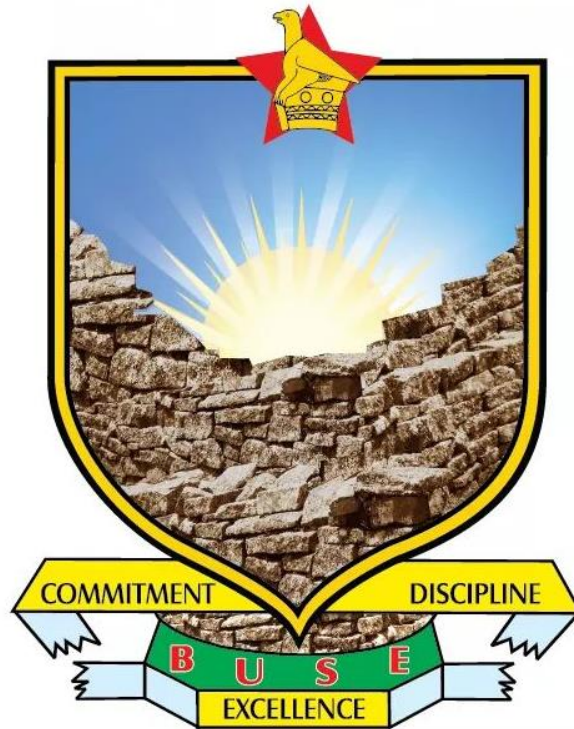BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

DEPARTMENT OF ECONIMICS

GENDER HETEROGENEITY IN THE IMPACT OF AGRICULTURAL PRODUCTION ON FOOD SECURITY IN ZIMBABWEAN HOUSEHOLDS.

BY

TAFADZWA KANHEMA

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE BACHELOR OF SCIENCE (HONOURS) DEGREE IN ECONOMICS OF BINDURA UNIVERSITY OF SCIENCE EDUCATION

APPROVAL FORM

The undersigned certify that he has supervised the student **B1748040** with a dissertation entitled **Gender Heterogeneity Impact on the Agricultural production towards food security in Zimbabwe,** submitted in Partial fulfilment of the requirements of the Bachelor of Science (Honours) Degree in Economics at Bindura University of Science Education.

…………………………………/…………… …………/…………………..

    Student   Signature   Date

…………………………………/…………… …………/…………………..

    Supervisor   Signature   Date

…….…………………………/…………… …………/…………………..

    Chairperson   Signature   Date

…………………………………/…………… …………/…………………..

    External Examiner   Signature   Date

Release Form

NAME OF AUTHOR : Tafadzwa Kanhema

STUDENT NUMBER : B1748040

Project Tittle: Gender heterogeneity in the impact of agricultural production on food security in Zimbabwean households.

Year Granted :2021

Permission is hereby granted to BUSE library to produce single copies of this project and to lead or sell such copies for private scholarly or scientific research purpose only. The rights and neither the project nor extensive extracts from it may be printed or otherwise reproduced without the author's approval

PROGRAMME FOR BACHELOR OF SCIENCE HONOURS IN

WHICH PROJECT ECONOMICS (BSc ECONOMICS)

SIGNED

PERMANENT ADDRESS: 83 Old ZRP Camp Highfield Harare

Declaration Form

I Tafadzwa Kanhema declare that this project is an original copy of my own work and has not been published before or submitted to any other institution/university.

Signed…………………………….. Date………………………………….

Registration number …………………………………………

Physical address……………………………………. ……..

    ……………………………………...............

    …………………………………….......................

Dedications

This dissertation is dedicated to God Almighty, my parents Mr and Mrs Kanhema, my brothers and the entire Kanhema family.

Abstract

The study was conducted to find out gender heterogeneity in the impact of agricultural production on food security in Zimbabwean households. Using simple regression model, this research accesses the relationship between food security and agricultural production using variables like agriculture practice, gender, education level, household size, age, household income and marital status using secondary data drawn from cross sectional data. The secondary data was drawn from Zimbabwe Vulnerability Assessment Committee (ZimVAC) December 2018. The findings were estimated using STATA version 14 software. Practice agriculture was found to be positive and statistically insignificant to the study, also gender has a positive relationship with food security and it is statistically significant to the study. Household size was found out to have an inverse relationship with food security and it is significant to the study. To the policy makers should include the role of women in food security when crafting their policies.

ACKNOWLEDGEMENTS

Firstly, I want to thank the Almighty God for blessing me with the gift of life and strength that he has given me to prepare this project. I thank him for allowing me to study at Bindura University of Science Education. I would like to thank the economics department for such an academic environment.

My sincere gratitude goes to Mr Chigusiwa (my supervisor) for the unwavering guidance, support and fabulous supervision towards compiling my dissertation. I also would like to give my special thanks to my parents and my siblings for their support. Lastly, I would like to give my special thanks to my friends Kudakwashe Chekai, Rungamai Manamike and Beverley R. Rugoyi for supporting me through the difficult times and for encouraging me throughout my academic journey and dissertation.

May God bless you all.

Contents

List of Tables

LIST OF ACRONYMS

GDP   Gross Domestic Produce

FAO   Food Agricultural Organisation

WB   World Bank

SADC   Southern African Development Committee

SSA   Sub-Saharan African

RBZ   Reserve Bank of Zimbabwe

IMF   International Monetary Fund

HH   Household

ZIMPREST Zimbabwe Programme for Economic and Social Transformation

ZIMSTAT   Zimbabwe Statistics Agency

USD   United States Dollar

ZimVAC   Zimbabwe Vulnerability Committee

CHAPTER 1

1.0 Introduction

Agriculture is closely linked to food security as it provides a source of food and nutrients, broad-based source of income and by direct influencing food prices on the market(FOA 2012). The country has vast fertile and arable land, climate and the rainfall patterns are also favourable for crop production (Sithole 2006). Agriculture production is strategic to food and national security in most African countries including Zimbabwe, it was once the largest producer of maize, other SADC countries appointed the country as the chief of food security in 1980s. United Nations defined Food security as a condition in which all people at all times have access to enough food needed to live an active life (Food and Agriculture Organization [FAO 2010]). Most Zimbabwean households are found vulnerable to food insecurity especially those in rural areas. Agriculture accounts on average for 30% of the GDP in Sub-Saharan African (SSA) countries, provides about 45% of earning source, and employ over 65% of the total labour force (World Bank, 2015). According to (FAO, 2011), women account of 43% of the agriculture labour force in developing nations; yet gender bias exists in the agriculture sector, in terms of resource allocation between man and women. However, most women in rural areas of developing countries are at disadvantaged due to the fact that they do not have access to the same opportunities or resources as men owing to stereotype issues based on gender. There is a gender gap as regards access to certain resources such as; land, energy, technology, subsidies and agricultural information. Furthermore, women have limited access to training, information, public services, social protection and markets, due to this most women cannot do much for they are not fully equipped to be at the same level with their counterparts. Accordingly, this study wishes to examine gender heterogeneity in the impact of agricultural production on food security in Zimbabwean households.

1.1 Background of the study

Agriculture is an important engine which can be used to generate growth and drive away poverty if fully practiced. Since independence agriculture has been the biggest sector in Zimbabwe with maize being the largely produced crop and the country was referred to as an agriculture-based economy (Patrick, 2006). In the 1980's maize production was steady as it

was actually produced in excess compared to the population in the country since most farmers scrambled for the production of the staple crop and the rains were good. In Africa food security has been of great concern.

The food supply situation in Zimbabwe have deteriorate insignificantly in years now since 2000, the country has been facing challenges in the socio economic and political environment have worsened the situation even in urban areas thereby causing many urban households to try and navigate the problem through agriculture. Cropping have been negatively affected by climate change thereby worsening the problem of food security. It is estimated that any slight change in rainfall pattern in Zimbabwe may endanger food security for almost 8 million Zimbabweans (Ministry of Agriculture 2010). During the period of 1991-1992, Zimbabwe faced severe drought which affected food security at household level and at national level. Drought returned in 1993, 1994, 2002, 2004 and in 2012 seasons thereby affecting livelihoods. This worsened food insecurity in the country since most of the government policies to address food security continues to fail.

Furthermore, the Zimbabwean government tried to address the imbalances created by colonisation through land reform programme which was introduced in 2000, maize production drastically declined and food security was threatened in the country. During this period black Zimbabweans took farms and everything on it including machinery agricultural tools, labour and other properties owned by the white farmers. However, they could not fill in the agricultural gap since most of them lacks the farming knowledge and will to produce in large scale. There was no proper planning on part of the government which resulted in chaotic grabbing of land which disrupted farm activities and resulted in decline crop production (Sithole 2006).

The Zimbabwean government in 2005 to 2006 came up with Operation Taguta/Sisuthi which was an agriculture subsidy aimed at improving maize production (Ministry of agriculture 2010). This policy tries to address food insecurity in the country. Operation Taguta was spearheaded by the army giving people maize seed and fertiliser provided by the government. The operation was not successful and the government decided to come up with yet another subsidy programme in the following agricultural season called Mechanisation Scheme. Once again, the scheme pathetically failed as a result of alleged corruption as resources were distributed largely on political basis (Sachikonye 2004). The food security crisis further worsened in 2008 due to hyperinflation and liquidity crunches which resulted in commercial, communal and resettlement farmers not being able to afford agriculture inputs like maize seed and fertilisers.

Women play an important role in the agricultural labour force and other agriculture activities. Women's ability to generate income in the agriculture sector is severely constrained by their limited ownership and control of land, inputs and other agricultural tools. Although rural women constitute the larger percentage of labour force and contributions to food and nutrition security at the household level, they face many challenges. Women who live in rural areas represent an estimate of 25% of the world's population and constitute an average of 43% of the workforce in developing countries. Most of these women rely on faming for food. 70% of population in Zimbabweans depends on agriculture for income and food, 45% of these being women (ZIMSTATS 2015). This then point out that many women in Zimbabwe are involved in agriculture.

FAO (2017) reported that maize production increased significantly to above average level in Zimbabwe during the agricultural period 2016-2017, hence food security situation also improved. ZIMACE reported that at least one percent of rural households were food insecure in 2017.

1.3 Problem Statement

The food insecurity situation in Zimbabwe has gotten a great deal of consideration in response organizations bid and sustenance help has been seen as an earlier reaction to handle this issue. For example, more than 80% of the United Nations combined between office requests for June 2003 was for food only, while health fell under 10% of the total appeal (World Bank 2008). While food aid may serve a key apparatus in supporting against food security and reducing ailing health, it doesn't address the principal reasons for the food crisis (Watson, 2008). For over 10 years non-legislative associations have been effectively taking part in attending to the food crisis in the country groups of Zimbabwe.

Women outnumber men as labourers in the formal agricultural sector. They constitute the majority of subsistence food producers in Zimbabwe and control 70% of households and family labour in rural communities where they comprise about 70% of female population (ZIMSTAT 2015). In spite of these endeavours, food deficiencies in these regions have not changed and households are not producing enough food to meet their prerequisites. Slow progress towards gender equality in the SSA region implies that women continue to face challenges to access the land, productive assets, credit, extension services, input and output markets, which constrain agricultural productivity (World Bank, 2015). These challenges affect women to fully

exploit agricultural opportunities to help secure food at household level. This study intent to look at the gender heterogeneity in the impact of agricultural production on food security in Zimbabwean households.

1.4 Objective of The Study

The main objective is to assess gender heterogeneity in the impact of agricultural production on food security in Zimbabwean households.

- To show the Gender heterogeneity in the impact of agricultural production on food security in Zimbabwean households.
- To determine how agriculture practice is contributing to household food security.
- To show how the households' size affect food security.
- To offer policy recommendations based on the findings of the study in Zimbabwean households

1.5 Research questions

- How gender heterogeneity in the impact of agricultural production on food security in Zimbabwean households?
- How agriculture practice is contributing to household food security?
- How does households' size affect food security`?
- What are the policy recommendations to Zimbabwean policy makers?

1.6 Research hypothesis statement

Ho: Women participation in agriculture increases the level of food security

Hi: Women participation in agriculture does not increase the level of food security.

1.7 Significance of the study

Zimbabwe continues to suffer from food insecurity. The results from this study might be helpful to the government and policy makers. The government may use the findings when structuring yearly national budgets especially on apportionment to agriculture. To the policy makers, the findings will help on drafting and implementation of effective agricultural policies especially policies that benefits women in agriculture.

The research will add to the existing knowledge on the concept of agricultural production and document information on effective ways to improve food security in Zimbabwean households.

4

This research will also be important to the schools (students and stuff) and it will help them understand the importance of agricultural production on food security.

1.8 Assumptions of the study

The assumptions of the study are:

- The data used provides the paramount information for this research.
- Life challenge of skipping a meal as an indicator of food security.
- There is no spurious relationship.

1.9 Delimitation of the study

The main focus of the study is on the gender heterogeneity in the impact of agricultural production on food security in Zimbabwean households. 2017-2018

1.10 Limitation of the study

- The researcher relied much on secondary cross-sectional data.
- The research was performed in a short period thus some aspects may have been left out.

1.11 Definition of terms

Agriculture: Agriculture is the science, art, or practice of cultivating the soil, producing crops, and raising livestock and in varying degrees the preparation and marketing of the resulting products.

Food security Agriculture is closely linked to food security as it provides a source of food and nutrients, broad-based source of income and by direct influencing food prices on the market. (World Food Summit, 1996)

1.12 Scope of the study

This study focuses on the relationship between Gender heterogeneity and food security. Food security is the outcome variables like practice agriculture, gender, household size, age of head of household, marital status, education level, and household income are independency variables.

1.13 Organization of the study

The research project is organized into five chapters, where the first Chapter presents the introduction of the study. Chapter two is the theoretical and empirical review. The research methodology is discussed in Chapter three and Chapter four shows the results of the study. Policy recommendations are discussed in Chapter five.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter contains theoretical and empirical literature which outlines the theories associated with the fundamental study and researches that have been carried out by other researchers on the similar field. This study attempts to explore gender heterogeneity in the impact of agricultural production on food security in Zimbabwean households.

2.1 Theoretical Literature Review

This section highlights some basic theories that have been used to support the impact of women participation in agriculture towards food security in Zimbabwe.

2.1.1 The Cobb-Douglas Production Function

Cobb and Douglas put forward a theory in production which is known as the Cobb-Douglas production function. The function relates output to capital and labour, our labour being women who are estimated to have a leading number active in agriculture. It abnegates the fact that the relationship between output and the different factors is always linear as other economists assume. In other words, it was a development of older theories which related output to factors in a linear relationship. The theory shows that output is not directly related to the factors of production (capital and labour). Although it has proved to be the best one it however ignores other factors, which may affect production such as technology and weather among others. Therefore, it concentrates on these as if they are the only factors which affect production.

The Cobb-Douglas function takes the following form:

$Q = AKL$

Where Q is the output

A is marginal productivity of factors of production

K is capital

L is labour

2.1.2 Stochastic Production Function

Just and Pope who made use of an input conditioned output distribution introduced the stochastic production function in 1978 (Gardner & Rausser, 2001). This function allows for random elements associated with production uncertainty to enter the functional relationship and it goes beyond the scope of classical inputs. Aigner, Lovell and Schmidt also used the stochastic production function framework as a process that includes a random element corresponding to inefficiencies in a firm's technical production as well as predicted elements (Battese, 1997). In such an instance, the function is no longer deterministic or explained within the model but also includes a variable to account for production uncertainty.

In production agriculture, a stochastic production function is used to account for random elements of production: such as, weather, price fluctuations and soil quality. The stochastic set-up also allows certain variables to be treated as deterministic, while incorporating random components (Gardner & Rausser, 2001). Random components or stochastic factors which the farmer cannot control have been analysed for decades and are of great interest for management and policy decisions (Gardner & Rausser, 2001)

2.1.3 Leontief model

This is a model whose goal is to predict the proper level of production for several types of goods and services and it was introduced by Wassily Leontief in the 1930s. Travis M (1980) postulates that the model explains that the proper level of production can be achieved if two requirements are fulfilled and these are:

   I.   There should enough of each good to meet its demand, and

   II.   There should be no leftovers

Therefore, production should be equal to consumption. The input-output matrix is used so as to come up with the production vector. The Leontief model assumes that an economy can either be self-reliant and no goods would enter or leave, or the economy will have to satisfy demand in or out of its boundaries hence the economy can be referred to as closed or open respectively (Jones, 1984). The model tests two factors of production which are capital and labour and these can be used to come up with a paradox of whether a country should import labour or capital-intensive products.

Leontief's first study was based on computation from input output tables constructed for various industries in the U.S. Direct and indirect capital and labour were required to produce a given dollar value of output. He then calculated the effects on capital and labour use of a given

reduction in both U.S. imports and exports so that the relative commodity composition of exports and imports remained the same.

He came up with the conclusion that the given value of U.S. exports embodied less capital and more labour than would be required to expand domestic output to provide an equivalent number of competitive imports. Expressed inversely, U.S import replacement industries required more capital relative to labour than did U.S export industries (Jones, 1984). The Leontief conclusion that in the international division of labour, the U.S specialized in labour intensive rather than capital intensive goods. This theory applies to the study of women participating in agriculture towards food security, can also be largely determined by labour and capital.

2.1.4 Solow's long-run growth model

The model highlights that investment; savings and population are more important determinants of economic growth. The Solow model of economic growth postulates a continuous production function linking output and inputs of capital and labour which led to the steady equilibrium of the economy. The three major inputs to this model are capital, labour and technology, and the major driving force of economic growth is effectiveness of labour and technological change. The output produced in the economy is determined with these three variables as argued by Solow-Swan (1956). The model is based on the following assumptions; one composite commodity is produced and that output is regarded net output after making allowance for the depreciation of capital. He argued that the exogenous variables determine the steady-state level of income per capita because population growth rate and savings vary across countries. Ever since the appearance of Solow's long-run growth model, economic growth models have emphasized the importance of human capital in the economic growth of countries (Romer, 1992). A country's output depends on its human capital, which is determined endogenously, and "knowledge" is a public good which spread over the economy as an externality (Romer, 1992). This model relates to this paper in the sense that human capital is mainly put to use in the agricultural sector as mechanization is unattainable to most small-scale farmers, especially those in rural areas and they represent a large margin. Land and capital can be viewed as substitutes in the classical sense because sometimes what capital can do labour can attain the same results and an increase in labour may lead to a rise in production.

2.1.5 The Agro-ecological model

This can also be referred to as the climatic change model. Agro-climatic conditions mainly imply soil conditions and weather factors including rainfall, temperature and humidity (Heerink and Herman, 2001). In the previous five decades, human activity has altered ecosystems more rapidly and extensively than in any comparable period in the history of mankind, largely to meet the demand for food, fresh water, fuel and other industrial raw materials (FAOSTAT, 2006).

Climate change impacts include the increased atmospheric pollution, increased intensity and frequency of storms, rise in sea level, altered rainfall amounts and distribution, altered hydrological cycles, rising temperatures, desertification, decline of mountain glaciers and snow cover, Arctic warming, persistent droughts and flooding (FAOSTAT 2006). Generally, the impacts of global climatic change on agricultural crop productions include alteration of crop type and variety, reduction of soil moisture, increased evaporation and evapotranspiration, alteration of plant growth stages, reduced periods of grain filling, yield reductions, effects on partitioning and quality of plant biomass, and finally spatial shifts of agricultural potential.

Zimbabwe is already experiencing what scientists explain as the extensive impacts of climate change; persistent food problems as a result of decreased yields, increased water problems, declines in soil fertility, changes in plant diversity which includes indigenous foods and plant-based medicines. The major climatically factors affecting maize production in Zimbabwe include rainfall, temperature, day length, solar radiation, and humidity (Ministry of agriculture 2010).

2.1.6 Self-interest theory

Self-interest refers to action that elicit personal benefit. It suggests that women will produce more food and nutrition because of their own self-interest. Adam Smith, the father of economics, explain that the best economic benefit for all can usually be accomplished when individuals act in their self-interest. Women would produce more output and have more livestock so that they can use those to buy fixed assets like land, houses, sending children to school and also to sustain the household with food for next two sessions.

2.2 Empirical literature review

With the growing populations in most countries and worsening food shortages more researches have been carried out in most countries and they have yielded mixed results.

Developments in understanding of food security resulted in the expansion of the concept of food security by (FAO, 1983), by incorporating food secure access for vulnerable people to available supplies. This implied that there had to be a balance between the demand and supply side of the food security equation. The focus was that there should be assurance for all people at all times by ensuring both physical and economic access to the basic food that they needed. Studies on gender heterogeneity impact on agricultural production towards food security Zimbabwe are not common.

Debdulal (2009) studied on whether female headed household are more food insecure than man in Bangladesh. The data used in the study was of 510 households with more 20000 people. The findings were that only 5,8% of all the household were female headed. In analysis probit model was used and results showed that male headed households had 37% higher probability than female headed household, and the measure was based on the perceptions of the respondent.

Omonaet al. (2007) did a study in Nigeria and his results showed that household food insecurity increases with age, household's heads above the age of 60 are usually retired, with large household size and low income, thus increasing their likelihood of food insecurity. Elderly people will be less productive as compared to those who are still young. Household headed by elderly people are likely to be food insecure.

Carter et al (2010) in his research on food security he discovered that incidents of food insecurity are much higher for female headed compared to male headed households. Females are most likely to take care of their extended families and will usually sacrifice their food intake to feed other members of their household when threatened by food insecurity and they are most likely to be single parents than male counterparts.

Zerai and Gebereegziabher, (2011) in Eastern Tigrai, Ethiopia examine that off-farm activities may provide as a coping strategy outlet to manage with unexpected income losses for survival and the improvement of food security. Off-farm activities helps to secure more income as compared to on-farm activities since most household practice agriculture only during faming season.

Oseni and Winters (2009) in their study showed that off-farm activities in Nigeria help households to improve their farm production through higher input use, including more employment of hired labour. The study showed that household food security is strengthened through off-farm activities since they will help improve farm production. Off-farm activities contributed more income than on-farm activities.

Kassieet., al (2014) in Kenya examined the determinants inequality in household food security in Kenya. Their study was brief and based on 85 villages in of Kenya. The findings of the study were that female headed household are less food secure 9,6% of female headed household suffered chronic food insecurity. Female headed household where 43% food secure against 58% of male headed households. The conclusion of the study was that female headed households are worse off compared to similar male headed households.

Knueppelet al. (2009) did a study in Tanzania on food security status. His findings indicated that lower levels of education attainment are directly linked with high food insecurity. 48% of the sampled households were found to be severely food insecure.

Oyalemi (2012) conducted a study in Nigeria and found that household size and food security have an inverse relationship. They are negatively correlated an increase in household size will led to a decrease in food security levels. Larger households demand more food.

Bashir et al. (2012) did a study in Pakistan on the impact of age of the household and food security and his findings showed that there is a negative relationship between age of the household and food insecurity. A rise in the age of the household in a year was associated with a 4,5% decrease in the likelihood of being food secure. Households with older heads are exposed to chances of food insecurity because they might have retired and more heads to feed. Bashir et al. (2012) did a study of households in Nigeria on the impact of education and discovered that there is a negative relationship between levels of educational attainment and food security. There is lower chance of food insecurity in households with higher levels of education. This is likely to happen because households would have improved opportunities to sustain active lifestyles for their members. Education enhances better opportunities.

Delilah Takawira, FAO (2018), shared success stories providing that the promotion of gender equality and women's empowerment can generate significant gains for the agriculture sector and society if women had the same access to productive resources as men, they could increase yields by 20 to 30 percent in Zimbabwe. Women participation in agriculture will help to secure food at household level in Zimbabwe.

2.3 Gap analysis

Despite the above studies having been carried out before, the researcher acknowledges that there is very little comprehensive research focusing specifically gender heterogeneity impact in agricultural production towards food security in Zimbabwe. Thus, this study will add to the existing literature and board of knowledge. Most studies that focus on women in agriculture

towards food security were done outside Zimbabwe hence this research will bridge this gap by focusing on gender heterogeneity impact in agricultural production towards food security in Zimbabwe.

2.4 Summary

The above literature discussed the theoretical arguments and empirical evidence on the impact of women participation in agriculture towards food security. It is clear that researchers did not come up with the same conclusion. The next chapter focuses on research methodology and elaborates the methodological framework of the study.

CHAPTER 3

RESEARCH METHODOLOGY

3.0 Introduction

This chapter gave a description of how the research was carried out in order to meet the objectives of the study. It explains the instruments to be used and how the data that will be analysed or gathered and also presented. The tools examined will the researcher in explaining the relationship between gender heterogeneity and food security and other explanatory variables.

3.1 Research design

Research design is a structure that guides the execution of a research method and the analysis of the subsequent data (Bryman and Bell, 2003). Research design attends to the research problem using the available data. It explains how the study came about. The researcher will adopt descriptive research design because it provides accurate and valid representation of the factors relevant to the research through the use of statistics package. This study, the researcher tries to look into gender heterogeneity in the impact of agricultural production on food security in Zimbabwean households.

3.2 Empirical model specification

The main purpose of this study is to see gender heterogeneity in the impact of agricultural production on food security in Zimbabwean households. In order to achieve the main objective of this study the researcher adopted an empirical model which was used by Chumo (2013) who studied on determining factors that affect maize production in Kenya from the period 1980 to 2012. He used the following model:

$$\mathbf{MO} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1}\mathbf{GS} + \boldsymbol{\beta_2}\mathbf{LE} + \boldsymbol{\beta_3} + \boldsymbol{\beta_4}\mathbf{D} + \boldsymbol{\beta_5}\mathbf{MP} + \boldsymbol{\mu} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots$$

Where:

MO = Maize output

GS = Government subsidies on maize

LE = Labour Employed

AR = Average Rainfall

D = Drought

MP = Market Price of maize

μ = Error term.

The researcher will adopt the model and changes the variables in the model.

The model to be used is as follows:

$$FS = \beta_0 + \beta_1 PA + \beta_2 G + \beta_3 A + \beta_4 Ed + \beta_5 HS + \beta_6 MS + \beta_7 Y + \mu$$

Where;

FS =Food Security,

PG= practice agriculture

G =gender of the head of household,

A =age of the head of household,

Ed = Education level,

HS = Household size

MS =marital status,

Y=household income

u =the error term.

β_0 is the intercept

β_1, β_2, β_3, β_4, β_5, β_6 and β_7 are slopes of the regression equation.

3.3 Justification of variables

3.3.1Outcome Variable: Food security

The dependant variable of this study is food security. The outcome variable is being measured through checking which household is food secure and which is not. The indicators of food security ranges from 0-13. In this study a household which faces food insecurity will have value of 0 and 13 when the household is food secure.

3.3.2 Independent variables

3.3.2. a Gender (G)

Gender in this study is showing the difference in sex of head of household. It's a nominal categorical variable and it shows if the head of household is male or female. Several studies conclude that female headed households are mostly affected by food insecurity than male headed household. Gender is a dummy variable and it takes value of 1 if the household head is female and 0 otherwise. Gender of the head of household is a significant factor which determines the food security of a household. Female headed household are vulnerable to food insecurity and they are less secure because of lack of access to assets and information. This variable is going to be tested using simple regression model.

3.3.2. b Age (A)

Age is a numerical variable. According to Oxford University (2017) age is the length of time that a one has lived or existed. Age is said to have an impact on household food security. Kassie*et al* (2012) observed that there is an inverse relationship between age and food security of a household. Age of head of household is an important factor explaining the level of food security. Food security levels are expected to increase with age and then fall as the person ages, this is because head of household will no longer be economically active. In this study age is a continuous variable and measured in years. Variable age will be tested using simple regression model.

3.3.2.c Education (Ed)

Oxford (2017) defines education as the process of receiving or giving systematic instruction, especially at a school or university. Education is an ordinal variable. In this study its measured in levels, therefore the researcher is going to create multi-level dummy (D) variables. Education has 7 categories and 6 dummies. ZJC will be used as the bench mark in this study.

Primary level =D1,

ZJC = bench mark

O' level =D2

A' level = D3

Diploma after O' level = D4

Diploma after A' level=D5,

Graduate=D6

Education is significant in determining food security. Household food security levels are expected to increase with the level of education. The level of education determines whether an

individual has better access to job opportunities in the labour market and it's described as social capital Babatunde et al (2007). Education variable will be tested using simple regression model.

3.3.2.d Household size (S)

An economic unit which is defined for the purpose of census of population as a single person living alone or a group of people voluntarily living together, having meals prepared together and benefiting from housekeeping shared in common, Vinod (2012). Obamiro et al (2003) did a study which showed that large households are more to be food insecure than small households. According to Oyalemi(2012) family size has an effect on food security, the bigger the family the more food insecure they are. This variable will be tested using the simple regression model.

3.3.2.e Marital status (MS)

Is the situation of being married or not? The variable takes the value of 1 when never married, 2 when married or living together or cohabiting, 3 when divorced or separated and 4 when widowed. Marital status is an ordinal variable. In this study its measured in levels, therefore the researcher is going to create multi-level dummy (D) variables. Married living together will be used as the bench mark. Not married=D1, separated=D2, widow/widower=D3.

Marital status is an important factor in determining the household food security. Widows and widowers headed households are more likely to be food insecure because they will be lacking spouse support. Households headed with both a head and a spouse have greater chances of avoiding food insecurity. This variable will be tested using simple regression model.

3.3.7.f Household income

Is the situation of farm income or off-farm income? Households that have off-farm income are more likely to be food secure, because the income may be used to add agriculture labour, add more input. Household that relies on farm income alone may likely be food insecure compared to those that have both on-farm and off-farm income. Household income variable was tested using simple regression.

3.3.2.g Practice agriculture

Is a situation that the household practice agriculture or not. If the household practice agriculture it is denoted by 1 and if it does not practice agriculture it is denoted by 0. Households which

practice agriculture are more likely to be food secure than households that do not practice agriculture. Practicing agriculture helps households secure food and also improve household income.

3.3.3Error term

It is the remainder term. It represents variables that were left from the equation (David and Freedman, 2005).

3.4 Justification of the packages used

STATA package will be used to estimate the equation and results. STATA provide values for the existence or non-existences of the problems of multicollinearity. The package also gives descriptive statistics which show the summary of statistical properties. STATA provides the R squared (Nagelkerke) R^2 and measures the regression model. It explains the variation in Food security. It explains how well the explanatory variables explain the outcome variable using simple regression models.

3.5 Estimation procedures

The Ordinary Least Squares (OLS) estimator model is used to solve and estimate for unknown parameters which are α and β. This method gives the most excellent technique for the confirmation and status of parameters. It also provides quantitative estimation of the relationship amongst variables without much prejudiced judgment. According to Gujarati (2003), the simple classical regression model in its general form which is the general set contains simple and multiple regressions as corresponding subsets. This can be represented as:

$$Y = \alpha + \sum \beta i X i + \mu$$

Where Y is the dependant variable; $X1+ X2+ X3$............... Xk where k are independent variables, α and β are the regression coefficients representing the parameters of the model for a specific population and μ is the stochastic disturbance term which can be interpreted as resulting from the effect of unspecified independent variables.

3.6 Type of data

This research will use secondary data from a survey done. 14 265 Observations were observed in Zimbabwe. Data type is cross sectional data. The data was drawn from Zimbabwe Vulnerability Committee (ZimVAC) 2017-2018 survey.

3.7 Model diagnostic tests

Diagnostic tests are tests done in economics in measuring the validity or checks of a model in a number of ways (Gujarati, 2004). The study will test on multicollinearity and the goodness of fit. These tests will help on meeting the assumptions of logit estimation. Since the model follows a logistic distribution.

3.7.1 Multicolinearity

A multicollinearity test will be carried out. It tests if there is correlation between two or more independent variables. A correlation matrix will be drawn and if the correlation matrix is 0,8 hence there is multicollinearity. If the independent variables are correlated it becomes difficult to separate effects of the independent variables on the outcome variable (Maddala, 1992). It is diagnosed through high p values and low t ratios.

H0: There is no multicollinearity among variables

H1: There is multicollinearity among variables

3.8 Summary

Chapter three gave an elaboration on the methodology used in the research. The chapter dealt with the research design, gave empirical model specifications and also justified the use of variables and packages. Chapter four will concentrate on estimating and presentation of the data, also presenting and interpreting the data.

CHAPTER 4

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.0 Introduction

This chapter outlines the findings and results of the study, it is going to present results of the data analysis. The main procedure used to answer the research questions is the Regression analysis using software STATA (Version 14) package. Statistical and economic interpretations will be discussed in this chapter. There will use of tables in the presentation of results. The main aim of this study is to determine the relationship between food security, gender, agricultural practice, education level, age, household size, household income, agriculture labour, marital status, province. Finally, a brief summary of the study finding concludes the chapter.

4.1 Descriptive statistics

Table 4.1: Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Food security	14,241	12.37757	2.125335	0	13
Practice agriculture	14,220	1.327848	6.678187	0	1
Gender	14,238	.5168563	.4997333	0	1
Age	14,241	47.86497	17.61829	24	98
Primary level	14,075	.3883481	.4873918	0	1
ZJC	14,075	.1215631	.3267921	0	1
O' Level	14,075	.2566963	.4368259	0	1
A' level	14,075	.0076021	.0868612	0	1
Diploma after O' level	14,075	.0031261	.0558261	0	1
Diploma after A' level	14,075	.0102309	.1006328	0	1
Graduate	14,075	.0050444	.0708471	0	1

Household income	14,252	81.29651	254.8223	0	20350
Married living together	14,229	.61712	.4861065	0	1
Not married	14,229	.0719657	.2584402	0	1
Separated	14,229	.0494061	.2167221	0	1
Widow/widower	14,229	.2076745	.4056567	0	1
Household size	14,252	4.569183	2.232233	0	20

Source: Own Source

The table above shows the descriptive statistics summary of the variables used in the empirical model in terms of the mean, standard deviation, minimum and maximum values. Food security is the dependent variable. Food security have mean of 12.4 and standard deviation of 2.13. Maximum rate of household which is food secure is 13 with a minimum of 0. The standard deviation of Age is17.6 and mean value of 14.9. minimum household head age is 24 and the maximum age 98, the unknown code.

4.2 Diagnostic Test

Table 4.2: Correlation Matrix

	Practice Agric	Gender	Age	Education	HH income	HH size
Practice Agric	1					
Gender	0.0136	1				
Age	-0.0027	-0.0255	1			
Education	-0.0058	0.0124	-0.0979	1		
HH income	0.0131	0.0429	-0.0319	-0.0063	1	
HH Size	-0.0240	0.0670	0.0497	-0.0035	0.0013	1

Source: Own Source

Correlation analysis between the seven independent variables. If the variables are above 0,8 it means that we have to correct for multicollinearity (Gujarati, 2004). The above table illustrate that the model is not suffering from multicollinearity since all variables are below 0,8 so there is no need to correct multicollinearity.

4.3 Estimation of results

The results of the analysis are shown below. The analysis was done through regression. Since the correlation test does not imply the effect of one variable to another.

Table 4.3: Regression

fdseccat6	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Practice agriculture	.0084676	.019683	0.43	0.667	-.0301141	.0470493
Gender	.0906359	.05187	1.75	0.081*	-.0110375	.1923092
Interaction	.0006725	.0278318	0.02	0.981	-.0538823	.0552272
Age	.0039404	.0012827	3.07	0.002***	.0014262	.0064546
Primary level	.1230517	.0499137	2.47	0.014**	.025213	.2208904
ZJC	.326822	.0669266	4.88	0.000***	.1956352	.4580087
O'LEVEL	.3722354	.0596514	6.24	0.000***	.2553092	.4891617
A' level	.2106612	.202524	1.04	0.298	-.1863178	.6076402
Diploma after O' level	.4643916	.324815	1.43	0.153	-.1722972	1.10108
Diploma after A' level	.6087396	.1794818	3.39	0.001***	.2569268	.9605523
Graduate	.5522704	.292449	1.89	0.059*	-.0209758	1.125517
Household income	.0004849	.000067	7.23	0.000***	.0003534	.0006163
Married living together	-.0389123	.0953279	-0.41	0.683	-.2257701	.1479455
Not married	.0881915	.1154375	0.76	0.445	-.1380844	.3144673
Separated	-.1856797	.1272584	-1.46	0.145	-.4351262	.0637669
Widow/widower	-.1138717	.1101064	-1.03	0.301	-.3296977	.1019542

Household size	-.1424798	.0084519	-16.86	0.000***	-.1590468	-.1259127
_cons	12.57893	.1191062	105.61	0.000***	12.34546	12.8124

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.

Source	SS	df	MS
Model	1712.19129	20	85.6095643
Residual	45458.6641	12,214	3.72184904
Total	47170.8554	12,234	3.85571811

Number of observations   =   12,235

F (20, 12214)   =   23.00

Prob > F   =   0.0000

R-squared   =   0.0363

Adjusted R-squared   =   0.0347

Root MSE   =   1.9292

Source: Own Source

4.4 Results interpretation and Discussion

4.4.1 Practice Agriculture

Practice agriculture variable is statistically insignificant at 10% significant level towards Food security at household level. It has a positive coefficient to food security. This then mean an increase by 1% in practice agriculture will lead to an increase by 0.085 units on food security.

Delilah Takawira, FAO (2018), shared success stories providing that the promotion of gender equality and women's empowerment can generate significant gains for the agriculture sector and society if women had the same access to productive resources as men, they could increase yields by 20 to 30 percent in Zimbabwe. Promoting gender equality will improve practice in agriculture and this will help in improving food security at household level. The results showed that there is a positive relationship between food security and practice agriculture.

4.4.2 Gender

The variable gender is positive and statistically significant at 10% significant level since the p-value is 0,081. Since the variable gender assumes value of 1 if the household is headed by a

male, it means that male headed households are more food secure as compared to female headed households.

The results conform to those of a study done in Kenya on what determines gender inequality in household food security by Kassieet.al (2014). The findings of the study were that female headed household are less food secure. The variable Gender is accepted and conclude that females contribute to food security in Zimbabwe since the results have shown that they are significant to our study variable food security.

4.4.3 Interaction

Interaction variable is positive with coefficient 0.0006 and statistically insignificant at 10% significant level since the p-value of 0,981. This shows that there is no gender heterogeneity in the impact of agricultural production towards food security at household level in Zimbabwe.

The results shows that there is no gender heterogeneity, this may be due to the facts that males may be involved much in off-farm activities. This confirms to the study done by Oseni and Winters (2009) that off-farm activities in Nigeria help households to improve their farm production through higher input use, including more employment of hired labour there by helping to drive away food insecurity at household level. The study shows that off-farm income is a major contribute to household food security in Zimbabwe households, since most males spends most of their time doing off-farm activities.

4.4.3 Age

Variable age is positive and statistically significant at 1% significant level to the dependent variable food security. 1% increase in age will lead to an increase in food security by 0.039 units.

Omonaet al. (2007) did a study in Nigeria which confirms with this study results, and his results showed that household food insecurity increases with age, household's heads above the age of 60 are usually retired, with large household size and low income, thus increasing their likelihood of food insecurity. In Zimbabwe most households in rural areas are headed by elderly people who will be uneconomic and these households will be food insecure as compared to households which are being headed by young people who are still economically active.

4.4.4 Education

ZJC was used as the bench mark in this study, education variable is positive and it is statistically significant at 1%,5% and at 10% significant level. A' level and diploma after primary level are

24

insignificant in this study. Households headed by graduates are statistically significant at 10% significant level.

Similar results were also produced by Knueppel (2009) in Tanzania which indicated that lower educational levels are directly related to high food insecurity at the household level. Bashir et al. (2012) did a study in Nigeria on the impact of education on food security on household level and discovered that there is a negative relationship between levels of educational attainment and food security. Household with educated people are more likely to be food secure than those without educated people, this is due to educated people may work outside and help secure food security. Educated people will also be aware of how to improve their agricultural production without straining their budgets.

4.4.5 Household income

The variable household income is statistically significant at 1% significant level since the p-value is 0,00. An increase by 1% in household income will results in an increase by 0,005units in food security.

Zerai and Gebereegziabher, (2011) in Eastern Tigrai, Ethiopia examine that off-farm activities may provide as a coping strategy outlet to manage with unexpected income losses for survival and the improvement of food security. This study showed that household income may be improved also though off-farm activities. Households with low income are likely to be food insecure as compared to household which are food secure.

4.4.6 Household size

The variable household size is statistically significant at 1% significant level since the p-value is 0,00. Household size have an inverse relationship with food security. A 1% increase in household size will lead to a decrease in food security by 0,142 units.

The results conform to the study done in Nigeria by Oyalemi (2012), on the effect of family size on household food security and the results showed that a larger household demand more food. The size of household plays a major role in contributing to food security. Results of the study confirms that of Oyalemi since the relationship between food security and household size is inverse, large household are likely to be food insecure compared to household which are small in size.

4.5 Summary

This chapter outlines the results of the study for 2017-2018 session. The next and final chapter will give a summary of the whole study, also suggest recommendations and suggestions for further study.

CHAPTER 5

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This research was on gender heterogeneity impact on agricultural production towards food security of households in Zimbabwe. The study was motivated by the fact that food insecurity is major problem in Zimbabwe. This chapter gives a precise summary of the study and also suggestions for further study as well as policy recommendations to the policy makers in Zimbabwe to help increase food security.

5.1 Summary

The gist of this research was to determine gender heterogeneity in the impact of agricultural production on food security in Zimbabwean households. The study was triggered by the food and nutrition shortages in Zimbabwe. Data analysis was done using STATA package version 14. The ordinary least squares estimator was used for the estimation of the variables. This research has contributed literature on how food security is affected by variations which includes practice agriculture, gender, age, household size, marital status, education level, and household income. The findings of the study show that food security and practice agriculture are positively related meaning practice agriculture have a positive effects on food security. However, practice agriculture was also found to be insignificant to food security. This result was not expected as some studies are of the view that practice agriculture largely affect food security in general. Gender of the head of household has a positive effect on food security in Zimbabwean households. This conforms to the findings of other empirical studies.

The study also found that household size had a significant impact on food security and also inverse relationship with food security. Evidence from the study showed that the larger the size of the family the more the food insecurity it will be. This goes in line with a brief study done by Oyalemi (2012) on the effect of family size on household food security in a state of Nigeria.

The study showed a positive relationship between education level and food security. The variable is significantly associated with household educational attainment. Households with higher educational attainment was food secure and those with none were highly food insecure. A study done by Mutsiyaet., al (2016) confirms these results.

5.3Conclusions

The study wanted to see the relationship between food security and practice in agriculture, household size, marital status, gender, age of head of household, education level, household income. It was also found that an increase in agriculture practice reduces the levels of food insecurity on a household level, meaning household which practices agriculture will not likely face food insecure. Practicing agriculture plays an important function in improving food security. There are other significant variables in the model like gender of household head also contribute to the food security of a household. It was found that male headed households are more likely to be food secure than females headed households. It was also found that an increase in household size leads to food insecurity of the household. Showing that larger families are associated with a negative status of food security, they are more likely to be food insecure. The larger the family size the less the less food secure they will be.

5.4Recommendations

➢ Government should encourage and support females who are involved in agricultural practice since it helps to strengthen food security at household level. This can be done by providing subsidies to those who would like to venture into agriculture.

➢ The policy makers should include the role of women in food security when crafting their policies. Women and the society as a whole should be empowered so as to avoid cases of female being constrained.

➢ The government should encourage women agriculture clubs or associations. This can be done by providing financial support and trainings as they can support female headed households by providing information and helping them in getting inputs and credit facilities.

- Government and other stakeholders should encourage family planning. Women should be educated on the importance of having few children. Family planning methods and education should be readily available to everyone.

- There is need for Zimbabwean government to always plan ahead for events like droughts. It can as well work closely with academics and other research institutions and venture into programs like disaster management programs to tackle hunger and uncertainties.

- The Zimbabwean government should provide more infrastructure building more storage and improve conditions of the current facilities like Grain Marketing Board (GMB) this reduces stress on its citizens during disasters like drought.

- The government should also eliminate the dependence syndrome of the communal farmers and encourage them to be self-reliant through usage of own resources in order for them to boost agricultural production.

- There is need for the government to improve on good governance and focus more on transparency and accountability to improve the effect of government subsidies on agricultural produce. When there is good governance and good institutions, there will be assurance that the government will perform according to its mandate and be able to enforce policies to meet its objectives.

5.5 Suggestions for further research

There is room for further research and study as the results obtained in this study should not be viewed as conclusive but as a stimulant for further research on gender heterogeneity in the impact of agricultural production on food security in Zimbabwean households. Studies on how changes in practice agriculture, gender, age, household size, marital status, education level, household income, agriculture labour, and other independent variables towards food security should be done in other developing countries besides Zimbabwe. Further research can also be conducted to determine other factors which affect food security in Zimbabwean households which are not included in this research. Lastly the research can be extended to other SADC, Sub-Saharan countries and even to all African countries at large.

References

Agriculture and modern communication technology. *Proceedings of workshop* (available Aitkin, H. 1998. Rural women and telecommunications in developing countries. Women in at www.husdry.kvl.dk/htm/php/tune98/13-HelenAitkin.htm).

Baddeley, MC and Barrowclough (2009). Running regressions, a practical guide to quantitative research in economics, finance and development studies. New York Cambridge University Press

Bashir, M Schiliizi ,Panditt (2012) The determinants of rural food security :the case of Landless Households of Punjub, Pakistan .Crawley :The Western University of Western Australia.

Carter, N.K, Taylor (2010) What are the determinants of food insecurity in New Zealand and does it differ for males and females. Wellington: Public Health Association of Australia

Chang,C.C.(2011) Food security :global trends and region perspective with reference to East Asia .Pennsylavania:Department of Agricultural Economics

David Romer, David N. Weil, Gregory N. Mankiw, 'A contribution to the empirics of Economic Growth': the Quarterly Journal of Eonomics, May 1992.

Chukwuma, D., and Uju, E., 2013. "Does agriculture matter for economic development?
 Debdulal M (2009) Are female headed households more food insecure in Bangladesh.

Empirical evidence from Nigeria". J of Fin and Eco. 2013; 1(1):61-77.

Falcon, W. 1996. Commentary: Food policy really matters. Washington, DC, International Food

FAO (2001), Food and Agricultural Organization Committee on World Food Security Rome 28, May, June :14-15

FAO (2003), Food and Agricultural Organization Committee on World Food Insecurity in the World, Rome

FAO. (1996). Rome Declaration on World Food Security and World Food Summit Plan of Action. Rome.

Financial Gazette, 2013. Food Insecurity Issues Globally: The Case of Africa. World Rev. Bus.; 1(1):191-200

FAO. (2015). Research and institutes with activities in plant

FAO. (2017). WTO Agreement on agriculture: The implementation experience. Trade and Development Studies Centre, Harare

FAO (2012). Agriculture, trade and food security: Issues and options in the WTO negotiations from the perspective of developing countries - Report on papers of a FAO symposium held in Geneva. Geneva 38

Gujarati, D, (2004), Basic Econometrics, Fourth Edition, Boston: McGraw-Hill international

Gujarati, Porter, D.C. (2010) Essentials of econometrics .4th Edition. New York: McGraw-Hill international

Jones J, 1984. Factors that Reversals Leontief's Puzzling Paradox. New Haven: Yale University Press.

Kairiza, T. and Kembo, G. D. Agricultural and Food Economics. Online [https://doi.org/10.1186/s40100-019-0144-6] Coping with food and nutrition insecurity in Zimbabwe: does household head gender matter? Article number: 24 (2019)

KassieM,Stage J (2014) : What determines gender inequality in household food security in Kenya? Application of exogenous switching treatment regression, World Development 56

Maddala G, S, 1992. Introduction to Econometrics.2nd Edition. Macmillan, New York

Mutsiya,Ngware, Kabiru (2016) Effects of education on household food security in two informal urban settlements in Kenya :a longitudinal analysis

Nyoro T, 2005 'The Impacts of Agriculture Expenditure on Poverty in Zimbabwe'. Journal of Economics and Sustainable Development, University of Fort Hare, South Africa

O Connell, A.A. (2006) Logistic Regression model for ordinal response variable London: SAGE Publications

Omonona, G. (2007): An analysis of food security situation among Nigerian urban Households: Evidence from Lagos State Nigeria, 397-407

Oseni, G., Winters, P., (2009). Rural nonfarm activities and Agricultural crop production in Nigeria, Agricultural Economics 40(2), 189-201.

Oyalemi A (2012) Effects of family size on household food security in Onusstate, Nigeria

Sachikonye, D. 2008. The ever-growing corruption in Africa. Joberg Personal RePEc Archive, No 55536

Sithole. S Z, 2006. Ministry of Lands, Agriculture and Rural Resettlement, Harare. Plant Protection Institute, Zimbabwe

Solow, Robert M, 'A contribution to the Theory of Economic Growth': Quality Journal of Economics, LXX (1965), 65-94.

World Bank (2005). Global Development Finance 2005.Washington D.C; World Bank

World Bank (2008). World development report 2008: agriculture for development; the International Bank for Reconstruction and development.

World Bank. 2002. Integrating gender into the World Bank's work: A strategy for action. World Food Program. 2001. Decision-making in WFP's food for work projects. Gender Zerai, B., and Gebereegziabher, Z. (2011). Effects of non-farm income on household's food security in Eastern Tigrai Ethiopia: An Entitlement Approach: Food Science and Quality Management, 2224-6088 (Paper) 2225-0557 (online) Vol 1 [Google Scholar]

Zimbabwe Agricultural Commodity Exchange (ZIMACE). 2017. Food Insecurity in the Rural Areas: A Case Study of Chendambuya. Harare, Zimbabwe

Zimbabwe Vulnerability Assessment Committee (ZimVAC)

ZIMSTAT (2015) Zimbabwe Poverty Atlas, Harare, Zimbabwe

List of Appendices

Appendix I: Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Food security	14,241	12.37757	2.125335	0	13
Practice agriculture	14,220	1.327848	6.678187	0	99
Gender	14,238	.5168563	.4997333	0	1
Age	14,241	47.86497	17.61829	24	98
Primary level	14,075	.3883481	.4873918	0	1
ZJC	14,075	.1215631	.3267921	0	1
O' Level	14,075	.2566963	.4368259	0	1
A' level	14,075	.0076021	.0868612	0	1
Diploma after O' level	14,075	.0031261	.0558261	0	1
Diploma after A' level	14,075	.0102309	.1006328	0	1
Graduate	14,075	.0050444	.0708471	0	1
Household income	14,252	81.29651	254.8223	0	20350
Married living together	14,229	.61712	.4861065	0	1
Not married	14,229	.0719657	.2584402	0	1
Separated	14,229	.0494061	.2167221	0	1
Widow/widower	14,229	.2076745	.4056567	0	1
Household size	14,252	4.569183	2.232233	0	20
Agriculture labour male	12,381	1.469752	1.413469	0	99
Agriculture labour female	12,378	1.572871	1.387998	0	99

Source: Own source

Appendix II: Correlation Matrix

	food security	Practice Agric	Gender	Age	Edu	HH income	Marrital status	HHSize	Agric labour Male	Agric labour Female
food security	1									
Practice agric	0.0039	1								
Gender	0.0395	-0.0008	1							
Age	-0.01	-0.0009	-0.0266	1						
Education	-0.0376	-0.0101	-0.0403	0.0497	1					
HH income	0.0754	-0.0012	0.0402	-0.0205	-0.0516	1				
Marrital status	0.007	-0.0034	0.5105	-0.1815	-0.0088	0.0252	1			
HHSize	-0.1424	0.0074	0.0818	0.0269	0.0307	0.0131	0.1949	1		
Agric labour M	0.013	-0.0038	0.1594	0.0526	0.0003	0.0573	0.1766	0.291	1	
Agric labour F	-0.0152	-0.0001	-0.067	0.077	-0.0042	0.0178	-0.0134	0.2936	0.5818	1

Source: Own source

Appendix III: Pseudo R^2

Source	SS	df	MS
Model	1712.19129	20	85.6095643
Residual	45458.6641	12,214	3.72184904
Total	47170.8554	12,234	3.85571811

Number of observations = 12,235

F (20, 12214) = 23.00

Prob > F = 0.0000

R-squared = 0.0363

Adjusted R-squared = 0.0347

Root MSE = 1.9292

Source: Own source

Appendix IV: Regression

fdseccat6	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Practice agriculture	.0084676	.019683	0.43	0.667*	-.0301141	.0470493
Gender	.0906359	.05187	1.75	0.081*	-.0110375	.1923092
Interaction	.0006725	.0278318	0.02	0.981*	-.0538823	.0552272
Age	.0039404	.0012827	3.07	0.002***	.0014262	.0064546
Primary level	.1230517	.0499137	2.47	0.014**	.025213	.2208904
ZJC	.326822	.0669266	4.88	0.000***	.1956352	.4580087
O'LEVEL	.3722354	.0596514	6.24	0.000***	.2553092	.4891617
A' level	.2106612	.202524	1.04	0.298*	-.1863178	.6076402
Diploma after primary	.4643916	.324815	1.43	0.153*	-.1722972	1.10108
Diploma after O' level	.6087396	.1794818	3.39	0.001***	.2569268	.9605523
Graduate	.5522704	.292449	1.89	0.059*	-.0209758	1.125517
Household income	.0004849	.000067	7.23	0.000***	.0003534	.0006163
Married living together	-.0389123	.0953279	-0.41	0.683*	-.2257701	.1479455
Not married	.0881915	.1154375	0.76	0.445*	-.1380844	.3144673
Separated	-.1856797	.1272584	-1.46	0.145*	-.4351262	.0637669
Widow/widower	-.1138717	.1101064	-1.03	0.301*	-.3296977	.1019542
Household size	-.1424798	.0084519	-16.86	0.000***	-.1590468	-.1259127
Agric labour males	.0591945	.0158949	3.72	0.000***	.028038	.090351
Agric labour female	.0107994	.0160285	0.67	0.500*	-.020619	.0422178
_cons	12.57893	.1191062	105.61	0.000***	12.34546	12.8124

Source : Own source

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1