending, and food for work, livestock production and vegetable gardening that are practised in Zvishavane. The sustainability of these coping strategy is what guarantees their significance. For instance food for work is not an everyday activity and cannot sustain an individual, gold panning involves several dangers and one is never guaranteed that they will get the gold and there are several restrictions involved. For instance not everyone can participate in it, like the elderly and those who are not strong enough. Small grains are highly sustainable and can be produced by everyone and the yields can be high and it is guaranteed that all the four pillars of food security are present.

METHODOLOGY

Research design

The main approach that was used for data collection was a case study. A case study of Zvishavane rural was used to gather information. This gave an in depth analysis of a single area, over a long period of time. Case study provided an in-depth investigation of whether small grain production is enhancing food security on the ground.

Research methods

The researcher used qualitative and quantitative methods (triangulation). Qualitative approach is characterized by the collection and analysis of textual analysis, interviews, and by its emphasis on the context within which the study occurs. Most writers like Krauss (2005), Gray (2009), Corbin and Strauss (2008), among others agree that the best way of

understanding the social world is through the qualitative design which takes into consideration peoples' contexts, values, beliefs and thoughts to generate meaning. Hence the researcher will talk to people from the ground and involve them through interviews, questionnaires, sampling to mention a few.

Interviews

The researcher employed face to face interviews with key informants. Key respondents included 6 from AREX office, 4 from Community Development Department in Women Affairs, and 15 farmers. These respondents were chosen specifically because, for instance the AREX officers are directly involved with disseminating information about small grains to the local farmers in Zvishavane. The 15 farmers involved were largely the concern of the study as they were the ones producing the small grains or choosing not to produce and in so doing their views were the central concern. Face to face interviews offered a great advantage of probing with the respondents on the subject. They offered the researcher a distinct advantage of immediate feedback as the respondents' emotions were shown clearly on their faces. Also non-verbal cues gave the researcher messages which helped in understanding the verbal responses, which will be changing or even, in extreme cases, reversing or contradicting its meaning. Notably one of the advantages of these types of interviews is the fact that the most respondents had a hard time in turning down the interviewer. They also provided instant responses which helped the researcher to make quick decisions.

Questionnaires

The researcher made use of questionnaires as a way of collecting information in order to be able to address the objectives of the research. Questions on small grain production as a means of enhancing food security were asked. Again these were done with key informants as 5 were given to Christian Care, 5 were given to Agritex, and 10 were given to farmers. The

questionnaires allowed the researcher to gather a lot of information from different people in a short time. The use of unstructured questionnaires were used in this research.

Sampling

The researcher employed non-probability sampling techniques. Purposive sampling was used to pick respondents of questionnaires and interviews, for instance those from AREX, Christian Care. For the local farmers at large, the researcher employed convenience sampling as the researcher realised the convenience of asking any farmer in Zvishavane as they were faced with the same problem of drought whether they chose to produce small grains or not. Ten were thus chosen using this type of sampling. For the remaining 15 the researcher employed cluster sampling whereby she put respondents into 3 clusters which are group A those who had never produced small grains but have always stuck to maize, group B, those who have mixed maize and small grains and group C, those who planted small grains as an adaptive measure.

Ethical considerations

According to Mermon (1998) professional codes are essential to protect participants in social research from harm, while ensuring the right of privacy adhering to the action of informed consent and avoiding deception. Ethical dilemmas are likely to emerge during collection of data and publication of research findings. This research adhered to codes of strict ethics during data collection. A sense of expertise was carried out giving the respondents respect. In addition the researcher sought permission from the responsible local authorities first before undertaking the research. Participants were assured that the information they provided would be confidential and used solely for stated purpose of the study.

Delimitation

The study was limited to Zvishavane rural. Zvishavane is situated in the Midlands region and it is located to the south of the country. It is found in region four in the southern part of Zimbabwe and is bordered by Mberengwa, Chivi and Shurugwi districts. It is subdivided into 29 wards. Nineteen of the wards are communal while the rest are resettlement and urban. Zvishavane is a mining town that boasts four big mining companies as well as several other small ones. Water sources in the district include boreholes, dams, deep wells and rivers. The adoption of Zvishavane semi-arid areas is not by accident but has been motivated by the fact that for the past two decades, the afore mentioned areas, among others in Zimbabwe and beyond, have witnessed pronounced increases in temperature, recurrent droughts and unpredictable rainfall patterns, yet people mainly depend on rain-fed agriculture and natural resources for their livelihoods. Receiving low rainfall and experiencing high temperatures, place this area in one of the most vulnerable regions to climate change in Zimbabwe.

STRUCTURE OF THE DISSERTATION

Chapter 1

An Overview of food security in Zimbabwe

This chapter gives an insight on food security in Zimbabwe. It looks at the causes of food security in the country.

Chapter 2

Small grain production in Zvishavane

The chapter gives a detailed analysis of the climate in Zvishavane and how the frequent droughts occurring in the area have affected agricultural production leading to high levels of food insecurity in the area. The chapter pays attention to the small grains farmed in the area and discuses on their adaptability to hot humid areas prone to frequent droughts.

Chapter 3

The Impact of small grains on food security in Zvishavane

The chapter looks at the positive and the negative impacts on small grains in Zvishavane. The chapter elaborates on the nexus between small grain production and food security in the area.

Chapter 4

Challenges and prospects of food security in drought prone Zvishavane

The Chapter focuses on the challenges that the people in Zvishavane might be faced with in implementing small grain production. It looks at some of the expectations of small grain production in the future.

CHAPTER 1

An Overview of food security situation in Zimbabwe

1.1 Introduction

It is widely recognised that Africa is one of the most vulnerable regions in the world. IPCC (2007) stated that Africa is most vulnerable "…because of multiple stresses and low adaptive capacity. The multiple stresses may arise from current climatic hazards, poverty and unequal access to resources, food insecurity, globalization trends, social and political conflicts and incidences of diseases such as malaria, tuberculosis and HIV/AIDS" *(Ibid)*. Among all these factors food insecurity has remained endemic throughout much of Africa, with climatic factors such as rainfall variability a major cause. Notably food security in Africa is closely linked to agricultural production with any negative disturbance leading to food insecurity. Considering this the key to enhancing food security should be greatly linked to agricultural production. This is mainly because to a large number of developing countries, agriculture has remained one of the most important sectors in most African countries with more than three-quarters livelihoods depending on the sector for their means of survival.

According to Hoffmann, (2011) of the developing world's 5.5 billion people, 3 billion live in rural areas – nearly half of humanity. Of these rural inhabitants, an estimated 2.5 billion are in households involved in agriculture, and 1.5 billion are in smallholder households. Agriculture provides the livelihood for approximately 2.6 billion people which is about some 40 per cent of global population (World Bank, 2008 and Herren et al., 2011). This sector therefore carries a heavy burden for food security for the whole nation. Importance of food security and agriculture production is also further linked by the fact that about over 70

percent of the poor live in rural areas, where also the largest proportion of the food insecure live and they largely depend on agriculture for survival.

Food production in Zimbabwe, previously the breadbasket of the Southern African region, has remained below subsistence levels since 2000. This has led to food security reduction being concentrated more on agricultural production as most food emerges from the soil. Zimbabwe is not exempted from this. It is also one of the countries that largely depend on agriculture as a way out and that also host a large number of people who are dependent on the sector. Since the 1980's, food insecurity due to falling per capita output of food production and recurrent droughts has been a major challenge for Zimbabwe. The chapter pays attention to trends on food insecurity particularly in the rural sector and the causes that is low agricultural production, climatic conditions, HIV/AIDS in accord to the four pillars of food security namely accessibility, availability, stability and utilization.

1.2 Food security concerns in Zimbabwe

The concept and definition of food security have changed since the first introduction of the concept in the early 1940s. Food security in the 1970s was taken in the perspective of food-supply, ensuring that all people everywhere have enough food to eat. This line of thinking changed with the coming in of different views from different scholars, for example the likes of Amatye Sen who came with the theory of 'entitlements'. He emphasises the importance of consumption and access through the concept of entitlement (Sen 1981). In his renowned work, Sen highlighted that food related problems are influenced not only by food production and agricultural activities, but also by the structure and processes governing entire economies and societies (*Ibid*). Following his view, food insecurity has been caused not only by scarcity

but also by institutional failures that led to suboptimal food distribution. This led to food security to be redefined and embrace multidimensional issues.

Hence the current terminology in use, as adopted from the 1996 World Food Summit, emphasizes the multidimensionality of food security providing the definition of food security as a situation that exists when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO 2000). According to World Bank (1986), "food security" entails access by all people at all times to enough food for an active and health life. Therefore, food security refers to a situation where everyone in the country can access sufficient and decent food stuffs for their normal well-being. This definition has widely established the four pillars of food security: availability, accessibility, utilization and stability.

Food security remains one of the central concerns in the whole world in general and Africa in particular. Notably Food insecurity is high across the African region compared to other regions in the world. Zimbabwe is not exempted from this drastic issue that calls the attention of the government and NGOs alike to work together. The country has become more food insecure in the recent years with the Zimbabwe Vulnerability Assessment Committee (ZIMVAC, 2013), highlighting in their 2013 report that about 2.2million Zimbabweans in the rural areas will be food insecure.

It needs to be noted that food security is affected by a complexity of factors. These include unstable social and political environments that preclude sustainable economic growth, war and civil strife, macroeconomic imbalances in trade, natural resource constraints, poor human resource base, gender inequality, inadequate education, poor health, natural disasters, such as

floods and locust infestation, and the absence of good governance (Hoffman, 2011). All these factors contribute to either insufficient national food availability or insufficient access to food by households and individuals. The main aspects that indicate that food is not secure are namely availability, access, utilization and stability. These indicators are mainly used as a way of determining the presence or absence of food security. Availability of food mainly focuses on the supply of food and its presence in the area. A household should have a sufficient food in quantity and the food should be of quality. Food availability is determined by production i.e. food produced in the area, stocks which are maybe food held by traders, in government reserves and at farm level in the area (FSC, 2012). Other determinants are trade which is based on the food brought into and taken out of the area through market mechanisms and lastly bulk transfers which the food is brought into the area by the government and aid agencies.

Food access addresses the demand for the food. It is influenced by economic factors, physical infrastructure and consumer preferences (FSC, 2012). It may include factors like own production of crops, livestock or farmed fish; purchases at markets, shops, etc.; barter exchange – exchange of items for food and gifts from friends, relatives, community, transfers from government or aid agencies (relief or safety net programmes), food-for-work, cash/vouchers etc. (*Ibid*). Food utilization looks at the use that households make of the food to which they have access to, and individuals' ability to absorb and metabolize the nutrients (Masters, 2005). Food utilization depends on how food is stored, processed and prepared (including the water and cooking fuel available, and hygiene practices); feeding practices, particularly for special needs individuals: the young & elderly; the sick; pregnant & lactating women; sharing of food within the household; the extent to which this meets individuals' nutritional needs – growth, pregnancy, lactation, etc. and health status of each household

member (FSC, 2012). The fourth element is stability. Stability looks at the consistency and reliability of food availability and access. It means that households should not risk losing access to food as a consequence of sudden shocks or cyclical events. Households should produce food that will allow them to bounce back if they experience disasters like droughts that are now a threat in Zimbabwe. The four pillars are summarised by Saad (1999), "household is food secure when it has access to the food needed for a healthy life for all its members (adequate in terms of quality, quantity, safety and cultural acceptability), and when it is not at undue risk of losing such access".

In Zimbabwe, production of the main staple foods has been declining since the early 1990s greatly compromising household food security (Jayne *et al.,* 2006). Whilst various reasons have contributed to this, Rukuni *et al* (2006) pointed out that institutional and policy factors have played a major role in this decline. The policies that have attributed to food insecurity include the once mentioned FTRLP and Economic Structural Adjustment Program (ESAP). In the past ten years, the country has failed to produce enough food to meet its needs and has had to rely on imports. General poverty and chronic food and nutrition insecurity have led to reduced diversity of household consumption and increased prevalence of chronic malnutrition, especially among women and young children.

It needs to be highlighted that there are two types of food security which is chronic and transitory food insecurity. Chronic food insecurity is a long term or persistent inability to meet minimum food requirements and without appropriate attention it can lead to stunt growth (FSC, 2012). Transitory food insecurity is a short-term or temporary inability to meet minimum food requirements, indicating a capacity to recover and if not addressed it can lead to wasting (*Ibid*). A research carried out in Zimbabwe by the Food Security Research Project

(2013), suggest that up to 40 per cent of households in the Communal Lands may be faced by chronic food insecurity. This arises from the fact that a good number of households do not have adequate resources i.e. land, animal draft power, working capital, etc. to produce enough food nor do they have adequate cash to purchase food available in the market.

Lack of adequate food is affecting households leading to high levels of malnutrition an indicator of food insecurity in the country. Food utilization has been lacking in Zimbabwe due to inadequate availability and accessibility of food. The country's nutritional status has not changed much over the last ten years and chronic malnutrition (stunting) remains a major challenge. The country has a double burden of malnutrition, where less than 10 percent of children aged 6–24 months consume the minimal acceptable diet (FNC and MHCW 2010), while 6 percent of children under the age of five are over-weight (ZDHS, 2010-11). Approximately one in three children (32 percent) is stunted (ZDHS, 2010-11), while one in three pregnant women is anaemic (CSO, 2005). Children living in rural areas are more likely to be stunted and underweight than those in urban areas (FNC, MOHCW, 2010). These trends are due to a combination of reduced food availability caused by poor agricultural performance, lower access to food due to high levels of poverty and poor food utilization due to lack of knowledge on how to use the available food. This an illustration that food insecurity is now a challenge in the country

1.3 Factors contributing to severe food insecurity in Zimbabwe

In 2002-03, Zimbabwe was the epicentre of the so-called Southern Africa food crises with over six million people declared in need of emergency food aid. The crisis was triggered by a drought and compounded by the consequences of the economic decline, notably the poor availability and high prices of agricultural inputs. The Fast Track land reform programme

started in 2000 also greatly contributed to the crisis, by reducing food production and compounding economic difficulties. Despite some improvements in 2004, economic difficulties, including low food production, inaccessibility of basic commodities and rising unemployment, have continued, threatening livelihoods of millions. Many factors have been brought forward as to the main causes of food insecurity in the country. This chapter is going to focus on factors that are mainly linked to agricultural production and how they affected food security using the four pillars as indicators. This is after the consideration that the study is mainly focusing on rural households who depend on agriculture as their cornerstone to survival.

With most of Africa's economies being based on agriculture, Masomera (1998) observed that crop production forms the corner stone of household food security in Africa. In this regard, a household is considered food secure if it produces enough grain for its needs to last the whole year until the harvest of the next season. Furthermore, FAO/ World Food Program (WFP) (2008) noted that food security of individual households in any given location would be influenced by an array of factors. These factors affect household access to food either through their own production or market purchases using cash income (or exchange) earned from agricultural or non-agricultural livelihoods. At a household level food security is said to be present if the household has access to the food needed for a healthy life for all its members (adequate in terms of quality, quantity, safety and cultural acceptability), and when it is not at undue risk of losing such access" (Saad, 1999).

Some of the factors that have contributed to food security are climate change, droughts. FTRLP, HIV/AIDS, to mention only a few. Mwaniki (2011) propounds that many factors have contributed to food insecurity, including the high prevalence of HIV/AIDS; civil war,

strive and poor governance; frequent drought and famine; and agricultural dependency on the climate and environment. Barret C *et al* (2006),argues that the food crisis was triggered by a drought, but the unfavourable rainfall patterns were compounded by the economic decline, and its consequence on the poor availability and high prices of inputs (fertilisers, seeds, tillage). The Fast Track land reform programme started in 2000 also greatly contributed to the crisis, as it has resulted in reduced food production and compounded the economic difficulties. As a result, the 2001/02 harvest was the worst in the decade since the 1991/92 drought. The level of food insecurity continues to worsen for rural population due to reduced availability of staple cereals and the ever rising cost of living. Some of the factors that led to food insecurity are explained in detail below.

1.3.1 Climate change

While food security depends on access, availability and utilization of food which is determined by culture, politics, infrastructure, markets and resources; availability of food is linked to household agricultural production which is often at the mercy of the timing and amount of rainfall (Serigne *et al*, 2006). Climate change has become a tropical issue in the 21st century mainly because of its detriment effects on agriculture in Africa and in particular Zimbabwe. Serigne *et al* (2006) goes on to state that studies and reports show that the projected increase in greenhouse gas emissions in the atmosphere over the 21st century will have detrimental and disruptive effects on human and economic activity. Africa is anticipated to be the most negatively affected continent on the planet due to a combination of particularly severe projected impacts and relatively low adaptive capacity.

It needs to be noted that climate change has been taking place for many decades but its effects are now clearly being witnessed now and are likely to continue rapidly taking place. A

warming trend in Africa has been observed since the 1960s and this is expected to continue as global mean temperatures rise mostly consistently across the continent (Frost, 2001). With global-mean warming of 4°C above pre-industrial levels by the end of the century, monthly summer temperatures across Sub-Saharan Africa are projected to increase by 4-6°C above present day temperatures, and reach 5-7°C over North Africa (Schellnhuber *et al*., 2013). These increases are limited significantly to around 1°C above present-day temperatures in a scenario approaching 2°C globally by 2100.

Some experts suggest, that drought and extreme weather in regions affected by food crises in the recent decades could be a result of climate change. This is the same situation that has affected the semiarid regions in Zimbabwe which are facing food insecurity. Climate change has grossly affected food production in Zimbabwe and Zvishavane in particular. It need to be noted that extreme heat stress during the crop reproductive period can be critical for crop productivity. Considering the fact that Zimbabwe consist of semi-arid and arid zones climate change has been detrimental as it has increased the dryness in these zones already. In other words a bad situation has been worse.

Climate change is defined as a shift of climatic conditions in a directional incremental mode, with values of climatic elements changing significantly (Houghton *et al*. 1990). IPCC (2007) also defined climate change as the significant variation of the mean state of climate relevant variables such as temperature, precipitation and wind in a certain period of time, usually over 30 years. The United Nations framework Convention on Climate Change (UNFCCC, 2006), states in article 1 that climate change is a change of climate which is attributed directly or indirectly to human activity that alerts the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. The World

Bank forecasts show that SSA will surpass Asia as the most food insecure region inhabiting 40-50% of undernourished people globally in 2080 compared with 24% today (*Ibid*). Levels of viable arable land for production are predicted to decline by 2080, with 9-20% of arable land becoming much less suitable for agriculture due to climate change (UNFCCC, 2006).

What makes climate change important in Africa's development is the reliance of many African countries on rain-fed agriculture. Climate change determine agricultural production as unfavourable weather conditions affects agriculture. Changing rainfall patterns, for example, threaten to severely impact agricultural activity in Africa especially in the Sahel, East Africa and Southern Africa reducing rain fed agriculture by as much as 50 percent in some countries (Garcia 2008). It needs to be highlighted that agriculture and climate change are inextricably linked. According to Nelson (2000), climate change threatens agricultural production through higher and more variable temperatures, changes in precipitation patterns and increased occurrences of extreme events like droughts and floods".

Increase in temperatures across Africa has negatively affected crops like maize and rice. Hulme (2001), points out that temperatures are expected to increase by between 2°C and 6°C by 2100.There are significant regional variations within these projections. Using a medium warming scenario, Hudson and Jones (2002) found out that temperatures in southern Africa would increase by 3.7°C in the summer and 4°C in the winter. Under a high warming scenario, temperature increases are expected to be more dramatic (Ruosteenoja *et al*. 2003), temperatures could increase by up to 9°C for North Africa in June to August, and by up to 7°C for southern Africa in September to November by the end of the century.

Rainfall currently varies considerably across Africa, both spatially and temporally (Boko *et al*., 2007). In recent decades, the continent's sub-tropical zones have become more arid, particularly the Saharan and Mediterranean regions and southern Africa (WBGU, 2007). In southern Africa, there has been an increase in inter annual variability over the past 40 years, with more intense and widespread droughts. Southern Africa is faced by a number of weather and climate-related hazards, particularly cyclones, floods and droughts *(ibid).* The impacts and losses caused by these events are high because poverty and weak institutions make populations very vulnerable, with little capacity to prepare for and recover from these natural occurrences. Human-induced climate change has caused an increase in the frequency and intensity of extreme events as well as gradual changes in the rainfall and temperature patterns (*ibid)*. This is expected to continue to varying degrees under different climate scenarios for the future.

People who live on semi-arid or arid lands, in low lying coastal areas, in water-limited or flood prone areas, or on small islands are particularly vulnerable to climate change (Waston *et al*, 1996). The prevalence of climate change has put the lives of those people living in semi-arid areas at stake, bearing in mind that as much as these areas are already dry they are becoming drier due to climate change.

Zimbabwe has not been left out of the effects of climate change. Climate change is one of the major threats to the development of rural Zimbabwe, and without wide-ranging adaptation strategies the challenge it presents cannot be met. It is one of the major challenges that is impacting sustainable development, food security and poverty reduction in the country. Considering the importance of agriculture in Zimbabwe climate change poses a risk in agriculture production. The most dangerous aspect is the fact that on its own the agricultural

sector in the country is already facing problems of providing a sustainable livelihood for the growing rural population, let alone to ensure national food security. The coming of climate change will strain more the agricultural sector with dreadful effects. According to Wilhite, D.A (2005), critically, the window of opportunity for investment in agriculture is restrained due to the potential impact of climate change in minimizing viable options for rural development.

Zimbabwe for the past years has been experiencing high temperatures like the rest of the world. According to Zimbabwe.com, "on 24 October 2011 Zimbabwe experienced hottest temperatures in almost 50 years; with temperatures soaring to 42 degrees Celsius. Places like Lupane recorded highest temperatures of 41 degrees Celsius which were last recorded in 1962. Temperatures in Plumtree and Tsholotsho also rose above the previous records of 1962 with the mercury hitting 39 degrees in Plumtree and 42 degrees in Tsholotsho. Rusape and Harare were not exempted from these high temperatures for they both recorded a temperature of 35 degrees Celsius (Newzimmbabwe.com).

The reliance of the vast majority of Zimbabweans on rain-fed agriculture and the sensitivity of major sectors of the economy to the climate makes Zimbabwe particularly susceptible to climate variability and change. As already mentioned, Zimbabwe's climate is mostly semi-arid. The country lies in a region with limited and unreliable rainfall patterns. Climate change in Zimbabwe has greatly affected the semi-arid regions with frequent droughts being felt more in dries regions iv and v. According to Manyeruke C, *et al* (2013), Zimbabwe's agro-ecological zones have shifted drastically due to the devastating effects of climate change and global warming. He states that according to a research that was carried out by Mugandani

(2012) major shifts have occurred in the drought prone regions IV and V which have become drier that previously experienced. Climate change has resulted in the shrinking of the natural regions whereby region II is said to be shrunk by 49% while region II has shrunk by 14%. Manyeruke C *et al* (2013), state that the dry regions, that is, region IV and V have expanded by 5, 6% and 22.6%. This is an indication that the climate in Zimbabwe is now changing for the worse and is now affecting agricultural production.

Other effects of climate change can be witnessed in the country's increasing variability in rainfall patterns and increased and extremity of droughts and floods. According to Magadza (2008), Zimbabwe has experienced more recurrent drought and flood episodes in recent times. According to Mugabe (2010) by the end of the twentieth century, Zimbabwe was a warmer and drier country than it was at the beginning. Annual mean temperatures had increased by about 0.4 degrees Celsius since 1900, and rainfall had declined by nearly 5 percent across the country. The 1990s were on record as the warmest and driest decade of the century. Temperature analysis results from meteorological stations in Beitbridge, Bulawayo and Harare indicate a rise in daily minimum temperatures of around 2.6 degrees Celsius in the last century *(ibid).* The number of cold days is decreasing at a rate of about fifteen days per 100 years. Further, six of the warmest years on record have occurred since 1987 (*ibid)*.

It has come to the attention of most researchers that, more than 80% of Zimbabwe is subject to conditions which make dry land cropping a risky undertaking because of low and erratic rainfall (Gambiza and Nyama, 2000). Agriculture has always been the most important economic activity in Zimbabwe, with about 60% of industry being agro-based with maize as the main cultivated crop (Rukuni, 1994).Furthermore, in previous years, the agricultural

sector consumed about 20% of total output of industry (CFU, 2000). The agricultural sector employed a large proportion of the country's labour force and contributed about 18% of GDP and 40% of export earnings annually in a normal year. Noteworthy is that about 70% of the population is dependent on farming for a livelihood (CFU, 2000). With the emergence of climate change some areas that were regarded as agricultural zones are no longer yielding any positive results. Given such a situation, climate change is likely to determine the future of many Zimbabwean people countrywide who strongly depend on agriculture.

In other words, global climate change raises major dilemmas for developing nations such as Zimbabwe mainly because of their dependence on rain-fed agriculture. It is imperative to state that agriculture is important for food security in two ways. Firstly, it produces the food people eat. Secondly, it provides the primary source of livelihood for 36% of the world's total workforce (Garcia 2008). If agricultural production in the low income developing countries of Asia and Africa is adversely affected by climate change, the livelihoods of large numbers of the rural poor will be put at risk and their vulnerability to food insecurity increased (FAO, 2008). Agriculture, forestry and fisheries are all sensitive to climate. Their production processes are therefore likely to be affected by climate change. An average of 500 weather related disasters are now taking place each year, compared with 120 in the 1980s, the number of floods has increased six fold over the same period (Oxfam 2007). Such evidence indeed shows the negative effects of climate change on agricultural production.

The fact that climate change is an irreversible process makes climate variability a recurring topic and calls for the dire need to adapt to it especially among many people who have become vulnerable. It has become common knowledge that the poor people will be hit

hardest by climate change due to obvious reasons. For instance, it appears clear that vulnerability to climate change is closely related to poverty, as the poor are least able to respond to climatic stimuli. It has also become common knowledge that capacity to respond to climate change is lowest in developing countries' semi-arid areas. Certain regions of the world are more severely affected by the effects of climate change than others. Generally speaking, vulnerability and adaptation to climate variability and change are urgent issues needed in Zimbabwe's semi-arid areas.

The urgency to address the climate change phenomenon is evidenced by the situation prevailing in Zvishavane district which is in the part of Zimbabwe. Semi-arid Zimbabwe experiences frequent droughts and dry spells during the growing season, making rain fed cropping risky. In some years the rains start early whereas in others they arrive late. An abrupt end of the growing season in semi-arid parts of Zimbabwe has been experienced in some years (Mupangwa, 2008). This annual variability makes the selection of crop types and varieties and planning of planting dates critical, yet also difficult, for successful cropping in rain fed systems (Hussein, 1987, Kinsey *et al*, 1998, Raes *et al*, 2004). Crop yields are often reduced significantly due to the late start and early cessation of the growing season. This is further complicated by the occurrence of long dry spells during the January to February period when most crops are in their vegetative and reproductive growth stages.

It need to be highlighted that climate change is irreversible so it therefore poses as a major risks compared to other factors that can be corrected. The climate in Zimbabwe has changed in the past years with the most effect being felt in the already dry regions IV and V where Zvishavane, the area under study is located. According to Mugabe (2010) "In Zimbabwe

sectoral impacts are beginning to be witnessed on the environment due to exposure to extreme events resulting in droughts and floods and the expansion of semi-arid areas". For example some shifts in natural regions have been noted at stations such as Chinhoyi, Chibero and their surroundings which were formerly in natural region II but are now classified under natural region III (Mugabe 2010). The size of natural region I has been reduced, while natural region II has been pushed further east and natural region III has shifted slightly upwards with Kwekwe and surroundings now classified as natural region IV (*ibid*).

From what has been mentioned above it can be seen that the major negative impact of climate change in Zimbabwe is the erratic rainfall pattern that has led to recurrent droughts (Dube, 2008). As already mentioned about 70% of Zimbabwe's population derives its livelihood from subsistence agriculture and other rural activities, but these livelihoods are threatened by climate change. Climate change is one major contributory factor that has affected agricultural production which in turn has reduced food security in Zimbabwe. The agricultural sector's reliance on seasonal, rain-fed cultivation makes the sector particularly vulnerable to climate variability and change (Andear, 2009).The country is prone to drought which has become more frequent in the past decade (Andear, 2009). Climate change is now posing a threat to food security through erratic rainfall patterns and decreasing crop yields, contributing to increased hunger. Furthermore, adverse climate change impacts on natural systems and resources, infrastructure, and labor productivity may lead to reduced economic growth, exacerbating poverty. This can be summarized out by Manyeruke S *et al* (2013) who state that despite other factors that have affected Zimbabwe's agricultural sector such as agrarian land reforms, climate change has played a major role in destabilizing food production in the country. It has worsened drought and dry spells in the country.

1.3.2 Geographical location and Drought

Accessibility and availability of food has greatly been incapacitated by the droughts that are prone to Zimbabwe's semi-arid areas like Zvishavane. One major negative effect of climate change in Zimbabwe's semi-arid regions has been recurrent droughts that have grossly affected agricultural production and food security. They resulted in poor or failed harvests which in turn resulted food scarcity and high prices of the available food. Drought is a chronic problem in sub-Saharan Africa and the most important factor affecting livelihoods of the people in the region (Hagman, 1984; Sear, Campbell, Dambe & Slade, 1999; Wilhite *et al.*, 2000). International Strategy for Disaster Reduction (ISDR), 2002 states that drought is a normal, recurring feature of the climate and occurs virtually in all climatic regimes in high as well as low rainfall areas.

It is a consequence of a natural reduction in the amount of precipitation received over an extended period of time, usually a season or more and is also related to timing and effectiveness of the rains such as delays in the beginning of the rainy season, occurrence of rains in relation to crop growth stages, rainfall intensity and number of rainfall events (Wilhite *et al.*, 2000; Wilhite, Hays & Knutson, 2005).Concern is now growing that drought might become more frequent in the region as a result of global warming (Sear, *et al.,* 1999; ISDR, 2002; Bang and Sitango, 2003). If this occurs it will exacerbate problems for vulnerable households, communities and economies. Drought has actually caused more socio – economic damage than any other hazard in the whole world (Wilhite, 2000; Wilsner, *et al.*, 2004). Because of the recurring drought over the years compounded by other limiting factors of production, most households have become food insecure and most vulnerable cases are found among women, elderly persons and child headed and/or with chronically ill person (WFP-Plan, 2009).

In Zimbabwe, the incidence of drought has worsened since the 1980s due to climate change (ISDR, 2002). Severe droughts in 1980s, 1990s, and 2000s to date, have significantly reduced agricultural production and disrupted national economies (Sear, *et al.,* 1999). The 2001-2002 drought worsened this situation and was a contributory factor to a drop in agricultural production. Floods that frequently occur in the northern and southern provinces of the country, compound drought conditions in other parts of the country (ISDR, 2002). Given that agriculture is the mainstay of development it becomes worrisome as to how much is going to be acquired in the presence of drought. The main impact of drought is on livelihoods of those who are depended on agriculture.

Drought has worsened up the gaps of vulnerability to food insecurity on rural livelihoods. Recurrent droughts have opened gaps of vulnerability among the majority rural people who largely depend on rain-fed agriculture. To be realised is that some people are more prone to damage or loss in the face of a different hazard and variations in impact are also a result of differences in wealth, caste, ethnicity, gender, health and physiological status, disability and age, immigration status and types of social networks (Dercon, 2002). According to Wilhite (2000), vulnerability is a function of factors that influence the degree to which someone's life, assets and livelihood are prone to damage by a discrete and identifiable hazard. Vulnerability is a function of social, economic and political processes that determine how a hazard event would affect people in varying ways *(Ibid)*. IPCC (2007) define vulnerability as the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity (IPCC, 2007).It needs to be pointed out that

vulnerable people are those that find it difficult to reconstruct their livelihoods following a disaster such as drought. In general the poor suffer more from drought than the rich (Wisner, *et al.*, 2004).

In Zimbabwe droughts have become frequent especially in drier regions. Zvishavane is one area which has been affected by drought. Climate change and droughts have opened up wider spaces of vulnerability and the most affected have been the rural population that depends on agriculture. The rural people have been exposed to minimum rainfalls which have affected their maize yields and increased levels of poverty and malnutrition compromising food security. This has decreased production yields automatically reducing availability and accessibility of food. Effects of climate change have made it difficult for the rural people to have any food from their fields. Surplus yields have become difficult to attain with accessibility to purchase food, send children to school being affected in the process.

1.3.3. Fast Track Land Reform Program and its effects on food security

Policies have a huge impact on food security and livelihoods of the people in a country. They have the potential to improve a country in terms of economic, social, cultural, political and if they are not adequately implemented they can harm the poor at large. The problem with policies arises when the focus on policies, structures and institutions is put above that of the people themselves. When policies are not inclusive in their design they tend to handicap the exempted lot by providing barriers. Policies that have been undertaken by the government of Zimbabwe have contributed to the food insecurity that is being witnessed across the country. The policies have handicapped the economy and handicapped the agricultural sector which has affected the entire population at large. The Fast Track Land Reform Program (FTLTP) is one example of a policy that has failed. The FTLRP has negatively affected all the four

pillars of food security. According to Mudzonga (2009), the human rights violations and political tensions around the land reform have often obliterated the fact that a meaningful land redistribution, accompanied with relevant financial and technical support to resettled farmers, was essential to eliminate poverty and food insecurity in a country suffering from a highly skewed land repartition

According to Ignowisk (2012) another cause for Zimbabwe's food security challenges has been the fast-track resettlement program, which started in 2000 as an extension of the land reform that began in 1979. Before this program, Zimbabwe had a thriving agriculture sector and was a net exporter of food. It was considered as the bread basket of Africa. Food was accessible at most of the times and it was stable. The majority of the agricultural production was large, commercial, and owned by white farmers. This production brought money into the country and produced most of the country's food. But in 2000 this option for compensation was taken away and farms were taken away, often very violently, and redistributed. Although land ownership was much skewed before this reform, however, there was no training or education involved in the redistribution this land. Overall the agricultural production in the country severely declined along with the economy as a whole. Now Zimbabwe is a net importer of food with a poor economy. Simply having access to food and being able to afford food has become a difficult task for many Zimbabweans. Consequently, the land reform has resulted in a dramatic drop in food production and export earnings, which have induced food shortages and reduced Government's financial capacity to address them through commercial imports

The outcome of Zimbabwe's Land reform, particularly the Fast Track Land Reform Programme (FTLRP) of 2000 has shown that it was a shallow exercise that has highly created

spaces of vulnerability to hunger and famine to a greater extent. Instead of adequately addressing the imbalance of land perpetrated by the whites during colonialism, the FTLRP, basically worsened food insecurity in Zimbabwe and further expanded gaps for exposure to hunger and poverty. Land reform was divided into phases with the Land Reform and Resettlement Programme (LRRP 1) of 1980-1996 as phase one, which maintained agricultural production as it remained high. For instance, under LRRP 1, agricultural production continued to be the most important economic sector, accounting for 40% of GDP and employing 70% of the population thereby fostering food security (Cliffe, 1988).

Under the LRRP, Zimbabwe showed some progress in agricultural production. It was grounded on the understanding that land redistribution was a necessary prerequisite to correct colonial injustices. Bearing this in mind, agriculture production continued to be promoted. Lebert (2012) reiterates that the LRRP's goals were to, "create political stability and an acceptable property rights regime; to promote economic growth through wider equity and efficiency gains from land redistribution; and to foster national food security, self-sufficiency, and agricultural development through labour-intensive small-farm production, optimal land productivity, and returns to invested capital". The LRRP has been viewed as a well-planned, carefully organized and lawful manner as growth was witnessed during its period and the country was food secure.

This was however short-lived with the implementation of the FTLRP which began with the fast acquisition of white settler farms by the native blacks, perpetuating low agricultural production within a few years. The way land acquisition was applied in the 21st century has had downstream effects on food security and self-sufficiency of food production. The FTLRP

was done for the wrong reasons, it was unplanned, and it was more of a political gimmick rather than an economic and social motivated programme. Instead of promoting food security and alleviating hunger to the poor landless Zimbabweans the programme brought with it confusion, instability, violence, poverty, unemployment, worsened corruption and increased vulnerability to famine and food insecurity. All of these factors clearly stipulate how the four pillars of food security were affected by FTRLP. Unemployment worsened food stability as most rural people lost their jobs on the commercial farms that were grabbed. This in turn affected food availability, access and utilization. Hence the FTLRP impacted negatively on the people's livelihoods and increased their risks to hunger and famine.

This was totally opposite to the FTLRP which was more of chaos than order. The FTLRP was carried out at a spur of the moment and did not consider the implication of its action on a wider scale and future term. In fact, the implementation of the FTLRP triggered food shortages in the country thereby forcing the government to purchase food from its neighbours and depend on the donor community. Accordingly, the FTLRP coincided with an abrupt fall in agricultural production leading to food insecurity in the country. To this end, it would be correct to point out that the post 2000 era was characterised by inadequacy of food and absence of food on the market, lack of supply with variations and shortage from one season to another, un-affordability and poor quality of the available food (Hove, 2012).

One can give an example of the famous food shortages of 2008 that became widespread in the county. Even the UNDP (2002) acknowledged the impact of the land reform when it asserted that, "the FTLRP posed a threat to national agricultural production and food security in the short term, and made the provision of essential public infrastructure for settlers impossible to achieve within a reasonable time frame".

The replacement of the willing buyer- willing seller agreement with the rushed FTLRP, was negatively affected by a situation which saw no particular selection criteria for beneficiaries for the programme being considered, as war veterans mobilised villagers and urban based groups to occupy farms, with the support of the government. The ruling party adopted a slogan "Land is the economy and the economy is land" (Chitsike, 2003). Land became a prize to gain support where supporters were rewarded with large portions of land. Instead of land being regarded as more of an economic issue meant to enhance food security, land became a political tool meant to garner support for the ruling party ZANU-PF. Bearing this in mind the FTLRP has been detrimental to Zimbabwe's agricultural system and has negatively affected the once bread basket of Southern Africa (Hove, 2012). Unlike the LRRP, the FTRLP involved the acquisition of land from white commercial farmers for redistribution in a process marked by considerable coercion, violence and general lawlessness. The FTLRP also brought along challenges as evidenced by lack of social services provisions such as water, well-resourced schools, health provisions and land degradation caused by rampant cutting of trees.

Food security the area of concern in this study has been negatively affected by FTLRP. The issue of food security has largely been undermined by FTLRP as agricultural output declined substantially during 2001-2002 (Magaramombe, 2003). The 2001-2002 drought worsened this situation and was a contributory factor to a drop in agricultural production. Even if a drought had not occurred, with the implementation of FTLRP a decline would have been inevitable. Following a 21 per cent drop in output in 2001, it was predicted that output might drop by 40 per cent in the 2002-2003 season (Wright, 2002). For instance, tobacco production dropped from 236 million kg in 2000 to 165 million kg in 2002, and there were fears that it may slump to 75 million kg in 2003. When 65 per cent of 700 wheat farmers

were served with eviction notices in January, this implied that wheat production in 2002 would be cut by up to half, to 115,000 tonnes (Ibid). Maize and livestock production also declined sharply. One study concluded that agricultural exports had declined owing to disruptions associated with the fast-track programme (UNDP, 2002). The ripple effects have been felt widely in the economy with further contraction predicted for 2003. The presence of drought as a contributory has only been used to dismiss the negative impact of FTLRP. Output of agricultural production was reduced by the sudden evictions given to the whites who had been the ones mainly producing food at the national level.

Marongwe (2008) posits that national food access was curtailed. He indicated that national data from the Poverty Assessment Study Survey of 2003 shows an increase in the incidence of poverty across the country. He also indicated that the Joint Donor Review Food Aid Report articulated that "between 29% and 72% of the rural population were at risk of severe food shortage triggered by drought but exacerbated by land reform, sub-optimal economic governance, and worsening poverty, among other factors". Indeed, before the FTLRP in 2000, Zimbabwe from a national standpoint was food secure, with farmers producing adequate grain to fulfil the country's requirements even during droughts (Hove, 2012). So one can articulate that the FTLRP opened up spaces of vulnerability to hunger and famine as it greatly affected food production.

In most cases, land was given to ZANU PF supporters and people connected to those in power. There was no effort to vet the farming credentials of the beneficiaries or their farming capabilities to determine the size of the farm and regions to resettle them. Most of the new farmers were just happy to own a new farm but they didn't know what to do next nor did they have the farming equipment and skills to produce on a large scale. It was not until 2003 that

the Government set up the Charles Utete land audit commission to investigate irregularities of the land reform exercise (Utete, 2003). Several senior government and ZANU PF officials were found to be multiple farm owners. According to Mutubuki (2003), an estimated 90% of the farms acquired under the A2 model are under-utilised or simply operating below their potential. Many beneficiaries under the fast track programme are poor and lack the farm management skills and wherewithal to do little more than engage in subsistence agriculture".

Mutangi (2010) asserts that many scholars of land reform have argued that FTLRP has had a lot of effects on farm labour, ranging from loss of employment to displacement of people. Hence, food insecurity can also be widened to encompass loss of employment ignited by the eviction of commercial farmers together with their workers from farms (Hove, 2012).This resulted in loss of income for these workers and led to hunger particularly at the family level. This has negatively affected the livelihoods of the workers and has resulted in most of them resorting to casual labour under a more flexible hiring and firing system (Sachikonye 2003). In addition, industries which rely on agricultural produce such as tobacco and cotton were heavily affected with most of them compelled by shortage of raw materials to shut down. Subsequently, most ordinary people were left susceptible because they had no sustainable sources of income and were therefore unable to buy food from the market.

The problem with the FTLRP was that it got too political. Despite overwhelming demand for land distribution, land should not be politicized. Such actions in the long run will definitely result in unintended results such as famine and environmental degradation. Bernstern (2002) further asserts that the recent comparative political analysis of land redistribution plans have also tended to treat the Zimbabwe FTLRP as an odd abnormality, machinated for narrow political ambitions or electoral dominance reasons. A distinction must be drawn between the

relationship between land and politics and the politicization of land. Whilst the former is inevitable and part of governance, the latter is counter-productive and sows seeds of future conflict. Hence it can be argued that an unplanned and unsustainable agrarian reform serves the political and economic interests of few people whilst sacrificing both the present and future generations to severe food and environmental problems. Instead of ensuring a speedy land transfer to the blacks, the FTLRP posed detrimental effects on the country's food security. According to Moyo (2002), the government of Zimbabwe used the unplanned land reform as a strategy for political expediency because 'the FTLRP was launched shortly after the ZANU PF government which has been in power since independence in 1980 experienced its first major defeat in a national referendum held to change the constitution.'' As such, the government was forced to further its political interests of re-invigorating its support base at the expanse of socio-economic objectives which include poverty alleviation.(Marongwe, 2000).

The Zimbabwean case has shown that, an insecure regime can use land as a political tool for short term political gains with long term consequences on human or food security. It is important that planned, sustainable and apolitical land reforms be carried out to improve food security in countries where land is a contentious issue. Politicization of land may lead to three problems namely underutilization of land, abuse of land and illegal hunting activities leading to the depletion of wildlife. Land reform in Zimbabwe resulted in land being given to the wrong people. If it was given to the right people then Zimbabwe would have remained a bread basket. Notably the people who have largely been affected by the FTLRP are none other than the rural smallholders' farmers. The issue of food security has largely been undermined by FTLRP as agricultural output declined substantially during 2001-2002 (Magaramombe, 2003). In a context of high political tensions and strong criticism over the

way the land reform has been conducted, food and agriculture have been politically charged in Zimbabwe: the Government is on the one hand held responsible for the food shortages and on the other hand accused of not addressing them properly because of inefficiency, politicisation and discrimination of the public food distribution system and Government's obstructions to foreign aid (*Ibid)*.

1.3.4 Environmental problems/ Poor and Depleted soils

People depend on the environment for almost all their necessities. This means that the environment, having this vital role should be conserved for the continued survival of the human race. For example, the land is used for agricultural purposes and food is obtained from it. The forests provide fruits, fuel-wood and construction poles. The environment needs great care if people are going to continue getting their means of production from it. However in Zimbabwe environment degradation has been on the increases which in turn has increased to food security as rural production yields have been affected. Environmental degradation caused by soil erosion, desertification, deforestation and inappropriate agricultural practices is a major threat to agricultural sustainability. It is estimated that 80 percent of rangelands and rain-fed croplands in southern Africa are degraded (Abalu and Hassan, 1998). Rural livelihoods are affected as the majority of the poorest people continue to live in rural areas depending on agriculture for their livelihoods where environmental degradation, erosion of natural resources and biodiversity loss are challenging their ability to cope with and adapt to climate change and to ensure food security (IFAD, 2010).

According to the Environmental Liaison Forum Report of 2005, environmental degradation is one of the leading effects of the failure to adequately address food security in Zimbabwe to date. Environment in the country has been affected mainly by the FTLRP and climate change.

The FTLRP has led to environmental degradation considering that in most cases where poor people were resettled there was no alternative source of energy. People were left with no choice but to engage in indiscriminate cutting down of trees for domestic chores. To aggravate the environmental degradation the government instructed the new farmers not to construct permanent dwelling structures on the acquired farms. Only the political heavyweights in ZANU PF occupied farm houses built by the fleeing white commercial farmers. The consequence was as predictable as it was calamitous. The new settlers went on a rampage, cutting down trees to build temporary shelter on the acquired farms. It is not only trees that were decimated. They also dug large mounds of earth to fill gaps in their temporary wood dwellings. All of this affected food production as soils became less fertile which in turn meant that agricultural production was restricted.

Furthermore, gold panners have been on the increase in Zimbabwe. Prior to the 2000 land invasions, Zimbabwe had about 320 000 farm worker households, of which 200 000 households had been evicted from the farms along with the white farmers by the end of 2002 (Sachikonye 2003). Some of these displaced households ventured into gold panning along river banks to earn a living. The resettled people also found themselves panning gold and other precious minerals both on the farms and along river banks. This number has increased over the years as the economy continued to shrink, turning majority of the jobless Zimbabweans to illegal mining of gold and the recently discovered diamonds in Marange District, Manicaland. Land resettlement far from putting Zimbabwe on a developmental path has thrust it onto a minerals-driven resource path, whereby the economy continues to de-industrialize. The involvement of people in the mining sector is an illustration of the negative effects of which left people who once had the means of production stranded and with no way of surviving and being forced in the dangerous mining business.

Land resettlement far from putting Zimbabwe on a developmental path has thrust it onto a minerals-driven resource path, whereby the economy continues to de-industrialize. The involvement of people in the mining sector is an illustration of the negative effects of which left people who once had the means of production stranded and with no way of surviving and being forced in the dangerous mining business. This has affected the environment as land that is meant for farming is now only empty trenches as miners dig up pits looking for minerals. These pits are usually left uncovered and trees are being cut in search for minerals as a means for survival. In addition the business of mining has affected labour as men have left their rural homes to become 'makorokoza' leaving farming to women and children who usually can only farm a small piece of land leading to inadequate use of the land. This has affected the stability of food production in these households as the homes can now no longer produce enough food that they would have produced if the whole family members had been present.

1.3.5 Inadequate support systems

In addition, agricultural productivity also remained low as a result of a number of other factors which include lack of farming inputs in the form of suitable seed varieties, limited farming equipment and farming expertise, labour shortages among other aspects (Moyo and Yeros, 2006). Most of these factors have been caused by the rushed FTRLP which did not consider that giving farms to people with no expertise in farming on a national level will affect food production. Most people who were given communal farms were used to produce at the family level and not on a large scale. So in the end these farmers continued to produce for their families instead for the nation which greatly incapacitated the food production in the country. To aggravate the situation, a significant number of the occupiers of the commercial farming areas did not take farming seriously leading to a decline in food production (Kojo, 2008). This is shortened by Hellum (2005) who argues that the main problem of FTLRP that

led to food insecurity was that the land resettlement switched resources, workers and capital, from a relatively high-productivity commercial farm sector, able to develop agribusiness linkages with manufacturers and retailers in Zimbabwe and abroad, to a low productivity, smallholder sector where the difficulties of building such links are far greater. Zimbabwe became an importer instead of the exporter it once was. Chimhowu (2007) indicate the FTLRP of 2000 contributed to a deepening of rural poverty in the country. He asserts that success of agriculture depends on a number of factors such as skills development, financial and technical advice. These were limited in the FTLRP.

Climate change has also led to soil infertility which has greatly failed to support the growing of other crops that require soil fertility. According to Manyeruke C *et al* (2013), the soils continue to degrade leading to a reduction in the productivity of the farms. Some of the causes of soil fertility depletion in Africa include the limited adoption of fertilizer replenishment strategies and soil and water conservation measures; the decline in the use and length of fallow periods; expansion of agricultural production into marginal and fragile areas; and the removal of vegetation through overgrazing, logging, development, and domestic use (Ibid). Other causes include rapid population growth, limited access to agriculture-related technical assistance, and lack of knowledge about profitable soil fertility management practices leading to expansion into less-favourable lands.

Droughts and dry spells have also made smallholder farmers to be expected to rely on irrigation schemes if they want to produce good yields but unfortunately most of these farmers do not have the money to purchase the required equipment and the much needed fertilizers. Serigne T, *et al*, 2006, state that there is an overall decline in farm input investment including fertilizers, seeds, and technology adoption. Access to fertilizer use is

constrained by market liberalization and trade policies that increase fertilizer prices relative to commodity prices, limited access to markets and infrastructure, limited development of output, input and credit markets, poverty and cash constraints that limit farmer's ability to purchase fertilizer and other inputs. So all in all the FTRLP, Climate change, and drought have all worsened the agricultural production in Zimbabwe. This in turn has led to food insecurity with most pf the rural population being forced to depend on donors for food in order to survive.

1.3.6 HIV/AIDS

The Human Immune Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) epidemic is a global crisis with impacts that will be felt for decades to come. More than 28 million people have died since the first case was reported in 1981 (Gillespie, 2006). In 2005, AIDS killed 2.8 million people, and an estimated 4.1 million became infected, bringing to 38.6 million the number of people living with the virus around the world; 24.5 million of these people live in Sub- Saharan Africa where in some countries one in three adults are infected and 8.3 million live in Asia (UNAIDS 2006). The Food and Agriculture Organization of the United Nations (FAO), estimates that by 2020 the epidemic will claim the lives of 20 percent or more of the population working in agriculture in many Southern African countries (Mwaniki, 2011). Notably, AIDS epidemics are most severe in the region of the world where food insecurity is most severe, Sub-Saharan Africa, although there are significant differences between countries (Gillespie, 2006). Zimbabwe is not exempted from this pandemic.

One major negative impact of HIV/AIDS is that it does not only reduce the man-hours available to agriculture and household food acquisition, but also increase the burden of household in acquiring food (Mwaniki, 2011). High levels of HIV/AIDS in a country are an

indicator that food security is predominant in a country as it is usually common in underprivileged households. One can give an example of the economic meltdown that Zimbabwe experienced in the late 1990s and how it has affected food security as it led to unemployment which in turn affected all the four indicators of food security. This has led to individuals looking for jobs in the informal sector like gold panning especially in Zvishavane as a means of survival. This has increased the numbers of HIV particularly in rural areas and poverty stricken homes. According to Khozombah (2005) the link between poverty and HIV risk may be mediated through the need to move in search of work. Men tend to live away from home for long periods, increasing the chances of both partners engaging in commercial sex *(Ibid)*. The links between livelihoods and risk suggest that HIV is an "occupational hazard" for particular economic categories of people (Bryceson and Fonseca, 2006).

Some scholars have gone to the extent of stating that HIV/AIDS is not very threatening compared to the hunger which most households face. In fact it is hunger, which is contributing to the rise in HIV infections (Bryceson and Fonseca, 2006). Therefore food insecurity, as an emergency within another emergency, makes the situation much more complex and therefore requires a multifaceted response. Furthermore it is clear that people living with HIV/AIDS are more prone to suffer from disease and death as a consequence of limited access to food, water and good hygiene than are people with functioning immune systems. In emergency situations, the AIDS epidemic presents an added risk and burden to the communities and households, as it builds upon and exacerbates existing vulnerability and impairs prospects of recovery (Gillespie, 2006).

HIV/AIDS has also worsened food insecurity especially in rural households who depend on manpower for agriculture practices. The disease which is a serious public health concern in

the sub-Saharan Africa has worsened food insecurity in two ways. Firstly, it reduces the available workforce in agriculture and secondly, it puts an additional burden on poor households. As has been highlighted above food security mainly at household level in rural areas in Africa is mainly determined by agricultural production and any disturbance in the area is likely to result in food insecurity. Labour is one important way that can bring about good production yields which will provide adequate food to the family. If this is disrupted the likely cause is less yields and less food for the family which will reduce availability, accessibility and stability of food. HIV/AIDS has the potential to reduce agricultural productivity in a number of ways. It increases the demands on a declining working population for food production. This exacerbates labour shortages at critical peak periods.

As one or more productive members of a farming household succumb to sickness and eventually die of AIDS the family is gradually impoverished due to costs incurred in purchasing drugs, prescribed special foods, time, transport to and hospital among other expenses. Such costs affect the household income that is supposed to be used in getting food for the family. This threatens the household food security. The epidemic affects sexually active individuals who also happen to be productive in various sectors of the economy. These active members tend to have strong links with communal agriculture through remittances for input procurement as well as needed investment in the sector. The epidemic kills after a long time such that by the time the victim die quite a substantial amount of expenses would have been incurred much to the detriment of the rural household. Furthermore the epidemic infects in pairs there by threatening the household heads that make crucial decision in enterprise selection. The availability of labour and the quality of labour is also affected since mostly the children would be left to do the work in the fields. The evolving food security crisis will also likely lead to the further spread of HIV/AIDS. The greatest threat is among

girls and women, in part because of the practice of transactional sex as a coping strategy but also because they are at risk of forced sexual relationships either through dependency or through increased exposure when forced to walk long distances to look for food and water. Finally, children, especially older girls, are vulnerable to sexual abuse when they are left at home by parents away searching for food or alternative sources of income. So all in all HIV/AIDS has been exacerbating poverty levels and economic decline through its impact on all sectors of the economy and all segments of the society, such as the loss of skills and knowledge, loss of manpower and human resources, increased burden for the State and the communities to deal with orphans and sick people as well as funerals

1.3.7 Other factors

Other issues that have contributed ton food security are corruption and political instability. Distribution of aid in Zimbabwe has been affected by high levels of corruption and political instability. Aid that is supposed to benefit the poor has being diversified into personal pockets leaving the poor with less and poorer. Another factor that has led to food insecurity is the economic decline being experienced in Zimbabwe. The policies undertaken by the government of Zimbabwe have led to unemployment, inflation, shortages of food to mention a few. One can cite the Economic Structural Adjustment Program of 1991/2 which affected the economy. This was followed by the 1997 crises which led to the 'black Friday' and the deflation of the dollar. The FTLRP of 2000 worsened all leading to an increment in food crisis in the country. All of these factors have worsened the vulnerability of the rural households who are more prone to the effects of bad policies. There is the need to come up with ways that can reverse the crisis and bring about sustainable development.

1.4 Ways that have been used to promote agricultural production by the Zimbabwean government

Unganai in CARE (2012) asserts that the question of whether or not climate change is happening is being replaced by the question of what we can and should do about the problem as climate shocks such as droughts, floods, cyclones and related problems such as food insecurity and infrastructure loss are on the rise. One thing that needs to be pointed out is that climate change is irreversible and the few opportunities that it comes along with should not be taken for granted. Community adaptation is a relevant way practical enough to help in dealing with this predicament. The government of Zimbabwe has come up with ways in trying to adapt to the changes in the climate which are leading to seasonal changes. According to Mugabe (2010) it has become noticeable that on the agriculture and food security sector, crop yields in marginal zones have become variable. Yields from rain-fed agriculture are expected to decline by up to 50% by 2020. Mugabe (2010) pointed out that, climate change introduces greater variability in maize yields. "There is a strong likelihood that climate change will make natural region IV a non-maize producing area. If it is such that natural region IV becomes a non-maize area then it means the situation within natural region V will be worsening (*ibid*).

Agriculture feeds the Zimbabwean population yet its survival in several semi-arid areas is questionable. Given that much of Zimbabwe's population is employed within the agricultural sector it becomes difficult as to whether Zimbabweans are going to be able to sustain themselves in the presence of this challenge. There is therefore the need to come up with ways that can deal with the effects of climate change like drought that are now taking place. In Zvishavane dry spells have become prominent with minimum rainfall affecting maize production leading to food insecurity. Droughts are affecting the rainfall seasons making it

questionable and unknown to the farmers as to whether they should plant early or late. People in Zimbabwe continue to grow crops like maize which are no longer conducive to the climate. More research on adaptation is required in Zimbabwe so as to promote agricultural production on which many depend upon. Adaptation will enlighten farmers on which crops to grow especially in a situation where there are variations in rainfall patterns. The Zimbabwean government have promoted issues like irrigation schemes, rainwater harvesting and small grain production the focus of this research. The next chapter will look at small grain production as one of the viable ways to combat food security in drought prone areas like Zvishavane.

1.5 Conclusion

The chapter has highlighted on food and security in Zimbabwe and the determinants that have affected food security and agricultural production in the country. The chapter has emphasised on agricultural production as the main livelihoods activity that many largely depend on. Issues like drought are posing a threat to food security as most of the crops that are being grown in semi-arid zones are no longer suitable to the climate in these zones. The only way that food security can be brought in these areas is through adaptation means that are in conducive with the climate in these areas. It ended by looking at ways that can promote agricultural production in this era of climate change bringing in the aspect of small grain production. The next chapter is going to dwell on these measures solely concentrating of small grain production as they respond well to hot areas.

CHAPTER 2

Small grain production in Zvishavane

2.1 Introduction

Populations in sub-Saharan Africa are at higher risk where livelihoods and 90% of staple food production come from rain-fed farming systems, 40% of all exports are agricultural products with crop production and livestock husbandry accounting for about half of household income (FAO 1999, Rosengrant *et al*, 2002). This may mean that by the 2080s, climatic changes are expected to place 80–120 million people at risk of hunger of which 70–80% of these will be in Africa (Parry, Rosenzweig , Iglesias, Livermore and Fischer, 2004) consequently worsening the state of food insecurity and malnutrition. According to Maunder (2006:13), 'food insecurity is a moral challenge, vulnerable starving populations have to be fed and yet the protracted relief programmes continue to make more people vulnerable and less productive'. There is a need to look for livelihood strategies that will assist in enhancing food security to rural livelihoods on a more permanent basis. Considering that most rural livelihoods depend on agriculture for sustaining themselves it is more logical that the strategies should directly involve agriculture. Small grain production is one way that can effectively bring about food security as an adaptation strategy in drought-prone areas and result in making food available and accessible at all times. FAO (2006) explains that for those farmers in dry regions their comparative advantage is in the production of small grains.

The main problem that is causing the continuation of food insecurity in drought-prone areas like Zvishavane is the fact that most rural people prefer to ignore the conducive crops to grow pertaining their geographical location. Rukuni *et al*., (2006) point that natural regions IV and V where most communal farmers reside and derive a living are too dry for successful crop

production in precise maize without irrigation but they continue to grow maize which is the preferred staple despite the low rainfall. In Zvishavane the rainfall pattern has been so erratic and mostly characterized by dry spells such that rain fed agriculture has become unreliable. Poor rainfall has resulted in rural households failing to harvest any meaningful produce, even those who harvested some grain; it was not enough to see them throughout the season resulting in food insecurity and stress as confirmed by reports from ZimVAC (2009). This has been the scenario since 2000 with 2008 being the worst year with high rates of food insecurity in the rural areas worsening food security. This chapter is going to look at Zvishavane area and small grain production. It is going to address the question of the need to adapt to small grain production and look at sorghum and finger millet, the main small grains produced in the area.

2.2 Zvishavane: case study

The study was conducted in Zvishavane district, a semi-extensive agro-ecological region (Vincent *et al,* 1961). Zvishavane is located in the Midlands region and is classified as belonging to region V and VI. Zvishavane is bordered by Mberengwa, Chivi and Shurugwi districts. Zvishavane is subdivided into 29 wards with 19 being rural. Activities that are mainly undertaken in the area include agriculture and gold panning. It is a mining town that boasts four big mining companies as well as several other small ones. These are Shabani, Mimosa, Sabi Gold and Murowa Diamond Mines. The companies mine gold, asbestos, diamonds and platinum. According to the 2012 population census, Zvishavane rural had a total population of 72, 513. The other names include Shabanie, Shavani. Water sources in the district include boreholes, dams, deep wells and rivers.

The Zimbabwe Vulnerability Assessment Committee (ZimVac) and CSFAM Reports ranked Zvishavane district as the most food insecure in Zimbabwe. It is estimated that about 51.7% are food insecure followed by Binga which host 49.7%. In Zvishavane the current levels of food insecurity are being attributed to various factors including adverse weather conditions, the unavailability and high cost of agricultural inputs such as seeds and fertilisers and projected high cereals prices due to the poor harvest (*Ibid*). Considering the fact that it is placed in the semi-arid zones, Zvishavane is prone to droughts and dry spells.

Zvishavane receives an average of about 450-600 mm of rainfall per annum and this year according to AREX Zvishavane, it managed to receive about 563mm. However in the past years the rainfall received has been much less due to droughts and dry spells. Most of the rainfall is received in summer that stretches from November to March. The mean annual temperature is 20 °C although high temperatures of up to 30 °C have been recorded during the hot months of October to December. Winters can also be extreme in some years reaching 5 °C in winter between May and July. Crop production is, therefore, risky except in certain very favourable localities, where limited drought resistant crops are grown as a side line (Vincent & Thomas 1961).

Rural household in the area continue to struggle with food insecurity primarily caused by extreme droughts. Rainfall in Zvishavane has been erratic such that in some areas like Mazvihwa rain-fed agriculture has become unreliable worsened by droughts that have gripped the country. This has resulted in most of the people in the area to fail to harvest any meaningful produce with ZIMVAC 2011 stating that even those who harvested some grain it was not enough to see them throughout the season resulting in food insecurity and stress (ZIMVAC 2011). This has affected household food security with many rural households

failing to fend themselves and their children. According to the District Drought Relief Committee 10 wards have greatly been affected by food security in the area and these are Matenda (2), Hombe (4), Mpirimira (6), Ngomeyebani (7), Mhototi (16), Shavahuru (19), Vukuso (10), Chenhanguru (13), Indava (15) and Mutambi (17).

Another issue that has contributed to low production yields of food production is the condition of the soils in the area. The soils in Zvishavane lack fertility and they continue to degrade and this is affecting food production. Mwaniki (2011) cites some of the causes of soil fertility depletion in Africa as the limited adoption of fertilizer replenishment strategies and soil and water conservation measures; the decline in the use and length of fallow periods; expansion of agricultural production into marginal and fragile areas; and the removal of vegetation through overgrazing, logging, development, and domestic use. She goes on to state rapid population growth, limited access to agriculture-related technical assistance, and lack of knowledge about profitable soil fertility management practices leading to expansion into less-favourable lands as also other prominent causes of soil fertility depletion. In Zvishavane most of the soil in the area lacks fertility and is sandy.

According to Nyamapfene (1991) the soils are sandy loam, predominantly derived from granite characterized by low agricultural potential due to low nutrient content, particularly nitrogen and phosphorous Elwell, H. A (2000) states that **t**hey have to be limed to correct for soil acidity and then fertilized to correct for low phosphorus and potassium levels. This sandy soil makes it difficult for the production of maize which requires more fertilizers and manure. However, in Zvishavane investment in improved soil fertility is low due to financial constraints. The farmers use limited fertilizer quantities because it is expensive as it is not readily and locally available. As fertilizers are expensive most of the farmers in the area

depend on manure if they expect high yields. For example Mrs Ganyani stated that they use anthill soil (*churu)* as manure as their soils are poor in fertility. Those who do not use manure will not harvest anything.

The Zvishavane area is largely populated with shrubs and sparse bushes. Most of the rivers are nearly dried up and are far from full. The main rivers in the area are Save, Mupeti and Runde Rivers. These rivers are the main ones that the local people depend on for sources of water and for their livestock. The frequent droughts in these areas has made the rivers to be far from full with Mupeti River nearly died up. This has affected livestock as their drinking sources and also affected the rural people as they depend on these sources for their household gardens. Although most wards have boreholes most of them are not working making people depend on river sources. Communities largely depend on boreholes and deep wells fitted with hand pumps for provision of safe water for home use.

These water points are also used for watering small livestock like goats and in some cases irrigating small kitchen gardens close to the water points. A community-based maintenance System supported by DDF is in place in Zvishavane to maintain the water points. Since communities indicated that broken down boreholes were not being repaired due to lack of money, pressure on the functioning boreholes was mounting and this also led to the breaking down of more boreholes as communities then moved to the next functioning boreholes. The DDF, which is poorly equipped and under-resourced in terms of human resources, indicated that it was not receiving enough funding to properly carry out its duties, which involve repairing of broken down boreholes and developing new water points. One can site cite an example in Nyama area where the borehole is not working making the people to depend on dried up rivers whereby they dig up holes in the rivers called '*mufuku'* and look for water.

For those who have wells most of them would have dried up soon as rainy season is over making them to also depend on river sources.

The government is also not helping considering that it had proposed to build Shave dam in the area in the 1960s but currently the project is still pending and with questions on whether it will be built. This has meant that doing household gardening is not an option either is owning many livestock as they are likely to die from drought. According to Livestock Department in Zvishavane, livestock losses due to drought ranged about 1300 cattle in the period 2012-2013. This stand to show the severity of drought in the area and how it's affecting the lives of many households. It needs to be known that water is life and without it life becomes extremely unbearable and most income generating activities will be affected.

In order for the rural livelihoods in Zvishavane to survive they are depending on irrigation schemes as a way of watering their agricultural produce. It will be safe to state that those who are surviving in the hot areas of Zvishavane are those who have irrigation on their homesteads. One can give an example of Mr Mpofu who stays near Mabasa turn-off who has many cattle and also uses irrigation equipment to water his crops and plants. His household is better off and one can see that most of his maize crops are green with other crops like cabbage being grown for sale. One can also give the famous example of Mr Phiri who resides along Runde River who is famous for water harvesting. As many households are poor it means that only a few have irrigation equipment leaving the masses to depend on rain-fed agriculture. Others depend on wells in their homesteads but these only fill up with water during the rainy season and dry up as soon as the season is over.

Consistence droughts in the area have not only affected the agricultural production but accessibility of food in general. Due to low agricultural production food has become less

accessible limiting also cash flow as most households depended on surplus yields for sale. This has led to most rural households in Zvishavane to depend on purchasing foods in local shops. The need and demand for basic commodities by the rural household has led to the local shops to seize the opportunity and increase the prices. For instance some basic commodities like sugar are little more expensive compared to town prices making these basics to be out of reach to most people. The poor, for example, can only afford to buy 2kgs of sugar per month while the better-off purchased 10kgs. This is the same with cooking oil whereby poorer households can go for longer periods without cooking oil. The prices for relish such as meat, fish and pulses are also prohibitive such that the poor's diet is composed more of vegetables from their gardens and the staple (sadza or maize porridge) even in good years. All the four pillars of food security have been disturbed by this leading to increased high levels of poverty and food insecurity.

This has led to the area being in the top six of the most food insecure districts in Zimbabwe. Non-Governmental Organisation are working hand in hand with the government in trying to increase food security in the area. Christian Care in conjunction with AREX has been assisting in giving food and seeds to the poorest houses with Christian Care assisting about 2000 households so far this year. In 2013 6000 households were assisted in the form of sorghum seeds with the Officers explaining on how to plant them and the positive impacts that they can have in enhancing food security. Adventist Development and Relief Agency (ADRA) also assisted in pursuit of the fight against food security in the area and it initiated a the World Food Program (WFP)-sponsored program called Seasonal Targeted Assistance (STA) from October 2013 to March 2014. The program was dealing with the most severe households who had no means of accessing food and were highly suffering from poverty and

malnutrition. About 34 634 people managed to benefit and they were entitled to 10kgs of maize, 2kg of peas and 0.75 kgs of vegetables.

In other words these are indicators of likely food insecurity in the area. The fact that all these households are receiving maize is an indication that they could not produce enough maize on their own farms hence the dependence on food aid as a means of survival. Small grain production now comes into play as a way that will stabilize food and at the same leads to accessibility and availability of food. Gukurume *et al* (2010) argues the reduction of food security and poverty has become one of the most compelling challenges of our time. The most viable way that can minimize food insecurity is the introduction of small grains. As 95% of all rural households in Zvishavane rural depend on agriculture, the best solution is to keep them in the agricultural field but with a change of crops. Instead of concentrating on maize the concentration should now be on sorghum and millet.

Research has shown that in these regions small grains have the potential of stabilizing household food security (Leuschner and Manthe, 1996). In Zvishavane production of the main staple maize continues to dominate in its semi-arid areas. This should stop and small grain production should start dominating. AREX in conjunction with Christian Care a Non-Governmental Organisation are working in Zvishavane area promoting the growth of small grains as a way of enhancing household food security. Sorghum and millet were chosen for this paper not only because of their importance to food security but also because of the major role of the study in increasing the sorghum and millet production in this region.

2.3 Small grain production in Zvishavane

Staple food grains are the first priority of the poor because their very lives depend on these foodstuffs. Yet, most dry land smallholder farm households do not grow the appropriate grain to feed themselves for the entire year, and shortfalls become even worse when drought hits, resulting in severe hunger and malnutrition, especially affecting women and children. There is the need to concentrate more on the suitable grain for maximum yields that will not be affected by hot whether hence the need for small grain production. Small grain are not a new thing in Africa and they are being produced in almost all the African countries. Sorghum and millet have been noted as staple food grains in many semi-arid and tropic areas of the world, particularly in Sub-Saharan Africa because of their good adaptation to hard environments and their good yield of production (Dicko *et al*., 2005).

That being the case Food and Agriculture Organization (FAO) and International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) (1996), Leuschner and Manthe (1996) agree that sorghum and millet have got the potential to contribute towards the food security of many of the world's poorest and most food-insecure agro-ecological zones. This can be achieved through increasing production and productivity of these crops in such agro ecological zones. To be noted is that sorghum; pearl millet and finger millet are indigenous African cereals and unlike maize are well adapted to African semi-arid and sub- tropical agronomic conditions (Taylor 2003).

According to Christian Care small grain production is not a new thing in Zvishavane. Small grains have been farmed in the area due to the dry spells and recurrent droughts that are common in the region. Mr. Shumba pointed out that the local peoples had a culture of

farming small grains around the 1930s. However there was a shift in the 1950s with maize taking over the small grain production. This led to a reduction of small grain production in favor of the maize production which is the main staple food in the country. According to Rukuni *et al* (1994) the area under small grains has been declining for the past years in semi-arid communal areas and at the same time the area under maize in the same areas has been increasing. It was realized that this was contributing to food insecurity in the region considering the fact that droughts are common and that maize production requires more rainfall compared to the minimum rainfall that the region is prone to receiving. Furthermore the effects of climate change have worsened the situation with the low rainfall affecting maize production greatly.

This trend has raised major concern to the policy makers and researchers hence various work has been done in order to reverse the situation since small grains are better adapted to the semi-arid areas than maize as maize is regarded as a high risk crop in these regions. According to FAO (2008), findings large parts of the SADC are semi-arid, with erratic rainfall and nutrient poor soils. While maize is the major staple that is grown in this region as a whole, sorghum and millet were found to be important crops in these driest regions where rural farm households have limited production capacity and lowest incomes (FAO, 2008). Sorghum and millet being drought tolerant have a strong adaptive advantage and lower risk of failure than other cereals in such environments. This led to the need to call for the shift back from maize production to small grain production around the 1990s up to the present. Chenje *et al* (1998) argue that the risk and uncertainty brought by climate change such as drought, encouraged society to engineer a variety of contingent responses to drought using a combination of options and diversification of crop varieties and livelihood strategies.

Household in Zvishavane are being urged to use coping drought strategies and concentrate on small grain production

Small grains consist of sorghum, finger millet, wheat, barley, finger millet etc. Farmers in Zvishavane have developed diverse adaptive and coping strategies which have become part of their livelihood systems to reduce vulnerability to drought stress. In Zvishavane the main small grains that are being produced are sorghum and finger millet. Crops like finger millet are more drought – tolerant and, therefore, insensitive to temperature rise which makes them attractive in drought prone areas like Zvishavane. Small grains have been noted by experts to be better performers in poor seasons and also in drought-prone areas and are considered to have better nutritional value than maize, which is viewed as an unsuitable crop in these agricultural regions. The farmers acknowledged that incessant dry spells that hit these regions from time to time have not in any way affected the production of the small grains, leaving it as the only solution to deal with the perennial dry weather conditions which are characteristic of this region. Taylor (2003), pointed out that considering that the country and the rest of the world are experiencing climate change, it was imperative for the farmers in this part of the country to engage in the farming of small grains which were tolerant to the harsh weather patterns.

Diversification to small grains production is important at household level as a way of increasing yields. AREX pointed out that growing small grains suitable in marginalized areas is one of the successful approaches for improving household food security.Research worldwide has shown that small grains like sorghum and finger millet have the potential to end food insecurity especially in semi-arid regions because of their good adaptation to hard environments and their good yield of production. These conclusions concur with those of

Taylor (2003) that sorghum and millets have the potential to improve household food security in semi-arid regions because of their adaptability to such environments. By concentrating on these crops households will have food to cater for their families unlike if they concentrate on maize production. Taylor *et al* (2006) expands on Dicko *et al*'s findings by describing sorghum and millet as generally the most drought-tolerant cereal grain crops that require little input during growth and with increasing world populations and decreasing water supplies, represent important crops for future human use.

The main reasons that have been given for the favourable of small grain production in Zvishavane is that they are tropically adapted C4 plants with high water use efficiency due to their morphological characteristics that reduce water transpiration for growth and yield of the crop (Rohrbach *et al*., 2007). They can endure long periods without rainfall and they also require less plant food hence they tend to mature early (*Ibid*). This makes them the conducive plant and best choices in drought prone-areas as they are drought tolerant. The reason why sorghum's yields are not affected by short periods of drought is because it develops its seed heads over longer periods of time, and short periods of water stress do not usually have the ability to prevent kernel development.

Rohrbach goes on to state that even in a long drought severe enough to hamper sorghum production, it will still usually produce some seed on smaller and fewer seed heads. Rarely will one find a kernelless season for sorghum, even under the most adverse water conditions. This is in total opposite to maize which requires rainfall especially in its early stages and minimum rain will result in stunted growth with no grain. Furthermore sorghum has the ability to hold water in its foliage compared to maize and it has a waxy coating on its leaves

and stems which helps to keep water in the plant, even in intense heat. The temperatures in Zvishavane will be favourable for the growing of sorghum and other small grains.

Another advantage of small grains is that they mature early and this fits in the current Zimbabwe climate. Najafi (2003), point out that short – season crops mature earlier than the maize varieties which normally takes a long time to mature. Mayhew & Penny, (2008) blatantly asserts that maize varieties dominant throughout the country by virtue of being the staple are too physiological and take between 90 to 200 days to mature hence during drought periods they do not do well as compared to small grains. In view of that maize production does not grow well in dry regions small therefore grains like sorghum and finger millet need to be prioritized as their potential to end food insecurity is far much greater. This can lead to household food security as its production can increase food availability and stability.

AREX and Christian Care are the two main advocates of small grain production in Zvishavane. Their main goal is to encourage the farming of small grains like sorghum and finger millet and also emphasize the advantages of these crops to the local people. Field days have been conducted in most wards as the staff try to teach people how to farm these crops and be able to produce more yields for a better effect. Mixed cropping has been encouraged as the organizations realised that people were reluctant to just shift all the way to small grain production. Therefore the local people are being told to plant a portion of maize, sorghum and finger millet and with time be encouraged to increase small grains productivity area. In the event that maize has failed, small grains can remain as a stable grain reserve. The local people have been given small grain seeds and fertilizers as a way of ensuring that small grains are planted. Farmers in the area have been appreciative of the information of small grain production for example Mrs Svovi of Mapirimira ward near Mapanzure clinic was

eager to plant sorghum and finger millet and dedicated about four acres on her 6 acre plot to grow these grains.

Small grain production has gone hand in hand with the promotion of conservation farming. Mutekwa (2009) noted that conservation tillage, for instance, is a useful option for improving the storage of rainwater in the soil and can help mitigate agricultural drought. Conservation farming has likewise promoted the introduction of small grains drought resistant crops like millet and sorghum and it is being taught to the locals as a way of protecting land and the soils. In Zvishavane there is what is termed Dhigaudye or dig and survive which has been emphasised as an ideal adaptation strategy to climate change and variability in most drought prone areas. It is a conservation farming method of trapping water and conserve soils and improve fertility. There has been the call for the promotion of zero tillage conservation together with planting of drought resistant crops as the antidote to food insecurity challenges. The main disadvantage of conservation is that most of the times it requires adequate draught power, appropriate machines and good training of farmers to be effect. Most of the local farmers are poor and don not have most of the equipment making it expensive.

2.3.1 Sorghum

Small grains (sorghum, pearl and finger millet) are ranked second as staple cereal crop after maize in Zimbabwe. As previously mentioned two main small grains that are farmed in Zvishavane are sorghum (*mapfunde)* and finger millet (rapoko/zviyo). Sorghum is one small grain that is farmed second after maize. According to Makiwa (2002), of all Africa's cereal grains, sorghum is the most important especially in drought prone areas. Two varieties of sorghum which are SV3 and SV2 are grown mainly grown in

Zimbabwe and this is the same in Zvishavane. It is a staple food crop for millions of the poorest and most food-insecure people in the semi-arid tropics of Africa, Asia and Central America. The crop is genetically suited to hot and dry agro-ecologies where it is difficult to grow other food grains. These areas are frequently drought-prone and characterized by fragile environments. It is crucial to a substantial portion of the millions who coax from their meagre and often declining lands barely enough to sustain life. For them, it provides the dietary energy and nutrients that make the difference between health and hunger. It can tolerate poor soils and thanks to some unique features of its anatomy, resist drought (*Ibid)*. It is usually grown without application of any fertilizers or other inputs by a multitude of small-holder farmers in many countries. This makes it perfect for the poor soil in Zvishavane.

Sorghum originated in northern Africa and has spread to many tropical and subtropical regions of the world. According to Carney (2003), it is an important cereal crop in marginal areas of Africa where other cereal crops such as maize would normally fail. Sorghum has been, for centuries, one of the most important staple foods for millions of poor rural people in the semiarid tropics of Asia and Africa (*Ibid)*. For some impoverished regions of the world, it has remained a principal source of energy, protein, vitamins and minerals. Its main strengths is that sorghum grows in harsh environments where other crops do not grow well, just like other staple foods, such as cassava, that are common in impoverished regions of the world (Gopal, 2006).

Sorghum is drought tolerant and heat tolerant, and is especially important in arid regions. It requires an average temperature of at least 25^0C to produce maximum grain yields in a given year. Maximum photosynthesis is achieved at daytime temperatures of at least 30^oC. For sorghum to be effectively produced the night time temperatures should not be below 13^oC for

more consecutive days as this reduce the potential grain production and the soil temperatures have reached 17^0C (*Ibid)*. The temperatures in Zvishavane go hand in hand with the production of sorghum as they are usually above 20^oC. Another feature that makes sorghum to be adaptive in Zvishavane is that it has a very large root-to-leaf surface area. The leaves have a waxy cuticle for protection and under water stress, the leaf margins roll up to reduce transpiration. Plants will go into dormancy if the stress is too great. This makes sorghum a very important crop for millions of poor farmers around the world.

Despite its benefits its production is still limited especially on a commercial level. Only about 20% of the sorghum is commercially processed, mostly for use as malt in the opaque beer industry (Leuschner and Manthe, 1996). It is practiced on a subsistence level with smallholder farmers being involved more in the field. Zimbabwe ranks at position 43 in the world in the production of sorghum producing 65.00 MT over 1000MT (DFID, 2013). First position goes to USA producing 9882.00 with Nigeria on number 3 producing 6500.00 MT, Sudan and Ethiopia are 5th and 8th, respectively (*Ibid)*. In rural Zvishavane, sorghum production is being practiced but is being done on a small scale. Large portions of land are still being dedicated to maize. This has made AREX to continue advocating for mixed cropping and hoping that with time it will interchange with sorghum being planted on a larger portion.

Among the 60 households that were interviewed 40% had planted sorghum. Most of these households are mainly concentrating in mixed cropping but there are dedicating more space to maize production. In the Nyama area few households planted sorghum and still giving maize a bigger portion compared to sorghum showing their preference to maize. In much drier areas of Mazvihwa are farmers are realising that sorghum responds well in their climate and it can provide food to them all year round compared to maize. In Mutambi and Mhototi

ward many households planted sorghum and are expecting good yields. They have no option but to farm small grains if they want to survive in the harsh climate of the area. One man in the area said

> '*zviri nani kutombowana chekudya ichocho pane kutoshaya zvamuchose'* (it is better to have something than nothing at all).

The response of sorghum in some of the wards is proving to be positive and the future is bright in the years to come if respondents are continuously shown the advantages of the crop and how it can contribute to food security on a larger scale.

2.3.2 Finger Millet/Rapoko

Millets are an agronomic group of hardy, small seeded cereals important around the globe for food and fodder. Among cereals, millet ranks 6th in world area production behind wheat, maize, rice, barley and sorghum. In sub-Saharan Africa it is the 3rd most widely grown crop. Africa produces 56% of the world output, of which 99.9% is produced in sub-Saharan Africa (FAO, 2013). The top world producers are India, followed by Nigeria, Niger and Mali. These three African countries alone make up 70% of sub-Saharan Africa's production (*Ibid)*. There are about 5 species of millet which include foxtail, barnyard, proso, finger and peal millet (Evenson, 2003). Among them two are mainly grown in Zimbabwe which are pearl and finger millet. Pearl millet originated in Africa and is the hardiest and most important staple food among the millets. It can survive the hottest climates and driest regions, making it a staple food of many poor people. Finger millet also originated in Africa in and it originated from Ethiopia and Uganda. In Zvishavane finger millet is more common than pearl millet and this study is going on focus on finger millet.

Finger millet has an annual production of4.5 million tonnes of grain, and Africa produces around 2 million tons (Maunder, 2006). Though it was a predominant crop in Africa until recent decades, the crop's production has declined significantly (*Ibid*). In Zimbabwe the crop is more produced at a subsistence level than commercial and smallholder farmers are the main producers. Zimbabwe is no 23 producing 55MT /1000MT with India being on the top followed by Nigeria producing 5000 MT (DFID, 2013). Finger millet is the third important crop next to maize and sorghum in the communal areas of Mashonaland, Midlands and Manicaland provinces. Its other names are rapoko, rukweza, njera or zviyo.

It is said to be one of the most nutritious all of the world's major cereal crops. This is mainly because the grain is rich in methionine, an amono acid lacking in diets of many who rely on maize meal, cassava and plantains as their carbohydrates (National Academic Press, 1996). Finger millet carbohydrates are reported to have the unique property of slower digestibility and can be regarded as food for long sustenance. It provides 8-10 times more calcium than wheat or rice. The excellent malting qualities have added to the uniqueness of the grain in expanding its utility range in food processing and value addition.

Finger millet is a tufted annual crop, growing to a height of 30–150 cm and maturing in 75–160 days (National Research Centre, 2006). Leaves are narrow, grass-like and capable of producing many tillers and nodal branches. The panicle consists of a group of digitally arranged spikes often referred to as fingers. Some of the fingers are curled into fists. Finger millet cultivation is more widespread in terms of its geographical adaptation compared to other millets. It has the ability to withstand varied conditions of heat, drought, humidity and tropical weather. It grows best in an environment with medium rainfall (29–429 cm) and an annual temperature range of 11 to 27°C, and is reported to tolerate a soil pH of 5.0– 8.2

(Duke 1978, 1979). Areas with low precipitation and low relative humidity during seed ripening and maturation are best for regeneration. Easy to grow, it succeeds in ordinary garden soil in a sunny position (*Ibid*).

Finger millet is suitable as a subsistence food crop particularly in Zvishavane because it can store safely for many years without insect damage due to its small seeds, hence fitting well in farmers' risk avoidance strategies in drought-prone regions Asia (Holt, 2000). The crop is an ideal crop in the area as it can lie dormant for weeks. Once the rains do come, the grain springs to life and can be ready to harvest in about 2.5 to 6 months. This makes the crop to be adaptable in hot humid areas like Mazvihwa in Zvishavane. During its growth the grain is tolerant to weevil damage probably due small seed size. This is in opposite to maize which can be exposed to different diseases and pests resulting in major losses especially left untreated. Furthermore the grain can be stored for years without insect damage, which makes it a particularly valuable crop for poor households who cannot afford pests control treatments. This makes it an ideal important staple when no other food is available. If dried well and stored in a dry place, it can be stored for as long as up to five years. The long storage life makes it an important crop in risk-avoidance strategy in food security. The grain tastes better than other small grains. One factor that makes it attractive is that the locals stated that the grain tastes better than other small grains. One individual stated that

> *'sadza rezviyo riri nani nekure kudarika remapfunde' (*sadza from finger millet tastes much better compared to sadza from sorghum).

It has a high impact in regards to the poor particularly looking at the indicators of food security as it provides stability which will be looked in detail in chapter 3.

The crop however faces an image problem as it is regarded as a poor person's crop leading to communities ignoring it. Many farmers are giving up growing the labor intensive finger millet in favor of maize, sorghum, and cassava. This has resulted in a few households in the area farming finger millet with those who are affected with HIV/AIDS giving up altogether as it is laborious. This has led to organization like Christian Care carrying out workshops in trying to promote the growth of finger millet as a way of eradicating hunger and food insecurity. Workshops have also been conducted by AREX in all the wards with the main objectives of promoting finger millet productions using conservation farming, to improve seed access to farmers by providing the farmers with seeds and to demonstrate finger millet value-addition. They have called out for the promotion of minimum tillage seeding, wide rows for water capture, sowing or transplanting with other crops, control of birds and developing ox-drawn implements for planting, cultivating, harvesting, and threshing finger millet.

Finger millet has the potential of enhancing food security in Zvishavane if planted by all smallholder farmers. People in the area need to realise how these crops can provide a household with all the indicators of food security by providing stability, accessibility, improve nutrition and availability of food at all times unlike maize.

2.4 Conclusion

The chapter paid attention to the area of Zvishavane and the high levels of food security in the area. It highlighted on how drought and dry spells have affected agricultural production the main backbone of rural households. This has had negative effects on food security with the district being placed first as the most food insecure place in the country. Non-Governmental Organisation in collaboration with the government are working hand in hand

in trying to bring up sustainable ways that will bring food security in the area. One major way is the concentration on small grains farming in the area. There is the need to increase small grains production in the area as these crops are the most suitable to the weather in Zvishavane which has high temperatures and prone to dry spells. Furthermore the realisation that people can only respond familiar projects small grains is proving as a way that will get positive responses from the households. In Mazvihwa area the respondents are responding positively mainly because it is the driest area in the district. The other areas are still hesitant to leave the production of maize for the larger scale production of small grains but it is proving that with time small grains are going to become dominant in the area. They need only to be encouraged and to be made to realise that the advantages of the small grains outweighs the production of maize. The next chapter will look at the impact of small grain production to food security in Zvishavane. It will concentrate on how small grain has brought food security concentrating on the four pillars of food security.

CHAPTER 3

The Impact of small grain production on food security in Zvishavane

3.1 Introduction

The Chapter focuses on the effects of small grain production on food security in Zvishavane. It highlights on the significance of small grains like sorghum and finger millet which are produced in Zvishavane. In order to address food insecurity in Zvishavane there is need to increase food availability, food access and food adequacy for all. Small grains have the potential of increases all these factors of food security. In most cases small grain production has had an impact on food security. As mentioned in the previous Chapters small grain production can enhance food security particularly in the semi-arid places like Zvishavane. Although maize is the preferred grain crop it is frequently written-off due to droughts and its yields have been on the decrease in these areas. Small grains like millet, and sorghum which can better withstand drought conditions and offer more stable yields in the long term. They play vital role in food and nutrition security. Their drought tolerant nature make them able to thrive better in marginal areas thus being key to grain security in this current environment of climate change and variability. Among these and other significant issues the chapter fosters a deeper understanding on small grain production and its impact on food security in Zvishavane.

3.2 Relationship between small grain and food security

The research takes into consideration the conceptualisation of the term food security in an endeavour to examine the impact of small grain production on food security. “Food security exists when all people at all times have physical and economic access to safe and nutritious

food which meets their dietary needs and food preferences for an active and healthy life" (World Food Summit, 1996). The concept of food security includes both physical and economic access to food that meets people's dietary needs as well as their food preferences.

According to the World Health Organisation (2012), food security is built on three pillars which include

- Food availability: sufficient quantities of food available on a consistent basis.
- Food access: having sufficient resources to obtain appropriate foods for a nutritious diet.
- Food use: appropriate utilization of the available food based on knowledge of basic nutrition and care, as well as adequate water and sanitation. The researcher thus pays attention to these three pillars in relation to small grain production.

The last element although not involved in this definition is stability.

- Stability entails consistence and reliability of food availability and access. It means that the house should not risk losing access to food as a consequence of sudden shocks (FSC, 2012).

If small grain are fully implemented in Zvishavane all these elements of food security will be adequately addressed. In assessing the impact of small grain production on food security the chapter thus looks at all the four pillars and how small grains have had an impact on them.

3.3 The impact of small grain production on food utilization.

Food utilization refers to the use of food and how a person is able to secure essential nutrients from the food consumed. It encompasses the nutritional value of the diet, including its composition and methods of preparation; the social values of foods, which dictate what kinds of food should be served and eaten at different times of the year and on different occasions;

and the quality and safety of the food supply, which can cause loss of nutrients in the food and the spread of food-borne diseases if not of a sufficient standard.

Climatic conditions have brought negative changes in dietary patterns and new challenges for food safety, which are affecting nutritional status in various ways. It needs to be noted that the physiological utilization of foods consumed also affects nutritional status, and this – in turn – is affected by illness. Climate change will cause new patterns of pests and diseases to emerge, affecting plants, animals and humans, and posing new risks for food security, food safety and human health. In addition food insecurity is usually associated with malnutrition, because the diets of people who are unable to satisfy all of their food needs usually contain a high proportion of staple foods and lack the variety needed to satisfy nutritional requirements. In Zvishavane declines in the availability of food like maize, due to scarcity of water or labour resulting from climate change risks like drought have affected nutritional status adversely. Stability once brought about by maize production is no longer present with households in the area now depending on food aid from the donors and the government.

3.4 Impact of finger millet and sorghum in Zvishavane

Droughts in the previous years have affected the continual availability of food particularly mealie meal the main staple in Zimbabwe. Many of the household's interviewed pointed out that their maize production of the past five years only lasted for two to three months and after that they will depend on maize from donors and for those with a little money will have to purchase. This was greatly affecting the health of the individuals considering that they depended on eating sadza twice a day whilst they would have eaten nothing in the morning. The scarcity of mealie meal in the area was making individuals to only have one meal in the

evening. The coming in of small grains have managed to change all this and has changed the diet of most individuals.

Finger millet can have a great positive impact on household members if used appropriately. The farming of finger millet cultivation is highly encouraged due to its great utility. As already mentioned finger millet is the most nutritious of small grains making it have a great role in combating disease and fighting infant mortality. For example finger millet can be used to make porridge which is very health to children. In Zvishavane finger millet is being used to make porridge and bake bread. According to Mr Pakati of:

> "*Zvakangonakira zviyo ndezvekuti unogona kubatsirakana pazvinhu zvizhinji nekuti hazvibiki sadza chete uye zvinonaka kudarika mhunga"*
>
> "*What is good is that you can finger millet has many uses and is tastier than sorghum"*

Small grains therefore come into play as ways that can boost up nutritional values and utilization. Finger millet as a food is nutritious, easily digested, and is recommended particularly for infants and the elderly (Taylor, 2003). Many households in Mazvihwa area are using the finger millet flour to make porridge and it is said to be helping greatly in both the children and adults. Instead of always eating sadza twice a day, finger millet has diversified the food eaten in the households. As a consequence of this diversity of the roles of finger millet in society, there is growing market demand for the grain especially among the poorest household.

In most places food products of finger millet are eaten to satisfy traditional requirements or as nutritional supplements. As nutritional supplement, the food products are fed to expectant and lactating mothers, babies and the sick. Finger millet grain has good taste and is an excellent dietary source of methionine. It is higher in protein, fat and minerals than rice, corn, or sorghum (Reed, 1976). Finger millet has a better nutritional profile in terms of minerals (e.g. calcium > 5,000%; Iron and Manganese > 350%; and copper) and essential amino acids than maize (National Research Council, 1996).

Finger millet is high in starch and is considered "superior" to wheat in that its proteins are more easily digested. It has the third highest iron content of any grain, after amaranth and quinoa (*Ibid)*. Zvishavane pregnant women are being encouraged to eat the porridge, bread and sadza. This is helping in tackling anemia in pregnant women as many women in poor households do not have the money to buy the food that is needed by pregnant women. All these contents makes it to have a big impact on food security as it will reduce untimed deaths and will also assist those suffering from HIV/AIDS in boosting their immune systems.

Finger millet has the inestimable value of growing in the latitudes where malnutrition is rife unlike barley, which grows only in temperate areas. In Kenya finger millet is in high demand for infant feeding, special dishes for the sick and for special purposes among some people and, therefore, fetches a good price in market (Oduori, 2000). For this reason alone, finger millet is an important preventative against malnutrition. This grain is benefiting the rural households who are producing it for house consumption. Although some people are still reluctant to grow these grains for instance in the Nyama there is evidence that soon they will also grow the grains on larger scale after hearing success stories from their neighbours in Mazvihwa ward. People in Mutambi ward are a good example of people who are realising the

good effects of small grains and the potential that these crops have, not only on local level but also on the national level to boost food security.

This is the same with sorghum which also has nutritional value that can improve food utilization in Zvishavane. Sorghum grain contains 11.3% protein, 3.3% fat and 56–73% starch. It is relatively rich in iron, zinc, phosphorus and B-complex vitamins. Tannins, found particularly in red-grained types, contain antioxidants that protect against cell damage, a major cause of diseases and aging (National Research Council, 1996)). The protein and starch in sorghum grain are more slowly digested than those from other cereals, and slower rates of digestibility are particularly beneficial for people with diabetes. Sorghum starch is gluten-free, making sorghum a good alternative to wheat flour for individuals suffering from celiac disease. Because of its nutritive properties and medicinal value the crop can be used in management of measles, anaemia, and diabetes diseases.

Considering the nutritional value in these grains they are also good for people suffering from disease like HIV/AIDS. Lack of resources makes it more difficult for HIV-affected households to supplement their diet through the purchase of more nutritious and varied foods (Gillespie, 2006). Sorghum and millet have the capability of providing the nutritional value that can boost the immune system of those effected hence their impact is much greater. From this one can articulate that sorghum can address diseases that many people are battling with every day. This will be a great opportunity to the rural households who are facing difficulties in getting medical assistance due to lack of financial services. Considering that the health sector in the country has been crumbling for year's sorghum can be the saviour that will improve people's health. In Zvishavane rural most clinics are far well and are of poor quality

with no doctors but just a few nurses in attendance. By adopting grain as the main staple some diseases can be avoided from taking place which will positively lead to cutting down off expenses. Furthermore, as most of these rural are poor sorghum will help in retaining cash that was once meant for medical bills and use it for other crucial things like paying for school fees. Hence rural households are likely to have improved health and at the end of the day still have access other.

3.5 Impact of small grain production on food accessibility

Food accessibility as already alluded to in Chapter one is a measure of the ability to secure entitlements, which are defined as the set of resources (including legal, political, economic and social) that an individual requires to obtain access to food (A. Sen, 1989, cited in FAO, 2003a). Until the 1970s, food security was linked mainly to national food production and global trade (Devereux and Maxwell, 2001), but since then the concept has expanded to include households' and individuals' access to food. The mere presence of an adequate supply does not ensure that a person can obtain and consume food – that person must first have access to the food through his/her entitlements. The enjoyment of entitlements that determine people's access to food depends on allocation mechanisms, affordability, and cultural and personal preferences for particular food products. Increased risk exposure resulting from climate change risks like droughts will reduce people's access to entitlements and undermine their food security.

Noteworthy is that food is allocated through markets and non-market distribution mechanisms (Khozombah, 2005). Factors that determine whether people will have access to sufficient food through markets are income-generating capacity, amount of remuneration received for products and goods sold or labour and services rendered, and the ratio of the cost

of a minimum daily food basket to the average daily income. Non-market mechanisms include production for own consumption, food preparation and allocation practices within the household, and public or charitable food distribution schemes (Carr, 2006). For rural people who produce a substantial part of their own food, drought impacts on food production may reduce availability and accessibility to the point that allocation choices have to be made within the household. A family might reduce the daily amount of food consumed equally - among all household members, or allocate food preferentially to certain members, often the able-bodied male adults, who are assumed to need it the most to stay fit and continue working to maintain the family.

Food security issues will also be affected by the accessibility and affordability of food. The social values of foods are important determinants of food preferences, with foods that are accorded high value being preferred, and those accorded low value being avoided. In many traditional cultures, feasts involving the preparation of specific foods mark important seasonal occasions, rites of passage and celebratory events.

The international aid group Action Aid said a key approach in addressing global food insecurity is to focus on making food more accessible. In order to achieve this, the group points out that attention must be placed on empowering smallholder farmers. In Zvishavane emphasis on small grains is being done as the surest way of promoting food accessibility. This has produced positive results in this area as accessibility to finger millet has since increased specifically to those farmers who have adopted this production. To those households who have planted small grain production, food accessibility is now within their reach. It has meant that they can no longer have to go with no food compares to other previous years.

Food accessibility can be heightened by both finger millet sorghum. According to Gopal (2006), these drought resistant crops have become extremely important to the local community given the fact that they act as both food and cash crops which enables the smallholder farmers to adapt to climate change and variability and attain sustainable livelihoods. The two crops have been used in beer brewing. Locals produce beer which is later sold and called 'Ndari' or "7 days". It is common in the area and most people just farm small grains for the main purpose of making this beer. This traditional beer is providing as an alternative source of income for many people who brew it commercially. 70% of the households who grow small grains have been brewing beer from these crops and selling the beer increasing their access to cash.The study analyzed the economics of using sorghum and millet in processed form as traditional beer. Results show that traditional beer production adds value to small grains with a potential to realizing a good gross profit. The study concludes that traditional beer is therefore an important source of cash income in the semi-arid smallholder sector.

The poor and middle groups and some of the better-off indicate that beer brewing is a very popular way of paying such costs as school fees as the profits realized are very high. The money is also used to buy other food commodities making food to be accessible at most times. In some wards such as Mapirimira village, beer brewing clubs were formed in an effort to control over supply of the commodity in order to maximize demand and better returns. The club members not only contribute money that is given to one member at a time so that they manage to buy all the ingredients required for beer brewing but also give each other chances for brewing the beer so that there is no competition for customers. The club members have three to four opportunities of brewing and selling the beer over the year.The income raised

could be used to purchase supplementary food during drought periods. Small grains have been commercialized to a smaller extent and some farmers are selling their produce to GMB who later sell this to Delta a brewing company that brews the famous 'chibuku'.Some of this money is also being used to purchase the next season's seeds. However other farmer's interviewed pointed out that sometimes GMB refuses to buy their grains pointing that they need to produce more if they want to sell making the grains to be a challenge to sell on a national level.

This beer has been brewed since the pre-colonial times with the sole purpose of performing ritual ceremonies and in some cases this is still being practiced in the area. The most popular ceremony is 'nhimbe' whereby the community collaborates collectively in their agricultural activities and then later on drinks this traditional beer. This has been of great help in the area especially to those vulnerable homesteads with individuals with HIV/AIDS, orphans and widows. This kind of ceremonies have managed to assist the vulnerable people to improve food accessibility as they can now be able to have their farms cultivated and also expect yields and improve their access to food. Other uses of the beer in the area have been for what is termed 'kurova guva' a death ritual and in the Nyama area one household actually stated that they produce this beer every year in order to carry out traditional ceremonies like 'mukwerere' a rainmaking ceremony. Household income may also be enhanced by sale of finger millet and income generated through trade as well as production. According to Mrs Svovi who atays in Mapirimira ward near Mapanzure clinic, they plant sorghum to sell or trade with other households who stay in drier areas like in Vukuso ward.

3.6 Impact of small grains on food availability

Food availability has globally been on the decline over the last decade. The 2006 maize harvest, for example, was at 1.1 million tonnes, against a human consumption requirement of 1.4 million tonnes. Maize grain, while sold at subsidized prices, remained out of reach for very many vulnerable households. The overall production of maize in 2008 was estimated at 575,000 metric tons—28 per cent lower than 2007's already low levels. The Food and Agriculture Organization/World Food Programme Crop and Food Supply Assessment Mission (CFSAM, 2010) estimates total domestic cereal availability for the April 2008–March 2009 marketing year at 840,000 tonnes—leaving a shortfall of around 1.2 million tonnes, including one million tonnes of maize, which needs to be imported. These figure have continued to drop especially in rural areas like Zvishavane. Zvishavane has been part and parcel to this drastic situation that has been worsened by drought issues in the area. Food availability is far from being achieved in the area in its totality with many households not producing enough food that can last for more than 4-6 months.

Noteworthy is that food availability is determined by the physical quantities of food that are produced, stored, processed, distributed and exchanged. FAO calculates national food balance sheets that include all these elements. Food availability is the net amount remaining after production, stocks and imports have been summed and exports deducted for each item included in the food balance sheet. Drought and its impacts on water sources have affected food availability in Zvishavane for those who continuously produce maize but as the study shows will be better to small grain producers. Temperature increases will affect several crops which are not drought resistant. Moderate warming i.e. increases of 1 to 3^0 C in mean temperature is expected to have negative impacts in already dry areas like Zvishavane. Crops

like maize are likely to be damaged by a few days of temperatures above or below a certain thresholds.

Small grains like sorghum and finger millet have proved to have a high percentage of availability. For instance, finger millet when properly dried can be stored up to a period of five years. In such a case this promotes its availability and thus strengthen issues to do with food security. The strength of small grains when it comes to food availability is shown by the realisation that small grains like millets can make flour and from the flour only a small amount is required to make bread which ensures food availability for a long period. In this regard, Van Oosterhout (1995) pointed out some advantages of small grains like sorghum and millets over maize as: a smaller amount of flour is needed to cook the main meal compared to maize;a meal cooked from the small grains satisfies hunger for a longer period and gives more energy (which is especially important for persons who do heavy manual labour like farmers).

When maize is planted in dry areas, it is highly affected by temperature and will result in very limited yields. Availability of maize is also limited as it can be stored for over 2 years as insects are more likely to feed on it. This renders the fact that small grain production should be the way forward in drought prone areas. Many households in Zvishavane especially those who are regarded as poor are likely to have their maize stock run out quick within less than a year. This could be attributed to the fact that they could have failed to apply fertiliser due to lack of finances. This is however different with small grains as they do not highly require fertiliser.

According to Mutekwa from Agritex:

"*What I have realised is that in many respects maize requires several inputs for a bumper harvest to be realised. Fertiliser is the highest requirement but it again depends on water availability. In Zvishavane having fertiliser and applying it on maize might actually worsen the situation. Maize crops dry up if fertilizer is applied where there is limited rainfall like in Zvishavane."*

The researcher received several responses similar to this which showed that Zvishavane is no longer suitable as a maize growing area. A comparison on of maize yields and millet in line with Mutekwa's sentiments showed that producing millet should highly be taken into consideration and this will mean food availability for many. From the above it can be stipulated that small grains had the positive impact of providing food availability to those farmers who produced it compared to other farmers who concentrated on maize.

3.7 The impact of small grains on food stability

Sorghum and millet are important traditional cereal crops in southern Africa for food security and are largely grown by smallholder farmers. In long-distance food chains, storage, processing, distribution and marketing processes contain in-built mechanisms have protected the global food system from instability in recent times. However, if projected increases in weather variability materialize, they are likely to lead to increases in the frequency and magnitude of food emergencies for which neither the global food system nor affected local food systems are adequately prepared. Furthermore stability captures the consistence and reliability of food availability and access. It means that the house should not risk losing access to food as a consequence of sudden shocks.

According to one respondent from the Zvishavane rural,

"...when we produce small grains we are always sure of accessibility and that when problems arise millet can be stored for a long period as compared to maize."

Droughts in the area have affected food stability in most of the rural households as low production yields have left people with no food and depending on food aid. This is an example of how food insecure the people are as there are easily affected by drought and left with no food. The main reason for this is the production of maize a crop that is easily affected by drought and cannot thrive and produce any meaning yields in the hot areas of Zvishavane. However, the crops face stiff competition from alternative crops such as maize in the production system. This is one factor that has contributed to food instability in Zvishavane. However the planting of sorghum will promote stability in households as these crops are not affected by harsh conditions that prevail in Zvishavane. These grains have managed to stabilize food in those households that have shifted from maize to small grains. These households have managed to quickly recover from droughts as these grains can be stored for many years without being affected by pests and diseases. Therefore as the area witnesses' prolonged dry spells, it is important for farmers to undertake the farming of small grains seriously, unless where circumstances avail like irrigation facilities.

3.8 Negative effects of small grain production

There are however a number of constraints that are attached with finger millet production. Mushonga *et al* (1993) listed processing as limiting. Agrawal *et al* (1993) listed labour in both cultivation and processing, poor technology, research emphasis given to maize and little to finger and non-production of new technologies like row planting. Mnyenyembe, (1993)

listed lack of improved varieties and credit, weeds, pests & diseases. Chambo, (1993) from Tanzania listed poor cultural practices, lack of improved varieties, diseases and pests, limited uses, unpredictable markets and limited research. Tadesse and Kebede (1993) listed lack of good varieties, weeds, lodging, disease, and moisture stress in dry areas. Kenya listed low research priority, limited uses, difficulty in management, lack of improved varieties, poor crop husbandry, competition from other crops with better economic returns, and lack of commercial food products (Mitaru *et al*., 1993 and Oduori, 1993).

In Zvishavane about 95% respondents pointed to the labour intensiveness it has. According to Nyoni, Arex Zvishavane:

> *"the production of finger millet require so much labour making several people find it difficult to produce it"*

In Zvishavane many people have concurred to the fact that weeding is the most challenging aspect that requires people with advanced skills as most of the weeds look exactly like finger millet. In so doing involving someone who has limited knowledge and who fail to see the difference between finger millet and weeds will yield disappointing results. In Zvishavane women were the major ones who were complaining about the labour intensive that finger millet has. Many of them were even pointing out that even though it can enhance food security the labour is too much hence opting to just planting it on a small piece of land. They mentioned that the crop has small seeds that prove to be laborious especially during harvesting time. Because the seeds are small, it takes skill and much effort to mill finger millet, especially by hand. Hammer mills have to be fitted with very fine screens and run at high speed, but the National Research Council, 1996, reported the development of a special

mill for millet. Furthermore weeding is one of the most negatives of the crop as it the weeds that are found in millet look exactly like the plant.

According to Mai Ncube a newly married woman

> '*zvinotoda vanoziva uye vagara vachiirima kuti vakwanisa kuziva kuti ayaya ndiwo mashawi iyi ndiyo mhung. Kana tiri isu zvedu tinonzwa nekutema zviyo tivhiti ndiro sora'* (finger millet growing requires those individuals with the trained eye who are able to distinguish the real millet from weeds).

Subsequently weeding is a problem making cultivation of the crop labour intensive. The difficulty in weeding is complicated by wild relatives of the crop (e.g. Eleusine indica) that look like finger millet at the time of weeding. The problem of seed size carries over into processing (National Research Council, 1996).

Blast caused by the fungus Pyricularia grisea (a close relative of rice blast) is the most serious disease of finger millet (National Research Council, 1996; Consultative Group on International Agricultural Research, 2001). The crop has few pests, but shoot fly and stem borers, which can be controlled by insecticides. Birds are also a pest, especially, the notorious Quelea birds and other small grain feeding birds.

The research in Zvishavane has revealed that new sorghum and millet varieties can reduce the probability of zero yields. Thus, they can make a significant contribution to household food security in drought years (Alumira and Rusike, 2005). There has been considerable measures

taken by the Government of Zimbabwe to improve the competitiveness of the small grains. New varieties and small grain processing technologies have been introduced.

Although improved sorghum and millet varieties grown in semi-arid regions, have shown potential to compete with maize in terms of productivity, the study showed that the adoption of these varieties has resulted in a decrease in land area allocation to small grains. This tends to suggest that, lacking a well-developed outlet for excess small grain outside the communal areas, high yielding improved small grains reduce the area required to achieve minimum subsistence grain requirements freeing extra land for cash crops such as maize.

All these factors highlight that if fully produced small grains can boost food security in rural households of Zvishavane. Although there are challenges being faced being faced for instance the danger of birds and their poor taste compared to maize, these cops if fully produced can enhance food security.

3.9 Conclusion

The chapter has looked at small grain production in Zvishavane and its impact on the rural household. The factors that were used to measure this were the four pillars of food security which are stability, availability, accessibility and utilization. The chapter has illustrated that if small grains are produced on a large scale then the four pillars will be addressed enhancing food security in the area. Impact studies conducted in the area, however, show that adoption rates are largely low. Some of the reasons cited for this are lack of improved seed, information, alternative end uses, poor marketing strategies, poor grain quality and lack of fertiliser use. The impact of these small grains has been largely positive on those few households who are producing them as food security has increased with the four pillars being

present in these households. The main problem is that most households are still reluctant to move away from the popular maize production. The challenges for the future lie in the various disciplines working closely together to address these concerns through participatory approaches and move these two crops from subsistence to a commercial level. The next chapter is going to focus on the challenges faced by the production of small grains in Zvishavane and on the other hand the prospects.

CHAPTER 4

Challenges and Prospects for small grain production and food security in Zvishavane

4.1 Introduction

Sorghum and millet are important traditional cereal crops in Southern Africa for food security and are largely grown by smallholder farmers. In Zimbabwe as has been shown in previous Chapters sorghum and millet production is being promoted in Zimbabwe's semi-arid areas like Zvishavane. However, the crops face stiff competition from alternative crops such as maize in the production system. Impact studies conducted in the area show that adoption rates are largely low. Some of the reasons cited for this are lack of improved seed, information, alternative end uses, poor marketing strategies, poor grain quality and lack of fertiliser use. The challenges for the future lie in the various disciplines working closely together to address these concerns through participatory approaches and move these two crops from subsistence to a commercial level (www.afripo.org.uk/papers/Paper15Chisi.pdf). To this end, the Chapter highlights on significant issues that have proved problematic in sorghum and millet production thus posing as challenges that can affect progress. The following factors stand as major challenges of small grain production in Zimbabwe.

4.2 Marketing and Utilisation

For sustainable production of these crops there is need to promote markets and utilisation of these crops beyond subsistence production. Studies undertaken in the region have shown that unless sorghum and millet can be produced at a competitive level with maize, commercialisation will be a difficult task to achieve (www.afripo.org.uk/papers/Paper15Chisi.pdf). Small grains like sorghum and finger millet are facing challenges in marketing as some of the industries in Zimbabwe for example GMB have been known to have been known to refuse these grains in preference of maize. The reason for the lack of competitiveness of these crops is the low average grain yield. Whereas the genetic potential of the improved varieties is high the average yields achieved by smallholder farmers are below a tonne per hectare (www.afripo.org.uk/papers/Paper15Chisi.pdf). This is the same case with farmers in Zvishavane who even they produce millet as advertised by Christian Care, they fail to get buyers of such grain. For instance the Grain Marketing Board (GMB) buys millet but only if it is above a tonne. In such a case it becomes problematic for the poor farmers to get buyers since their produce in most cases will be way below a tonne. Commercialisation of sorghum and millet is also deterred by the denial of credit facilities. Research efforts need to be applied in product development and commercial outlets need to be established (*Ibid)*.

4.3 Poor Seed Delivery Systems

While improved varieties of seeds have been released by Non-Governmental Organisation, the main challenge is that the seed of these small grains is not readily available from the various seed producers. Except in South Africa, seed companies that were tasked to be conduits of government to release varieties have failed to deliver, citing low demand and the high cost of distributing the seed in far flung areas

(www.afripo.org.uk/papers/Paper15Chisi.pdf). This has led to the low adoption of these varieties. This is common in Zimbabwe as several farmers whether they want or do not want to promote small grain production are affected by the limited seeds of the grains. This is typical in Zvishavane where Christian Care tries to hand out the seeds to the farmers but only in limited numbers. Be that as it may this determines the yields to be produced. In such a case many end up resorting to cultivating maize whose seeds would be readily available in markets across the country.

If small grains are to be produced NGOs need to move beyond foundation seed and deliver seed to farmers. Generally programmes have embarked on on-farm seed production as a way of getting the seed to farmers (*Ibid)*. This has led to positive response by the farmers in the region and in the country. The need to train smallholder farmers has been encouraged as a way of ensuring that good standards are adhered to in seed production. The private sector's interest in these crops is not sufficiently high to warrant investment in open-pollinated varieties but hybrids (*Ibid)*. Evidence has shown that hybrid varieties are popular to farmers however the poor farmers have been affected as they do not have the financial resources to purchase the seeds.

Inclination to Maize Production

Although the benefits of small grains have been acknowledged there is the continual inclination to maize production in many semi-arid areas. This is the case in Zimbabwe, where the continual production of the main staple maize is still dominating the semi-arid areas. These views are further supported by FAO (1996) that Zimbabwe government support measures for small grains have been shown to be relatively minimal compared to maize, and the latter has encroached into sorghum and millet land. This is after the knowledge from

previous studies that have noted that small grains have an advantage in these semi-arid regions over maize. Taylor (2003) goes on further to highlight that even though being the case research on these crops has been lagging behind in Africa because they suffer something of an image problem and there often tends to be a preference for maize as the premier crop. Small grains in Zvishavane have faced rejection in many cases as people favour the production of maize. This has hindered on food security in the area which small grains seek to address.

4.5 Labour Intensive

During the period of research it was realised that rising labour costs in small grain production have affected most farm operations, from land preparation, weeding, bird scaring to harvesting and grain processing (FAO, 1996). In addition, the ease with which maize can be processed compared to the traditional staples of sorghum and millet is the other main reason why maize became widely accepted even in Zimbabwe's semi-arid regions during the green revolution (Alumira and Rusike, 2005).Another very important factor, which has been acting as a production constraint towards sorghum and millet production, is changing food preferences. FAO (1996) explains that as incomes rise, consumers tend to purchase wheat, rice and in some cases maize, rather than traditional coarse grains.

This has resulted in farmers viewing small grains like sorghum and millet as having lower earnings than other crops. Real producer prices for sorghum, millets and edible legumes dropped considerably, since the trade liberalization program, compared to that of cash crops and maize (Macgarry, 1994). This also has acted as a major reason why rural farmers have shunned small grain production in favour of maize.

The Challenge of Birds

Insect and diseases are not prevalent in sorghum crops compared to maize crops. However, sorghum crops are challenged by birds known as quelea birds. This has affected the production of sorghum in Zvishavane especially considering that it is a big challenge to chase away these birds. The quelea birds are the most known birds that are known for attacking small grains. This has resulted in farmers preferring maize production as the maize is prone to attacks by baboons and wild pigs which are easier to scare away than birds which attack the crop in large numbers and are difficult to chase away. This made many farmers to cite that small grains were laborious and prefer maize production.

4.6 Poor policy framework

In that regard Rohrbach (1991) pointed out that governments need to come up with policies that favour the development of competitive intra rural markets if smallholder farmers are to be encouraged to grow sorghum and millet. This is mainly because the development of rural markets for small grains like sorghum and millet would help in providing interest for rural farmers to grow these crops. This is because they will now be growing them for both subsistence household food security as well as cash crops to meet other financial demands. Notably the government is the link that is needed small grain production is to be highly implemented. The government should assist the farmers in semi-arid areas like Zvishavane by giving seeds particularly to those who lack the financial access to these seeds.

The Zimbabwean government has in many cases and at many occasions failed the rural people. It appears to be largely ignorant to the needs of the rural people. Development of the rural people is difficult to evidence without the involvement of the government. The problem that the Zimbabwean government has is that it has since assumed that it is the role of NGOs

to provide rural development. In so doing the government has remained relaxed and has left rural development largely in the hands of NGOs yet NGOs should only play a complementary role.

Low yields

Sukume *et al* (2000) further noted that low yields of small grains have acted as a major obstacle and challenge for communal farmers in Zimbabwe's semi-arid regions to expand and adopt production of small grains on a large scale compared to maize. This lower productivity causes small grains to be very unattractive to communal farmers in the semi-arid regions also cited by FAO (1995). Farmers in Zvishavane who grow small grains practise a mixed type of farming as they find small grains unfavourable for household consumption. This will continue rendering low yield returns. If this continues food insecurity in Zimbabwe's semi-arid areas is likely to continue unless something is done that promotes its wide production.

Another aspect that result in low yields is the issue of technology. It has been noted that current technologies for sorghum, millets, and groundnuts do not give a favourable return to production of these crops in the low rainfall areas. This is because the technologies (seed varieties, fertilizer recommendation) do not result in substantial yields compared to technologies available for maize in the same agro-ecological area (Mudhara, 1988). Mudhara (1988) observed that small grains out-perform maize only in severe dry spells and drought conditions.

4.7 Ignorance by the community

It was realised by the research that people tend to be largely ignorant about small grain production. Many farmers in Zvishavane ignored the calls to adopt small grain production

and in many instances continued to produce maize despite the realization that they are likely to get very low yields due to drought. This is mainly so because they prefer and will continue to prefer maize production. Most farmers have failed to acknowledge the significance of small grain production as they are driven by the taste of maize. The fact that small grain production is only being promoted in semi-arid areas while other areas in town are likely to continue farming maize make them ignore their condition and proceed with maize cultivation.

The ignorance by farmers on the production of small grains has led to crops like finger millet to be considered as neglected crops both at national as well as international levels. The production of this crops instead of rising have continued to decline rapidly, a fact that is raising questions considering its enormous benefits particularly to the poor in drought-prone areas. Furthermore most farmers have the problem of not prioritizing small grains as some of them grow these crops in their waste part of arable land whilst others ignore the effective time of planting. This really has a negative effect on their production.In addition the farming of small grains like finger millet require knowledge especially during weeding time as it tends to have weeds that look exactly like the plant. To the unpractised eyes it is difficult to distinguish and this may result in pulling out the finger millet leaving out the weed. Therefore there is a need for the more education lessons for these crops among the rural households especially the young generation.

The above are the challenges that have been realised in small grain production. A combination of problems such as lack of certified small grain seed in the market, tastes and preferences as a contributory factor that is derailing the production of small grain. For instance thick porridge prepared from white maize is more preferred than small grains. Some

of the general factors include the fact that production of small grains is affected by poor prioritization of resources. Most farmers do not allocate inputs to small grains. Some grow small grains in their worst part of cropping land and others do not prioritize time of planting and fertilizer management. This really has a negative effect on their production. Most farmers are not even aware of fertiliser use in small grains during the look and learn visits. In addition most do not know about weed management in small grains. Many assume that once the crop is planted it grows up to harvesting without weed control. In such a case there is need by the government and the NGOs involved to promote fertilizer use in small grains. Currently, few farmers use fertilizers on small grains. Future demonstration plots must have such message to the farmer. In addition, number of farmers for finger millet demonstration plots must increase to a village or even a ward if seed is availed to encourage farmers to grow the crop.

4.9 Lack of markets

One major disadvantage of small grains cited by farmers is the limited marketing opportunities. Although a lot of publishing and research has been done for these crops there is still lack of markets. Several farmers complained about the absence of a ready market for small grains. If farmers had a reliable buyer then they are able to maximise their total gross production. In Zvishavane farmers could not rely on GMB to buy small grains neither could they rely that individuals in their area could buy these crops leaving out the more marketable maize. This limited formal marketing opportunities for the crops except for sorghum. Farmers expect spreading production and post-harvest costs on the market price, but the demand for small grains is very low in Zimbabwe.

4.10 Prospects on small production in Zimbabwe

Small grain production

Be as it may the cultivation of small grains is likely to continue and to increase in the near future. As much as farmers find small grain production unfavourable they will be forced to cultivate it if they want to survive. To be noted is that NGOs are likely to find it difficult to continue providing food if the people are ignorant about farming it themselves. Hand outs are supposed to be there during initial stages, however this should not be a permanent thing as it will make it seem as if the farmers will be always given food hand outs of millet if maize fails to reach expected yields at any given year. In such a case the farmers will have to realise the benefits that small grains pose to them and how their food security is increased by farming small grains. Such a realisation will make them willingly adopt small grains and leave maize production which is no longer conducive in semi-arid area. In Mazvihwa area small grain production has shown positive results with many households realising the importance of farming this crop. This respond is likely to pass on to other households in the nearby areas and people will realise that it is only through small grains that their households can be secure.

4.11 Climate change

As previously mentioned small grains come as a response to climate change which has negatively impacted crop production like maize. Climate change has affected the semi-arid areas of Zimbabwe worsening drought occurrences in these regions which is resulting in low agricultural yields heightening food insecurity. Although climate change is a global threat, populations in developing countries, particularly in rural areas, are at greater risk because of the more limited means available for adaptation and mitigation. Climate change has increased the dependency of developing countries on food imports worsening food insecurity in sub-Saharan.

Semi-arid areas have grossly been affected, in particular, Zvishavane, where maize production has become a risk crop. In Zimbabwe, the response to this crisis has been the wide scale relief distribution of food aid and direct agricultural input assistance without an exit strategy for sustaining some of the new technologies promoted within the context of relief aid (DFID, 2009). This has led to dependence syndrome among the rural people to the donors and the government which has led to the continuation of food insecurity as most of the solution prove to be non-viable. Small grains as discussed in the previous chapters is the viable solution that can be a lasting solution to food insecurity mainly because of their adaptation capabilities to hot dry humid areas that are being affected by climate change. As previously mentions small grains like sorghum and finger millet can withstand high temperatures and can thrive in drought prone areas like Zvishavane. They therefore are the present and future solution to food insecurity in semi-arid areas.

4.12 The Zimbabwean government

The government of Zimbabwe views access to land by the majority as the basis for eradicating poverty and increasing food security. Food availability has, however, declined over the last decade. There seems to be little incentive for farmers to produce beyond their subsistence needs, given the lack of alternative marketing channels and the presence of price controls with static procurement prices in an environment of hyperinflation. Food availability has also been worsened by issues like climate change which is opening more spaces of the vulnerability. Considering the prevalence of food insecurity the Zimbabwean government in conjunction with NGOs has been involved in small grain production as a means of enhancing food security.

NGOs in Zimbabwe need to be complemented by the government if development is to prevail. Despite the deterioration in the food security situation in Zimbabwe the government of Zimbabwe has been issuing agricultural input aid (seed and fertilizer) to communal and resettled farmers as an agricultural recovery strategy (Foti *et al*., 2007). Nonetheless, Foti *et al* (2007) suggest that not much benefit has been achieved from the government's subsidized input scheme especially in the semi-arid regions because input type and variety that was being issued did not tally with the agro-ecological location of the farmer. Issuing inputs to boost production of smallholder farmers, equipping them with improved crop management practices can assist in improving Zimbabwe's food security situation (FAO, 2008).

In addition, FAO (2008) further supports the same notion that inputs need to suit farmer agro ecological region for better returns to be realized if Zimbabwe is to address its food security situation through increased agricultural production. FAO (2008) goes on to suggest that inputs of sorghum and millets should be distributed to low rainfall areas while inputs of maize should be distributed to high rainfall areas. In addition, Mudimu (2003) revealed that there has not been much diversification from maize as the dominant source of food in Zimbabwe. Even in drier areas where small grains can be produced economically and sustainably, maize is the mainstay of household food security (Rukuni *et al*., 2006). Hence, production of sorghum and millets is seen as another crop diversification strategy that can alleviate food security in Zimbabwe's semi-arid regions (Rukuni *et al*., 2006). It is the Zimbabwean government which should highly promote crop diversification with small grain production as the compulsory grain to be grown by all farmers in semi-arid areas like in Zvishavane.

4.13 Economic growth

According to Chitongo, (2013), most livelihoods approaches imply that food security is the only desired outcome of household livelihood strategies without also taking into consideration issues such as having increased income, stronger 'voice', reduced vulnerability or sustainable use of the natural resources base (FFSSA, 2004). Food production in Zimbabwe, previously the breadbasket of Southern African, has remained below subsistence levels since 2000, contributing to an economy-wide adverse effect. The agricultural sector has for many years suffered neglect that has resulted in decreased agricultural productivity which have strongly led to economic decline. Decreased production in this sector has also been affected by the government's land reform program. Crumbling irrigation systems and infrastructure in general has reduced agricultural production, resulting in widespread shortages of goods and services, high unemployment levels and declining living standards (Chitongo, 2013).

Concerning that agriculture forms the backbone of Zimbabwe's economy climate change has also been a contributory factor in the decline of economic growth in the country. Maize production has declined and the country is now an importer of maize. Furthermore climate change has increased semi-arid areas in the country reducing maize production areas. Small grains now come into play as a way that can help in boosting up the economy of Zimbabwe again. There is the need to realise the importance of these crops in enhancing food security not only on a national level but also on a commercial level. Taylor *et al* (2006) explain that commercial processing of sorghum and millet into value added products in developing countries has the potential to stimulate economic development in these countries.

Therefore, policies that support increased production of sorghum and millet should be viewed in a holistic approach regarding contributions they can make to the macro economy and not only as a means of increasing food security to those in semi-arid areas. In Zimbabwe, it has been deduced that the industrial and commercial use of sorghum and all small grains in general are very limited (Sukume *et al.,* 2000). That being the case, Rohrbach (1991) mentions that gains to the economy from increased industrial use of small grains will have ripple effects besides just improving rural food security. These include but are not limited to reducing the need for drought relief, lowering the level of subsidies underlying grain markets, and, at least in the short run, stemming migration from rural to urban areas. So all in all it can be seen that the prospects of small grain production are much higher compared to its demerits. The only demerits of these crops in on its plantation process which is outweighed by the benefits that they bring in the long run after the harvest period.

4.14 Conclusion

The field of small grain production has become of interest in recent years and this research has added emphasis on the need to incorporate small grains as a way that can promote food security. Food security is a global concern that calls for attention from development practitioners. What makes it worrisome is that agriculture which is the backbone to the survival of most people in most developing countries has been undermined by drought especially in drought prone areas. Countries that depend on agriculture have largely been affected by food insecurity recently as rainfall patterns have become erratic. The agro base of these countries has been greatly affected which in turn has affected food production. Erratic rainfall patterns due to changing climatic conditions have seriously affected weather patterns and have led to weather variability. Zimbabwe is not exempted from such issues. Zimbabwe's dependence on rain-fed agriculture especially for the rural poor people in semi-

arid areas calls for concern. Zvishavane the case that was used in this research is a semi-arid area where maize production has dismally failed. This is due to erratic rainfall patterns that have befallen the area in recent years leading to water scarcity and reducing maize yields which are depended on rainfall. The frequent occurrences of drought in the area have contributed to food insecurity leaving the ordinary people vulnerable and depending on food aid.

Small grains have been noted by experts to be better performers in drought-prone areas and are considered to have better nutritional value than maize, which is viewed as an unsuitable crop in these agricultural regions. The research has shown that small grain production is the response needed to address the effects of food security in Zvishavane. In a country where agriculture is the dominant source of livelihood, responding to climate change should come as a necessity and as the way forward. One way that can promote food security is small grain production. Small grain production has become rampant in dry areas with promise of enhancing food security if planted on a larger scale.

Chapter 1 gave an overview of food security in Zimbabwe. It touched on definitions of Food security and its four pillars which are accessibility, utilization, stability and availability. These four pillars are mainly the ones that are used as indicators of food security. It also looked at the causes of food insecurity in Zimbabwe. Chapter 2 looked at small grain production in Zvishavane. It was realised that sorghum and finger millet are the most cultivated grain in the area. Chapter 3 emphasised on the impact that small grains have on food security. From the responses given by informants it was realised that small grains can promote food security though many did not find them favourable. It was discovered that they respond well to drought and are not affected by it like maize.

Chapter 4 emphasised on the challenges and prospects of small grain production in Zimbabwe. As a concluding Chapter, the chapter enlightened the challenges that small grain production is likely to be faced with in Zimbabwe. Despite effort by NGOs and the government to promote these drought resistant crops responses by farmers in Zimbabwe's semi-arid areas has drastically remained very low. There are several challenges that will hinder small grain production which involve processing issues, labour intensiveness it poses, ignorance from the local farmers to produce it. These among other challenges have contributed to low yields. If the government becomes actively involved in the fight for food security through small grain production in semi-arid areas it appears that greater strides will be achieved from which everyone can benefit from.

Several challenges were raised which included processing, tastes, attacks from birds etc. However despite these challenges the research showed how small grains can address the problems of the people in semi-arid areas. The researcher noted the low adoption of farmers to small grain production in Zvishavane but concludes that people in the area will be forced to plant these grains either out of sheer will or not because it is the types of crops that are conducive to the semi-arid environment. The most significant aspect is that small grains largely promote food security.

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APPENDIX 1

Questionnaire for farmers in Zvishavane

Midlands State University

Department of Development Studies

My name is Tendai Nciizah a student at Midlands State University doing her research on "the contribution of small grain production to food security in drought prone areas: The case of Zvishavane Rural"

Confidentiality and Consent: 'I am going to ask you some personal questions that some people may find difficult to answer. Your answers are however completely confidential. Your name will not be written on this form, and will never be used in connection with any of the information you give me. However, your honest answers to the questions will be greatly appreciated."

1. How do you earn a living……
2. What crops do you farm…….
3. Have rainfall patterns changed……..
4. Is there drought in this area and how frequent are these drought……..
5. Do you get enough produce from farming…….
6. Have you received any food hand-outs from NGOs and the government…….
7. Is the climate in your area conducive for maize production……
8. Have you ever planted small grains……
9. What do you prefer small grains or maize production……
10. Did you have a good harvest last year……
11. Do you think small grains can enhance food security……

12. Do you practice mixed crop farming……

13. Where do you get small grain seeds from……

14. Do you earn more yields when you cultivate small grains as compared to maize production…….

APPENDIX 2

Interview questions

1. What do you understand by the term food security?
2. What qualifies as food insecurity?
3. How can you tell a household is food insecure?
4. What methods are you using to promote food security in Zvishavane?
5. What do you understand by small grains?
6. Is the climate in Zvishavane still conducive for maize production?
7. Why are small grains being promoted in semi-arid regions like Zvishavane?
8. To what extent can small grains promote food security?
9. Is Zvishavane community adopting small grains production?
10. How are households in Zvishavane responding to a shift from maize production to small grain production?
11. What challenges are you facing in your quest of promoting small grain production in Zvishavane rural?
12. What assistance are you providing for the food insecure households?