ROLES OF IRRIGATION SCHEMES ON HOUSEHOLD FOOD SECURITY. THE CASE OF MUNDI MATAGA IRRIGATION SCHEME.

BY

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(R091970 F)

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DEDICATION

I dedicate this research project to my sister Precious Ncube.

ABSTRACT

The purpose of the study was to evaluate the role of Mundi-Mataga irrigation Scheme in improving household food security in Chikure Ward 26 in Mberengwa District. The study specifically sought to assess how the land was allocated to the beneficiaries in the scheme, examine the types of crops grown in the Mundi-Mataga irrigation Scheme, analyse the output trends in the Scheme and assess knowledge of farmers in the Mundi-Mataga irrigation Scheme. The study adopted a triangulation design which encompassed both qualitative and quantitative approaches. Random sampling was used to recruit primary participants in the study. Purposive sampling was used to recruit key informants into the study. The sample size for primary participants was 19. One person refused to participate in the study giving the study a non-response rate of 5%. Pretested, self-administered, semi-structured questionnaires were used to collect data from the primary participants (irrigators). An interviewer guide was used to collect data from key informants. The findings of the study are that farmers who were affected by the construction of the scheme were given first priority to choose the plots of their choices in the scheme. Males were the dominant plot holders who participated in the study constituting 58% (n=11). Female headed households had higher household composition (6-10). There was a decreasing trend in production, from 2008/9 season to 2012/13; of maize (from1.3 tons to 0.9 tons) and beans (from 0.9 tons in to 0.4 tons). There was an overall decrease in income generated from sale of produce from 2008/9 season to 2012/13 season. Maize decreased from $240 to $125, beans decreased from $560 to $80. There was no increase in income generated from sale of vegetables. There was an increase income generated of tomatoes from $45 to $55. In conclusion, the scheme is not realizing its full potential in addressing food security concerns in Mundi-Mataga Irrigation Scheme. Farmers are failing to meet expected outputs per hectare. The study, therefore recommends reintroduction of agricultural financing to boost productivity to fully address food security challenges in the area. The study further recommends periodic farmer education programs to adequately utilise the benefits of the irrigation scheme towards adequately addressing food challenges in the area.

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LIST OF ABBREVIATIONS

AGRITEX	- Agricultural Research and Extension
ARDA	- Agricultural Research and Development Authority
F.A.O	-Food and Agriculture Organisation
I.F.D.C	-International Food Development Committee
M.T	-Mega Tonnes
W.F.P	- World Food Programme
W.H.O	-World Health Organisation
ZESA	- Zimbabwe Vulnerability Assessment Committee
ZIMWA	-Zimbabwe Water Authority

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CHAPTER 1

1.0 Background of study

Food security is a situation which exists when all people, at all times, have physical, social access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO 2003,WHO 2011). At household level, food security implies physical and economic access to foods that are adequate in terms of quantity, nutritional quality, safety and cultural acceptability to meet each person's needs. According to Peter, (2011), food enters a household in a variety of ways, were a household can produce food when it has got human and material resources to do so and such households are said to have direct access to food. More so, the ability of the household to produce food depends on the access to resources. There is an alarming rate of population growth in the world, especially in developing countries without corresponding growth in food production which is likely to cause drastic hunger. According to Feresu (2010), agriculture is the backbone of the Zimbabwean economy, serves both as a source of raw materials for industries and consumer of industrial products. Irrigated agriculture contributes about 20% of the total Zimbabwe's agricultural output. However, in the Midlands Province it has been observed that, there is a cereal deficit of 67 584 MT (Ministry of Agriculture, Mechanization and irrigation Development 2013). Major deficits were recorded in Mberengwa were there was a deficit of 11 421MT (17%). These statistics gives a clear picture that in Mberengwa there is greater food insecurity, despite the fact that the a number of irrigation schemes in the district which include Chimwe-Chegato, Biri irrigation scheme, Vurasha irrigation scheme and Mundi Mataga irrigation scheme.

There is a looming shadow of food and agriculture crisis as a number of hydro-climatic and institutional factors which converge to emphasize the need for investment in agriculture and food security modeling in the Southern Africa. The coming decades will pose difficult problems for national policy makers and the international institutions in agricultural development, as there is cause for future food availability, (Rose grant, etal 1995). Moreover changes in local regional and global trends in climate such as global warming related, declines in annual rainfall in the sub- Saharan Africa are likely to have a strong influence in the availability and increase of food insecurity risk,(Feresu,2010). It had been also noted by Chazovachii (2012) that, changing weather patterns across the Globe has magnified the importance of irrigation schemes and

particularly the poor southern and Eastern parts of Zimbabwe, where in the couple of seasons they have compromised food security in most African states. In Zimbabwe, three quarters of the districts continue to report a deteriorating food supply situation. That is stocks are reported to be running out and staple food prices are widely reported to be unaffordable on both formal and informal markets. According to Mudzungairi and Mtomba (2012), production of maize declined by 79%, wheat 90%, soya beans 66%, fresh produce 61% and citrus 50%. However the achievement of sustainable food production is a critical step towards the reduction of food insecurity and malnutrition, but this does not guarantee substantial movement along the zero path to zero food insecurity.

Upton, (1996), irrigation schemes have been seen as the option for improving household food security. Erratic rainfall and unfavorable climatic conditions in the sub-Saharan region requires farmers to adopt irrigated agriculture to guarantee all year round food production. However many challenges remained associated with underlying poverty as the case of Ethiopia small scale irrigation scheme, (John, et al 1987).

Irrigation schemes have become complex solution to food insecurity, in response to chronic food shortages resulting from drought. More so, Rosegrant, et al (1995), is of the view that, most aged majority and most vulnerable people live in the rural areas and this implies that, there will be increased rural household food insecurity and malnutrition especially for the regions in Africa and Asia. The Department of AGRITEX, (1999), noted that, most rural communities in the developing countries are increasingly becoming the prime movers of development efforts which are imposed on them, until recently, when this is no longer the case. Historically in Zimbabwe food insecurity concentrated geographically in the rural areas of Matabeleland north (24%), Masvingo (20%), Matabeleland South (20%), (FAO, 2007). This had been further been accelerated by the unstable prices for most commodities, water and sanitation, (FAO, 2007). However, more information is needed to assess the extent of such difficulties and their implications for continued investment in irrigation schemes as the solution to the risk of food insecurity and malnutrition.

1.1 Problem statement

The need for adequate food security is paramount for every nation, where one of the major problems that is facing Mberengwa district, is of meeting the food security needs of an average increasing population over a limited arable land. For the past decade, food production levels in most parts of the district have declined or remained stagnant, whilst population growth rates have continued to soar. This had been further accelerated by extreme testing environment, terrain remoteness and climate which all pose significant challenges to crop production, where farmers tend to struggle for their living. According to Manzungu, et al, (2000), food demand is in precarious balance with the available resources with major deficits recorded in droughts. . Zimbabwe's food situation is characterized by food insecurity at both micro and macro levels. The major area of concern is the availability of food at household level. However, this national level of security is not translated to household level. There is need to address the issue of distribution and effective demand. In average years, food demand is in precarious balance with the available resources with major deficits recorded in droughts, such as 1990-1995, 1997/98, 2000-2007, (Manzungu, et al 2000). These droughts and dry spells have made daily life a struggle for many Mberengwa inhabitants. The problem of food security continue to affect these rural dwellers in the face of continual climatic changes as there is no developing country that afford to ignore the phenomenon of rural dwellers, (Lewis, 2003).Reports from the meteorological services shows that Zimbabwe is one of the countries which experiencing climatic changes, where parts of the Southern Zimbabwe are receiving precipitation, reduced run off and excessive evapotranspiration.

In this context there is a clear requirement for food security modeling to support integrated food resource planning in order to balance the need of the environment in the allocation and development of food security, as the fight to reduce food insecurity continues to be at the forefront of mankind priorities. However, research alone cannot produce meaningful change in the lines of the poor African people. This is an area where our ignorance exceeds our knowledge.

1.2 Objectives

1.2.1 General objective

- To evaluate the role of Mundi-Mataga irrigation scheme in improving household food security in Chingoma B ward 26, Mberengwa district

1.2.1.1 main research question

- what is the role of Mundi-Mataga Irrigation Scheme on household food security?

1.2.2 Specific objectives

- To assess how the land was allocated to the beneficiaries in the Mundi-Mataga irrigation scheme in Chingoma B ward 26
- To evaluate the types of the crops grown in the Mundi-Mataga irrigation scheme in Chingoma B ward 26
- To analyze the quantity of output per beneficiary in the Mundi-Mataga irrigation scheme in Chikure B ward 26
- To assess the knowledge of farmers in Mundi-Mataga irrigation scheme on the roles of irrigation schemes.

1.2.2.1 Sub-research questions

- How was land allocated in Mundi-Mataga Irrigation Scheme?
- What types of crops are grown in Mundi-Mataga Irrigation Scheme?
- What is the quantity of output produced by each beneficiary in Mundi-Mataga Irrigation Scheme?
- What is the level of knowledge of farmers on the roles of irrigation schemes on household food security?

1.3 Justification

A poor agricultural season has serious implications on the entire district which may in turn affect the national economy, as it has forward and backward linkages. So irrigation has become of paramount importance due to erratic and changing rainfall patterns. It can be justified that the

shortage of land in rural areas which is a consequence of historical circumstances and low rainfall in in the regions where the majority of the communal people live, means that irrigated plots are indispensable to both men and women.

1.4 Study area

The Mundi-Mataga irrigation scheme was derived from the name of a river (Mundi River), which is a tributary to Mwenezi River. After the construction of the Mundi-Mataga Dam, there was the construction of the Scheme as the extension of Biri irrigation Scheme. The Scheme is located in Mberengwa District approximately 170 kilometers from Zvishavane Town. The scheme is located in Agro-ecological Region Five, which is characterized by low rainfall, low run off and higher rates of evaporation, (Feresu 2010).

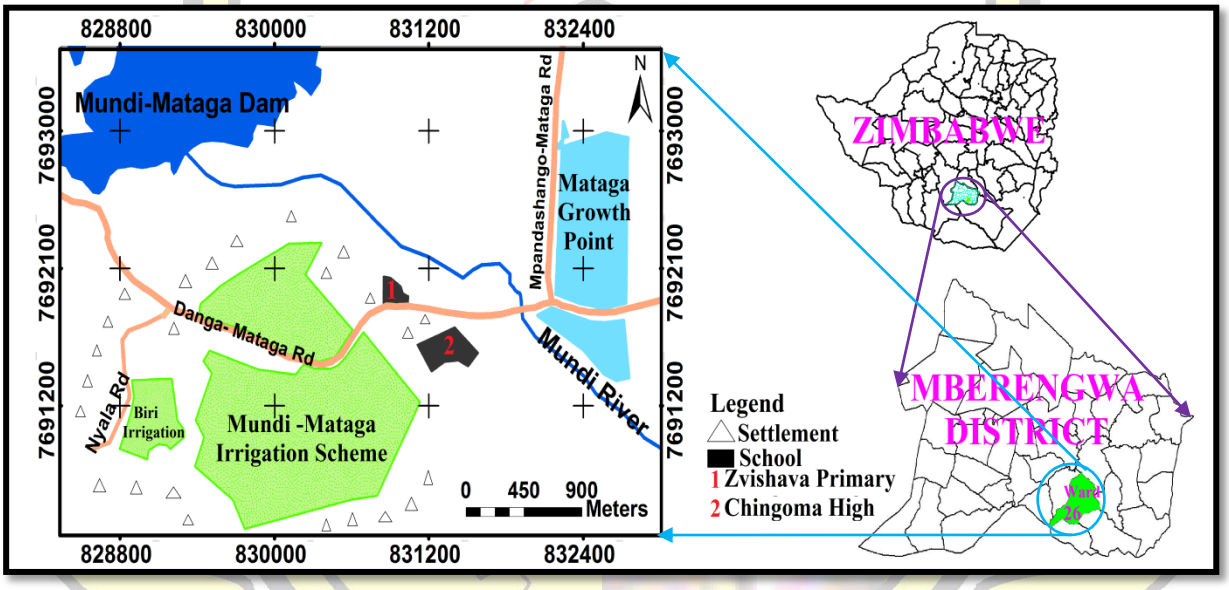

Fig 1.1 Map of Mundi-Mataga irrigation Scheme,Mberengwa,Midlands

The scheme supports about 200 plot holders on 130 hectares that are divided into four irrigation blocks ,A (42 Ha), B (23 Ha), C (34 Ha) and D (21 Ha). The plots were allocated on the basis that first priority was given to the Farmers who were affected by the construction of the Scheme. Those who were affected by the construction of the Mundi-Mataga Dam were given the opportunity to have plots in the scheme. Other beneficiaries were chosen on the basis that they picked numbers which corresponded with plot numbers. The Zvishava and Chingoma schools

were allocated 0.25 Ha in the scheme. The AGRITEX and Irrigation Department were allocated demonstration in the scheme.

1.5 Significance of the study

1.5.1 To the Researcher:

- The researcher acquired skills and in-depth knowledge about the role of irrigation as a food security strategy.

1.5.2 To Midlands Sate University:

- May publish the research through an accredited journal
- May put this document in the library for other students or researchers
- Can be a teaching material for other students.
- Can add to the board of knowledge

1.5.3 To the AGRITEX and Irrigation Department:

- If they can implement the recommendations as it can help improve the productivity of the Scheme and enhance the role of irrigation in the area.

1.5.4 To the Academic World

- The Research may propose for grey areas for studies by other researchers.

1.6 Scope

1.6.1 Delimitation

The research was carried out in the Mundi-Mataga Irrigation Scheme, Ward 26 in Mberengwa District because people in the area face food security challenges despite the presence of the scheme.

1.6.2 Limitations

- Lapse of memory affected the validity and reliability of the study. However, the researcher used a retrospective review to overcome the bias.

- There were limited resources to conduct the study and the researcher only interviewed people who were in the Scheme.
- The researcher had limited time as he had other academic responsibilities such as lectures and assignments.

1.7 Definition of terms

a) Food security

Is a situation that exists when, all people at all times have physical, social, access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and health lives, (FAO, 2003, WHO 2011 as sited in Chazovachii 2012).

b) Food insecurity

food insecurity exists when people do not have adequate, physical, social and economic access to food, (Food and Environment, 2013).

c) Irrigation

Irrigation is the supply of water to agricultural crops by artificial means designed to permit agriculture in arid regions to offset drought in these regions.

1.8 Summary of chapter

The chapter focused on the background of the study analysis on the role of irrigation on household food security. Research objectives and the research questions were also formulated in this chapter. It also highlights the limitations faced by the researcher during the course of the research and how they were tackled, assumptions made in relation to the study and definition of terms. The next chapter will focus on reviewing the literature that is relevant to the study.

CHAPTER 2

2.0 Literature review

This chapter reviews the selection of existing literature on smallholder irrigation schemes. The attempt is made to cover not only literature for Zimbabwe but also literature on other African and Asian nations and to some extent the international community at large. FAO had noted that literature on smallholder irrigation gives conflicting results on the roles of irrigation schemes on household food security.

Bagson and Wuleka Kuunder (2013), had pointed out that, multiple factors from natural events, and activities have given enough signals to the research community to ignite conscious efforts to ensure sustainable food security worldwide, where households in developing countries, attempt to reach their food needs through own production. It is by the virtue of food security where many food security experts had opened their minds as to find ways on which nationals can attain food security and nutrition security. Thus the multiple factors from natural events and human induced activities had given enough signals to the research community to ignite conscious efforts to ensure sustainable food security worldwide. Therefore it is better to gain a clear understanding of the roles of irrigations on household food security as this affects community food security until we reach the global food security arena. Agricultural growth is more important for Africa than any other continent. About 70 percent of people in Africa and 80 percent of the continent's poor live in rural areas. These depend on agriculture and non-farm rural enterprises for their households and increasingly are unable to meet their basic foods needs as population pressure on land grows and water resources become scarce or degrade and agricultural productivity stagnates, (FAO)

2.1 Definition of food security

Food security is a situation that exists when, all people at all times have physical, social, access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and health lives, (FAO, 2003, WHO 2011 as sited in Chazovachii 2012). It had been noted that, food security is built on three pillars which are access, availability and utilization, (Peter, 2011). Access of food can be achieved through own production, where individuals or households use the available resources to produce their own food. Availability implies that, the food will be

always there, but there is need to bear in mind that, there is no food security as it cannot meet the dietary requirements of the people. According to FAO, achieving food security has got three dimensions. First it is necessary to ensure a safe and nutritionally adequate food supply both at the national level and at the household level. Secondly it is necessary to have reasonable degree of stability in the supply of food both from one year to another and during the year. The third and the most critical is the need to ensure that each household has physical, social and economic access to enough food to meet its needs.

According to Peter(2011),at household level, food security implies physical and economic access to food, that are adequate in terms of quantity, nutritional quality, safe and culturally acceptable to meet each person needs. Thus food enters a household in a variety of ways, (Chazovachii, 2012). It can produce food when there is human and material resources to do so and such households are said to have direct access to food. This means that, each household must have the knowledge and ability to produce or to procure the food that it needs on a sustainable basis. In this context, properly balanced diets that supply all necessary nutrients and energy without leading to overconsumption or waste should be encouraged. Household food security affects both rural and urban areas. The food insecure socio-economic groups may include farmers, homeless people, elderly, female-headed households, isolated rural households and all those who have no access to resources. This had been the turning point for most developing countries as they need to make sure that their inhabitants are food secure.

2.2 Food insecurity

According to Food and Environment (2013), food insecurity exists when people do not have adequate, physical, social and economic access to food. About 870 million, of which 853 million from developing countries are estimated to be food insecure during the period of 2010 to 2012 (GFAR 2013). Food insecurity can be categorized into two forms that is, chronic and transitory food insecurity. Chronic food insecurity, is when a household/family lacks minimum requirements of the people for a period of time to extended periods of time, extended periods of poverty, lack of assets and lack of aces to productive or financial resources. Transitory food insecurity is the sudden lack or reduction in the ability to produce or access minimum requirements of food due to short term shocks or fluctuations in food access and availability.

Characteristics of households with very low food security are characterized by failing to afford to eat balanced meals and have to rely on inexpensive, non-nutritious foods or they can be hungry because they could not afford enough food, (Food and Environment, 2013).

Bagson and Wuleka Kuunder (2013), are of the view that, households in many developing countries attempt to reach their food needs through own production and reliance to rain fed agriculture. However climate change and unpredictable weather patterns are changing farming activities and negatively affect food security at different households. It had been noted that, poor households are particularly at risk because of the limited access to income and resources, (ZimVac, 2011). This is so because of the unpredictable rainfall patterns, poor agricultural financing and climate effects which had posed serious consequences. They then combine to increase vulnerability of household's to food insecurity. Stinger (2000), aired the view that, during the 1990s, food security issues pushed their way back onto crowded international focuses which focused much attention in seemingly never ending race between food production and population increases where it included the access dimension by millions of households, for instance in Kenya and Malawi household security is influenced by total household income. FAO had noted that severe droughts and sharp increases in prices in the 1960s and 1970s led to green revolution. This focused on increased fertilizer use, crop variety improvement and expansion of irrigation schemes to avert the problems of food insecurity.

A multiple of factors from natural events and human induced activities had given enough signals to the research community to ignite conscious efforts to ensure sustainable food security worldwide. Thus increase in vulnerability of households to food insecurity which had led to most of the developing countries to raise their eyebrows on the issue of food security issues.

Belder, et al (2007), is of the view that food insecurity remains a persistent feature in developing countries. There is evidence that, for many developing countries ,increasing productivity is the key to reduce food insecurity, while on the other hand over these periods ,several countries in Africa are experiencing real declines in agricultural growth and also show lowest growth in gross domestic product and increase in food insecurity,(Peter 2011). Canter (1967) also aired the view that, the alarming rate of population growth of the world especially in developing nations without corresponding growth in production is likely to result in drastic hunger. According to the World Bank, population growth and the lagging agricultural production pose significant

challenges to food security affecting both food availability and affordability were climate change tend to reduce agricultural productivity and food availability which results in direct vulnerability to food insecurity.

There are a number of strategies that had been placed forward to reduce the rate of food insecurity. These include food aid, construction and rehabilitation of irrigation schemes among others. This is so as, the fight is greatly to reduce food insecurity, continues at the forefront of mankind priorities and irrigated agriculture had played a significant role in achieving this goal, (FAO, 2013). However, rural communities in developing countries had become prime movers of development, an effort that affect their social, economic and their food security status, (AGRITEX 1999). This brought the results which were poor as communities did not feel ownership of ideas imposed on them. However, the choice of the policy must be attuned to the country's food security problem and the nature of the food insecure population.

2.3 Irrigation.

According to FAO, irrigation is a complex situation to the problem of food insecurity. Irrigation is the supply of water to agricultural crops by artificial means designed to permit agriculture in arid regions to offset drought in these regions. They can also be applicable to areas where total seasonal rainfall is adequate but on average it maybe poorly distributed and it can vary from year to year. Irrigations can be classified according to their sizes and/or types of crops which are grown in them. According to Field and Collier (2009), irrigation are of different typologies and these differ from country to country and/or region to region. They can be classified according to their sizes, type of ownership among others. In Zimbabwe, irrigations are classified into three types which are formal schemes, informal schemes and parastatal schemes, (Manzungu and Van de Zaag, 2006). Formal irrigations are the ones which are initiated by the government, informal schemes are the ones which are run by the farmers themselves and those under parastatal are the ones which are controlled by ARDA. According to Beldier, et al, (2007), by independence, Zimbabwe had about 150 000 hectares under formal irrigation schemes. 68% of this was in the large scale commercial farming areas, another 20% was linked to commercial estates, 7% of ARDA and only 3% were smallholder irrigation schemes. It was noted that the distribution of irrigation schemes was unequal than that of land and other resources. The need is usually driven by the need to meet the water needs of the crop from year to year as some areas receive little

rainfall during the growing season to support crop growth. So irrigation can be viewed as an insurance against occasional drought, (I.F.D.C 2013). FAO had noted that irrigations do not only raises the yields of specific crops, but also prolongs the effective crop growing period in areas with dry season thus permitting multiple growing of crops when a single can be grown otherwise. By assuring year availability of water, production can be intensified the availability of water, production can be intensified through double or multiple cropping, thus raising resource productivity and total production.

2.4 History of irrigation

According to Scoones, (2013), expanding population and the failure of agriculture to meet food security needs in periods of drought (notably 1947 and others too), had resulted in concern at the highest policy levels to do something with agriculture investment. Irrigation began at about the same time in Egypt and Mesopotamia, (present day Iraq and Iran), using water flooding the Nile and Tigris/Euphrates rivers. According to the University of Nebraska-Lincoln, showed that, irrigation was practiced at Fort Sidney, where a ditch from Lodge pole Creek brought water to the gardens. However, irrigation received scant support in Nebraska until the 1980s. In 1952, major reports on large scale irrigations made the case for a substantial increase in investment in irrigation in Zimbabwe, then Rhodesia (Scoones 2013). However irrigation in Zimbabwe had much longer history. The ancient systems of Nyanga offer an example of highly intensive and sophisticated small-scale systems. Dambo or vlei cultivation dominated the agriculture in the 19th century as farmers farmed intensively on valley bottom hilly areas. So in the colonial era missionaries encouraged irrigation at times of famine and set up a new farmer near missionary stations.

2.5 Irrigation and change in food security

The need for adequate food has gained a global attention especially in developing countries, as it can be viewed as an old age problem that endure today, (Stinger 2000). It had been noted that agricultural growth is more important for Africa than any other continents. About 70% of the people in Africa and roughly 80% of the continent's poor live in the rural areas where they depend on agriculture which sometimes is affected by population pressure on the land and degradation leading to reduced productivity. However, FAO estimates show that, between 1995/7 and 2030, about 75% of projected growth in crop production in Sub-Saharan Africa will

come from intensification in the form of yield increases (62%) and higher cropping intensities (13%), with the remaining 25% from arable expansion. Unfortunately about 70% of the world's supply of fresh water is being used for irrigation whilst irrigation is the key to increasing agricultural production, it is clearly limited by the amount of fresh water on this planet. Curruthers, et al (1996), is of the view that, demand for irrigation water can be regarded as a derived demand for food. This is so because irrigation development today's aggregate food supply is sometimes overlooked as evaluations of policies and projects focus on identifying problems rather than benefits. However, on the other hand irrigations enthusiasts should not exaggerate the contributions of irrigations to food security and neglect other influences on global food growth. According to Stinger, (2000), irrigated land area increased rapidly until 1980 with the expansion rates of more than 2 %, where in Asia it led to a steady increase of staple food production and in Sub- Saharan Africa it remained low and 18% of the irrigated land.

It had been noted that, the rate of population growth of the world especially in the developing nations without corresponding growth in food production is likely to result in drastic hunger. Bagson and Wuleka Kuunder, (2013), pointed out that, households in many developing countries attempt to reach their food needs through own production and reliance on rain fed agriculture. However climate change and unpredictable weather patterns are changing farming activities and are negatively affecting food security.

Irrigation agriculture has become a relief to food and nutrition security, (Bagson and Wuleka Kuunder 2013), for both the poor and the disadvantaged especially in developing countries. Crop production is the main food source where it can contribute 38% of every poor household and 82% of the better households. Irrigation had gained global attention and about 279 million hectares (19%) are irrigated throughout the world, (Hanjra and Qureshi 2009). Although 30% - 40% of the world's food comes from irrigated land, there is no need for continuous construction of irrigation schemes before considering the contribution by rain fed agriculture. Irrigation cannot be apparent alternative for improving local food security. Moreover some of the sub-Saharan African nation's rivers dry up during the dry season and the levels of ground water. Notwithstanding some disappointing experiences with irrigation in the past have shown that about 75% of all sub-Saharan African irrigation achieved or exceeded the expected rate of return, for instance, in Ghana, the effectiveness of irrigation schemes has been observed as they assume

that irrigation schemes alone will not achieve food security for most vulnerable households, (Oxley 2013).

2.6 Roles of irrigation in increasing crop productivity.

Irrigation is considered to be an important factor for agriculture and food security. Knowledge gaps however still exist with regard to Africa south of Sahara, (FFAR 2013). However understanding the patterns of irrigation use and household characteristics is of great importance. At the World food summit of 1996, FAO had estimated that, 60% of the extra food which is required will come from irrigated agriculture and this had assumed to be the call on the role of irrigational agriculture in sustaining future world food supplies. Even though, only 16% of the world's food croplands are irrigated, those irrigated crops produce 36% of the world's food, (World Food Summit, 1996). The table below shows the percentage of food produced on irrigated land by different regions.

Region	Percentage of food
Asia	60
Pakistan	80
China	70
India	50
Indonesia	50
Middle East and North Africa	33
Iran	50
Egypt	98
Latin America	10
Sub-Saharan Africa	9

Table 2.1. irrigational crop productivity. ***FAO***

Some scholars had pointed out that, irrigation allows land to be on average, twice productive as rain fed agriculture. According to Musa, et al (2010), irrigations encourage higher yields, cropping intensity and diversification towards higher value crops and they can increase production by at least thrice. This means that, they are potential to enhance the opportunity to generate income and reduce poverty. As it noted that irrigation schemes increase food production and availability, but the question is does more food always lead to improved nutrition? Irrigations frequently enables as much greater variety of crops to be grown than is under natural conditions. For instance in the upper Ganges Valley of India, perennial irrigation makes possible cultivation of both winter crops like wheat and vegetables and summer crops such as rice, cotton and maize,(Canter,1967). In Malawi, it had been noted that, 9% was considered to be food insecure after the installation of the treadle pumps as they increased crop production, (Mangson 2008). Moreover, changes in cropping patterns were witnessed in India after the installations of micro irrigation adaptors, (Domenech and Ringler 2013). In Zimbabwe, it had been noted that, when Manunure irrigation rolled into life in 2012, irrigators stared to grow a variety of crops such as carrots, cucumbers and cabbages of which most of the households where used to sadza and vegetables especially the poorest households, (W.F.P 2013). Moreover, Hama Mavhaire irrigation scheme was constructed in 1992, after the drought and it saw the growing of a cereal (maize) followed by beans and vegetables. However, as it had been noted that, irrigation schemes increase food production and availability, but does more food always lead to better nutrition? This can be so as irrigation agriculture, encourage mono-cropping, which tends to have negative impacts on household food security. This can be witnessed in Bangladesh where irrigation encouraged the production of rice and increased the intake of rice and reduced dietary diversification amongst poorest households, (Domenech and Ringler 2013).

Increased crop production in irrigated agriculture accounted for half of the global gains in foods production, (Amankwa and Ocloo, 2012). It had been noted that, irrigated land has increased three folds from 1950 to 1985 and one tenth of the arable land of the world is now irrigated and of this one sixth produces one third of the world's food production, (Wild,2001). According to Bagson and Wuleka Kuunder, (2013), food crops had been affected by vagaries of weather, but irrigation schemes which have been used in the ancient times have positively controlled the effects of drought and floods on food crop yields. For instance between 1970 and 1990, irrigated land had increased by 17 percent worldwide. However, the limiting factor in developing

countries is that the element of high costs of construction costs of irrigation schemes. Rosegrant, (1995) as sited in Curruthers, et al (1996), noted that, it was this period when irrigation from developing nations expanded at 1.95 percent per year reaching 155 million hectares of irrigated land.

It had been noted that, the benefits of irrigation schemes are not evenly spread. That is there is good reason think that investing in irrigation alone will not achieve food security for the most vulnerable households. Domenech and Ringler, (2013), had noted that, Sub-Saharan Africa does not increase agricultural productivity through irrigation expansion and associated inputs as they can produce negative results. For instance, the Kennan sugar irrigation scheme which was started in 1973, in which 70 000 hectares of arid land were to be irrigated to produce 300 000 tons of sugar per year for export, but it was a failure as it only provided for domestic market, (Kiley-Worthington 1993). In Ethiopia, smallholder irrigation scheme farmers struggled to make a living in the extreme testing of the environments, (IFAD, 2005). Moreover, in Zimbabwe, the same scenario was witnessed at Biri irrigation scheme when 58 hectares of sugar beans were written off due to power cut-offs,(Gumbo 2013).

Kelley-Worthington, (1993), had noted that, improper use of irrigation schemes, can increase the rates of household food insecurity. That is, they can fail to meet the required targeted objectives. That is you can grow wrong crop on the wrong place like in the case of the Gezira cotton scheme of 1930 which was a failure, (Mutenga, 2005). Moreover, the issue of the Kennan sugar scheme of 1973 as sited by Kiley-Worthington (1993) must not be left out. FAO had also noted that in Zimbabwe irrigation schemes such Rozva (Masvingo) and Mambanjani (Midlands) had been seen as failures as they had only produced yields below the expected to sustain the day to day living of the people.

2.7 Conceptual Framework of the roles of the irrigation on household food security

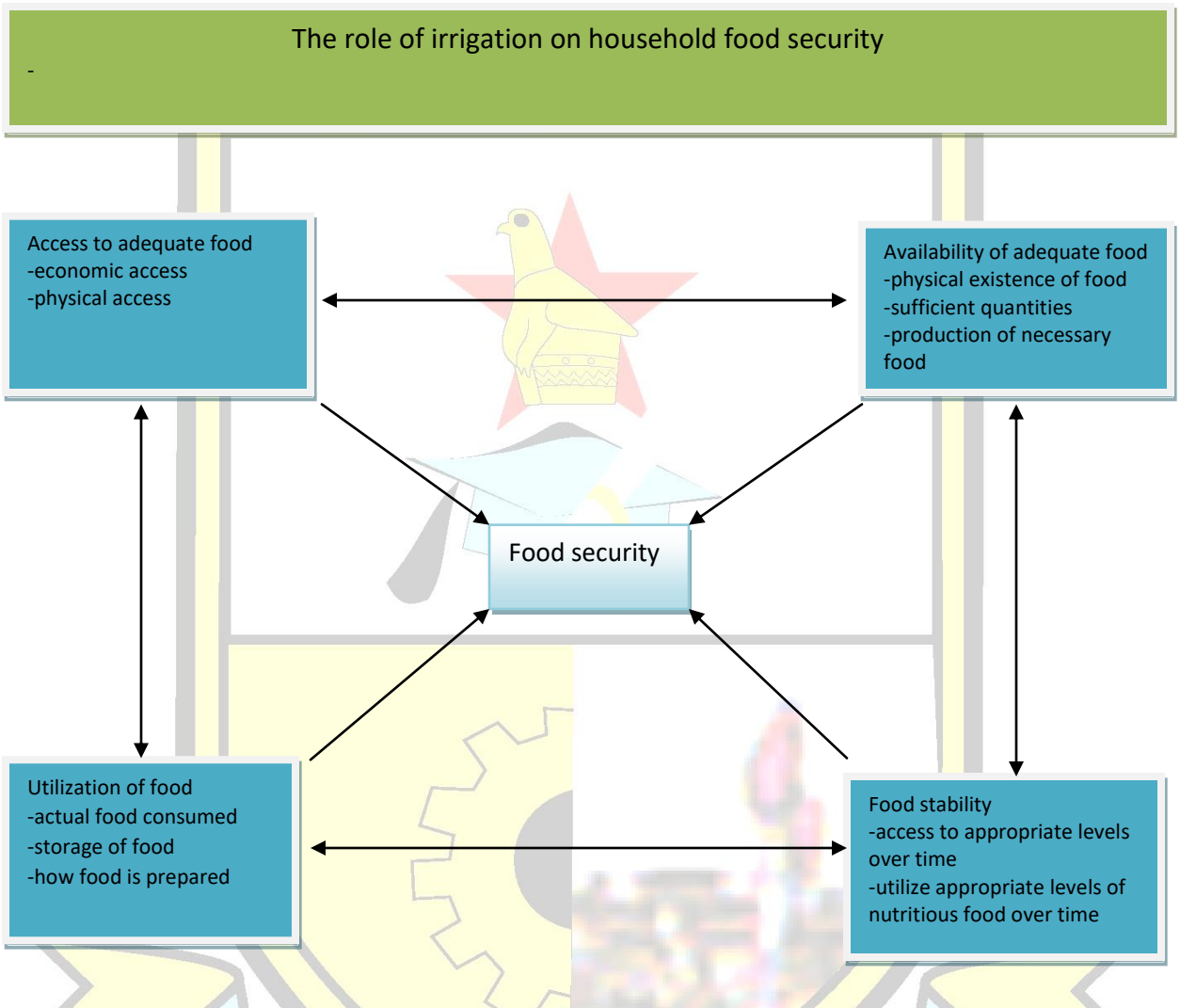

Fig 2.1. the conceptual framework of food security as adopted from Pieters, et al (2013).

2.8 Summary

In this chapter the researcher has reviewed the literature that analyzed the role of irrigation on household food security. It also highlights the conceptual framework of food security. The next chapter focuses on research methodology.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter discusses the methodological approaches and specific data gathering techniques that were used. That is it will spell out a number of concepts and methods with the key understanding of how data was gathered, analyzed, organized and presented. It is in this chapter where these data analysis tools will be used to in the evaluation of the role of irrigation schemes on household food society.

The study was a quantitative and qualitative evaluation of the roles of Mundi Mataga irrigation scheme in food security. The study further conducted a secondary data set analysis (historical design) for trend analysis. Therefore, the research was based on both numeric data and qualitative data (Walliman, 2008).

3.1 Population

According to Payne and Payne (2004), a study population is the total members of the study defined by a class of people, objects, places or events because they are relevant in research. There were key informants who included officials and engineers from the department of irrigation, the councilor, irrigation management committee and AGRITEX extension officers. Key informants provide specialist knowledge about the scheme more than any other people (Payne and Payne 2004). Irrigators were treated as primary participants.

3.2 Sampling

Random sampling was used to recruit 20 primary participants from the Scheme into the study. Purposive sampling was used to select key informants into the study.

3.2.1 Sample size

According to Rodgerson (2010), this replies from larger populations. Data collected from the Irrigation department, AGRITEX and the Irrigation Management Committee revealed that, the total population size of Mundi Mataga irrigation scheme is 200 plot holders. So from this research, a sample size of 10% was chosen as a representation of the irrigators. Therefore, twenty (20) irrigators were chosen randomly from the Mundi Mataga irrigation scheme.

3.3 Methods of data collection

The researcher used a desk review of secondary data, interviews and passive observations as data collection techniques. Data collection tools used include pretested semi-structured interviewee administered questionnaire, interview guide and passive observation checklist.

3.3.1 Questionnaires

One type of questionnaire was designed for one group of respondents which are scheme irrigators (primary participants). These questionnaires were administered on the basis of face to face due to the consideration of community and confidentiality (Somekh and Lewin, 2011). Questionnaires were used to gather information from a sampled number from the community. Data was collected using questionnaires, interviews and observations. About twenty questionnaires were randomly distributed amongst scheme beneficiaries. In the questionnaires there were structured and unstructured question which were aimed at collecting data patterning to the role of Mundi-Mataga irrigation Scheme on Household food security.

The responses from the questionnaires and interviews used are shown in the table below:

Study participants	No. of Participants	No. Participants who responded	Data Collection Technique	Tool	Rate of response
Primary Participants	20	19	Interview	questionnaire	95%
Key Informants	5	4	Interview	Interview guide	80%

Fig 3.1: Response rates from questionnaires and interviews

3.3.2 Interviews

These were used to get an in depth information from both primary participants. Further interviews from key informants, local authorities such as the local Councilor, Irrigation

management committee, AGRITEX Extension officers and officials from the irrigation department, were done to special knowledge about scheme and observed trends.

3.3.3 Field observation

During the tour, the researcher took time to observe the state of crops in the Mundi-Mataga irrigation scheme. This method was used to see the quality of irrigated crops.

3.3.4 Use of secondary data

Secondary data was also collected from AGRITEX and irrigation department (that is monthly, quarterly and annual reports) for trend analysis.

3.4 Chapter summary

This chapter focused on the research methods, research sample and data collection techniques which were adopted by the researcher. The next chapter deals with data presentation, analysis and interpretation.

CHAPTER 4

Data presentation, Analysis and Interpretation

4.0 Household composition, characteristics and crop outputs

Below is a table showing household composition, characteristics and crop outputs for participants in the study (Table 4.1)

Participant	**Characteristic**		**Household composition**	**Type of crop and output**				
	Gender	**Marital Status**		**maize (tons)**	**Beans (tons)**	**Vegetable (bundles)**	**Tomatoes (buckets)**	**Okra (buckets)**
1	male	married	< 5	0.5	0.2	45	22	-
2	male	married	<5	1.1	0.5	33	14	-
3	male	married	< 5	0.9	0.1	16	24	-
4	male	married	6-10	1	-	28	37	-
5	male	Divorced	< 5	1.5	0.3	50	18	-
6	male	single	< 5	1.5	0.6	48	-	-
7	male	married	< 5	0.8	-	21	19	-
8	male	married	< 5	1	0.4	39	12	-
9	male	married	<5	0.9	-	34	5	-
10	male	married	6-10	1	-	-	8	5
11	male	married	6-10	1	-	38	-	-
12	female	married	6-10	1.5	0.1	46	13	-
13	female	single	<5	0.7	-	26	23	-
14	female	married	6-10	0.2	-	20	11	2

15	female	married	6-10	2	0.4	52	2	-
16	female	married	6-10	0.3	-	23	9	-
17	female	widow	< 5	0.3	-	19	1	-
18	female	widow	6-10	0.8	0.1	-	6	-
19	female	widow	6-10	0.4	-	26	1	-

Table 4.1 distribution of study participants by household composition, characteristics and crop outputs for Mundi-Mataga irrigation scheme, Mberengwa district, Midlands Province, 2012/13 season.

As indicated in the table 4.1 above, most plot holders, 58% (n=11), who participated in the study were males. Widows constituted 36% (n = 3) of female plot holders who participated in the study. Males plot holders produced higher yields as compared to their female counterparts especially for the widows (see table 4.1 above). Female headed households have got higher household composition as compared to male headed households (see table 4.1 above). The most commonly grown type of crop was maize, followed by sugar beans. The least grown crop is okra.

Key Major Finding: (a) Males plot holders produced higher yields as than their female counterparts.

(b) Female headed households have got higher household composition as compared to male headed households.

(c) The most commonly grown type of crops are maize and beans and the least grown is okra.

(d) Most farmers are failing to meet the expected output targets

Expected outputs per hectare according to the Department of Irrigation, Midlands province (2013/14 season), are as follows: Maize is six (6) tons, beans is three (3) tons, tomatoes is 1500 buckets and vegetables 22 800 bundles. Against the expected output, farmers are failing to meet targets per hectare for all the crops except for maize (staple food) where 21% (n =4) of all the plot holders that participated in the study managed to meet the expected output targets. The implication of this in terms of food security is that the Irrigation Scheme is falling short of its full

potential. The department of irrigation raised concern that food is not always available in the area. The results given above explain why food is not consistently available throughout the year in the Mundi-Mataga area despite the presence of this irrigation scheme. The study noted that 32% (n=6) are able to sell their surplus. The remainder used their produce for subsistence only, 31% (n=4) of whom experience deficits and resort to buying food for supplementation. Basing on production levels shown in table 4.1, it is plausible to infer that in terms of nutrition, plot holders may be failing to have balanced diet. The scenario is slightly skewed towards staple food. While the study appreciates the role of the irrigation scheme is providing food security in the area, it may be inferred that it is failing to do that.

Female headed families have higher numbers of household composition, yet they have lower production levels relative to their male counterparts. Men migrate into towns for employment leaving women as key cadres for agriculture production in rural. However, the findings in this study points out that they have less composition than men in the scheme. According to Domenech and Ringler (2013), irrigation intervention is critical important development projects for women empowerment. To some extent the scheme achieved this phenomenon. However, over all the implication in terms of food security is that the irrigation scheme did not adequately target the vulnerable groups in Mundi-Mataga area.

The scenario shown in table 4.1 above, in terms of failing to meet the targets by water rationing which is taking place. This was caused by the fact that, ZIMWA had stopped water supply and ZESA had stopped electricity supply to the farmers due to non-payment of rates. In contrary to this, Kiley-Wirthington (1993), found out that, improper use of irrigation caused a decline in productivity and increase in food insecurity in Canada.

AGRITEX officials and the Irrigation Management Committee emphasise that farmers prioritize the farming of maize and beans in Mundi-Mataga irrigation scheme which explains these are the mainly grown crops in the area. This is because maize is the staple food in the area and farmers can sell the surplus to get which they can use to access other food types for improving their food security. However, against the finding in the study that farmers are failing to produce surplus it means there is food insecurity in the area despite the presence of the scheme. Farmers are however encouraged, on a voluntary basis, to practise horticulture where they grow vegetables,

tomatoes, carrots, butternuts and okra. This option has encouraged multi- cropping which noted during the study.

4.1 Maize and beans Productivity

Below is a graph showing productivity trends for maize and beans for Mundi-Mataga Irrigation scheme (fig 3.1).

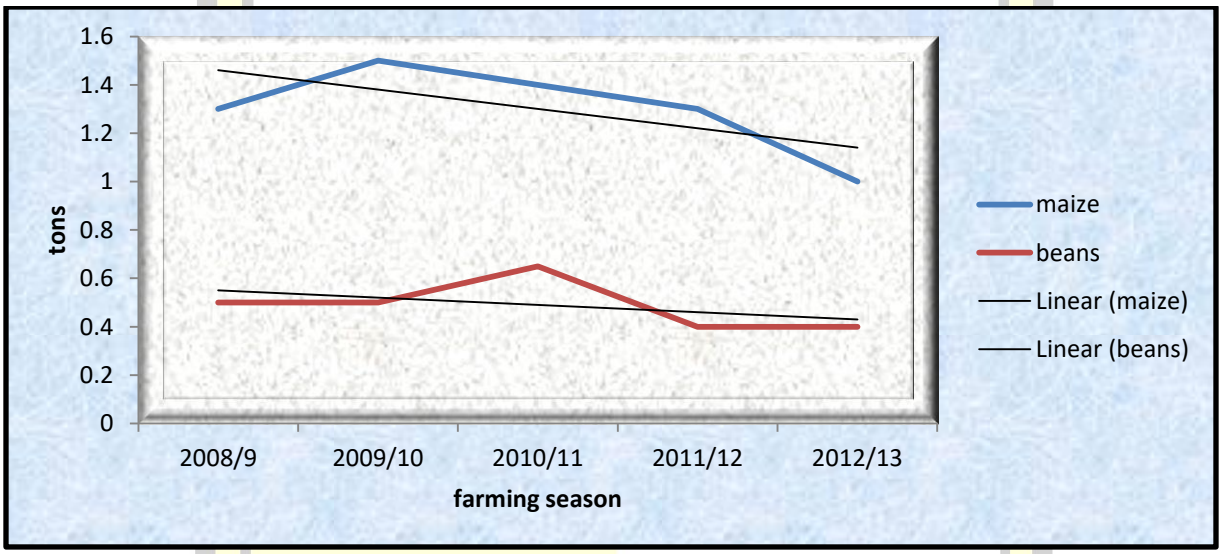

Fig 4.1 Maize and bean productions trends, Mundi-Mataga Irrigation Scheme, Mberengwa district, 2008/9-2012/13.

As indicated in fig 3.1 above, there is a decreasing trend of maize and beans production from 1.3 tons and 0.5 tons during the 2008/9 season to 0.9 tons and 0.4 during the 2012/13 season respectively. Relative to beans production trends; maize production trends, besides being higher during the period reviewed, show a steeper decline as indicated by linear trend lines shown in fig 3.1 above.

Key major findings: (a) there is a decreasing trend of maize and beans production from 2008/9 season to the 2012/13 season.

(b) Farmers produce more maize than beans.

The 2008/9 season showed lower production than the succeeding season because of the economic challenges during this period in Zimbabwe. Although, seasonal reports from AGRITEX officials for Mundi-Mataga Irrigation Scheme showed that irrigators manage to grow adequate food for them, production levels as shown in the diagram are decreasing every year

over the period reviewed. This is consistent with Beldier et al (2007), who showed a 30% decline in irrigation, food production from 1964 to 1995. Key informants and participants attributed this to lack of agricultural financing as most farmers are only using this scheme as an alternative measure for subsistence in the face of economic challenges the country is facing. This finding is consistency with findings by Domenech and Ringler, (2013), that Sub-Saharan Africa does not increase agricultural production through irrigation expansion. The trend in food production as indicated in Fig 3.1 shows that, beneficiaries are steadily getting vulnerable to food insecurity because there is negative production every year.

4.2 Trends in vegetable production (bundles)

The graph below shows vegetable production trends from 2008/9 to 2012/13 seasons for Mundi-Mataga Irrigation Scheme (fig 4.2).

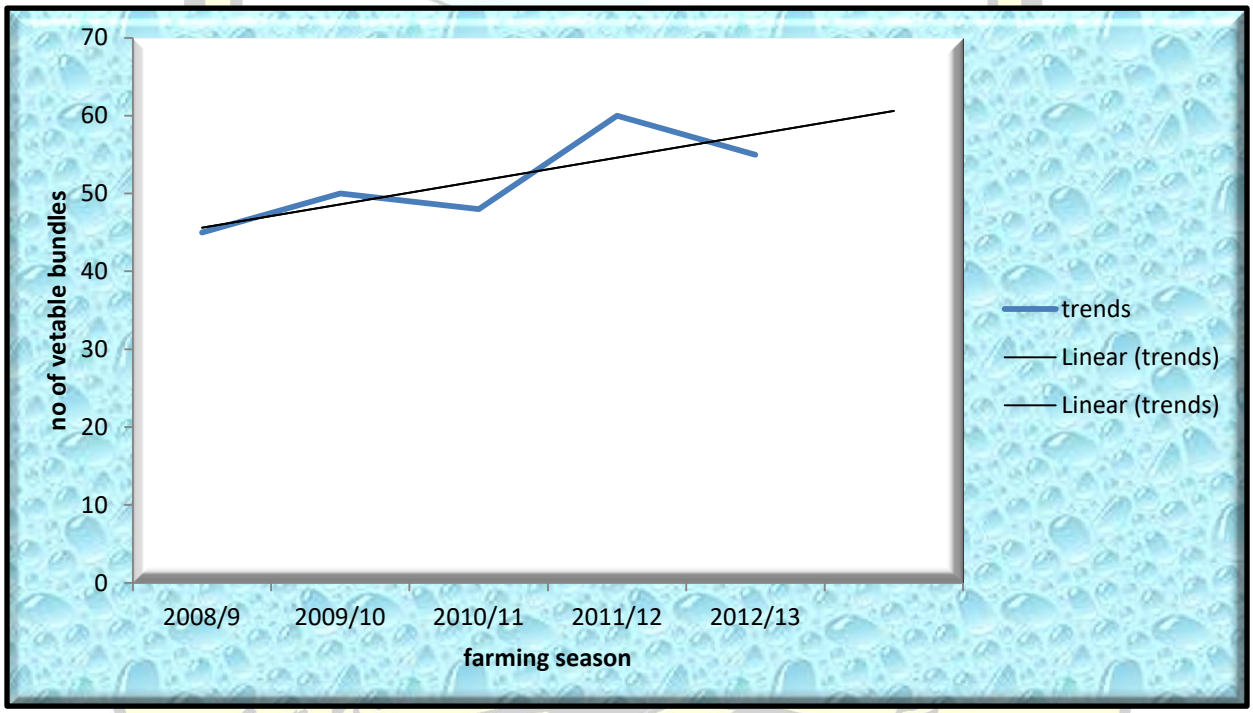

Fig 4.2 vegetable production trends, Mundi-Mataga Irrigation scheme, Mberengwa District, 2008/9 to 2012/13 seasons

As indicated in fig 4.2, there is an increasing trend in vegetable production from 45 bundles during the 2008/9 season to 55 bundles during the 2012/13 season.

Key major findings: (a) there is an increasing trend in vegetable production from the2008/9 season to the 2012/13 season.

This demonstrates the people shifting to horticultural crops. This is not translating to food security as there no income generated from this to access (economic) other foods.

4.3 Trends in tomato production (buckets)

Shown below is a graph indicating tomato production trends in Mundi Mataga Irrigation Scheme for 2008/9 to 2012/13 seasons.

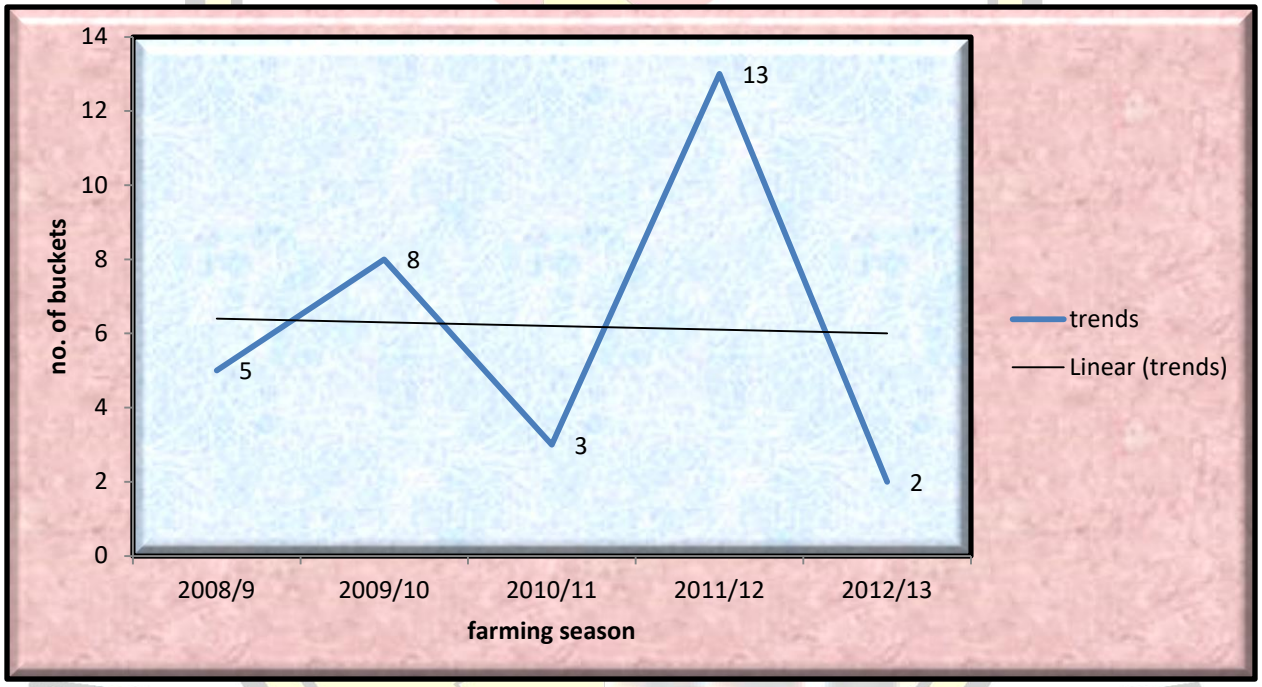

Fig 4.3 trends in tomato production, Mundi-Mataga Irrigation Scheme, Mberengwa District 2008/9 to 2012/13 seasons.

There is a gently decreasing tend in terms of tomato production from 5 buckets in 2008/9 season to 2 buckets in 2012/13 season.

Key major findings: (a) there is a gently decreasing trend in terms of tomato production in 2008/9 season to 2012/13 season.

The low production level in 2008/9 could be attributed to the country's economic challenges. In the 2010/11 season, the tomato crop was affected by frost. In the 2012/13 season, tomato production was affected by water supply closure and power cuts by ZESA. The declining trend could be due to government policies, land tenure and water allocation which do not create a conducive environment for successful operation of smallholder irrigation schemes (Munjere and Mazvimavi, (2013) and Manzungu, (1999) ascribed the failure of irrigation schemes in Africa to sub-standard infrastructure, and unclear irrigation scheduling and inefficient water use.

4.4 Incomes generated

Records review of income generated from the sale of green mealies, vegetables, beans and tomatoes showed trends, average incomes, as shown below in 4.4

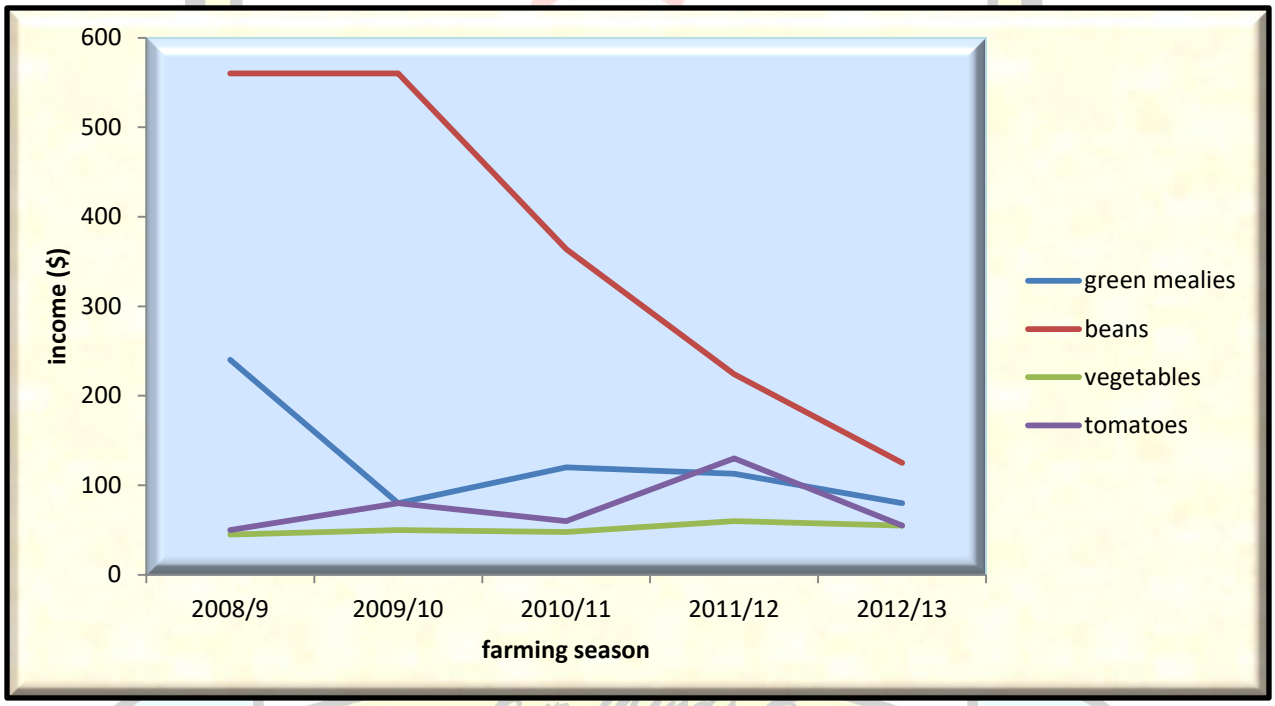

Fig 4.4 Income generation trends, Mundi-Mataga Irrigation Scheme, Mberengwa, and Midlands Province.

As shown in fig 4.4 above, there is a sharp decrease in the incomes generated from the sale of beans, from $560 in 2008/9 season to $125 in 2012/13 season. There is a decreasing trend in the sale of green mealies, from $240 in 2008/9 season to $80 in 2012/13 season, (see fig 4.4). There epis no change in the sale of vegetables from 2008/9 to 2012/13 season. There is an increasing

trend in the sale of tomatoes, from $50 in 2008/9 season to $55 in 2012/13 season, (see fig 4.4 above).

Key major findings: (a) There is an overall decreasing trend in income generated from the sale of the produce for Mundi-Mataga Irrigation Scheme from 2008/9 to 2012/13

Mundi-Mataga irrigation scheme facilitated generation of income from the sale of different crops produced from the scheme. However it was noted that, horticultural products are high value crops which are grown by the irrigators. These crops are cultivated at a lower scale that is 0.01 ha. The period between 2010/11 experienced a decline in the sale of tomatoes because they were affected by frost (Ncube, 2013).

The decline in income levels generated from the scheme is consistent to production levels that were affected by lack of water supplies, power cuts by ZESA which saw 58 Ha of soya beans reported to be completely write off (Gumbo, 2013).

4.5 Knowledge of farmers on irrigation

Knowledge was measured on a five scale liket scale were 0-2 is poor knowledge 3 is fair knowledge and 4-5 is good knowledge of irrigation. Most participants, 42 %(n=8) have got poor knowledge. Then 32% (n=6) had fair knowledge and 26%(n=5) has got good knowledge on irrigation. Over all the knowledge was fair.

Key major finding: (a) there is fair knowledge on irrigation in the Mundi-Mataga irrigation scheme

This to some extent can explain why people are not meeting their expected target and instead have decreasing productive levels over years. Perceptions can impact on the knowledge levels about irrigation, which might explain why the farmers have fair knowledge of irrigation

4.6 Chapter summary

This chapter focused on data presentation, analysis and interpretation were the data was presented in order of objectives. The next chapter focuses on conclusion and recommendations.

CHAPTER 5

5.1 Conclusion and recommendations

This dissertation has investigated the role of irrigation schemes on household food security, $with the main objective being the evaluation of the role of Mundi-Mataga irrigation scheme in improving food security in Chingoma B, ward 26, Mberengwa District. The study intends to make the following conclusions and recommendations

5.1.1 Conclusion

(a) The land was allocated on the basis that first priority was given to the Farmers who were affected by the construction of the Scheme. Those who were affected by the construction of the Mundi-Mataga Dam were given the opportunity to have plots in the scheme. Other beneficiaries were chosen on the basis that they picked numbers which corresponded with plot numbers.

(b) Males plot holders produced higher yields than their female counterparts.

(c) Female headed households have got higher household composition as compared to male headed households yet land allocation is skewed in favor of males. The scheme did not adequately target vulnerable groups in the area. So the project is not realizing its full potential in addressing food security concerns in the area.

(d) The most commonly grown type of crops are maize and beans and the least grown is okra. This compromises diversity hence food security in the area.

(e) Most farmers are failing to meet the expected output targets. This affects the role of the Scheme in providing food for beneficiaries in the scheme.

(f) There is a decreasing trend of maize and beans production from 2008/9 season to the 2012/13 season.

(g) Farmers produce more maize than beans.

(h) There is an increasing trend in vegetable production from the 2008/9 season to the 2012/13 season.

(i) There is a gently decreasing trend in terms of tomato production in 2008/9 season to 2012/13 season.

(j) There is an overall decreasing trend in income generated from the sale of the produce for Mundi-Mataga Irrigation Scheme from 2008/9 to 2012/13

(k) There is fair knowledge on irrigation in the Mundi-Mataga irrigation Scheme

5.1.2 Recommendations

- There should be Agricultural financing targeting the most vulnerable households which will be used to source inputs to boost production and improve income- Director of AGRITEX.
- ZIMWA and ZESA should negotiate a sustainable payment plan for the date to be serviced by the Scheme-Director ZIMWA and ZESA.
- There is need for farmer education through field days, master farmer training courses and outreach field trips. AGRITEX Extension Supervisor.

Anexxure 1 questionnnaire

MIDLANDS STATE UNIVERSITY

My name is Ncube Surprise a level 4.2 student at Midlands State University in the department of GES. Am currently doing research **on the roles of irrigation schemes on household food security**. I will be almost grateful if you assist me with information. The information will be treated with strict confidentiality and will be used for academic purpose only. Names of individuals/ institutions will not appear in the analysis. PARTICIPATION IS VOLUTARILY. If you volunteer to participate sign in below

Sign……Date…/…../……

Questionnaire number | | | |

Personal and Household data

1. Sex | Male | Female |
2. Age | below 16 | 16-24 | 25-33 | 34-42 | 42+ |
3. Marital status | married | single | Divorved | Widow |
4. Educational status | G7 | O' Level | A' Level | DIP | Degree |

5(a) Size of family | Below 5 | 6-10 | 10-15 |

(b) Other specify _____

6. Children under 18 _____

B. Land allocation

7 a. How much land had been allocated to you? 0,5h | 1h | other

(b) If other Specify_____

8 (a) Do you know how the land was allocated? Yes | No

(b) If yes in (a) specify_____

9. Is the land allocated to you enough? Yes | No

If No, How much do you need_____

C. **Agricultural production. Types of crops grown**

10 a. Which types of Crops do you grow on your irrigated land? (Tick applicable.)

Summer		**winter**	
Maize		Soya Beans	
Rice		Wheat	
Cotton		Sugar beans	
Soya beans		Vegetables	
Groundnuts		Tomatoes	
Other _____		other_____	

(b) If other in (a) give reasons for your choice (tick applicable)

Summer Weather related

Nutritional

Financial reasons

To increase of food

11 (a) Have you cultivated your land during the dry season Yes | No

B (i) If yes, which crops? 1_____ 2, _____ 3_____ 4_____

(ii) If no in (a) give reason _____

D. **Output produced by the beneficiary**

12 (a) what was your total production for 2012/12

No.	Crop	Amount produced
1	Maize	
2	Wheat	
3	Groundnuts	
4	Soya beans	
5	Vegetables	
6	Tomatoes	
7	Groundnuts	
8	Other	

b. Did you produce enough for the family? Yes No

c. (i) do you have surplus Yes No

c. (ii). What did you do with the surplus? Store Sell Other

e. **Knowledge of the farmers**

13(a) Do you have any idea about the imputation of irrigations to home food security

(b) Does food demand of your family?

Annexure ii Interview guide for key informants

The following questions were used as an interview guide for the key informants.

- How old is the irrigation scheme?
- How big is the irrigation scheme?
- How many households are in the scheme?
- Is the any criteria which was used to allocate the land?
- What do you do in the event that the plot holder had died?
- Is there any irrigation management committee? What is its role and is it efficient?
- Who decides the cropping program for the scheme?
- In your opinion does this scheme have impact on food security?

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