

# ***THE INTERNATIONAL JOURNAL OF HUMANITIES & SOCIAL STUDIES***

## **Impact of Small Scale Irrigation Schemes in Addressing Food Shortages in Semi-Arid Areas: A Case of Ingwizi Irrigation Scheme in Mangwe District, Zimbabwe**

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### **Abstract:**

*The endeavor of Ingwizi small scale irrigation scheme was to address food shortages in Mangwe District. However, it remains a pressing issue as economic and social problems continue to affect farmers. The purpose of this research is to assess the impact of Ingwizi small scale irrigation scheme in addressing food shortages in Mangwe District. Qualitative research methods were used in the investigation. A sample of forty six people was selected using purposive sampling that is typical, critical and expert sampling. Data was collected using focus group discussion, observation and key informant interviews. Analysis was done using the thematic approach. However the yields produced have not yet addressed the food insecurity situation in the district. This was due to lack of government support and lack of finance from farmers which arrested the community's ability to produce enough food from the irrigation scheme. The study recommended that, the farmers in the irrigation scheme should get subsidized inputs from the government and also the selling prices should be lucrative to cater for overhead expenses, to sustain their families and to ensure the viability and sustainability of irrigation on rural livelihoods.*

**Keywords:** *Irrigation scheme, food shortages, food insecurity, livelihoods, sustainability*

### **1. Introduction**

The reality of food insecurity is now a well-accepted living reality and there is emerging evidence that food insecurity poses a massive threat for development especially in poor countries. An understanding of the emerging trends of food insecurity and its effects in local environs is an important starting point in addressing the negative effects of food insecurity. This study seeks to understand the impact of Ingwizi irrigation scheme in addressing food shortages in Mangwe district, Matabeleland South Province in Zimbabwe. The objective of the study was to understand how communities have been affected by food shortages and how they are coping to it as well as their perceptions about the gravity of the food insecurity phenomenon. An understanding of both the effects of food insecurity and community adaptation mechanisms would facilitate for effective development programming to strengthen food insecurity resilience on the basis of community driven approaches.

#### *1.1. Theoretical Framework -Food Availability Approach*

Theory is a model or framework for observation and understanding, which shapes both what we see and how we see it (Denzin, N & Lincoln, Y, 2005). Theory allows the researcher to make links between the abstract and the concrete; the theoretical and the empirical; thought statements and observational statements (Denzin, N & Lincoln, Y, 2005). This study is deeply rooted in the food availability approach commonly known as the Malthusian Theory on population and food availability. The concept of food availability has been viewed as a very complex concept as scholars define it differently, varies from place to place and no standard measure has been identified yet. Since the concept of food availability has different dimensions, the study used the food availability approach which squarely fits with the phenomenon under study. Although the core ideas of this approach could be traced back to the Venetian thinker Giovanni Botero (1588), it was Thomas Malthus (1789) that popularized it, and, in fact, it also known as the Malthusian approach (Jaspars,S, 2006)

The approach is focused on the (dis)equilibrium between population and food: in order to maintain this equilibrium the rate of growth of food availability should be not lower than the rate of growth of population (Maxwell, D, 1995). Until the early 1970s, this was the reference approach for the international community, both at political and academic level. This is well reflected in the definition of food security given at the World Food Conference of 1974: "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" (UNDP, 1994).

The population growth in Mangwe district does not commensurate with the amount of food that is available in the district, the district has a population of 115 000 people and 80 percent is food insecure (Zimstat, 2016). This imbalance is the one that the food availability approach tries to explain. Consequently, in this view food security is merely a matter of aggregate (per capita) food availability (Maxwell, 1996). In a closed economy, this depends mainly on food production and stocks, while in an open economy also food trade can play a relevant role (Sen, 1989). The food availability approach clearly condenses the abstract concept of food security to a concrete concept that can be understood in the context of Mangwe district.

1.1.1. Problem Statement low food availability, low incomes, deteriorated living standards, poor nutrition, poor housing and health (ZIMVAC, 2015). This is aggravated by the fact that, there is usually very little rainfall, and rain fed agriculture has minor chances of thriving. Annual rainfall is less than 500 mm per year in this region. In this area, rain fed agriculture fails four years out of five (ZIMVAC, 2015). Thus, people who rely on rain fed agriculture in this area are still impoverished

Smallholder farmers in Mangwe district suffer a major blow of and they are faced with food insecurity. If the question of food security is not addressed with the urgency that it deserves, there is a possibility of emergence of nutrition related diseases and possible deaths.

### *2.1. Hypothesis*

H1-The establishment of Ingwizi small scale irrigation scheme led to the improvement of food availability in Mangwe District, Zimbabwe.

#### 2.1.1. Description of Study area

The study was conducted in Mangwe District, which is found in Matebeleland South Province of Zimbabwe. It is situated 84km from Plumtree town and 184km from Bulawayo, the second capital city of Zimbabwe. It is South East of Plumtree town and shares its borders with Botswana, Bulilima District and Matopo District. The annual rainfall is very erratic in nature and varies greatly. The annual rainfall ranges from 1000mm to 980mm (ZIMVAC, 2015). According to the daily air temperature data collected from the Matopo research station 25km from Bulawayo City, the average monthly temperature ranges between 25 degrees Celsius to 32 degrees Celsius respectively.

##### *2.1.1.1. Research Methodology*

The study utilized the exploratory research design and qualitative methods of collecting, analyzing and presenting data. Qualitative methods were suitable to explore the benefits as well as the impact of Ingwizi small scale irrigation scheme on improving food security. A purely qualitative research design and a constructivist grounded theory approach was used in this study. In other words, the study used an exploratory design that was sequentially timed. As the research evolved participants were constructing meaning from the data collected. The study was carried out in Mangwe district, 84 km east of Plumtree town. The study employed purposive sampling that is expert, typical case and critical case sampling. Only wards that recorded highest number of people who are food insecure (ZIMVAC, 2015) were selected under critical case sampling, under typical case sampling only those farmers practicing irrigation farming were selected and under expert sampling, the office bearers constituting the District Food Security and Nutrition Committee were selected, that is Agriculture, Social Welfare, World Vision, Agricultural Rural Development Authority, Rural District Council and the District Administrator's office. Population means all subjects or objects that have a common attribute or characteristic that is being studied ( Silverman, 2010 ). It therefore, refers to all subjects possessing a common characteristic that is being studied, may it be subjects or objects. It denotes a large group of objects or people which is defined in terms of elements, sample units, time and size. The population consisted of extension officers from the ministry of Agriculture, representatives of Zimbabwe Farmers Union, officials from District Administrator's office, Chief Executive Officers from Rural District Council, community members, members from World Vision and officials from Agricultural Rural Development Authority. The population of this study were settlers who were residents in Mangwe District of the ages of between 20 years and 50 years. This age range was selected because it is a productive age which takes active part in finding food for the family. Furthermore, the researcher chose that age group because they are mature and capable giving meaningful data.

### *3.1. Operationalization of Variables: Small-scale Irrigation and Food Security*

This study reviewed the economic contribution of small scale irrigation on household income, employment, modern farm input uses and food security. Farm production in irrigation- and rainfall-based areas of Mangwe and found that the rain-fed areas produced subsistence crops and encountered a chronic food deficit while the irrigation-based areas produced cash crops with surplus production due to post-harvest storage facilities, and doubling or tripling effects of irrigation (G/Egziabher, 2008). Construction of one hundred and twenty six surfaces and fifty four sprinkler irrigations in the Arab countries also led to the cultivation of high-value horticultural crops such as tomatoes, peas, green peppers, groundnuts, maize, cucumbers and rape.

Small-scale irrigation in Zimbabwe enabled households to diversify production to new types of marketable crops like fruits, cash crops and vegetables (Eshetu, 2014). People can earn a living from selling irrigated crops and fruits as well as vegetables. Without physical participation in irrigation schemes, farmers in Ghana indicated that they have enjoyed indirect benefits for example, market stabilization, access to nutritious diet, access to improved seed varieties and technical knowledge, and so forth (Kuwomu, J and Owusu, E, 2012). These are the same spillover effects that should be enjoyed by farmers in Matabeleland South, Mangwe district in particular.

Irrigation investment in India enabled farmers to increase diversification of crops, and use of more chemical inputs like pesticides, fertilizers or improved seed varieties. A study by (Chiza, 2005) on Pangani and Rufiji basins of Tanzania found that irrigation increased yield per hectare, for example, rice, maize, tomato and onion. However, taking a closer look at this small-scale irrigation scheme, this might be not applicable in Zimbabwe since the climatic conditions of the two countries are not the same. A similar study in China in 2005 shows that cropping intensity was higher for irrigated than for rain-fed areas; agricultural yield was higher in irrigated areas and employment and wage rates were higher in irrigated areas. Irrigation in Arab increased cropping intensity up to three hundred percent between 1992 and 1996 (Singh, A, Rahman,A, Sharma,S, Upadhayu,U and Sikka,A., 2009).

### 3.1.1. Irrigation-Food Security Linkage

The adoption of new technology innovation (e.g. irrigation) is the major driving force for agricultural growth and poverty reduction (Norton,G, Alwang,J and Masters,W, 2010). An irrigation-poverty dynamics linkage model is constructed to explore how irrigation can reduce poverty (Swamikannu, 2009). This study modified the Swamikannu-Berger model and built small scale irrigation-food security framework.

This conceptual framework indicates that investment in irrigation schemes can relieve farmers from high dependence on rainfall. It increases irrigated farmland and also generates employment. It encourages farmers to produce two or three times in a year and use more of chemical inputs. Studies show that small scale irrigation in developing countries were created to increase production, reduce the dependence effects of unpredictable rainfall and provide jobs to the poor (Chazovachii, 2012). Bhatpara et al. (2007) argue that, irrigation in semi-arid tropical countries is an important investment rural development that can have direct and indirect impacts on food security and poverty (Bhattarai,M, Barker, R and Narayanamoorthy, N, 2007). Investment in small-scale irrigation creates on or non- farm employment opportunities, increases consumption expenditure and accumulating assets.

Accordingly, irrigation lowers food prices so that the poor can afford and get access to the required food at fair prices (Huang et al. 2006). Use of more chemical inputs and year round production in irrigated farmland improves productivity, and shifts from subsistence crops to high-value cash crops, which in turn enable people to take nutritious food and keep good health status. Irrigation development increases productivity of inputs, mitigate vulnerability of rainfall variability, and promote rural dynamic economy (Awulechew, S. B. and Merry, J. D. , 2005).This clearly indicates that, irrigation development cushions people in times of food insecurity and leads to various income generating activities in the rural economy. Reliable small scale irrigation increases land productivity, crop yields and application of mineral fertilizers, which, in turn, enables to diversify into non-conventional and market-oriented products such as high value crops, vegetables and fruits, which positively improves farm households' diet, incomes, health and food security (Eshetu, 2014) .Thus, the study built the model to illustrate the contribution of small scale irrigation in ensuring food security and attracting inward investment in the economy.

In a nut shell the model explains that, investment in small scale irrigation schemes generates off farm employment through selling agricultural produce. When farmers are depending on irrigation schemes there is reduced dependency on erratic rainfall which sometimes cannot be available throughout the season. When water is available farmers have the capacity of increasing the sizes of their lands to boost production. When all these the aforesaid activities take place this will translate to diversified income and production might be doubled per year because of the availability of water from the irrigation scheme. The model further denotes that, farmers' income will increase as well as food price because food will be abundant in the district. When supply is high, prices normally fall down. The health status also improves because all nutritional requirements needed by the body will be available. When the prices of food are low this will increase food availability in the district. At the same time when people engage in different income generating activities this increases their income which help the farmers to accumulate wealth. When farmers accumulate wealth, this wealth acts as a guarantee to food security in the district.

#### 3.1.1.1. Dependent Variable: Food Availability

Every living creature on earth, human beings not excluded entirely depend on food availability. Eshetu, (2014) defines food availability as, "the amount of food that is present in a country or area through all forms of domestic production, imports, food stocks and food aid." Eshetu, (2014) confirms that, the term tends to be applied to food available at a regional or national level rather than at household level, which can lead to some confusion as the word "availability" sometimes is used at a micro level. Looking at the two definitions, it can be noted that, food availability is the amount of food present whether at micro or macro level, that is food presence at village or regional level. Food availability can be literally defined as the physical existence of food. Committee on World Food Security (CFS), Global Strategic Framework for Food Security and Nutrition, (2011), on national level food availability is a combination of domestic food production, commercial food imports and exports, food aid and domestic food stocks. In other words, food produced from both peasant and commercial farms, what the country buys and food from non-governmental organizations all feed into the national basket of a country. On household level food could be from own production or bought from the local markets, (Eshetu, 2014)It is imperative to point out that, for food production to be a success water availability is a necessary factor. Due to population growth and climate change, the pressure on existing natural resources, namely land and water, increases, (Huang et al. 2006). Impacts of climate change are often leading to land degradation, lack of irrigation water, reduced soil moisture and therefore losses of economic livelihoods, (Huang et al. 2006). Coupled with a sudden increase in tensions over the use of precious resources such as water, comes as a threat to long term food security. Chazovachii, (2012) resonates that, the Stockholm International Water Institute (SIWI) emphasizes the growing importance of green water, i. e. the water hidden in the ground as soil moisture (while blue water refers to water available in lakes, rivers and aquifers).Chazovachii, (2012) posits that, with suitable adaptation measures to soil such as irrigation systems improving water-use efficiency through cultivation methods and technologies, or infrastructure

development for water harvesting and (re)use of marginal quality water and treated waste water, or improved soil-water management in rain fed systems like, the resilience of agricultural systems can be strengthened, risks reduced and livelihoods secured.

### 3.2. Food security

At the 1996 World Food Summit, one hundred and eighty two nations agreed to the definition of food security as “access by all people at all times to enough nutritionally adequate and safe food for an active and healthy life” (FAO, 2007) Different scholars have put heads together worldwide embarking on a serious research of trying to understand household food security, food insecurity and hunger. This meticulous work was carried out by some experts working in the American Institute of Nutrition (AIN). The Food and Agricultural Organization, American Institute of Nutrition and World Bank came up with the following definitions: Food security refers to the availability of enough food in order for all people to live a healthy, active and productive lives at all times, across all countries and regions, across all income groups, and across all members of individual households. According to this definition emphasis on availability of food at all times not only to a selected few but to everyone else and this food should not cause harm to people (FAO, 2007).

There are two sides to the food security equation that is food availability and food access (Rukuni, M. and Bernsten, H., 1988), argue that, in some cases food might be available in the shops but it can only be accessed by people who have money only. This is a typical situation which is in Mangwe district. The only solution is for the people to engage in agricultural activities to run away from the problem of food insecurity. Many households simply lack the means to secure consistent access to food, which will allow them to live active and healthy lives. This study assesses food security status at household level. It looks at the ability of the household to produce its own food to meet food requirements of its people.

### 3.3. Data Collection

Research instruments are measurement tools designed to obtain data on a topic of interest from research subjects (Kvale, 2007 ). The research used key informant interviews, observation and focus group discussion to get information from the respondents. The purpose of each research instrument was highlighted and the various variables which constitute rural livelihoods were measured in the study. The three research instruments, Focus Group Discussions, observation and Key Informant Interviews were used holistically to plaster and tackle the weaknesses of another. Harding (2013) described Focus Group Discussions as a qualitative research method where a group of people usually 6 to 10 are asked about their opinions, perceptions, beliefs and attitudes towards a concept, service or idea. The group consisted of participants 6 to 10 people and the moderator was guiding the participants or in control of the Focus Group Discussions. It was an interactive group setting where participants were free to talk with each other about a phenomenon under study. The researcher conducted five Focus Group Discussions with each having 10 people. The first group had men only, second group had women only, third group had young women, fourth group had young men and the fifth group was mixed. This was done so as to allow the study to get multiple responses, getting diverse ideas, opinions, beliefs, practices and experiences to be analyzed by sex, age and geographical location. Harding (2013) posits that Focus Group Discussions are adequate in that, the researcher is engaged in a more natural conversation pattern than typically occurs on one on one interviews. however, they are criticized for producing biased results, Rushkoff (2005), regarded Focus Group Discussions as one shot case study which cannot be repeated, it makes sure that no one is offended to produce ‘blame inoffensive products’.

Key informant Interviews are one of the methods used in qualitative research, a technique which involves intense oral individual questioning of technical persons. Interviews are a semi directional form of discourse or conversation between two people with the goal of uncovering the participant’s view point (Keytone, 2001). Key informant interviews are appropriate for addressing sensitive topics, eliciting individual experiences; opinions and personal feelings. The study employed key informant interviews which allowed face to face interviews with five technocrats in the department of Agriculture. The chief reason why the study used Key Informant Interviews is that, it allowed flexibility of both researcher and respondents. Flexibility is described as the willingness to transition or change of direction during an interview (Keytone, 2001). Slight deviations from the research topic allow for clarification of any misunderstanding and in turn give instant feedback from respondents which illuminated researcher to make necessary variations and clarifications timely. It gives the respondents an opportunity to relax, for refresher which helped later chipping in of new ideas into the interviews. Key Informant Interviews captured emotional responses in an interview which in turn helped the researcher to go beyond simple assessment. Key informant interviews enables a distinction to be made between the objective facts of the situation and the interviewee’s subjective definitions of the situation with the view to compare them (Kvale, 2007 ). Key Informant Interviews helped the researcher to gather quality data because they were specific in nature, therefore evidence gathered was not confusing as it does not reflect general statements since the knowledge was obtained from technocrats and was well framed within the range of the topic.

### 3.4. Data Analysis

The study used the thematic approach of analyzing data. Results were presented in form of themes, data was grouped into themes which were related derived from respondents in the study. First section was on socio-economic factors that led to the establishment of Ingwizi small-scale irrigation scheme. From the data gathered from respondents, the themes had been grouped into procedures in land allocation, economy of affection, mismanagement of funds by the rural district council and ARDA officials and misinterpretations of government policies. It further looked at the relationship that existed between stakeholders in Mangwe District, the settlers, traditional leaders and Mangwe Rural District Council officials. All these themes were discussed so that the impact of Ingwizi irrigation small scale irrigation scheme in addressing food shortages in the district can be easily noticed. The themes were also grouped into benefits and negatives brought by small irrigation.

#### **4. Challenges Facing Ingwizi Irrigation Scheme**

The research revealed that, the challenges faced by Ingwizi small scale irrigation scheme leaves a lot to be desired in as far as addressing food shortages is concerned. The challenges include; lack of government support, poverty, and increased number of food imports from both Botswana and South Africa and increased number of food insecure people in the district.

##### *4.1. Poverty*

Most of the people in Mangwe district, their way of life and standards of living are deteriorating day in day out. Most participants in Focus Group Discussions revealed that, irrigation was an important coping strategy amongst the poor in order to supplement their incomes and food security; it was no longer productive as the land was infertile due to old age, it needed fertilizer to gain its strength yet people had no money. These farmers who benefited from the irrigation scheme had nothing at their disposal to resuscitate the farming hence they left the irrigation scheme idle and unproductive. The poor were left with nothing or little to depend on when disaster like hunger strikes.

Furthermore, another respondent gave his opinion saying that, Agricultural Rural Development Authority was charging very exorbitant prices on water usage in such a way that most farmers abandoned their small pieces of land. The increase in water charges has reduced drastically the production output of maize grain from 100 metric tons to 25 metric tons this year. This rendered the district more vulnerable to food shortages. Most of the farmers did not have money to pay up the bills since their farm produce could not give them enough to sustain the expenses. The irrigation scheme was affected immensely and its normal functioning deteriorated drastically which impacted negatively on food security.

##### 4.1.1. Lack of Government Support

There was increased marginalization of small scale irrigation schemes by the Zimbabwean government because of the ever escalating economy. The government was lagging behind in rendering support to the Ingwizi irrigation scheme and left farmers with a hard task of failing to harvest since both the inputs and the irrigation infrastructure was dilapidated. One respondent was arguing that, even if the well-wishers would want to extend a hand to revive the scheme; roads are in poor state that big trucks cannot be able to deliver inputs to the irrigation scheme. Some of the respondents were saying that the government has neglected rural people and regarded them as officially invisible. This came out in Focus Group Discussions where the majority of respondents acknowledged the absence of Agricultural extension officers and building a market place where they can sell their produce. One respondent further alleges that; the services of the government are non-existent; we get water direct from the canals using buckets, no water pipes to direct water in the small portions of land and farmers are using ashes to control pests. Government itself has not yet funded the provision of infrastructure in this area, in May 2014; "Deputy Minister Peddy Zhandu informed us that, the government has noted with great concern that the district has acute shortage of food and promised to employ raft measures to revitalize the irrigation scheme". The respondents further argued that, nothing has been done yet and people are now relying on food imports from neighboring countries Botswana and South Africa.

Irrigation farming like any other business requires financial capital. It also needs chemicals, seeds, fertilizers and in certain instances irrigation pipes and sprinklers. It is unfortunate that, most farmers in Mangwe do not have money to purchase agricultural implements. Resultantly, they are forced to do away with such important inputs which negatively affect the quality of their crop. Makumire (1996) puts forward the idea that lack of inputs is a major setback. The research established that, some farmers do not have the financial capacity to repair irrigation pipes and to buy chemicals. At the end these problems make irrigation farming a failure in uplifting rural people's livelihoods.

##### 4.1.2. Increased Food Imports

Mangwe District has got seventeen wards. All most every ward is depending on food imports from neighboring countries that is Botswana and South Africa. The increase in imports is evidence that, the irrigation scheme is not producing much to feed the people of Mangwe. Most respondents revealed that, most shops do not have locally produced food since it is expensive to transport from either Plumtree or Bulawayo. One of the extension officers in the Ministry of Agriculture highlighted that, the Ingwizi Irrigation scheme in 1982 helped to feed the people of Mangwe when the district was hit by drought. He went on to reveal that, at the moment, the irrigation scheme is operating less than 20% of its capacity and this made the district to entirely depend on imports from both South Africa and Botswana.

#### **5.1. Conclusion and Recommendations**

The data extracted from the research revealed that, the impact of Ingwizi small scale irrigation scheme in trying to address food shortages in Mangwe leaves a lot to be desired. The factors which affected the impact of the irrigation scheme are multiple and dynamic hence the solution should follow the same trend of multidimensionalism and dynamism. The study indicated that, lack of government support in supporting the irrigation scheme arrested the ability of the scheme to produce enough food for the people of Mangwe. The failure by the irrigation scheme to adequately address food shortages in Mangwe district increased the number of people who are food insecure. The population which is vulnerable to acute food shortages heavily depends on food imports. To realize the usefulness of the Ingwizi small scale irrigation scheme, the government of Zimbabwe should subsidize the farming inputs such as seed, fertilizer and chemicals and increase the buying price of agricultural produce so that farmers are able to pay back the loans. The government should also lower the rentals of small scale irrigation schemes that is, low cost to allow financially handicapped farmers

to take part in the irrigation scheme. Government should subsidize agricultural inputs and increase the buying price of agricultural produce so that farmers are able to pay back the loans.

## 6. References

- i. Awulechew, S. B. and Merry, J. D. . (2005). Assessment of Small Scale Irrigation and Water Harvesting In Ethiopian Agricultural Development. . Colombo Sri Lanka.
- ii. Bhattarai,M, Barker, R and Narayanamoorthy, N. (2007). Who Benefits from Irrigation Development in India? Volume 56. 207-225.
- iii. Chazovachii, B. (2012). The Impact of Small Scale Irrigation Schemes on Rural Livelihoods: The Case of Panganai Irrigation.
- iv. Chazozachil, B. (2012). The Impact Of Small Scale Irrigation Schemes On Rural Livelihoods: The Case Of Panganai Irrigation. .
- v. Chiza, T. (2005). Ground Water Sensitivity and Vulnerable To Pesticides., Morgan Valley Morgan County Utah.
- vi. D., S. (2010). Doing Qualitative Research. Sage Publications.
- vii. Denzin, N & Lincoln, Y. (2005). . 2005. Handbook of qualitative research. . Thousand Oaks CA:: Sage.
- viii. Eshetu, L. (2014). Occurrence of Aspergillus Species in Groundnut (*Arachis hypogaea* L.) along the value chain in different Agro-Ecological Zones of Eastern Ethiopia. *Journal of Applied and Environmental Microbiology*, 309-317.
- ix. FAO. (2007). Food and AgricultTrade Reforms And Food Security: Conceptualizing The Linkages. . Rome: FAO.
- x. G/Egzabher, M. (2008). Risk and Irrigation Management in a Semi Arid Economy.
- xi. Jaspars.S. (2006). From Food Crisis to food fair trade: Livelihoods analysis, protection and support in emergencies. Chicago: Emergency Nutrition Network.
- xii. Keytone, J. (2001). Communication Research: Asking Questions, Finding Answers . New York.: Mayfield Publishing Company.
- xiii. Kuwomu,J and Owusu, E. (2012). Irrigation Access and Percapita Consumption Expenditure in Farm Households Evidence from Ghana. *Journal of Development and Agricultural Economics*, Vol 4 (3).
- xiv. Kvale, S. (2007 ). Qualitative Research: Doing Interviews . California: SAGE Publications .
- xv. Maxwell, D. (1995). Measuring Food Insecurity: The Frequency and Severity of Coping Strategies. (pp. FCND Discussion Paper, No 8). IFPR.
- xvi. Maxwell, S. (1996). Food Security: A post-modern Perspective Food Policy., (pp. 155-170).
- xvii. Norton,G, Alwang,J and Masters,W. (2010). Economics of Agricultural Development World Food Systems and Resource Use, 2nd Edition. New York.
- xviii. Organization, F. a. (2007). Trade Reforms And Food Security: Conceptualizing The Linkages. . Rome: FAO .
- xix. Rukuni, M. and Bernsten, H. (1988). Food Security Options UZ/MSU Food Security In Southern Africa Project. Department of Agricultural Economics and Extension . Harare: University Of Zimbabwe.
- xx. Sen, A. (1999). Development as Freedom (Ed. A. Knopf) . New York: Oxford University Press.
- xxi. Silverman, D. (2010 ). Doing Qualitative Research. Sage Publications .
- xxii. Singh, A, Rahman,A, Sharma,S, Upadhayu,U and Sikka,A. (2009). Small Holders' Irrigation Problems and Options. *Water Resource Management*, Volume 23, 289-302.
- xxiii. Swamikannu, N. a. (2009). Impacts of Small Scale Irrigation on Poverty Dynamics in the White-Volta Basin of Ghana:An Integrated Multi-Agent Simulation Approach. Bonn: IHDP Open Meeting.
- xxiv. UNDP. (1994). Human development Report 1994: New Dimensions of Human Security. New York: UNDP.
- xxv. ZIMVAC. (2015). Vulnerability Assessment Committee Results. Harare: ZIMVAC.