A SYNTHESIS OF RURAL LIVELIHOOD APPROACHES IN ANALYSING HOUSEHOLD POVERTY, FOOD SECURITY AND RESILIENCE: A CASE STUDY OF RUSHINGA RURAL DISTRICT IN ZIMBABWE.

By

Onismo Muzah

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African Centre for Food Security,

School of Agricultural, Earth and Environmental Sciences

College of Agriculture, Engineering and Science

University of KwaZulu-Natal,

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_____

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ABSTRACT

Understanding rural livelihoods is an important goal to achieve the Sustainable Development Goals in Zimbabwe, in particular eradicating poverty and food insecurity in every household. Even though livelihoods of the rural poor are susceptible to recurrent shocks, risks and stresses, fostering resilience on rural livelihood approaches is a significant remedy for achieving household well-being. However rural livelihood failure to mitigate widespread poverty and food insecurity have never been adequately examined or explained in a context that can encourage rural development policies. The study provides a comprehensive analysis of livelihood approaches, specifically endeavouring to answer the following questions: What livelihood factors determine rural poverty and its dimensions in the study area? What is the extent of household vulnerability to food insecurity? Is the degree of livelihood resilience and adaptation to attain food security sustainable? The main objective of the study was to use the concept of livelihoods as the springboard to analyse and measure household vulnerability to poverty and food insecurity as well as the level of rural resilience.

The study focused on three distinct Wards in the Rushinga District, Zimbabwe. The multi-stage sampling procedure was adopted to select fifteen villages and simple random sampling was used to select 300 households for the survey, 100 from each Ward and 20 from each village. The household level was used as the appropriate unit of analysis, because on aggregate, pooling of labour, consumption, resources, coping and survival strategies are relatively identified from a household perspective, as a common unit of analysis. Data analysis employed econometric models to compare livelihood outcomes from different socio-economic variables included in the study. Descriptive statistics such as chi-square, t-test, mean, percentages and frequencies were used to answer the objectives of the study and test the hypothesis.

A theory of rural livelihood approaches was developed using conceptual frameworks compatible to the context of the study; the Sustainable Livelihood Framework (SLF), micro-level food security framework and the Resilience Framework (RF). In other words, the frameworks strive to explain that positive household well-being is a result of successful livelihood approaches and negative well-being is the result of livelihood failure. The Sustainable Livelihood Framework is an appropriate checklist tool to understand how poverty is influenced by socio-environmental factors, and also important for eradication models. It describes the relationship between the environmental context and the capitals or assets available to the rural poor. In negotiating possible livelihood outcomes, the poor select from a range of available options within a particular context and locality, and the study shows that natural and social

capital are easily available to the poor. The Food Security Conceptual Framework (FSCF), just like the SLA, identifies the reason some households become food secure and some food insecure. It is because livelihood activities, processes and outcomes differ from one household to the other. Household food security is a function of availability and access to adequate food, both dimensions hinge on resource endowments to acquire sufficient food. Furthermore, the stability of *availability* and *access* to food is considered an important dimension of food security as well as utilisation which has a bearing on nutritional security. Utilisation is considered a biological perspective of food security; as the ability of the human body to ingest and metabolise food. Because of the vulnerability context within livelihood approaches, which eventually result in poverty traps, the study shows that the poor find themselves food insecure. When compared to resourceful households who are food secure, they have the capacity to produce and procure adequate food. In other words, food insecurity in the District was a result of poverty, as the poor lack the means to pursue other livelihood options. The Resilience Framework improves the understanding of how the interaction of capacity, socio-economic and environmental factors affect rural livelihoods and household consumption welfare. The study revealed that highly exposed and sensitive livelihood systems eventually "collapse", leading to vulnerability to food insecurity as compared other household's livelihood systems which were highly adaptive, resulting in easy "bouncing back" to normal household's functions. Thus, livelihood approaches, in complex rural context, can only be sustainable to warrant food security if strengthened by the resilience of socio-ecological structures.

Quantitative estimation of the dimensions of poverty measured in monetary metrics and food insecurity measured in calorie intake per adult equivalence using the Foster, Greer and Thorbecke (FGT) indices revealed that 70% of households were poor, thus, living below absolute food poverty line, average poverty gap was 38% and severity 15%. The prevalence calls for relevant stakeholders like the government to scale up efforts to minimize household poverty. Since poverty in this study was measured in terms of expenditure on food, household's lack of purchasing power means households could be food insecure. Generally, the prevalence of food insecurity was high in the District; 60% households were deemed food insecure, the depth of food shortage per adult equivalence was 24% and the inequality among the food insecure households themselves was 13%. Notably, the results indicated that poverty and food insecurity were gender-skewed and geographically concentrated. There were more poor female headed-households than male-headed households, and concentration of household vulnerability to food poverty in Ward 12 signals geographical poverty. This all points to inequality when it

comes to controlling and access to key productive resources to enhance their livelihoods. At the household level, food insecurity alleviation strategies and policies should aim to empower women and transform the livelihood choices and priorities of vulnerable groups in society. The study revealed a strong relationship between geographically defined factors and level of well-being. Spatial disparities in living standards were caused by the existence of geographical poverty traps which caused cycles of livelihood failure, for example, inequality in resource endowments, education and health services and a host of other social economic factors.

To examine the determinants of poverty, the study utilized a binary logic model. The results of the econometric model revealed that rural poverty is linked to geographic location, dependency ratio, marital status, total monthly income per capita, asset endowment, access to support services and maize yield (statistically significant at 10% and below). The implication of this result is that not a single livelihood predicator can cause poverty. These variables interact at a scale beyond the control of households, causing households to fall into severe poverty, over a given point in time. A binary logit model was also used to estimate the determinants of household food security, daily calorie availability per adult equivalence was adopted as the dependent variable. The results showed that household food insecurity was linked to dependency ratio, per capita monthly income, the value of assets, total livestock units (TLU) and maize yield. In the rural context, there was a link between the predictors of poverty and food insecurity. Whenever poor households were confronted with either transitory or chronic food insecurity, they developed mild, moderate and more severe food deficit coping strategies. Generally, the households in the study used minimal coping strategies, the cause was attributed to the availability of external aid rationings which eased the severity.

Even though the utility of natural resources, in particular, land-based activities, constituted an important source of livelihoods, as Zimbabwe is regarded an agricultural economy, the sector has become a poverty and food insecurity trap. At the same time, results exhibited rural livelihood transition from conventional activities. In the rural context, the transition is owed to uncertainty in agriculture, because of erratic rainfall, shortage of labour, high costs of inputs, land degradation, among other factors.

Resilience is a developing research discipline in the wake of climate change, described in different ways and understood in complex dimensions depending on context. In the context of rural livelihoods, it is described as the capacity of the rural economy to simultaneously balance social, economic, ecosystem and cultural functions when confronted with predicted or

unpredicted vulnerability. As such, rural livelihood resilience is the ability of the socio-ecological system to cope, adapt absorb and transform from change. This study strives to quantitatively measure resilience in the domain of food security. Food security is an important aspect that every household strives to achieve. High costs of farm inputs, market failure, and rising food costs were among notable shocks uncounted by households in the study. However, agricultural drought was the major livelihood threat to land-based activities, as nearly 94% of interviewed households who relied on own production for their food security recorded absolute crop failure.

To measure household resilience against food insecurity, the study used two-stage factor analysis using the Principal Component Factor method. The model considers resilience against food insecurity as available household options over a given time. Among other options, adaptive capacity is the most important livelihood option, which is the ability of a system to adjust and take advantage of opportunities in order to offset risks and shocks. Access to natural resources was not significant enough to explain resilience against food insecurity, this is mainly attributed to degradation of the resources or inequitable access, for example to land. Validation of the mean resilience index indicates that livelihood diversification correlates with high resilience because of high adaptive capacity as compared to a single livelihood option. The mean resilience index also revealed that male-headed households improved adaptive capacity, given their better access to resources, whereas female-headed remained vulnerable because they were either involved in non-diversified livelihoods or they are constrained in accessing productive assets and low endowment in human capital. Thus, rural development policies should spur livelihood diversification as core resilience strategy against food shortages.

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LIST OF ACRONYMS

ABS	Access to Basic Services
AC	Adaptive Capacity
ANR	Access to Natural Resources
CC	Contingency Coefficient
CIS	Coping Strategy Index
DFID	Department Of International Development
FGT	Foster Greer Thorbacke
FIAS	Food Insecurity Access Scale
FSCF	Food Security Conceptual Framework
NGOs	Non- Governmental Organisations
PCA	Principal Component Analysis
PCF	Principal Component Factor
RF	Resilience Framework
SDG	Sustainable Developmental Goals
SLF	Sustainable Livelihood Framework
SSA	Sub Saharan Africa
SSN	Social Safety Nets
TUT	Total Livestock Units
VIF	Variance Inflation Factor
WFP	World Food Programme

DEFINITION OF TERMS

Livelihoods: The means of living in the form of resources, income, social safety nets, basic services and stocks that the rural people utilise to meet their basic needs, are regarded as their livelihoods. The livelihoods of the rural people in developing countries are land-based, even though livelihood transition is developing towards non-farming activities. They acquire their livelihoods from own production on land, selling casual labour, market or exchange entitlements and remittances. However, for livelihoods to be secure, individuals or households should have secure ownership of, or access to productive resources and income-earning activities, including reserves and assets to offset risks, easy shocks and meet contingencies (Acharya, 2006).

Poverty: People's deprivations and inequalities have many dimensions, the inability of rural households to attain minimum consumption needs can be regarded as their poverty, unlike lack of income or assets which are material. Treating expenditure of food (USD, 31.00) as an important benchmark to measure poverty, helps to understand if the frequency and intensity of poverty are correlated to the failure of their livelihood priorities to enhance well-being.

Food security: The concept of household food security can be understood from a point of livelihood security. It is contingent of two factors; having enough purchasing power to food needs which meet household caloric acquisition per adult equivalence (2100 kcal), and the ability to meet the overheads at which own production is covered to yield a decent return for self-sufficiency. Although food insecurity largely stems from poverty or income inequality, it is not a necessary result of poverty, because in other places food insecurity has been identified among households classified as non-poor (Hall, 2014).

Resilience: Resilience is a context construct of rural socio-ecological systems, where households and communities are expected to cope or adapt to a number of shocks, among others, seasonal droughts which directly affects their environmental dependent livelihoods, leading to food insecurity. A rural area is considered as a social system which interacts with and depends on an ecological substrate, whose survival depends, among others, on its relationship with the system of natural resources (Schouten *et al*. 2009).

Vulnerability: Rural livelihoods are frequently exposed to the sensitivity of idiosyncratic and covariate shocks and stresses, at which the ability of households to recover to pre-disturbance levels depends on their adaptive capacity. This makes vulnerability an independent entity to resilience, because households in the same geographical area may face the same risk but not

equally resilient or vulnerable. Natural disasters such as drought interact with multiple social economic factors to shape the 'dynamic vulnerability' of livelihoods constructed in unstable socio-ecological environments. Leichenko and O'Brien (2002); Mwamba (2013), use 'dynamic vulnerability' to explain the extent to which environmental and economic changes combine to influence the capacity of social groups to respond to various types of natural and socio-economic shocks. If the vulnerability is high it causes the sources and conditions of natural/environment to deteriorate, causing high, social and structural damage to low resilient households.

Sustainability: Environmental, economic, institutional, and social sustainability can be explained as a middle "phrase" between resilience and vulnerability. For example, increased sustainability of natural resources is critical in reducing poverty and food insecurity, at the same time stimulating resilience, whereas reduced sustainability as a result of depletion of resources like land degradation or overgrazed pastures could result in livelihood vulnerability. Thus, in the rural context, to enhance and maintain livelihood sustainability, the focus should be on ways to strengthen socio-ecological systems and people should have knowledge of the resources they use.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

The failures of rural development policies to bring about wide-spread improvement of rural livelihoods have not been adequately examined and explained in the context of the effects of livelihood outcomes on household well-being (Ontita, 2006). This study is stimulated by lack of understanding of the challenges the poor face, the resources they have access to or own to earn a living and the environment within which their livelihood strategies are moulded into positive or negative outcomes. Therefore, the overall objective of this study goes beyond horizontally investigating rural livelihood construction matrix but also to explore the relationship between livelihood activities, poverty, food security and the ability of systems to cope with external stresses as a result of disturbances. Thus, the relationship between these key concepts stems from the fact that in order to reduce food poverty, there is need to nurture resilience in livelihood systems. In other words, the study builds on the premise that 'poverty, food insecurity, and weak resilience systems is a result of policies that lack understanding of livelihood approaches of the poor. Incorporating livelihoods approaches in the discourse of household welfare provides frameworks on how to build resilience against the intensity and frequency of social economic and environmental risks. Although rural livelihood typology is not new in literature, this study is the first to use the livelihood lens to investigate the complex linkage between livelihood strategies, poverty, food security and resilience at the household level.

Therefore, this study could make a significant contribution to the understanding of rural livelihood, vulnerabilities, opportunities and exclusion which are key to the well-being, in particular, the vulnerability in rural areas of developing countries. Thus, to understand rural livelihood system and economy (Krantz, 2001), there is need to investigate the interaction between livelihood outcomes and drivers which reveal the depth of poverty, vulnerability and levels of self-sustainability (Morris *et al.* 2001). The results are expected to provide evidence of how to improve rural livelihood systems against the background of global climate change and variability.

1.2 Background

Generally, livelihood approaches are commonly practiced to address issues such as poverty, sustainability, resilience practices and to test the quality of well-being (Drolet, 2016). In rural development perspective and practice, livelihood thinking started with how individuals and households in different places make a living (Scoones, 2009). The approach was brought to the centre stage of development studies in the late 1990s and at the beginning of the new millennium by notable researchers in development studies, like Robert Chambers, Gordon Conway, Norman Long, Britain's Department for International Development (DFID) (De Haan, 2012). Their aim was to reflect the complex realities faced by poor people in specific context (Devereux *et al*. 2004),

in particular, increasing rural poverty and food insecurity in developing countries. Bryceson (2000) and Mdee, (2002) argue that livelihood analysis emerges from the weak responsiveness to neo-liberalism (contraction of government services and removal of subsidies) demonstrated by the livelihood strategies of African rural societies. The concept gained wide acceptance as a valuable mean of understanding the factors that influence people's lives and well-being, as a way of conceptualizing the economic activities the poor participate in their totality (Carney, 1999). Since then, the approach has become a paragon of development policy for international agencies such as UK Department for International Development, Overseas Development Institute, Oxfam, CARE, Food and Agriculture Organisation, among others (Mutami and Chazovachii, 2012). Using the livelihoods approach provides a useful, logically consistent picture for thinking through the complex issues influencing the welfare of the rural poor in developing countries (Chapman *et al.* 2003). For example, the approach draws on an improved understanding of poverty, but also on other streams of analysis linked to well-being like gender, household dynamics, and food security; bringing together relevant concepts that allow poverty to be understood in a holistic fashion (Farrington *et al.* 1999).

In order to understand the causal linkages between rural poverty and livelihood insecurity in a practical way, CARE International developed three livelihood categories appropriate in its relief spectrum; livelihood *promotion*, *protection,* and *provision*. It means that a good livelihood promotion strategy should have a protection element, which deals with existing areas of vulnerability and helps to ensure that any improvements in livelihood security are protected (Carney *et al.* 1999). Safeguarding the livelihoods of marginalized and vulnerable groups should be a priority; by providing social safety nets in the form of food aid, monetary aid and input subsidies. While livelihood approaches focus on the actors in a system, social protection focuses on policies aimed at preventing or alleviating vulnerability in the system of the poor, (de Haan, 2017). In Zimbabwe, rural social protection services are neither guaranteed nor predictable, they only appear as emergency relief aid from donors or used as government political instruments.

While the definition of a *livelihood* can be applied to different hierarchical levels, it is commonly used at the household level; of the various components of a livelihood, the most complex is the portfolio of tangible and intangible assets out of which people construct their living (Kratz, 2001). The poor in rural areas are believed to own few assets, lack education and pursue risky livelihood strategies with minimal returns, their livelihood outcomes are easily predictable. Then, in order to determine whether households are successful in pursuing their livelihood strategies, it is important to look at a number of outcome measures that capture need or well-being satisfaction (CARE, 2002). Livelihood outcomes in any given context vary; but how different strategies affect

livelihood pathways or trajectories is an important concern for livelihoods analysis (Scoones, 2009).

Just understanding livelihoods as adequate stocks, the flow of cash and food to meet basic needs and necessities, is not enough. One has to understand if the livelihood approaches are sustainable. The idea of "sustainable livelihoods" as a concept is widely attributed to Chambers and Conway upon realising that conventional development concept did not yield desired effects on humankind (Kollmair and Gamper, 2002). They expressed that, "a livelihood comprises the capabilities, assets, and activities required for a means of living". Land resources, especially agricultural land, support services, labour and equipment, and water resources in the form of adequate rainfall, significantly enhance the livelihoods of the rural poor in Zimbabwe. This means livelihood analysis goes beyond satisfying consumption needs only, to include sustainable livelihoods, stressing the desire of rural people to maintain and preserve the environment within which livelihoods are constructed (Yaro, 2002). The connection of the words "sustainable", "rural", " economic" and "livelihoods" as a term denoting a particular approach was made for the first time in 1986 in Geneva, during the discussion around the Food 2000 report (Scoones, 2009). Since the sustainable livelihood approach is concerned with factors and processes that affect people's livelihoods and ultimately their quality of life; to sustain the environment, it emphasises the need to consider amicable solutions for livelihoods that depend on natural resources (Drolet, 2016).

Livelihoods are said to be sustainable in two distinctive ways; environmental or social economic perspective. Environmentally sustainable if it maintains the local or global assets on which livelihoods depend on, for the benefits of other livelihoods and socially sustainable if it can cope with and recover from stress and shocks and provide for the future generations (Chambers and Conway, 1992). In the rural context, livelihoods can only be sustainable in eradicating poverty and attaining food security if abundant natural resources are utilised in an optimal way, so as to sustain both primary and other secondary livelihood opportunities. This means it is advisable to analyse the link between the wider environment and the socio-economic condition, before the rural poor plan to strengthen their livelihood security. Furthermore, the sustainable approach recognises the diversity of survival strategies that people utilize, at an individual or household level (Nunan, 2015). The reason people in rural areas remain poor and food insecure is that their livelihoods are regarded as homogenous, not just in terms of asset endowment or available activities, but in terms of socially and culturally constructed desires and preferences (Sick, 2016).

Despite increasing attention in the literature, rural livelihood strategies are still not well understood and limit the understanding resource-user behaviour (Salas and Garter, 2004; Pauly, 2006; Martin and Lorenzen, 2016). Studies into the nature of rural poverty utilizing the livelihoods approach

tend to uncover aspects of rural well-being that have not been well understood or have been neglected in mainstream rural development policies (Ellis and Allison, 2004). Rural livelihoods are multifaceted, to the extent that not all rural households are homogenously linked to agriculture to deal with poverty and food security.

However, there are three broad and distinct dimensions of rural livelihood strategies conceptualized by Scoones, (1998), Swift and Hamilton, 1998), that's agriculture, livelihood diversification, and migration. The ability to pursue any of these livelihood strategies for different reasons at different times is dependent on the basic material, social, tangible and intangible assets that people have in their possession as well as the constraints they face. (Sconnes, 2000). For example, gender construction naturally deters the woman from competing in other livelihood opportunities, lack of productive resources like land constrain the poor to pursue agriculture itself and the poor lack critical skills to migrate into other economies. Rural livelihood construction is different from urban context, the former is fundamentally grounded in the utility of natural resources and environmental services (land, water, forest, wildlife, biodiversity) whilst the scope of the latter is dynamic. Thus, rural economies of most Sub-Saharan African countries are still largely agrarian, which contributes the largest share of household income and employs the largest proportion of workforce (Zezza *et al.* 2009; Davis *et al.* 2010; Dzanku, 2015). However, to overcome increasing extreme poverty and enhancing food security, agricultural growth requires productivity of subsistence farmers in rural areas (World Bank, 2008).

Among other industries found in developing countries in arid and semi-arid regions, agriculture forms the backbone of their economies. Its impact is on the overall economic growth, households' income generation and food security. In Zimbabwe, unlike in Zambia, South Africa or Tanzania, the sector is dualistic, comprising of large commercial farms with an average size of 2,200 hectares and small-scale farmers who own between 1-8 hectares of land. The latter produce for commercial markets and the former in Zimbabwe context also mean communal farmers who produce food for home consumption and also grow other cash crops for domestic markets. Agronomy significantly contributes to livelihoods of the rural dwellers who make up nearly 70% of the country's population (ZimStats, 2012, Makate *et al.* 2017). Precisely, for the rural people, dry-land subsistence farming is an integral part of their social, economic and environmental well-being (Makate *et al.* 2017). Importantly, cropping and animal husbandry is supported by the natural agro-ecological regions, according to specific zone's annual rainfall and soil types. The study area is located in a semi-extensive farming constituency of region IV, which receives approximately 450-600 mm of rainfall annually. Nevertheless, production efficiency or deficiency is primarily attributed to inputs such as improved seeds and fertilizer, access to land size, soil type, accessibility

of traction power and household labour endowment. Maize is the major crop grown in all agro-ecological regions, not only the basic crop for household food security but also an important source of livelihood income (Maiyaki, 2010). Among other resources for well-being, the land tenure issue lies at the heart of agricultural performance and the overall economic growth; of which majority of the rural poor own small tracts of unproductive land. Security of land tenure is an essential prerequisite for successful production (Cliffe *et al*. 2014).

In Malawi for example, just like in Zimbabwe they there was an imbalance between estates and smallholder land ownership; now the land tenure is categorised into customary, private and public (FAO, 2015). This security of land tenure has improved agricultural production for the communal peasant households. The year 2000's Fast Track Land Reform (FTLR) programme reconfigured land tenure system in Zimbabwe, in which the government dismantled white-owned commercial farms into small and medium-scale model units. However, today the programme did less to transform the livelihoods of the poor as beneficiaries lacked requisite farming knowledge, equipment and not everyone deserving benefited. Since the farming sector is dominated by smallholder farmers, the industry faces a myriad of challenges including bottlenecks in market access, small land holding, dysfunctional infrastructure, low productivity, minimal support services, limited production technology and often practices that aggravate environmental problems (Anderson, 2007; Dzvimbo *et al.* 2017). Current debates on the problems facing the agricultural sector and the economy as a whole indicated poor incentives for farmers and lack of government support as major constraints (Juana and Mabugu, 2005). This means from the poor household's ̈point of view ̈, improving agriculture-based livelihoods implies transforming strategic institutions like extension services and improving their capital resources (Dzvimbo *et al*. 2017).

In the wake of widespread climate change and variability, rural livelihoods are now very broad and complex to be restricted to local agricultural economic typology. In pursuit of positive livelihood outcomes, rural households are often multiple, adopting a diverse portfolio of activities that enhance household well-being, increase production and their access to key resources (Dorward, 2002; Smith *et al.* 2005; Kalinda and Langyintuo, 2014; Martin and Lorenzan, 2016). In the rural context, the diversity of livelihood strategies can be described as a sectoral shift of rural activities away from farming into alternative livelihood regimes which exhibit non-linearity, irreversibility, and hysteresis (Tittonell, 2014). Livelihood transition evolving at different levels of the economy is always classified by *sector* (farm or non-farm), *function* (wage employment or self-employment) or by *location* (on-farm or off-farm) (Loison, 2015). Diversified livelihood strategies bridges on-and off-farming income-earning capacity gap between rural and urban spaces (Mushonga and Scoones, 2012), not only for those who have struggled to sufficiently invest in

agriculture but also for those whose agricultural growth spurs non-farming enterprise (Mkodzongi, 2013a; James, 2015). Thus, in the rural context, diversification is not only caused by negative factors and not all households are capable of diversifying. It is important to note that household capacity to diversify is differential, depending on asset endowment ("free or private"), income levels, access to support services, infrastructure development and availability of opportunities or incentives (Kalinda and Langyintuo, 2014). The typology of rural non-farm livelihood diversification takes on multiple dimensions depending on preferences and local economic context. They include co-operatives, natural resources extraction, petty trading, remittances, micro-businesses and wage labour (Mkodzongi, 2013b). Basically, pursuing non-agricultural activities represents a risk minimisation strategy to achieve basic household subsistence needs (Hussein and Nelson, 2000).

The behaviour of diversification is driven by two generic motives, either "*distress-push*" or "*demand-pull*" factors (Reardon *et al.* 1998; Haggblade *et al*. 2002; Dzanku, 2015). "Distress-push" factors are typically triggered by economic adversity, environmental variability, which set the household economy on a downward trajectory (Zeleke, 2013). For example, the performance of the macro-economy has a significant bearing on the livelihoods of the ordinary people, especially the rural poor who have limited livelihood options. The livelihood strategies found in Zimbabwe today are validated by events of Post year 2000 which had changed the livelihood trajectory and social fabric of the country. The micro economic environment between 2000 and 2008 which was characterised by unemployment, hyperinflation, the collapse of financial markets, repressive price controls, shortage of key commodities, and low exports led to innovative livelihood strategies including sprout of informal employment, cross border trading and international migration. The downstream effect of the wider economy after the Fast Track Land Reform Programme(FTLRP) caused wide spread livelihood vulnerability since the country is regarded an agricultural economy. At the same time, "demand pull factors" is a response to comparative advantage given by technology, skills, and endowments, which offers the potential of improving household well-being (Mutenje, 2010). These dual strategies mean 'pull' factors correspond to the emergence of improving labour market opportunities outside of agriculture, while 'push' aspects resonate with deteriorating conditions within the agriculture industry (Ellis, 2004). In sub-Saharan Africa, the link between push and pull factors is the idea of necessity vs choice.

In the absence of adequate social security systems, limited livelihood options, many people in developing countries especially the rural poor and vulnerable groups adopt migration as a key component of livelihood strategy (Anhi-na and Ying, 2017). Migration can be seasonal, circular,

rural-urban and international depending on "push and pull factors", which are stimulated by economic, political, socio-cultural, environmental, and demographic factors. The drivers are complex and varied, but mobility livelihoods are mainly propelled by push factors, in particular, poverty, food insecurity, inequality, unemployment and increased competition for scarce resources (FAO, 2014). Even though in limited frequency, "pull factors", also known as "place utility" are also equally considered, precisely, availability of economic opportunities, the desirability of a place that attracts people, and attractive amenities. In essence, migration at the household level can be viewed as a proxy of livelihood diversification in which remittances can be a great positive outcome from multiple scales (Mishi and Mudziwanepi, 2014). Remittances can be utilised for investment in micro-enterprises, accumulate assets, labour supply, smoothing consumption, education, agricultural inputs and reduced inequality (Isoto and Kraybill, 2017). The absence of locally available economic opportunities has turned the discourse of labour migration and remittances to more of an international phenomenon than internal migration.

After the livelihoods of both rural and urban Zimbabweans were simultaneously affected by a series of shocks such as climate variability, political conflicts, poor governance and economic sanctions (Galvin, 2015). This fuelled the exodus interface of both skilled and unskilled Zimbabweans to other countries, mainly neighbouring countries as a socio-economic risk deterrence strategy. International remittances proved to be potent in financial and economic crisis, leading to immediate take off of the standard living of the recipient households (Anyanwu, 2011). Finmark Trust (2012), in their economic research, found that Zimbabwean migrants are the leading remitters in Southern Africa, as measured by frequency and value of remittances (Mishi and Mudziwanepi, 2014). However, at micro-level analysis, the consequences of migration as a livelihood strategy is equally important as the causes. The implication is more fluid, dynamic and complex in multiple levels than pure economics implies (Petron and Connell, 2017), as not all households send migrants and not all migrants are able to earn income to send remittances (Randall, 2017). The assessment of the effects of migration has remained relevant in wider socio-economic context (Ajaero and Onokala, 2013). For example, the migration of young adults from rural to urban areas places more labour deficit on farming households and consequently increases food insecurity (Ofuoku and Emerhi, 2014).

While eradicating global poverty remains the pillar of the United Nations Sustainable Developmental Goals, attention should be placed on the livelihood options, processes and outcomes of the poor in developing countries. This is because poverty is a multi-dimensional and complex phenomenon, any strategy or approach aiming at alleviating must be comprehensive enough to capture the various dimensions and determinants (Olajide, 2013). In micro-economic

context, poverty is not only related to income, consumption, expenditure or non-momentary dimensions such as lack of education, access to infrastructure, access and ownership of assets, access to technology, and gender (Borko, 2017), but hinges on livelihood approaches. In simple terms, the concept of poverty to this study describes whether individuals or households possess enough resources to meet their subsistence needs.

Therefore, successful livelihood approaches can reduce poverty and ultimately improve the living conditions of the rural households. There is much ambiguity in terms of framing, methodologies, and measurement of poverty, but using a livelihood lens recognizes the flexibility and constraint within which rural poor people construct their livelihoods in dynamic ways (Olssonn *et al.* 2014). Rather than attempt to measure poverty or assume that increased income is the principal solution, the Sustainable Livelihood Framework (SLF) places a lot of emphasis on ownership of, or access to assets that can be put to productive use as the building blocks, by which the poor can construct their pathways out of poverty (Mukherjee *et al.* 2002). It is used to model the households' access to resources and how they are used to fulfil household needs. This integrated and rational methodology depicts the structural nature of poverty, by determining the type of assets open to rural people, thus giving more coherent insights into short and long-term poverty alleviating strategies (Sati and Vangachhia, 2017). However, what differentiate the poor from non-poor in rural societies is the way they trade-off their assets, for example, cash from non-farm income to farm labour or inputs which can lead to higher farm income as compared to asset disposal by the poor which can result in a spiral down into poverty (Freeman *et al.* 2004).

The conceptualization of food security at micro level analysis should not be narrowed to identifying the food insecure households only, but rather widened to quantitatively capture the socio-economic determinants, extent, and severity which varies from one household to the other. This is because food security and livelihood approaches share many common features that point to strong conceptual overlaps in a multidimensional and people-centred analysis. Looking beyond income and consumption levels only, but to include an assessment of strategies, assets, and capabilities that households might have (Devereux, 2004). On an aggregate, the two are linked in conceptual ways that are relevant to the analysis of household well-being (Oni and Fashogbon, 2014).

From an economic perspective, food insecurity is not only inadequate food supply but limited social safety nets and also the existence of poverty traps which constrain household purchasing power required to attain food security that in turn depends on the household's ability to generate income (Woller *et al*. 2011). This means the severity of food insecurity is gauged by the impact on people's socio-economic environment to sustain consumption in short and long-term. The

continuum of food insecurity varies between households depending on the way they respond. In order to protect their basic needs when confronted with either idiosyncratic or covariate shocks or a combination of both, households exhibit a sequence of food and non-food coping strategies that reflect their vulnerability to food insecurity. These coping strategies can permanently be adopted into households' normal consumption cycle or in short-term to bridge the food gap as a response to unexpected stress (Cavaglieri, 2005). In case of perpetual vulnerability to food insecurity, there is a need for people to adapt to food shortages, thus fostering resilience within their livelihood activities.

Linking livelihood dynamics and resilience draw attention to how some households are capable of reducing poverty and maintain food security in the face of change including risks, shocks, and stresses, while similar households could not (Berkes, 2006; Scoones, 2009; Sallu *et al.* 2010; Chimwe and Rest, 2014). This is because resilience is defined or perceived to be a direction function of household assets and livelihood capitals, against the undesired effects of change (Lokosang *et al.* 2014). It takes different forms, depending on the context in which it is applied. It can be viewed as a set of absorptive, adaptive and transformative capacities that enable households and communities to effectively function in the face of vulnerability and still meet normal well-being outcomes.

Absorptive capacity is the ability to minimize exposure through taking protective and coping measures against shocks and stress. Adaptation is about making appropriate changes in order to adjust to a changing situation and lastly, whereas transformation is about fundamental changes in the structures or systems that cause or increase vulnerability (Jean *et al.* 2017). Reducing people's vulnerability and building strong livelihood capacity means building and adjusting these capacities. Resilience to food insecurity, it is understood as the ability of a household to *"bounce back"* and *"bounce forward"* after exposure to livelihood threats (Lokosang *et al.* 2014). The relationship between exposure to shocks, resilience capacity and well- being outcomes was examined by Smith *et al* in 2014 in Ethiopia. Their results not only suggested that increased resilience capacity has a positive impact on household food security but that adaptive capacity has a greater impact than absorptive capacity, which has a greater impact than transformative capacity (Bene *et al.* 2015).

This study primarily adopted *adaptive capacity* as the most important dimension of resilience. However, there is always a need to ask, "Resilience to what and for whom". Frequent droughts which lead to crop failure, diminishing soil fertility, and increasing food prices are the main challenges threatening rural livelihoods in developing countries. As for the rural poor in the study who rely on natural resources for their livelihoods, resilience is viewed as the socio-ecological

capacity of households to cope or adapt from the exposure and sensitivity towards seasonal drought and periodic food shortages but still able to maintain food security. In other resilience contexts, adaptation and coping strategies are understood as distinct dimensions to deal with vulnerability. Adaptation builds resilience and reduces vulnerability in the longer term (Rose, 2008; El-ashry, 2009). Coping strategies are temporary adjustments in response to change which actually do not lead to net improvement in resilience, but seeks to minimise the potential impact of risks or shocks that may occur (Birhanu *et al.* 2017). Since resilience is not a static, but a dynamic spectrum of capacities that leads to better well-being outcomes (Sturgess, 2016), therefore, to improve the understanding of how households and communities respond to risks or shocks, there is need to measure resilience-focused indicators in a direction that may permit a plausible causal inference (Constas, *et al.* 2016). (WFP, 2014). Modeling or measuring resilience can be understood through a system perspective that influences development outcomes such as household well-being. In this study, resilience to insecurity can be a result of indicators such as income and food, basic services, access to natural resources, access to social safety nets, support services, adaptive capacity and stability.

1.3 Problem Statement

Increasing food insecurity and poverty is a challenge facing the rural poor and impeding sustainable development in developing countries because of perpetual livelihood failure. This is because the livelihood paths of the poor are not sustainable to enhance food security and reduce poverty, both in short and longer term, but rather encompass tremendous complex field underpinned by a range of factors that are dynamic. Low coping and adaptive capacity of the rural economy to livelihood risks and shocks, as well as over-reliance on natural resources which are quite sensitive to changes affecting the environment, are some of the challenges confronting rural communities (Kangalawe and Lymo, 2013). To mitigate these challenges, the United Nations Sustainable Developmental Goals (SDGs) adopted in 2015, among other targets, aims to end poverty in all its forms everywhere, end hunger, achieve food and nutrition security and promote sustainable agricultural livelihoods by 2030. Unfortunately, prospects of reversing increasing poverty and food shortages are impossible in the absence of decisive implementation strategies and clear guidance on how the goals are ought to be achieved (Jaiyesimi, 2016). Inevitably, in developing countries, these targets cannot be feasible if they are not aligned and acquainted with the complex dynamics of livelihood approaches of the poor. The dominant problem is that governments and organisations in different regions vertically implement policies to improve people's well-being without horizontally analysing the dynamics of livelihood constructions at micro or community level.

In sub-Saharan Africa, the incidence, depth, and severity of rural poverty and food insecurity remain widespread, deep and excessive. This causes irreversible damage to livelihoods, thereby reducing self-sufficiency and resilience of households (Bayu, 2013; Kedir, 2015). In Zimbabwe, the problem directly derives from over-relying on subsistence agriculture, institutional deficiencies, unfavourable economic trends, pests and livestock diseases. Food security, poverty, and the environment are inextricably linked when natural resources form part of the primary livelihoods. While major rural livelihoods are derived from domestic production, looking at net production value per hectare, which compares the value of production against a base year, showed that food production in sub-Saharan Africa is lower compared to other regions in the World (Livingston *et al.* 2011). In rural Zimbabwe, substantial resources in the form of extension services, research and input subsidies have been directed to improve household own production for years. However, the impact of these support services has not adequately improved the welfare of the rural poor to expected levels. This is mainly attributed to erratic rainfall, land degradation, lack of adequate human capital, and agricultural equipment.

Knowledge gaps exist on how poor people arrive at livelihood priorities and deal with concomitant policies as well as how they perceive, convert and use resources to service their livelihood priorities and lifestyles (Ontita, 2006). How rural livelihoods are intricately linked to food insecurity and poverty in different ways warrant interrogation. For example stresses on agriculture like drought and floods decrease net food production due to crop failure, thus increasing poverty and periodic food shortages. This causal link translates to households becoming trapped in vicious cycles of extreme poverty from which they cannot easily escape (Mapfumo, 2015). This sequence within which rural livelihoods strategies operate in risk environment is not well documented in existing literature. Therefore, a proper understanding of poverty and food insecurity is cognisant on how people are familiar with their livelihood constraints and opportunities. Inevitably, this will enhance the formulation of policies and interventions that build livelihood resilience. This study quantitatively endeavours to fill the knowledge gaps in rural development studies.

Despite an array of challenges like ecological instability, limited resources and lack of skills, rural households try to increase their livelihoods options. Research on the level of livelihood transition in rural areas is limited. Livelihood diversification is a pervasive and enduring characteristic of rural survival, reflecting the continuing vulnerability of rural livelihoods (Ellis, 2000; Perret *et al.* 2005). Rural non-farming activities are becoming important livelihoods in the rural economies of developing countries, but information regarding the level of participation among individuals and households is too sketchy. Despite their role to offer important opportunities to reduce rural poverty and food insecurity by way of multiple income sources, knowledge about rural non-

farming activities and their sustainability are insufficient for effective development policies (World Bank 2003; Robaa and Tolossa, 2016).

Mitigating the impact of risks and shocks through livelihood transition is a way of building resilience on a sustainable basis on account of available resources, through dealing with shocks using more than one livelihood option. However, little is known about the various dimensions of resources available to the poor and how they utilise them to earn a living, given the concept of 'resources' has been treated as axiomatic in the discourse of livelihoods (Ontita, 2006). Furthermore, the fact that rural livelihoods are contingent on varying ecosystem services such as natural resources, to which they are not flexible to cope or adapt to frequent stresses like poverty and climate change and variability is of concern. This increases *ex-post* and *ex-ante* prospects of households falling into severe poverty and food insecurity. As a remedy, the government of Zimbabwe and other agencies usually resort to food aid and imports which are not developmental or sustainable in nature (Togarepi, 2016). However, a sustainable way is to encourage rural communities to build and reinforce resilience in their livelihood systems; because if a household has a combination of adaptive and coping strategies, it is likely to offset any type of livelihood vulnerability.

Despite the importance of identifying groups or localities who are most vulnerable or non-resilient, very little is known about the dynamics and level of rural livelihood vulnerability, sustainability and the level of household adaptation to shocks. For example, there is a need for extensive information on how gender, livelihood choice and social configurations of households and communities contribute to vulnerability and adaptation capacities, preferences, and strategies (Omari, 2016). Consequently, understanding the dynamics of these socio-economic variables in specific context helps in devising appropriate local level solutions (Abudulai *et al.* 2017). But, how to design responding models to current and future risks is an empirical question, as rural households are affected differently and respond to change differently.

Rainfall variability despite being a covariate risk, does not affect households uniformly. This is because some households have different livelihood strategies and entitlements which makes them resilient to socio economic variability. This unpacks the role of resilience and adaptation strategies to food insecurity and poverty of rural households which is scarce in research. The ability of households to maintain food security in the face of shocks significantly depends on their adaptive capacity, such as the access to critical livelihood resources. There are gaps in livelihood studies which need to be bridged in order to find sustainable solutions to livelihood insecurity of the poor, in particular, the adverse effect of climate change and variability on communities that depend on farming. Existing household welfare studies consider food security, poverty and resilience as

unrelated research disciplines, whereas in actual fact household welfare outcomes hinge on livelihood approaches. In this study, these concepts are simultaneously discussed and expected to be related modules. This is because poverty, food insecurity and low resilience is a result of entitlement and livelihood failure. The enquiry can provide practical methodologies for improving the well-being of rural households in developing countries.

1.4 Study objectives

The overall objective of this study was to investigate the significance of livelihood approaches in analysing poverty, food security and resilience in the rural context of Zimbabwe. A household's ability to improve its well-being and increase flexibility (resilience) against risks is critical. A livelihood perspective explains the complexities different people, in different regions face in order to live. For example, rural people lack productive resources, formal education and natural resource-based livelihoods are no longer sustainable because of changing climatic conditions. Therefore specific objectives of the study in Rushinga District were:

a) To profile and examine the livelihood opportunities, resources and constraints of rural households in the study area,

b) To empirically use rural livelihood approaches to unpack the socio economic correlates, magnitude and determinants of poverty.

c) To establish the determinants of the food insecurity and evaluate the extent of its incidence, depth, and severity.

d) To investigate the level of rural livelihood resilience to mitigate food insecurity.

Questions to be answered in the study; the answers are expected to be shown in the study.

a) What were the significant determinants of rural livelihood approaches in the District?

b) What livelihood factors determine rural poverty and its varying dimensions in the study area?

c) What is the extent and determinants of household food insecurity?

d) Is the level of livelihood resilience and adaptation to attain food security sustain household well-being?

1.5 Study hypotheses

The hypotheses of this study are outlined as follows:

a) *Rural livelihood approaches is a function of household capabilities, available opportunities, resource endowments and the context in which their livelihood priorities are premised.* Livelihood analysis is based on the assumption that the prevailing

livelihoods approaches reflect people's decisions, the rural poor use their capability to build different initiatives in order to reduce the impact of the livelihood risks they face (Israr *et al.* 2014). Rural livelihood systems in developing countries are becoming more and more diversified because of environmental changes affecting the reliability of farming. Livelihood diversification from on-farm activities to the non-farm sector is determined by a set of social economic *"push or pull"* factors which are causally linked to influence or inhibit the outcomes. Available local opportunities in the non-farm sector can enhance the ability to survive relative to resource intensification.

b) *The extent of rural poverty is related to limited livelihood strategies in the rural economy.* Understanding the context in which livelihoods are generated is important for analysing the extent of rural poverty. Poverty in Zimbabwe like in any other developing country is a rural phenomenon attributed to livelihood failure because of constrained agrarian activities, truncated asset endowment, weak institutions, ecological variability, and overreliance on natural resources, poor infrastructure, and inadequate support services. Due to these constraints, the poor are most likely to be concentrated on unreliable and low return livelihoods within a risky environment making their livelihood options even more vulnerable and unable to sustain their well-being (Moyo and Chambati, 2013; Mapfumo, 2015).

c) *The incidence, depth, and severity of household food insecurity are influenced by livelihood failure.* Food insecurity in the rural economy is highly complex that it is determined by a range of interrelated agro-environmental, socio-economic and human factors (Zakari *et al.* 2014). The prevalence of production, distribution and consumption constraints are ascribed to rainfall variability which leads to crop failure, lack of productive resources (ie. equipment, labour, land, water) and lack of skills to enhance livelihood diversification. Hence, households who have access to adequate resources are productive, which in turn reduces their exposure to food insecurity.

d) *Rural household livelihood systems have marginal capacity to cope and adapt to multiple stresses, shocks, and risks to enhance food security.* The ability of systems to effectively cope with livelihood risks and adapt to change is held back by the lack of effective adaptive capacity. Rural households are not resilient to deal with risk induced food insecurity across multiple time horizons, given that they are highly resourced constraint and uniformly depend on a single livelihood portfolio, which is rain-fed agriculture, (Thiede, 2016).

1.6 Assumptions of the Study

The study assumed that in any given context, positive or negative dynamics of livelihoods would provide precise insinuations for household characteristics. While rural livelihood strategies, processes, and outcomes are assumed to be homogenous, variations do exist from one household to the other because of asset endowments, external activities, household demographics and geographical locations. A key assumption in that regard is that households in rural economies are agriculturally oriented, but climate change and variability have pushed many into non-farming sector without anyone noticing. Their livelihood pathways are now changing over time in a non-uniform context. This can be explained as a dynamic dimension into the analysis of rural well-being.

The study was chosen to be confined to a rural domain, on the assumption that this is where livelihood failure is rampant, poverty and food insecurity is deeply rooted and the rural poor have low resilience against change to their livelihood systems. Vulnerable groups cannot be defined as homogenous or rigid, they are heterogeneous and dynamic; both in terms of material well-being and age (Ansoms and McKay, 2010).

A key assumption in this study was that drought is the only major shock the rural poor have to cope and adapt to. Rural people deal with so many risks at the same time, but since their livelihoods are natural resource based, in particular, land base, seasonal or prolonged drought is one shock they have no control over, as it causes absolute livelihood failure. At the same time, the study assumed that not all households could be resilient against food shortages when confronted with drought. Coping and adaptation capacity is a function of household socio- economic configurations, female-headed households are vulnerable groups in societies.

1.7 Study Limitations

The study only relied on quantitative information and cross-sectional data collected on the typology of rural livelihoods approaches on household well-being, but several limitations became apparent. Firstly, based on the fact that there is already an extensive study on livelihood approaches, this study is only limited to a specific geographical sub-area. Focusing on a single geographical spread enables a deep understanding of the domestic context of the study area concerned. However, given that only one district was studied, the results cannot be assumed to be applicable to other districts in the country or to other neighbouring countries. This limitation leads to weak recommendations for similar studies in other rural districts. In future, a comparative study should be conducted between more than two districts in order to make comprehensive livelihood security policies which could affect the whole province.

Secondly, this study investigates people's livelihoods in villages facing both chronic poverty and severe food insecurity due to seasonal drought, many participants were not keen to disclose the actual resources they own and income they get from different sources, assuming we were researchers for Aid Organisations identifying vulnerable households in need of consumptions interventions. This limitation was resolved by using enumerators from these villages who are conversant with the social economic conditions of their areas.

Thirdly, the study was limited to rural set up only, not to be compared with urban livelihood approaches. The reason being that urban livelihood perspectives are not rigid but dynamic in terms of income levels, demographic composition, economic opportunities, and socio-cultural practises which are flexible. Investigation is needed to fill in missing links between urban and rural welfare approaches and ways in which rural livelihoods can be uplifted.

The livelihood outcomes (i.e., poverty, resilience and food security), and the factors influencing such livelihood outcomes were collected and measured using quantitative methodologies only. In household economic studies, there is a need for incorporating qualitative insights to complement quantitative information. Moreover, cross-sectional data has limitations when it comes to the system at which resilience information can be captured as compared to using panel or longitudinal data. Panel data is a crucial methodology of understanding resilience, as the capacity of households to cope and adjust to shocks can be observed over time. However, despite these limitations, the study significantly contributed extensive information to debates on rural livelihood strategies. To overcome this limitation in future studies mixed research approach is ideal when dealing with household livelihood strategies.

1.8 Summary of the Study Methodology

To establish the significance of livelihood approaches in analysing the welfare of rural households; a quantitative approach was used to analyse and observe livelihood dynamics at the household level. Semi-structured questionnaires which were able to gather the reliability and validity of information were used to collect primary data from the head of the households. Furthermore, multi-stage sampling procedure was used to select three hundred households from the District. The *first stage* was selecting three Wards, the *second stage* was selecting fifteen villages from the three words, five per ward. The *last stage* was a purposive sampling of twenty households per village. The sample size was enough to impact the significance of the study. To measure the objectives of the study, non-parametric statistical procedures that fit the empirical and descriptive nature of the study were used. The relationship between variables was tested using effect descriptive statistics such as relative frequencies, correlations, and the difference between means. A binary logistic regression model was used to explore the determinants of poverty and food

insecurity. Foster Greer Thorbecke (FTG) indices were calculated to examine the incidence, depth, and severity of poverty and food insecurity among households in the study. Poverty was measured by monthly per capita expenditure on food, USD 31.00 (R 432.00) as the threshold for this study, whereas food insecurity was measured by required daily calorie availability (2100 kcal) per adult equivalence. Principal Component Analysis (PCA), was applied to analyse the resilience constructs in rural household systems, based on the assumption that a household's resilience can be drawn from any available options.

1.9 Outline of the thesis

This thesis is presented in a paper form, each chapter has its own literature review. Chapter one has provided the background of the study, defined the problem statement, delineated study objectives, indicated research questions and outlined the study hypothesis. Chapter two highlights the livelihood approaches found in the study and the determinants of livelihood diversification. Chapter three provides the empirical extent and determinants of poverty from the literature, ***the detailed methodology of the whole study*** and the conceptual framework for the study. Chapter four presents the dimensions of rural food insecurity, micro level conceptual framework of food security, consumption coping strategies, characteristics of livelihood profiles, and determinants of food insecurity. Chapter five discusses the typology of livelihood resilience in the domain of food insecurity. This section account the resilience framework, quantitative approaches to resilience, shocks encountered by households, resilience constructs, and resilience measurements. Chapter six presents a summary of the study, discussing whether frameworks used, literature review, research questions asked and major findings correlate with literature and to the overall aim of the study. The chapter also has recommendations and suggestions for future studies in the field.

CHAPTER TWO: AN ANALYSIS OF RURAL LIVELIHOOD TYPOLOGY: EVIDENCE FROM THE WELFARE OF HOUSEHOLDS IN RUSHINGA RURAL DISTRICT

ABSTRACT

Livelihood diversification has long been regarded as a risk mitigation strategy in the wake of increasing economic and environmental risk in developing countries. In this regard, rural households face an increasing need for alternative livelihoods, thus, participation in the non-farm sector is gaining prominence because of the increasing inability of the farm sector to sustain rural livelihoods. However, livelihood transition is determined by dynamic, complex and yet empirically unverified factors. Therefore, the aim of this paper is to profile the typology of rural livelihood strategies at the household level. The primary data were obtained from 300 households in three Wards selected through a combination of multiple stages, purposive and simple random sampling procedure. The study indicates that 51% of the households in the study area engaged livelihood diversification that combined on-farm and non-farm sector, but the value of the returns was marginally low. Chi-square and t-test were employed to compare the distribution between farm and non-farming activities against social economic variables, and correlations were found amongst a number of variables. Probit model was applied to estimate the determinant factors influencing household livelihood choice, the model demonstrated that out of the fourteen variables included, value of assets, livestock holding in Tropical Units, access to credit, access to extension services and input subsidy were found to be positive and negative determinants up to 10% probability level. The positive determinants for participation were propelled by capacity variables and the negative factors for remaining in agricultural livelihoods were driven by pull factors, in this case, input subsidies and extension services were utilities to the livelihood strategy of farming. These positive and negative factors need to be considered by policymakers in formulating rural livelihood security strategies. This suggests that the capacity of both farming and non-farming households should be strengthened in order to sustain rural livelihood security and a comprehensive scope for the development of non-farm activities is urgent to facilitate successful rural livelihood diversification.

Key Words: Livelihoods, diversification, non-farm sector, assets, determinants

2.1 INTRODUCTION: Rural Farm and Non-Farming Economy

The livelihood approach recognizes that households use a range of resources in a variety of activities as part of a livelihood strategy and accept that they are multiple paths of improving the well-being of its members (Ellis, 2000; Winters *et al.* 2009). Livelihoods are quite broad and encompass many dimensions that need to be examined in detail, but understanding what constitutes a livelihood is complex. The term livelihood tends to be limited only to economic welfare or activities that generate income for a living, usually narrowly restricted to land based agriculture (Matondi, 2011). A livelihood strategy does not only capture what people do in order to make a living, it includes activities and the resources that provide the capability to build satisfactory living to households (Ncube, 2012). Livelihood strategies differ from place to place, between households and over time, meaning livelihood systems are dynamic, not static. In Sub-Saharan Africa (SSA), various studies have indicated that while most rural households are involved in agricultural activities such as crop, livestock or forestry production, they also combine other income activities to supplement agriculture (Abimbola and Oluwalemi, 2013). This is because of the decline in the relative importance of agriculture in sustaining the welfare needs of the poor has caused the expansion of non-farming activities as economic development initiatives. Livelihood transition has long been viewed as a risk mitigation strategy in the face of increasing environmental and economic risks, Zimbabwe is a distinctive example of rural households experiencing uncertainty in rain-fed agriculture. However, the structure and growth of non-farming activities cannot be discussed in isolation from agriculture, as both are linked through investment, production, and consumption throughout the rural economy, and both form complex livelihood strategies adopted by rural households (Davies *et al.* 2017). Meaning improving both the capacity of agricultural productivity and the growth of non-farming activities could significantly contribute to livelihood security and the development of the rural economy.

2.1.1 The Rural Non-Farm Economy

Even though the ability of the poor rural households to exploit available economic opportunities outside agriculture is still marginal, the number of vulnerable households exceeds the capacity of land to provide sustainable livelihood opportunities, thus non-farming could provide a prospect of improving the standard of living of those trapped in subsistence farming. However, the ability of a household to choose a livelihood option depends on its internal and external resources and the availability of livelihood options in a given area (Figure 2.1). Internal resources to a household are education, land, livestock, technical skills, savings, machinery, transfers, social capital and external resources are natural assets and market opportunities (Rahut, 2006). Rural livelihood activities are conceptualized into two main categories, farm and non-farming activities (Figure 2.1). The term 'Non-farm sector' includes all economic activities in rural areas except agriculture,

livestock, fishing and hunting (Lanjouw and Lanjouw, 2001). Farm activities are grouped into cash cropping, food cropping, small and big livestock rearing and off-farm wage in agriculture, whereas non-farming encompass wage labour, casual wage, skilled wage from the government or private, and lastly small and micro enterprises (Figure 2.1). Similarly, in livelihood diversification income is also found in three broad categories; farm income, off-farm income and non-farm income. Ersado (2003) emphasize that income diversification is not synonymous with livelihood diversification, only that the latter is a process by which households construct multiple portfolios of activities and social support capabilities in order to manage risk and improve the standard of living. Farm income includes income earned from the crop, forestry, livestock and fish production, off-farm income is wage earned from working in farms or agricultural related activities. Non-farm income broadly comprises on-agricultural income sources including casual wage, skilled wage from government or private sector, local level enterprises, petty trading, self-employment, rentals, pension, remittances, and transfers (Figure 2.1).
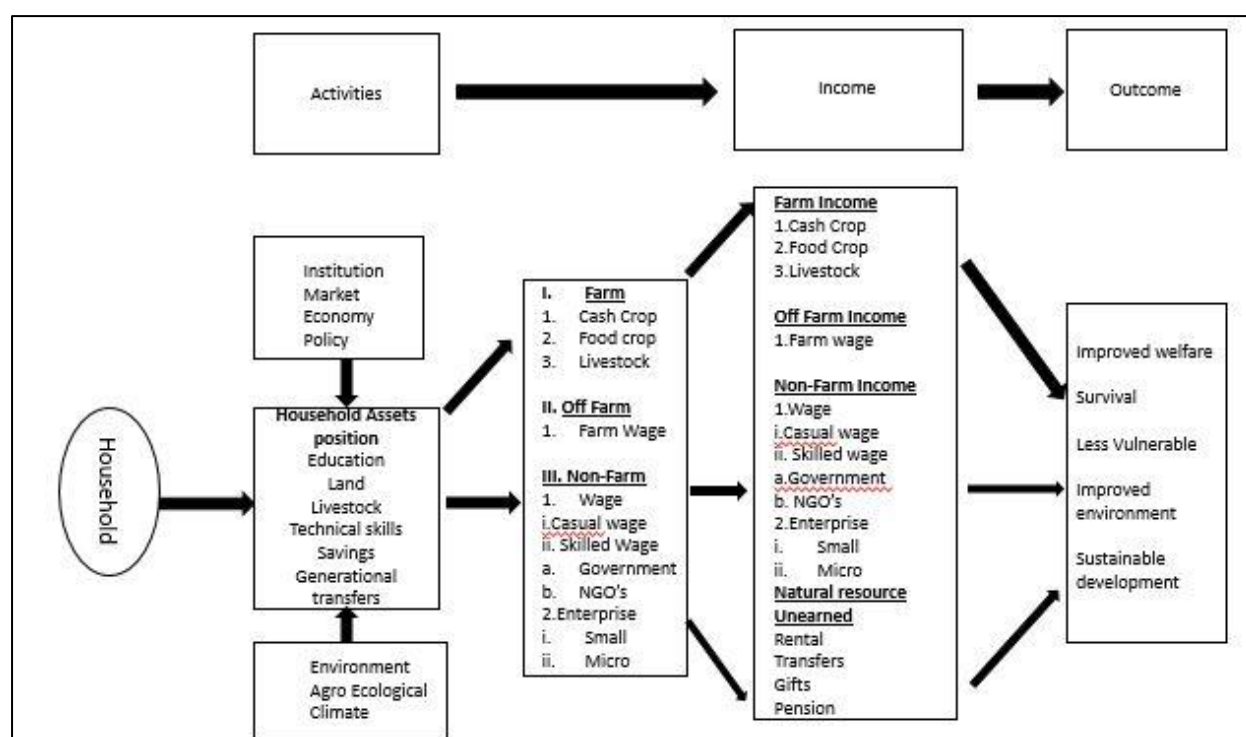
Figure 2. 1: Non-farm economy households in Rushinga District. Adopted from Rahut (2006)

However, there is need of critical understanding of the varying context, scale and size of the outcomes of non-farming activities in developing countries. In some instances diversification maybe strategic, occasional or a deliberate attempt to take advantage of changing opportunities to cope with unexpected livelihood constraints (Warren, 2002). Ellis (2003) argues that in rural environments diversification can be regarded as a dynamic adaptation process in response to threats as well as opportunities, by which the rural households can manage shocks as well as gain income and resources. In rural areas of developing countries, expanding into non-farming livelihoods is growing over time and now accounts for a considerable share of household income (Ersado, 2003). Just like diversification into urban agriculture, not all rural households diversify from agriculture, they are also exceptional situations of diversifying from professional occupations such as rural teachers or nurses being involved in farming livelihoods. Many studies have shown that non-farming activities have an important role on the distribution of non-food needs such as income, but their impact depends on the specific types of non-farming activities involved and the capacity of different types of households to access these activities (Janvry *et al.* 2005). In the same sphere, Ayele, (2017) posit that while there is some agreement regarding the relative importance of non-farm activities, there is debate around the incentives for participating in these activities and their ability to absorb poverty and food insecurity in the agricultural sector.

Non-farming activities play a critical role even in communities regarded as subsistence oriented such as SSA; directly by contributing considerably to rural household income and indirectly, by influencing agricultural activities with the potential implications for sustainability (Kniper *et al.* 2006). Sahal and Bahal (2015) support that multiple livelihoods are found to be a sound alternative for higher economic growth and a way of achieving sustainable livelihood outcomes for rural households, their success and failure are conditioned by an interplay of factors such as the capacity to access resources. Contrary to conventional wisdom, the value and significance of rural non-farming livelihoods typically far exceeds agricultural earnings by a factor of 20:1 in Africa (Readon *et al.* 2006), in other developing countries it contributes approximately 35 to 50% of rural household incomes (Haggblade *et al.* 2009). The basic hypothesis for this paper is that households who had the greatest endowment of productive assets and human capital were likely to be involved in the most lucrative non-farm activities.

2.2 Methodology

2.2.1 Data

The study used cross-sectional household data obtained in Rushinga district. A multi-stage sampling procedure was used to obtain data from 300 households. Semi-structured questionnaires were used to capture primary data from the direct interviews from the head of the households who were the primary respondents. Households were randomly selected on the basis of their livelihood preference. In order to assess the livelihood gradient in the District, demographic variables such as age, gender, dependency ratio, household headship, education, marital status and occupation were considered, as well as household endowment variables such as land size, size of land utilized, value of assets, livestock holding in Tropical Livestock Units (LTU), and maize yield per hectare. Livelihood support instruments such as access to credit, extension service and input subsidy were also included. These variables were assumed to either influence or inhibit household livelihood strategies, in particular, the decision to participate in non-farm activities.

2.2.2 Modeling the Probability of Non-Farm Activity Participation

The livelihood, either in terms of income or activity participation, it has to me be measured in its micro existence in different population domains (Mehta, 2009). A household is a multi-activity unit, hence there is need to develop composite indicators to measure the participation of the household in one or multiple activities. The household decision to participate in non-farming activities is assumed to be the outcome of a vector of factors related to the household endowments or constraints (Ofarso *et al.* 2016). This study is focusing on the factors that influence a particular household to combine both farming and non-farming livelihoods. The choice of an alternative livelihood is based on the *random utility theory*, where at a given point in time households or individuals are assumed to choose an unconventional livelihood with the highest utility using available resources, technology or opportunities. If the utility of engaging in non-farming is greater than the benefit from on-farm activities, then the household might choose non-farming as an alternative with the highest utility. In other words, the utility function suggests that a household would only engage in non-farm work if the returns could complement its on-farm activities.

Various factors have been found to influence non- farming activities in several studies and different econometric models have been used to measure the probability of a household choosing a non-farm activity. To measure household decision to participate in four non-farm

categories Zambo *et al.,* (2014) used Multinomial regression model, Idiowu *et al.,* (2013) used Tobit model to measure the level of non-farm participation and Seng (2015); Ayambiya (2017); Beyene (2008); Chan and Mishra (2008) used the standard Probit model to estimate the probability of households participating in non-farming livelihoods. Thus, the use of Probit model is more appropriate in this study since the dependent variable is not *continuous* but *dichotomous* which takes two modalities depending on whether the household participated in both farming and non-farming or on-farm only. The study modelled the decision to participate as a binary variable; which is defined as 1 if housed i participated in both farming and non-farming activities and 0 if household i participated in farming activities. The Probit model can be used to determine the attributes of the households participated in non-farming activities and the results can be used to predict the future of non-farming activities in rural areas. The model was chosen for its appropriateness in allowing for the estimation of marginal effects and its fitness to the data (Ayambiya, 2014). The standard Probit model can be specified as:

$$y^* i = x'_i \ \beta + \varepsilon i$$

$$yi = 1, \text{if } y^* i = 1$$

$$yi =, \text{otherwise}$$

Where y is the depended variable defined as $y=1$ if the household participated in non-farm and 0 if the household participated only in farming. Y can be observed as an indicator of whether this latent variable is positive or negative. x_i is a vector which explains social economic characteristics such as household characteristics, rural agricultural characteristics and agri-ecological risks which could determine the likelihood of non-farm participation. β is a vector of the estimated parameters, and εi is the error term assumed to follow a standard normal distribution with mean 0 and variance 1. Estimates of these participation equations provide information about the marginal effects of exogenous variables on the probability of a household participating in non-farm work (Bayene, 2008). The model of this study estimate marginal effect of "i" variable as the effect of a unit change of this "i" variable on the probability P (Y = 1| X = x), given that all other variables are constant and can be specified as follows (Habyarimana, 2015):

$$\partial P \ (y_i = 1 \mid x_i) \ / \partial \ x_i = \partial E \ (y_i \mid x_i) \ / \ \partial x_i = \varphi \ (x_i' \ \beta \ ) \ \beta$$

Average Marginal Effect for each continuous variable in this model is computed as follows:

$$AME = \frac{1}{n}\sum_{i=1}^{n} \quad \varphi(x_{\mathrm{i}}{}'\beta)\beta$$

And the Average Marginal Effect for each dummy variable in probit model is computed as follows:

$$AME = \frac{1}{n}\sum_{i=1}^{n} \quad \varphi[\vartheta\ (x_{\mathrm{i}}{}'\beta \setminus x_{\mathrm{i}}{}^{\mathrm{k}}{=}1) - \vartheta\ (x_{\mathrm{i}}{}'\beta \setminus x_{\mathrm{i}}{}^{\mathrm{k}} = 0)]$$

The marginal effects of a chosen explanatory variable explain how many percentages will change the probability that a reference household is participating in non-farm if the value of that explanatory variable has increased by 1 % (Verbeek, 2002). The signs of the coefficients marginal effects and the marginal effects could be different, as they depend on the sign and the extent of all other signs.

2.3 Results and discussions

2.3.1 Descriptive statistics

The livelihood groups found in the District and the contribution of different sources of income in the study are presented in Table 2.1. Out of the 300 respondents in the study area, 51% households diversified their livelihoods (*they combined farming and non-farming activities*) and 48% obtained their livelihoods from the broader agricultural activities. Of importance in this study, all the farming households did grow cash or food crops. In other words, in the rural context, farming entails crop husbandry, especially for household subsistence needs. The results show that among the 148 farming households, the average income was USD 180 per household per annum. The earnings were too diminutive considering that cropping is labour intensive, seasonal on dry land and the cost of farming inputs are beyond the reach of the poor. This shows that the relative importance of agriculture as a primary livelihood has decreased in rural areas. The result was attributed to two factors; erratic rainfall which caused large-scale crop failure in the 2015/2016 season and low prices on agricultural outputs especially Tobacco. Rural households were spending more resources on inputs and labour than the returns they got aftermarkets.

In this study, agricultural wage labour annually contributed USD 170.00 to the household income. Usually, agricultural labour is engaged to meet household monetary needs such as school fees, where household members sell their labour to neighbouring households. In most cases, households in this study usually work for cash, food and other items in Chesa communal

farms in Mount Darwin District. Unlike in commercial farms, the earnings of wage labour to other rural subsistence households are far much below the recommended minimum wage of USD 80 per month. This increases income inequality than decreasing it as poor households spend most of their productive time selling cheap labour than own production. However, because of drought, a limited number of households were able to sell.

Table 2.1: Distribution of Farm and Non-Farming Households in Rushinga District

Category of employment	Number of households n=300	HH Mean Average Annual Income (USD)
Agriculture	**148 = 49 %**	
Crop cultivation	49%	180.00
Agricultural wage labour	11.7%	170.00
Livestock	34%	233.00
Forestry	3.7%	222.00
Non-Farming	**152 = 51%**	
Small businesses	1.7%	828.00
Skilled Jobs	12.3%	6240.00
Off-farm wage labour	17.3%	2420 .00
Buying and selling	14.7%	1182.00
Pension	4%	2200.00
Remittances and transfers	9.3%	813.00
Rentals	1.3%	1110.00

Survey 2016

The results indicate that about 34% households used livestock assets for livelihood purposes contributing at least USD 233.00, more than the value of crop production. In this study, livestock includes fowls (chicken, ducks, guinea fowls, peacocks and quails), cattle, sheep, Donkeys, goats and pigs. However, in the rural economy, 'livestock assets' refer to ownership of a sizable heard of cattle, as they perform multiple tasks such as a measure of wealth, traction power for agricultural production or for cash to other households, smoothen consumption, manure for income or farm use, and to pay lobola. Nevertheless, less than half of the households utilised livestock endowments to supplement the household economy in this study. This implies that not all rural households own livestock or not all households sacrifice their livestock for household needs.

Rural people do use natural products for economic development and to combat rural poverty. About eleven head of households uses forest material to earn a living in the form of carpentry and aircrafts. However, the earnings per annum were quite meagre due to lack of lucrative markets for their products and services. This call for the need for technical skills training. Table 2.1 shows that more than half of the households in the study were non-farming households.[1] The study found that every rural household do practise some form of agriculture as their primary livelihood but the scale differs, meaning non-farming households combines both agriculture and allied activities which supplement their farming income. In some cases, because non-farming households are more resourceful they do better in farming than farming households.

Small businesses and micro enterprises do thrive in rural areas, five households were involved in services enterprises, two head of households owned grinding mills, one was full time in transport business and two were welders. Small businesses are vital in market economies as they provide good and services in the communities they exist, in this study they contributed a mean average of USD 828 per annum per household which is not much considering the overheads of operating any type of business for a profit. Microenterprises are essential for improving the standard of living, but they are extremely vulnerable to external challenges which they must navigate to operate. This is because rural entrepreneurs exist in a complex environment different to urban areas which limit the efficiency and effectiveness of operation and growth.

About 12.3% of heads of household were employed in skilled jobs, in the government and private sector. They were rural teachers, extension offers, health workers, social workers and veterinary scientists who were employed in their communities. People who are on salaried jobs are guaranteed a monthly flow of income. However, their employment barely contributed about USD 6240 per annum per household, which is far much below the remuneration of employees in their same positions in Botswana, South Africa, and Namibia. In Zimbabwe, a skilled government employee earns around USD 450 (R 5727.60) which is below the poverty datum line which currently stood at USD 574 for an average household of five and USD 96 for self-

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[1] The study found that every household do practise agriculture as their primary livelihood but the scale differs, meaning non-farming households combine both agriculture and allied other activities which gives them more earning than farming. In some cases because non-farming households are resourceful they do better in farming than farming households.

sustaining individuals (ZimStats, 2016).To close the income gap they get involved in agricultural activities and other small business enterprises.

About 17.3% head of households were employed in off-farm wage labour in this study. In other words, non-farming opportunities were concentrated in off-farm employment in this study (Table 2.1). The survey revealed that the employment was provided on a contract basis by two quarry mines operating in the District. Rural off-farm income is a significant input to rural household economies since it directly contributes towards basic needs. In this study, it contributed USD 2420 per household per annum, which was USD 200 per month. Chikwama (2010) in his study in Zimbabwe found no evidence to support the hypothesis that rural wage employment contributed towards increasing household income. This is because the world over unskilled employees are lowly paid and they are regarded as cheap labour.

The other portfolios in the non-farming sector found in the study were trading, pensions, remittances and transfers and rentals (Table 2.1). Buying and selling for a profit is prevailing socio-economic activity which had existed for a long time in Zimbabwe but in rural economies where income is relatively unpredictable, it faces many challenges in sustaining household welfare. In this study, trading contributed an average share of USD 1182 into household income. The share was not significant considering some of the business wares are acquired from neighbouring countries which makes their business overheads quite high. The reason pension or retirement annuities was regarded a non-farm income was because pensioners in this study were aged head of households who were no longer productive in agriculture. Even though very few households were benefactors of pension grants in this study as compared to the number of deserving head of households in the District, pensions were a major source of income to sustain livelihoods because of their regular flow on monthly basis.

The significance of remittances on household welfare cannot be ignored as a subset of nom-farm income. Remittances contributed an average of USD 813 per annum towards household income because merely 9.3 percent of the sampled households received remittances (Table 2.1). The survey also revealed that the flow of remittances is not consistent and often spontaneous. However, remittances from abroad or from internal urban areas increase rural income inequalities and distribution[2]. This also indicates the impact of migration on consumption smoothing, health, education and accumulation of wealth on recipient households

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[2] Even though remittances are an essential component of the non-farm sector they are not earned but received as transfers.

which lead to the reduction of poverty. Rural households also derive a proportion of income from rental revenue of physical properties such as accommodation, business properties and land. Four head of households in this study confirmed receiving incoming from rental accommodation in urban areas, which contributed an average of USD 1110 annually. This signifies the importance of acquiring immovable properties for income generation because they appreciate in value over time.

2.3.2 Characteristics of rural livelihood profiles

Table 2.2 shows the livelihood structure of the sampled households, according to the occupation of the household head, *in a descending order starting with t-test variables*. The t-test was computed to investigate mean comparisons for continuous variables while the χ^2 test was estimated to measure the proportions for categorical variables (also *see appendix 7 for socio economic demographics*). Even though agriculture is the conventional livelihood mainstay of the rural poor, the results showed a relative decrease in the importance of agriculture as 49 % were full-time farming households as compared to 51% households who had combined farming with other livelihood portfolios to increase income. Thus, livelihood diversification in the District was either a result of climate variability, the high cost of agricultural inputs, unfavourable agricultural markets, shortage of farming labour, population pressure for arable land, land degradation or the desire for livelihood transition. The type of occupation that a household head was engaged in had a significant bearing on income which translates into the food security status of the household (Fawehinmi and Adeniyi, 2014). Full-time farming increases the probability of a household being food insecure and less resilient to other social economic shocks. This could be attributed to the fact that agriculture which is characterised by seasonal variations in production as well as longer production cycles leading to irregular income and consequently high probability of being food insecure (Adepoju and Adejaire 2013).

There was a statistically significant difference between the choice of occupation and the age of the household head (Table 2.2). The mean age of the household head affects livelihood participation and decision making in livelihood choice. The younger head of households (47yrs) tend to participate more in non-farming activities due to high ambitions for better living standards, but this tends to decrease as their age moves to later stages of demographic life cycle (54yrs), as they choose to concentrate on a particular livelihood area in this study which is farming. This means risk-taking and labour flexibility decreases as age increases meaning

farming households might face a shortage of labour if they choose to venture into non-farming opportunities.

The results in Table 2.2 show a significant difference in welfare between the farming and non-farming households. Non-farming households were better-off (spent many years in school, higher monthly income and more valuable assets) than farming households. This implies that education, income, and valuable assets play a critical role in sustaining rural livelihood diversification. Education, the critical human capital, can significantly contribute towards high returns, such as, earning a better income, adopting technology, acquiring assets and the capacity to manage different livelihood portfolios. The level of education and occupation are causally linked in determining the household standard of living. Amaza *et al.,* (2009); Sakyi, (2012) support that increased level of education enhances food security and reduces poverty since it determines the opportunities available to improve livelihood strategies.

A combination of assets particularly productive ones is a precondition for success when venturing into non-farming activities, hence smoothing household consumption security. Meaning households with key resources are expected to withstand shocks in production or processes that create food shortages (Kassie *et al.* 2012). The results in Table 2.2 showed a wide variation in livestock ownership between farming and non-farming households. Farming households owned less livestock, yet in the rural context, successful agricultural production hinges not only on available labour, land, inputs but draught power have no substitute as an essential equipment. Livestock allows a wider proportion of assets to be owned by rural households in developing countries. They critically contribute to household income generation and food accessibility in different ways (FAO, 2006; Maponya, 2008), they can act as a consumption buffer in times of household economic hardships; can be traded to buy food or exchanged for food, in particular, maize grain or other basic needs.

The study findings showed a statistical difference between farming and non-farming households in terms of crop production (Table 2.2). As expected, non-farming households had higher maize yield per hectare than farming households. Maize is the staple food not only in Zimbabwe but also for southern African regions, meaning the quantity of maize yield against demand is a measure of household food security. The explanation for the variation is that households that choose to combine farming and other activities are regarded as resourceful to hire farm labour, buy equipment and inputs, and utilise their land effectively for both food and cash cropping as compared to farming households who are trapped at subsistence level.

Table 2.2: Socio-economic characteristics of the sampled households according to the occupation of the household head

Variable	Farming =148 49 %	Non-Farming =152 51 %	T-tests
Age	53.84	47.28	-0.79**
Dependency Ratio	55.53	54.44	-0.49
Land Size	3. 419	3.10	-1.30
Household income	0, 768	1, 309	5.31 ***
Education of HH	7. 45	8. 71	2. 69 ***
Value of HH assets	624, 787	1715,237	3. 38 ***
Total Livestock Units	1.739	2.303	1.02**
Maize yield per (Ha)	0.69	0.83	1.22**
			(χ^2 tests)
Extension (Yes)	0.32	0.14	38.91***
Extension (No)	0.18	0.35	
Access to Credit (Yes)	0.03	0.10	10.56***
Access to Credit (No)	0.46	0.41	
Input subsidy (Yes)	0.28	0.19	12.76***
Input subsidy (No)	0.21	0.32	
Married	0.34	0.40	3.92**
Not Married	0.15	0.11	
Female headed	0.18	0.13	4.11**
Male headed	0.31	0.38	

Source: Survey (2016)

Notes: ***, ** and * means significant at 1%, 5% and 10% significance levels, respectively

Rural livelihood security can be enhanced through access to strategic support services. Farming households were characterised by better access to extension services. Studies by Evenson and Mwabu, (2008); Maffiola and Ubful (2008); Sigei, (2014); have demonstrated the existence of a strong relationship between access to extension services and food security among rural subsistence households. Extension instruments of technology innovation and transfer, human capital development, social capital development and increased market access are effective means of addressing food insecurity and poverty at the household level (Abdu-Raheem and Worth, 2011). Contact with extension officers is an important source of information with

regards to new technologies and markets; hence, improving farming methods, production efficiency and increasing household income.

However, there was bias on criteria for dispensing subsidies between the "*poor and needy*" and non-farming households. The latter have the capacity for self- sustenance. Input subsidies and other social safety nets instruments are given according to political patronage in rural Zimbabwe. Furthermore, the study revealed a statistically significant difference between the farming and non-farming households in terms of access to credit and loans. Credit or loan facilities gives households the opportunity to diversify into other income generating activities, thereby increasing both financial capacity and purchasing power, and escaping the risk of food insecurity (Gebre, 2012). Even though at lower proportions, non-farming households have an improved access to credit or loans than the farming households. This might be because poor rural households lack not only the required collateral which ensures recovery after defaulting in payment, but financial institutions are also wary of credit default risks from the seasonal and subsistence nature of the rural agricultural livelihoods. Consequently, the reason for a limited number of non-farming households having access to credit and loans was that the diversity of farming and non-farming income generation activities are more difficult to monitor in rural areas than in urban areas (Manganhele, 2010). This is because urban livelihoods trajectories are dynamic, sophisticated and sustainable as compared to the poorly organised rural non-farming sector.

Even though the demographic configuration between the farming and non-farming households was similar, there is a statistically significant difference in terms of their access to support services. Even though access to input subsidy was at lower proportions across the board, farming households had an improved access as compared to non-farming households. This implies the rural poor constrained by high input prices have the chance to grow crops and try to avoid food insecurity. Consequently, the poor usually trade subsidies for income, hence remain trapped in food insecurity. Input subsidy programs are one of the pervasive policy tools used to address the problems of food insecurity and poverty through improvement of agricultural production and productivity (Sibande *et al.* 2015).

It is also critical to capture the dynamics of the marital status of the household heads because the effect of a household social structure is quite significant in livelihood decision making. Married head of households participated more in both farming and non-farming activities than their counterparts who were not married (Table 2.2). The assumption is that married head of

household has a greater comparative advantage on access to productive resources such as land. Unmarried women were less likely to participate in livelihood economic opportunities, presumably reflecting cultural constraints inhibiting women participating in income earning activities as compared to married women who could get resources and networks from their spouses to diversify into other opportunities. Being married generally can be a sign that somebody has responsibilities and dependents to look after, as such married household heads would prefer diversifying into non-farm activities to supplement the income they get from farming (Reardon, 2006; Zambo *et al*. 2014).

Gender dimension is important in livelihood choice and participation; the hypothesis is that women are more likely to participate in non-farming activities considering the difficulties associated with farming. However, this study revealed the opposite, women still lag behind men in social economic opportunities by a wider margin (Table 2.2). The strength of household headship as gender indicator is that it provides the variation between men and woman in terms of economic opportunities and circumstances at the household level. Men have authority over household endowments and their strategic deployments, as compared to female-headed households who are time constrained to participate in multiple activities, if they break through into non-farming activities, women are more likely to engage in low productivity and low return activities.

2.3.3 Determinants of Non-farming Activities

It is not clear whether households in Rushinga Rural District were engaging in non-farming economic activities as a result of 'push or pull factors', therefore, it is important to investigate the social, economic or ecological factors as the proximate causes that motivate rural people to participate in non-farm activities. The standard Probit model was applied to determine the probability of a household engaging in non-farming activities (P(Y=1)), as illustrated in table 2.3. The table presents the results of the regression model and marginal probabilities when other variables are held constant at their mean values. Fourteen independent variables included in the model were assumed to be instrumental in influencing household economic participation, these variables to some extent could influence the quality of the non-farm activities a household could get. The model indicated that, collectively, all estimated coefficients are statistically significant in influencing household livelihood decisions since the Wald χ^2 the correlation between errors has a p-value (0.001) of less than 1%, suggesting the model has strong explanatory power, hence livelihood decisions of the head of households were not independent.

The pseudo R^2 value is about 17% which is appropriate for cross-sectional data. The highly significant likelihood ratio chi-square (LR) value (-165.71) suggests that the model correctly predicted about 65% of the cases and fits the data well. Checks using Variance Inflation Factor (VIF) were done to ensure that there was no problem of Multi-collinearity, which is the linear correlation matrix between explanatory variables. The variables used in the model had a low average variance inflation factor (VIF) of less than 10 with an average mean of 1.63, indicating there was a low degree of multi-collinearity among explanatory variables (S*ee appendix 6*).

Table 2.3: Socio-economic determinants of Non-farm sector: Probit Model results

Variable	Coefficient		Marginal Effects	
	Value	SE	Value	SE
Age	-0.003	0.006	-0.001	0.002
Gender	-0.209	0.283	-0.076	0.101
Marital status	0.301	0.309	0.113	0.118
Dependency ratio	0.003	0.004	0.001	0.002
Education	0.004	0.026	0.002	0.010
Total monthly per capita income	-0.042	0.124	-0.016	0.046
Asset value	0.669***	0.191	0.247***	0.070
Total land size	-0.006	0.139	-0.02	0.014
Livestock hold in TLU	-0.029*	0.016	-0.011*	0.006
Access to credit	0.579*	0.265	0.190*	0.075
Access to Extension	-0.700***	0.167	-0.256***	0.060
Maize yield per hectare	0.018	0.087	-0.07	0.032
External Aid	0.362	0.223	-0.128	0.075
Input subsidy	-0.409**	0.177	-0.153**	0.067
Constant	-1.020	0.658		
Wald $\chi^2(14)$	59.98			
Correctly predicted	0.65			
Pseudo R^2	0.1661			
Log pseudo-likelihood	-165.711			
Observations	300			

Note: ***, ** and * means significant at 1%, 5% and 10% levels, respectively

Source: Household survey (2016)

A household decision to participate in the non-farm sector is a function of assets and an array of opportunities available in the environment in which they live (Dabalen *et al.* 2004). The value of physical assets owned by the household in this study was found to have a statistically significant (p>0.01) and positive effect on the level of household participation in non-farm activities. The value of assets means resources are of critical value when used in combination to complement other resources within household livelihood strategies, to some extent this reflects the viability of investing in a particular non-farm enterprise. Many poor households are excluded from non-farm activities due to lack of resources and they remain trapped in low enumerative activities equivalent to subsistence farming. The influence of assets was quite high in this study, the coefficient value of the model indicates that an increase in the value of assets by a USD increases the chance of a household to diversify into non-farm sector by 24%. This implies that the higher the asset value the higher the chances to participate in non-farming. The results are consistent with the findings by (Onya *et al.* 2016; Batunde *et al*. 2010; Matshe and Young, 2004). In other words, the nature of asset accumulation and application in livelihood strategies determine the characteristics of the returns.

In the rural economy, besides crop production, livestock holding is a flexible source of capital assets, as large livestock heard creates a better opportunity to earn more income from livestock production. As expected, livestock holding in Tropical Livestock Units (TLU), negatively correlated with non-farm livelihood diversification strategy (p>0.5). Livestock resources contribute positively to on-farm livelihoods than non-farm as livestock especially cattle are an indicator of wealth, a source of draught power, means of transportation services and provide meat and milk products. Most poor rural households own few livestock resources because of reasons such as structural poverty, inadequate grazing pastures, endemic animal diseases such as foot and mouth, and lack of veterinary clinics. Thus disposing livestock assets for non-farm activities could harm agricultural livelihoods significantly. The marginal effects of the model on (Table 2.3) indicate that a unit decrease in TLU decreases the possibility of a rural household to engage in non-farming by 1%, but increases the probability of households remaining in agricultural livelihoods. Sewnet *et al.,* (2015) and Yesehak *et al.,* (2014) found similar results that livestock holding has a positive correlation with agricultural livelihoods and a negative relation with non-farming activities.

For small and micro-businesses to thrive there is need to invest enough capital in order to get high returns. As expected, access to credit was found to have a positive and significant effect of the decision of households to combine both farming and non-farming enterprises as a risk

aversion strategy, especially in risk environments. It is a significant pull factor that potentially motivates rural households to engage non-farm activities since the rural poor are resource constrained, providing credit or loan could improve their livelihood strategies. To a larger extent access to credit or loans facilities can simultaneously influence both the growth of agricultural production and the development of non-farm sector as the two can easily complement each other if managed well. The marginal effects of the model highlight that a single household opportunity to access credit increases its likelihood to participate in non-farm activities by 19 % (Table 2.3). These results are consistent with the literature and with the findings by Gebreyesus (2016); Rahman (2008); Rahman and Akter (2015) who concluded that access to credit increases the chances of rural livelihood diversification. This means policies aimed at improving rural households' access to credit would not only influence investment in the rural non-farm sector but also improve food security (Sani *et al*. 2014).

While substantial resources are channelled to extension services to increase rural agricultural production, its contribution towards non-farm activities is not known. Extension facilitates the transfer of evolving technology and its adaption to local agro-ecological conditions and also to reduce the gap between potential and actual production by accelerating research (Anderson and Feder, 2003). However, as expected, extension training and frequency contact had a negative and significant relationship with the decision to participate in non-farm livelihood strategies. This means households would spend most of their time and resources on agricultural intensification activities than diversifying towards the non-farm sector. If other variables are held constant (Table 2.3), the probability of combining farming and non-farming activities decreased by 25% for households who had accessed extension services. The result is in line with similar findings by Dessalegn and Ashagrie (2016); Demissie and Workneh (2004) who concurred that extension services limit the potential to engage in non-farm livelihood diversification, but contradicts Bekaku and Abidi (2013), who found out that extension services actually does motivate the decision to participate in non-farming enterprises. This means the instruments of extension services, which only focuses on crop and livestock production should be extended to encompass both farm and non-farm and encourage the growth of non-farm opportunities in rural areas.

They are different support services aimed at improving and facilitating the livelihood strategies of the rural poor in developing countries, among them is input subsidy programmes. Input subsidy programmes are poverty and food insecurity alleviation strategies aimed to ease the burden of high cost of farming inputs from poor and vulnerable households. However, the

relationship between input subsidies and non-farm activities is missing in literature, what is known is that non-farm activities can factor the availability of cash to procure farm inputs and other on-farm services, thereby complimenting household agricultural production. As expected, input subsidy has a negative and statistically significant relationship with the decision to participate in non-farming livelihood strategies. The availability of seeds, fertilizer and chemicals increases the demand for farm labour, hence increasing the decision to remain on on-farm activities than other livelihood options. The marginal effects in (Table 2.3) indicate that household access to input subsidy decreases its likelihood of participating in the non-farm sector by 15%. However, policymakers should support the development of sustainable non-farming activities as a means of reducing rural dependency on input subsidy for agricultural production.

2.4 Summary

Agriculture and non-farm activities have been shown to be complementing livelihood strategies in Rushinga District since about 51% of the sampled households participated in non-farm activities to improve their well-being. This shows that farming alone is no longer a reliable livelihood without alternative income sources. However, the study indicates that even though rural households are diversifying their income sources, the contribution of non-farm income towards total household income was very low. This reflects that rural households were engaged in low return non-farm activities, indicating the extent of livelihood insecurity in the District. Policies aimed to configure non-farming activities should recognise that they are different types of rural non-farm activities with different returns. Thus, to improve the standard of living of the rural poor, rural development policies aimed at reinforcing livelihood security should focus on encouraging farm and non-farm linkages as a remedy of closing income gap. Policy makers should advocate for non-farm livelihood strategies such as poultry projects which require an investment of low income for them to participate.

Descriptive statistics show gender disparity in terms of economic opportunities between male and female-headed households. This calls for incorporating gender dimensions in rural policy initiatives. The model demonstrated that rural households can successfully diversify if they could accumulate valuable assets and have access to credit for start-up capital and for enterprise growth. Hence, it is critical to tailor develop rural micro-credit facilities which could be accessible to rural households at reasonable terms and conditions. In other terms, livelihood diversification in this study was driven by capacity variables which should be accessible to the poor in order to transform their livelihoods into positive outcomes. Overall, the study observed

the importance of the non-farm sector in augmenting agricultural income, therefore, promoting the sustainability of off-farm activities could be valuable for transforming the rural economy.

CHAPTER 3: A QUANTITATIVE ANALYSIS OF RURAL HOUSEHOLD EXTENT AND DETERMINANTS OF POVERTY FROM A LIVELIHOOD SECURITY PERSPECTIVE, IN RUSHINGA DISTRICT, ZIMBABWE

Abstract

Strategies to reduce poverty is the priority of developing countries like Zimbabwe in a bid to achieve the Sustainable Developmental Goals. This study examines the extent and determinants of rural household poverty in Northern Eastern Zimbabwe using the poverty class index, descriptive statistics, and logit regression model. The Foster, Greer and Thorbecke (FGT) poverty index examined the extent and severity of poverty in the study. The indices showed a significant variation in incidence, gap and inequality between the aggregated Wards, indicating that poverty concentration is location specific. In identifying the determinants of poverty, a binary logistic regression was estimated, based on food consumption expenditure per capita as the dependent variable. Applying the cost of basic needs approach, which agrees with the idea that the poverty is the inability to attain critical consumption, food especially being the principal proportion. The result of the econometric model revealed that geographical location, dependency ratio, marital status, total monthly income per capita, asset endowment, access to extension services and maize yield per hectare were found to correlate with household poverty (statistically -significant at 10% and below). Even though age, gender, occupation land size utilized, total livestock units, coping strategies, access to credit, external aid, input subsidy and the number of the chronically ill were either positive or negatively related to poverty, they were not statistically significant enough to influence household poverty status.

Keywords: Rural, poverty, dimensions, determinants, household,

3.1 Background: Vulnerability to Poverty

Poverty, household welfare and its causes have been a key and extensive area of study for many years in both developed and developing countries (Lee and Nerves 2011), but so far very few studies have narrowed their investigations to capture varying poverty dynamics into Zimbabwean rural context. This means that there is one principal question this paper endeavours to answer: what are the dynamics of rural poverty in Zimbabwe? Answers to this question need a comprehensive and disaggregated approach that captures all the proxies of livelihood approaches including the proximate variables endogenous to the household economy. Along with the rapid poverty growth, the dimensions of poverty are viewed in the context of household characteristics, as a function of the extent and level of various human and physical endowments (Jan *et al.* 2008). This extensive poverty profiling helps to identify methodologies in which the United Nations Sustainable Developmental Goals (SDGs) can easily be targeted not only in Zimbabwe but in the sub-Saharan region.

The way poverty is defined, understood and measured depends on context; different views about its dimensions and causes impact the types of directions and policies aimed at reducing it (Sekhampu, 2013). Poverty is viewed as the inability to maintain a minimum living standard anticipated with respect to basic consumption needs, income or resources required for satisfying them (World Bank, 2006; Hashmi *et al.* 2009). This is caused by many factors and has several effects which influence the lives of the people who are considered to be poor (Borko, 2017). In the rural context, greater propensity to poverty stems from limited access to living resources, institutional gaps, land degradation, lack of skills, environmental variability, HIV/AIDS pandemic, and constrained access to support services essential for livelihood strategy. Often, these factors interact with each other to reinforce the lack of well-being of the rural poor. Hence, there is need to understand why some households or individuals remain mired in poverty cycles, while others are able to lift themselves out of poverty.

'Real' poverty can be sensitively identified in terms of capability deprivations that are intrinsically significant unlike low income, which is only instrumentally substantial (Sen, 1999; Singh *et al*. 2013). Meaning the well-being of individuals and households in the function of resources, skills, and opportunities. Fundamentally, the concept of poverty is about the relationship between resources, opportunities available and needs (Leichenko and Silva, 2014). An endowment of rural productive assets such as land, skills, equipment, and labour helps reduce vulnerability to poverty and helps to exploit livelihood opportunities (Bluffstone *et al.* 2008). Inevitably, the majority of the rural poor in developing countries, have limited access

to or own meagre assets, which constrain their capacity to transform their livelihoods into to positive and desirable outcomes. At the same time, agriculture is the main livelihood opportunity at the disposal of the rural poor in Zimbabwe like in other developing countries. This sector is seasonal, subsistence level, low productivity and sensitive to climate variability, which increases the chances of being poor. This entrapment in agriculture is an immense problem for rural households because their productivity is too low to exit poverty (Chiripanhura, 2010). Unlike in South Africa for example, social safety nets in the form of social grants are not provided in Zimbabwe. Under normal circumstances, the poor and vulnerable fend for themselves with minimal or no government support. In that context, rural livelihoods in Zimbabwe today are characterized by heterogeneity in order to make a living in a country where the rural-urban gap is very wide (Chirau *et al.* 2014). Yet, rural livelihood diversification as primary poverty alleviation strategies is limited.

Furthermore, before poverty translates into micro or meso-level domain, it is highly linked to the performance of the macro-economy in terms of both Gross Domestic Product (GDP) and employment (Simpambe, 2007). Compared to other countries in SSA, Zimbabwe is one of the poorest in terms of extreme income disparity, bottlenecked economic opportunities and deprived access to necessary services by a large proportion of the population. Where the inequality gap between the rich and poor has continued to widen, many households have sunk deeper into poverty (Bhaigunhi, 2010). Zim Stats (2013) noted that approximately 62.6 % of Zimbabwean households were deemed poor, whilst 16.2 % of the households are in extreme poverty; (Manjengwa *et al.* 2012) to the extent that four out of every five people was classified as extremely poor. The World Bank defines "extreme poverty" as people in fragile contexts and remote areas, who often live on $1.90 or less a day. Furthermore, the country was ranked 172nd out of 187 countries on the 2013 Human Development Index, and 173rd of out 187 republics (Deressa, 2013). These macro-level dimensions were primarily a result of the rapid economic decline, inequality, and high structural unemployment. This calls for appropriate poverty alleviation strategies. In the context of effectively addressing rural poverty, governments should understand the underlying proximate causes and the constraints that the rural poor face. This, in turn, requires tools to measure the primary constraints and administer context-specific initiatives (Cohen, 2010). If poverty is more of a short-term phenomenon, then policies aimed at stabilizing temporary livelihood instabilities may be more appropriate; if it is more obstinate, then recommended policies should address concerns of a more structural nature (Glauben *et al*. 2012).

The identification of households well-being, constitute the first step in poverty analysis. The most important gap to fill, as the concept of well-being is not only the multi-dimensional aspect of poverty but also its subjective existence, which is one's perception of being poor (Fambon, 2006). On an aggregate scale, poverty seems to persist in unbearable levels but its nature does not say much about the location, specific extent and determinants of poverty (Bogale, 2010. In other words, there is need to know where poverty is concentrated, how poor is the poor and the correlates of poverty. The dimensions of poverty hinges on the determinants, not vice-versa. For this, the poor must be properly identified and an index taking the intensity of poverty suffered by the poor into account needs to be constructed (Bogale, 2005). Against this background, this paper tries to significantly contribute to an understanding of socio-economic correlates and dimensions of poverty in rural Zimbabwe.

3.2 Methodology
3.2.1 Study Area

Rushinga district is located within the boundaries of arid to semi-arid Zambezi valley, in natural agro-ecological region IV, in Northern Eastern Zimbabwe, Mashonaland Central Province. The region is characterised by low mean annual rainfall (450-650 mm), high temperatures, semi-extensive communal farming, drought-tolerant crops, short-term maize cultivars and frequent droughts. Agro-ecological Regions (AER) are defined zones on the basis of the combinations of soil quality, terrain, land-form and climatic conditions, for a specific level of agricultural practise and management conditions. The characteristics of the Agro-ecological zones could be a proxy for food insecurity and climate vulnerability, which are both important to indicate an areas' close representativeness of the country's natural regions and show the general environment of the area (Mubaya and Mafongoya, 2017). The Province covers a geographical area of 28,347 km² and a population of approximately 1 152 520 from the Census of 2012, representing about 8.5% of the total Zimbabwean population (ZimStats, 2012). Even though agriculture plays a very significant role in the economy of Zimbabwe, in particular, driving food security. However, of late, empirical climatic evidence shows that unpredictable rainfall pattern, floods, frequent droughts, and intra-season dry spells have increased in frequency and intensity causing disruptions to land-based livelihoods in the region (Nhemachena *et al.* 2014). This makes it quite vulnerable for poor households to cope, diversify, improve and transform their subsistence agro-based livelihoods. The area received about 50 % of the average rains for the 2015-16 cropping season (FEWSN, 2016). The district is wholly communal, had an estimated population of 72 040 in the 2012 census (ZimStats, 2014).

In this study, the Wards for enumeration selected were chosen to represent different structural livelihood characteristics that can give a comparison of the different conditions, situations and strategies in the District. This is because of distinctive features of rural people's well-being, their livelihood activities require a wider analysis from more than one sub-zone. These livelihood zones typically rely on cropping, artisanal mining, fishing, animal husbandry, and informal enterprises.
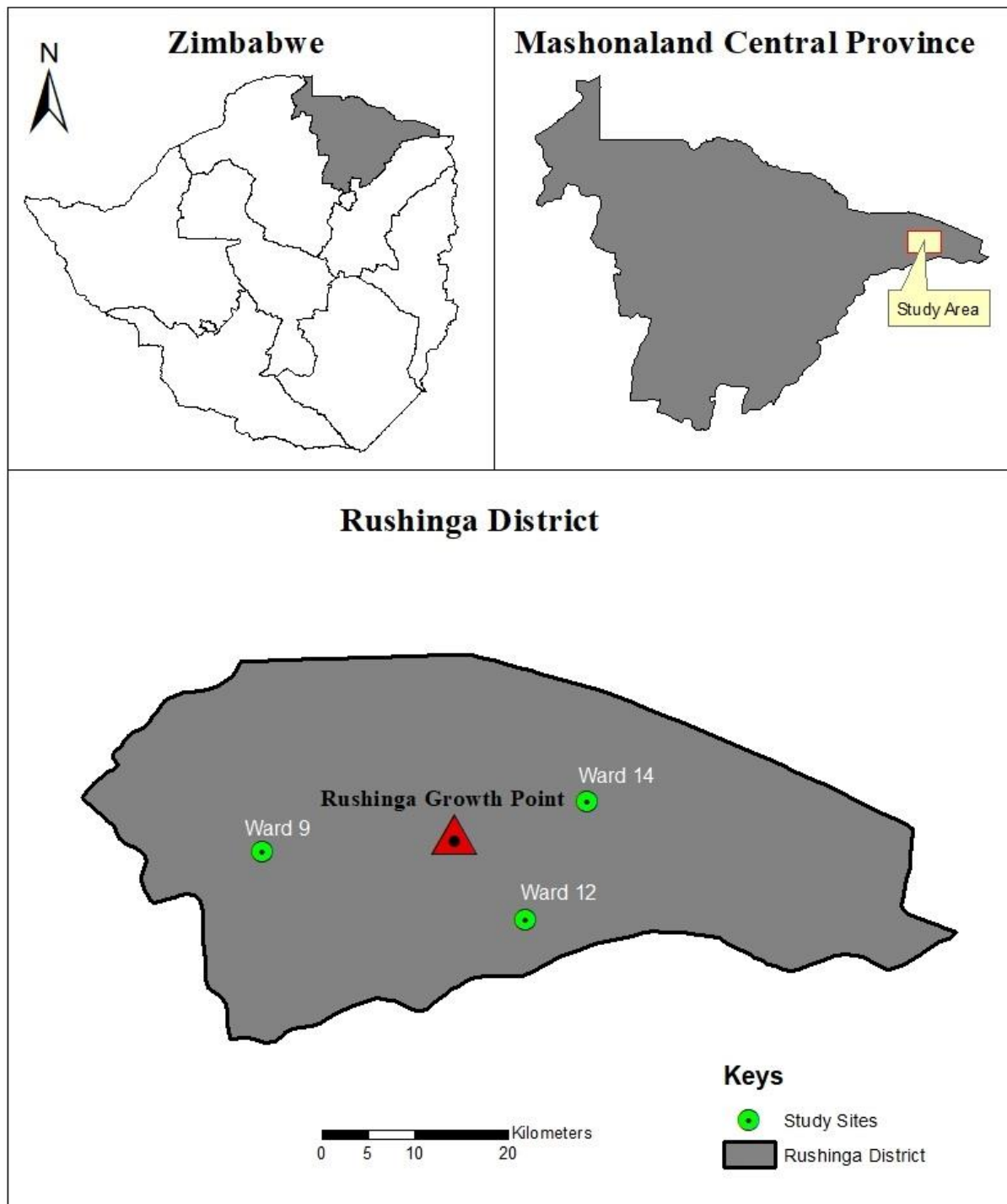
Figure 3.2: Map of Rushinga District

Dry-land peasant cropping system is based on maize (the staple food), tobacco has replaced cotton as the major cash crop, as well as the production of sunflowers, soya beans, grounds nuts as both food and cash crops. About 145 households supplement dry land cropping at Chimhanda Irrigation scheme sustained by Gulliver Dam. Due to limited livelihood opportunities, liquidity constraints, and high food prices, the majority of poor households experience challenges to food access because of extreme poverty and low livelihood resilience to shocks.

3.2.2 Sampling procedure and data collection

The data on which this study is premised was produced from a household survey of October 2016 (the lean season in Zimbabwe is when hunger levels are very high), over a period of 12 days through a semi-structured questionnaire (see Appendix 1). Interviews from semi-structured questionnaires follow the order of the interview guide with suggested themes but there is a dimension for the interviewees to develop their qualitative answers, this helps the researcher to gain more informative answers (Desai and Potter 2006, Niemisto, 2011). Four trained enumerators administered the questionnaires to capture relevant variables related to livelihood conditions and households welfare, which could successfully measure the study objectives (see 1.3). The head of the household was the primary source of information where rural livelihood approach was the principal indicator used to study the inference of rural households' well-being. Livelihood typology in the District, in particular examining those factors that shape them and are associated with their relative success or failures, was exhibited in a number of variables. Assets endowment, access to natural resources, access to infrastructure, and availability of social services. These variables make important components of the livelihood resources any household require to pursue livelihood strategies, ie natural, social, financial, physical and human capital.

Primarily, livelihoods and their outcomes affect the well-being individuals or households differently, as such they require quantitative identification of parameters and indicators that are measurable. Analysis of these components is important to examine the standard of living of the poor and improve their livelihoods in a sustainable way. The rural household maximizes utility by participating in multiple means of survival in terms of a diverse portfolio of resources and activities that influence livelihoods (Kirori, 2015). Identifying the dynamics of the livelihoods could give a clear picture of the realities of the poor. In order to capture the dynamism of food (in) security and in-depth profiling of poverty in the study, validated variables captured which were assumed could determine the level of food security and poverty

were income, household socio-economic demographics, crop and animal husbandry, coping strategies, expenditure, and consumption. There is a strong causal link between the correlates of poverty and food insecurity. Meaning, understanding the structural and fatalistic causes of poverty may also help to develop policies to eradicate food insecurity in rural areas.

How individuals, households or communities effectively emerge or collapse from social economic downturn dependents on a range of factors, some which relate social, economic and environmental conditions. Guided by an extensive review of the literature, variables were selected that could represent important facets of household resilience and vulnerability. Risks, shocks, trends, injuries, and sicknesses were used to capture the vulnerability dimension to livelihoods. Based on their direction to improve household well-being, in this study which is food security variables like the number of years spent in school, access to social services, the value of assets, household income, access to natural resources, social safety nets and social capital were used to capture the extent of resilience.

Multi-stage sampling procedure was adopted to select 3 Wards, 15 villages and 300 households in the District. This sampling procedure is commonly applied to household and health surveys, when there is no exact sampling framework or the population is scattered over a wide area, three or more stages of simple random sampling is commonly used (Chauvet, 2015). To make the sampling process more presentative and practical in multistage sampling, larger primary clusters are sub-divided into smaller secondary groupings or units, often taking into account the hierarchical structure of the population (Lavrakas, 2008). In this study, the sample was large enough to allow for the generation of statistically robust and stable parameter estimates of poverty, food insecurity and resilience. The first stage, was to carefully identify and randomly select three Wards, 9, 12 and 14, which could represent the wide range of agro-ecological and socio-economic conditions in the District. This was done with the help of the district administrator, ward councillors village heads, and agricultural extension officers. The second stage was selecting five villages from each Ward. Dambaza, Nyamushamba, Karonge, Bungwe, and Zambara were villages in Ward 9, Mugaradziko, Mutsvaire, Chitsota, Makusha and Nyatsato in Ward 12 and Matsikarima, Gwangwava, Ganya, Mupezeni and Chidyamudungwe in Ward 14 respectively. Geographically defined units such as villages or parts of villages are more likely to be internally homogeneous than heterogeneous in terms of livelihood activities (Turner, 2003). The last stage was to randomly select twenty households from each village. Random sampling was used to avoid picking households with homogenous characteristics, but rather to select households of unique socio-economic positions. This is

because the aim of the study was to find poor and non-poor, food secure and food insecure as well as resilient and non-resilient households in the study area.

3.2.3 Rural Livelihood Approach to Poverty: Theoretical Considerations.

Rather than understanding poverty as simply a lack of income or resources, a better account of the structural predicaments driving poverty begins by considering the premises of livelihood construction of the poor (Matshe, 2009). Livelihood approach reflects the diverse and complex realities faced by poor people in a specific context; they have limited resources, little or no savings, few income or production options, and they are more vulnerable to livelihood disturbances (Devereux *et al.* 2004). Among other tools, the Sustainable Livelihood Approach (SLA) (Figure 3.2), provides a comprehensive and multifactorial approach on how the rural poor maintain their livelihoods amid severe environmental and socio-economic constraints. The fundamental principle of the approach is to identify what the poor have rather than what they do not have (Allison and Ellis, 2001). A livelihood comprises the capabilities, assets and activities required for a means of living (Chambers and Conway, 1992; Rochestor *et al.* 2016).

The link between individual or household capabilities and activities is a function of available assets (human, natural, social, physical and financial), depending on the influence of context. This means that the multi-dimensionality of poverty can be analysed through indicators of livelihood capital available to the poor, where each livelihood resource can be considered as an important dimension of poverty which contains several important indicators of welfare (Khai and Danh, 2012). Human capital entails labour available, skills, knowledge, and health condition that together enable households to pursue livelihood strategies (DFID, 1999; Bhanderi, 2013). In the rural context and at a household level, the quality and quantity of on-farm and non-farm labour is an important human asset but highly dependent on sufficient nutrition, household size, health potential, safe environment conditions, ages, education and leadership potential. However, researchers consider ill health and lack of sufficient education as core dimensions of poverty constraining successful livelihood approaches (Tilahun, 2014). In other words, in order to efficiently utilise other assets, one has to be in good health and competently literate. Unlike people in urban areas who have easy access to quality health primary care, nutritional diets and education; human capital in rural areas are weak as the rural poor cannot afford quality services or they are not easily accessible by everyone.

Natural capital or assets includes all natural resources such as land, minerals, forests, pastures, and water, from which livelihoods can potentially be derived. In rural agrarian economy, access

to land and its ownership is crucial, the rural poor derive much of their sustainable livelihoods from land-based activities (Bhanderi, 2013). Basically, physical capital includes producer goods, tools, and equipment essential to support livelihoods such as boreholes, dams, transportation, markets, houses, roads and livestock. Often, access to physical capital is free, but sustainability to support livelihoods rely on adequate care and maintenance.

Financial capital is resources that people use to achieve their livelihood objectives, including savings in cash, bank deposits, pensions, transfers, credit, remittances or loans or liquid assets such as jewellery and livestock which can easily be disposed of income. Two main sources of financial capital are available stocks and regular flows of income like salaries, remittances and pensions (Khai and Danh, 2012). Lastly, social capital entangled in "social norms" is a means of widening livelihood options. Social assets are developed through networks, connectors, kinships, relations, caste, ethnicity and wider institutions like churches and workplaces. Put differently, social capital is only about the quality of relations between individuals, households and communities at large. The rural poor utilise social networks to diversify into non- farming activities like stokvels, cooperatives, land rentals and securing off-farm labour.

People require a combination of assets to achieve their self-destined priorities because no single capital or asset endowment is sufficient to yield the varied livelihood outcomes that people seek (Kollmair and Gamper, 2002). For the rural poor, their livelihoods, opportunities, and well-being are substantially shaped by the extensive utility of natural resources, in particular, land, water and forest products (Lee and Nerves, 2011). However, other complementing assets are also important to them, for example, rural households need income to buy inputs, farming skills and for them to be productive they need to be healthy.

Households often lack the right combinations of assets to exploit economic opportunities. Inevitably, the balance changes from household to household over time. Some assets may change over time, while others such as cash and social networks can be volatile and depend upon movement of people in and out of the household (Morse *et al.* 2009). The absence of suitable infrastructure is a major cause of poverty, as poor infrastructure can impede education, access to health services and livelihood processes. Even though financial resources are needed by the poor to transform their livelihood options, the presence of cash, loans, credit or savings per se does not guarantee sustainability in long-term. People require skills and knowledge to run entrepreneurs (Nakiyimba, 2014).
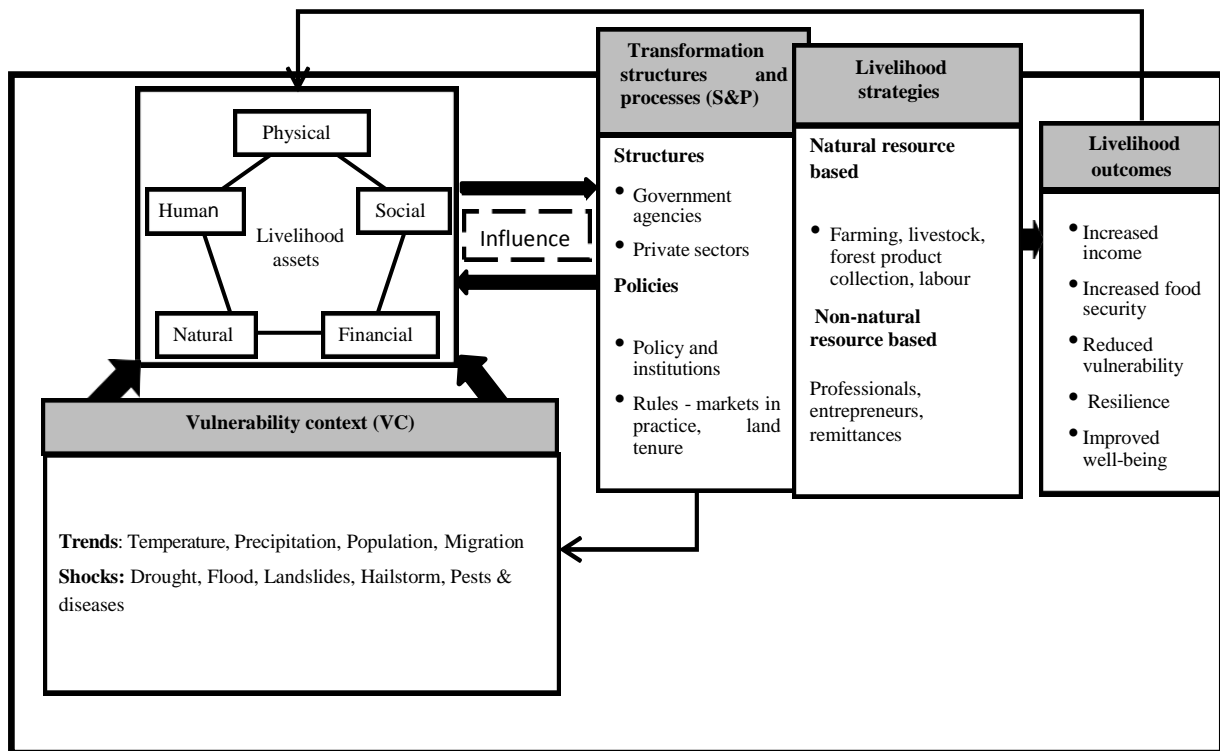
Figure 3.3: Conceptual framework for the study

Adopted from: Department for International Development, 1999; Ellis, 2000;

Access to land or land holding has different implications to well-being, production depends on the geographical area, relative to markets, availability of labour, access to credit or inputs, educational level or health of the landholder (Jansen *et al*. 2005). The utility of all the assets or resources discussed is strongly influenced by the vulnerability context and mediating factors that inhibit or influence livelihood strategies. The vulnerability context in the form of trends, seasonality and shocks that affect people's livelihood strategies, choices and priorities are caused by climate change and variability. Mediating factors such as policies, structures and processes intercede between capitals, livelihood strategies and operate at several levels, from social groups, local communities and agreements between governments (Neefges, 2000). However, when assessing the scope of poverty, the difference between vulnerability and risk is critical. A risk is the likelihood of occurrence of external shocks plus the severity thereof, whereas vulnerability is the exposure to the severity of risks (Laudi and Slater, 2008). The vulnerability context has the dual aspect of *external* threats to livelihood security due to risk factors, such as seasonality of livelihoods, low rainfall, high temperature, unfavourable markets trends and an *internal* facet of coping capabilities determined by assets, social safety nets, skills or support from kin or community (Allison and Ellis, 2001). In other words, shocks,

seasonality, and trends are the "vulnerability context" causing rural poverty in developing countries. The fact that rural households depend greatly on climate-sensitive natural resources, makes them more vulnerable to environmental risks, upon which they have limited coping and adaptive capacity in terms of the assets they own or can mobilise in response (Adger *et al.* 2003; Rochester *et al.* 2016).The solid relationship between natural resources and vulnerability context poses major threats to food security, resilience and poverty reduction in longer-term.

What this conceptual framework is trying to explain is that livelihood strategies comprise a combination of activities, preferences, priorities, and choices that individuals or households undertake, including the way they deploy the assets they possess or have access to, in order to improve their well-being. In the rural context, livelihoods are divided into natural resource-based opportunities, (farming, fishing, extracting forest products, artisanal mining) and non-natural resource based opportunities in the form of non-farming activities, off-farm labour, and remittances. The majority of the rural poor in developing countries are trapped in natural resource-based livelihoods, only a handful have resources and capabilities to diversify into non-natural resource-based activities.

Poverty and opportunities to escape on aggregate are determined by critical mediating structures in the form of policies, processes, and institutions that operate at all levels to facilitate or inhibit capabilities, thereby influencing positive or negative livelihood outcomes. In Zimbabwe, Non-Governmental Organizations (NGOs) have taken the role of weak institutions in supporting and facilitating rural livelihoods. Positive livelihood outcomes include highly resilient, improved well-being, reduced vulnerability, increased food security and sustainable use of the natural resource base. Consequently, poverty, food insecurity and low resilience are possible outcomes of negative livelihood processes.

3.2.4 The Concept of measuring poverty

Poverty profile and poverty status measures provide detailed information on the level of poverty concentration, characteristics and correlate, but not sufficient to target poverty (Nega *et al.* 2010). This is because, poverty is a complex and multidimensional social phenomenon, measured or defined in multiple variants and viewed as chronic, transitory, absolute and relative concepts, depending on the period experienced by a particular economic unit, i.e. household or community. For the sake of development policies, only to identify the poor is not enough, there is a need to investigate the nature of poverty households are facing. Is it temporary poverty or more persistent poverty? Chronic poverty is long-term and the causes are largely structural, endemic and individuals or households are poor most of the time, while

transitory is a temporary, transient and short-term in nature (Etim and Udoh 2013). The transient poor have a higher probability of bouncing back in the future. A household can be regarded as chronically poor if its current consumption is below an expected threshold. One important aspect of poverty study is whether the poverty reduction interventions will have a similar effect on addressing chronic and transitory poverty or whether their causes differ (Pitaro, 2017). In the rural context, chronic poverty is caused by lack of productive assets to generate income and weak human capital. At the same time, safety nets can be a remedy to deal with transitory economic shocks.

A distinction between absolute and relative poverty is also relevant. Absolute poverty denotes those who lack sufficient resources to meet their basic needs including adequate food, education, healthcare, safe drinking water or proper housing, to an extent which compromises their survival (Leichenko and Silva, 2014). Relative poverty is about the standard of living defined in relation to the position of other people's income or expenditure distribution (Donkoh, 2010) or inequality among households or individuals, based on what is considered to be normal standard of living in a particular social context (Leichenko and Silva, 2014). For the purpose of this study, the absolute approach is adopted. The concept of absolute poverty is preferable for an absolute measure of incidence where a poverty benchmark is used to differentiate the poor from the non-poor (Alemu *et al*. 2011). Households are deemed poor if they subsist below the observable poverty line.

There are a number of approaches and indices to model the determinants of poverty, such as the Watts Poverty Index and the Sen-Shorroks-Thon Poverty Index. However, the three commonly used poverty measures are the headcount Index (HI), the poverty gap index (PG) and the Severity Index, known as the Foster Greer Thorbecke Index (FGT). The FGT poverty calculation indices are designed to capture the significant variance in the structure and dynamics of rural poverty measured by a multidimensional approach. Meaning the distribution of deprivation, inequality and the actual poverty profiles are not the same. The model has been used to quantify the determinants of poverty in Nigeria (Edoumiekumo *et al*. 2013), Ethiopia (Babu and Reda, 2015), Ghana (Havi, 2015), Pakistan (Jan *et al*. 2008) and South Africa (Baiyegunhi and Fraser, 2010). Its properties are sound and allow one to decompose poverty into three components and also across population subgroups in a coherent way (Foster *et al*. 2010). The appropriation of any method depends on the availability of data and the objective of the study.

This study adopted the Foster, Greer and Thorbecke (FGT) index, which is an approach of using an absolute measure to determine the incidence (headcount ratio), depth (poverty gap ratio) and the severity of poverty (squared poverty ratio gap) as follows:

$$P(\alpha) = \frac{1}{n}\sum_{i=1}^{q}[(z - y)/z]^{a} \qquad (1)$$

Where:

z is the poverty line,

q is the number of households below the poverty line,

n is the total sample size population and

α is the aversion parameter which takes the values of 0, 1 and 2 depending on the scale of poverty.

When $\alpha= 0$, this simply represents the proportion of the poor, referred to as headcount or poverty incidence. When $\alpha= 1$, this represents the average gap, the level of income necessary for a household to be able to reach the poverty threshold. When $\alpha= 2$, the result shows poverty severity or the squared poverty gap, which reflects the distribution of poverty amongst the poor and places greater weight on those furthest from the poverty line. The result implies that the overall statistical value of poverty can be expressed as the sum of the incidence ratio, the aggregate gap ratio and the ratio of inequality among the poor. This allows determining if increasing poverty is due to either more people becoming poor, or increasing deprivation of the poor, or because short-falls below the poverty line have become more unequal, or some combination of the above (Aristondo *et al.* 2008).

3.2.5 Modelling the probability of a household being poor

The poor are clustered in certain socioeconomic categories that include small-scale farmers, pastoralists, agricultural labourers, casual employees, female-headed households, unskilled workers, disabled and HIV/AIDS orphans (Moyib *et al.* 2017). Yet, there is no commonly accepted methodology for identifying the poor from the non-poor between social groups for the purpose of policy analysis. Virtually all measures of economic poverty identify households whose economic position fall below some minimally acceptable level, either in terms of 'economic resources' or minimum levels of well-being or basic needs (Haveman and Wolf 2004). The process of measuring poverty can be sub-divided into two distinct stages: 'identification stage', which involves distinguishing the poor from the non-poor and the second stage involves 'combining the data on the poor', by instituting the level of percentage of poverty in a particular area (Makhalima, 2016). This study is only concerned with the latter.

Depending with context, measuring poverty and welfare takes many variants and approaches, some researchers believe the poor have lower levels of consumption expenditure devoted to necessities, few stocks of assets, others embrace lower income, low education and constraints accessing health care. The 'economic welfare approach' allows the use of consumption expenditures including food and non-food, assets or income to measure poverty (Khai and Danh, 2012). Even though in conceptualizing poverty, low income or low consumption is its symptom (Olowa, 2012). Income is not an adequate measurement of welfare because many forms of deprivations the poor people experience are not captured by income poverty measures (Edoumiekumo *et al*. 2013), and they are difficulties in measuring income in developing countries (Achia *et al*. 2010). In other words, in rural economies where income is unpredictable because the livelihoods are seasonally volatile. Consumption becomes a very sensitive indicator to ignore. It reflects the living standard of the household and also the ability to fulfil basic needs (Myftaraj *et al.* 2014). In the rural context, consumption it's a broad term, it encompasses food and non-food needs. However, the rural poor are concerned with daily modalities of accessing food.

In developing countries where food insecurity is a proxy for consumption poverty, food is the first and the most important priority of any household (Rhoe *et al*. 2008; Prakash *et al.* 2012). The food share reflects many factors, other than overall household welfare, such as relative prices, fluctuations of income and household demographics (Appleton, 1996). To identify households whose per capita monthly expenditure on food fails to meet the socially determined household minimum level, the study uses the absolute food poverty line, not relative poverty line. Absolute poverty lines identify those subsisting below a certain fixed level of welfare, The lines are essentially about the resources needed to sustain the most primary level of well-being, for example, the World Bank uses USD 2 per day per person as the minimum absolute value an individual can sustain a healthy living. Relative poverty lines thrive to measure the inequality between the poor and non-poor in relation to the well-being of the society. Therefore, according to Zim Stats (2016), '*the lower bound*' of the Food Poverty Line (TPL) which provides for essential food consumption for one person in April 2016 was USD 31.00, (R 432.00) per month, necessary to ensure that each household member can consume a minimum food basket representing 2 100 calories a day for thirty days. Thus, all households with food expenditure per capita below the poverty line ($Y_i^* <$ USD 31.00) were deemed poor and those above the poverty line ($Y_i^* >$ USD 31.00) were categorised non-poor. To identify the determinants of poverty, a dichotomous dependent variable was computed indicating whether

the household was poor or not. The study considers that a household is poor (Y=1) if its monthly per capita household food consumption was less than USD 31.00 or non-poor (Y=0) if the food consumption shortfall was less than or equal to zero.

3.2.6 Analysis of determinants of poverty using binary logistic regression

Poverty reduction strategies is a key policy debate in the recent literature, to the extent that there is a need for studies aimed at identification of the determinants of poverty and assessing the impact of policies at welfare programs on the poor (Dudek and Lisicka, 2013). While the empirical studies on the determinants of poverty and welfare within specific settings are well established, there is scanty literature with reference to the appropriate or conventional factors that are likely to influence poverty and welfare situations at the household level (Bayise and Zwane, 2017). Potential explanatory variables of poverty can concern economic, demographic and human capital attributes of the household (Dudek and Lisicka 2013), for example, household possession of income, household size and education. Therefore, to achieve the objective of this paper, there is need to examine covariates of poverty using econometric models.

Literature suggests that Logistic regression models are commonly used to determine the probability of a household being poor. It allows one to predict a discrete outcome such as group membership from a set of explanatory variables that may be continuous, discrete, and dummy or a mixture of these (Ho, 2014). Usually, where the dependent variable is dichotomous, regardless the value of the exogenous variables, logit models expect endogenous variables to be in the intervals such as male /females, poor/non-poor, married /not married or food secure and food insecure, binary logit model should be applied. By dichotomous, it means the dependent variable takes any two modalities, (0 and 1). To examine the key determinants of poverty, this study has adopted binary logit model. A binary logistic regression model is considered to be the most appropriate model for econometric analysis (Garson, 2011; Prakash *et al.* 2012), and preferred probability model recommended mostly from mathematical point of view, as it is extremely flexible for interpreting binary response dependent variables (Feder *et al.* 1985; Molla, 2014). Where Y is a dummy variable, the model has to find the relationship between the probability (P_i), such that Y will take a 1 and the characteristics of considered households. Specification of the model is as follows:

$$Y_i* = X'_i\beta + U_i \qquad (2)$$

Where Y_i^* is the underlying latent variable that indexes the measure of poverty, u_i is the stochastic error term, and β is a column vector of parameters to be estimated.

Following Greene (1993; Bogale, 2005) and assuming that the cumulative distribution of u_i is logistic, a logit model is employed. In this case, the probability of a household being poor can be given by:

$$P(Y_i = 1) = \frac{exp\ (\dot{X}\beta)}{1 + exp\ (\dot{X}_i\beta)}$$

If we let X_{ik} be the *k*th element of the vector independent variable X_i, and β_k be the *k*th element of β, then the marginal effect of a particular independent variable, X_i, on the probability of the occurrence of the response is given by Maddala, (1993; Bogale, 2005)

$$\frac{\partial P(Y_i = 1)}{\partial_i} + \frac{exp(X'\beta)}{[1 + exp(X'\beta)]}\beta k$$

Unlike in linear models in which the marginal effects are constant, in the case of logit models, there is need to calculate them at different levels of the explanatory variables to get an idea of the range of variation of the resulting changes in the probabilities (Bogale, 2005).

3.3 Empirical results and discussion

3.3.1 Household demographics and socio-economic characteristics

The frequencies for the poor and non-poor based on this study is shown in Table 3.1. Majority of the households 70.3% were classified poor and 29.7% were non-poor. Poverty dynamics in the study were disaggregated into *household characteristics*, *resource endowment* and *welfare indicators (also see appendix 7 for socio economic demographics)*. At the household level, characteristics such as sex composition of household members, age structure, the gender of the household head and the extent of economic participation, all matter to poverty. Resource endowments consist of all tangible and non-tangible assets that households might possess; lack of access to, or ownership of key productive resources, deepen rural poverty. Standard of living can be proxied by measures of daily per capita calorie intake, household income, consumption coping strategies, consumption expenditure, level of education and housing. *The results of poverty dynamics are presented in Table 3.1 in their descending order starting with mean differences (t-test values), then followed by proportions (Chi-square test).*

Table 3. 1: Household poverty dynamics

Variable	Poor =211	Non-Poor=89	T-tests
Household size	9.61	5.78	13.83 ***
Dependency ratio	60.37	42.21	-8.24***
Education of HH head	5.23	9.24	-2.06***
Age of the household head	52.72	18.14	47.25
Value of household assets	448.00	2905.41	-7.43***
Total land size	3.27	2.27	0.26
Maize yield per hectare	43.42	91.91	-2.34***
TLU owned	7.43	16.34	-5.83***
Food consumption score	5.23	9.24	-6.22***
Coping strategy index	117.36	57.49	4.80***
Monthly household income	34.11	171.95	-8.37
Monthly HH per capita consumption expenditure	53.11	111.38	-20.82***
			(χ2 tests)
Farming households	0,74	0,26	2.230
Access to credit	0,55	0,45	5.361**
Access to extension	0,63	0, 37	6.509*
Access to external aid	0,77	0, 23	17.643***
Input subsidy	0.27	0.73	0.941
Females	0, 81	0, 19	6.869**
Married	0, 85	0,15	6.869***

Note: ***, ** and * means significant at 1%, 5% and 10% levels, respectively

Note: *Male, 0, 66 (non-poor), 0, 34(poor), Not married, 0, 65(non-poor), 0, 34(poor).*Source: Household survey (2016)

The results showed a statistically significant mean difference between the poor and non-poor on household size and dependency ratio at 1% confidence level (p>0.08). Poor households have bigger family sizes, meaning higher dependency ratio as compared to non-poor households. The association between a bigger household size, poverty incidence, and vulnerability to poverty is strong and enduring (Orberta, 2005). A household as an economic

unit is made up of individuals with distinct characteristics such as age, health status, economic status etc., this eventually defines the economic activity of a particular household. This means a household is more likely to be poor if its composition is made of dependencies, (old, sick and young) meaning more resources are needed to cater for those who are not economically active. As the dependency ratio increases, so are the incidence of poverty. The high dependency ratio is negatively correlated to standard of living, especially in rural areas where livelihood options are limited in a poor country like Zimbabwe. The bigger the household composition, the greater the level of poverty and the lower the standard of living. Typical composition of dependency ratios in rural areas are orphaned young grandchildren looked after by aging grandparents as a result of HIV/AIDS pandemic. Experiencing high young age dependency ratios means more resources are needed from governments and other organisations to provide social protection services. In countries like Zimbabwe, social protection does not exist, the poor and vulnerable turn to social capital for short-term survival. However, the dependency ratio in this study was structural; unemployed young adults were providing food, education, and health for the sick, but at least acquired a tertiary qualification or training.

On poverty reduction, the effects of education not only depends on the number of years exposed to the school system, but also the relevance and quality of the education received. Even though not statistically significant, there was a mean age difference between the household heads of the poor and non-poor households. Rural households often become more vulnerable to poverty with the increase in the age of the household head. This implies that in poor households, as the head of the household grow older, the more unproductive they became and the more vulnerable to poverty they become. This is of an increase in the number of dependencies, low asset endowment and rare propensity for adopting improved skills and technology.

3.3.2 Household Asset endowment and productivity

Poor households have significantly lower mean asset value than non-poor households. The value is the sum of both productive and durable assets, including household accessories. These findings are similar to a rural study conducted in Bangladesh. The average value of assets for non-poor households was fourteen times higher than in poor households, three times higher than descending non-poor and four times ascending poor households (Rahman *et al*. 2009). This implies that assets can smoothen consumption during unexpected shocks, by easily converting them into income. Thus, assets can potentially act as "safety-nets" when households' income streams are interrupted (Carter and Barrett, 2006; Mayanga *et al*. 2012). This means poverty is not only about lack of consumption or income but it also abstract from

poor asset endowment. In other words, the rural poor rely on natural resources, which are "freely owned", but hold relatively few "private" liquid assets to invest for the future.

Poor households have a lower maize productivity output than non-poor households. This means they remain trapped in food insecurity if they fail to produce enough staple food for household consumption. Even though other major cash and food crops such as tobacco, cotton beans, and groundnuts are grown in the study area, maize is one of the most important and non-substitute staple food and also grown as a cash crop for the local market in Zimbabwe. Its availability significantly reduce food poverty to any household in the study area. In the context of subsistence farming, own production is not only constrained by rainfall variability, but they are multiple interlinked factors in which the resource-poor do not have control over. They are often confronted by the high cost of inputs, poor quality of land, crop diseases, labour deficits and lack of draught power.

 Rural households keep livestock across various levels of income in the form of cattle, sheep, goats, pigs and donkeys, which are raised free in local pastures, but on the other hand, poultry ownership is universal and constitutes the bulk of livestock asset holdings in rural areas of developing countries. Analyses of the livestock-poverty linkages are essential, one would expect poor households to keep smaller herds or flocks than well-off households (Pica-Ciamarra *et al.* 2011). Similarly, in this study, there is a statistical mean difference (p<0.01), the average number of Livestock Units owned by poor households was 7.43 Total Livestock Units (TLU) as compared to non-poor households who owned 16.34 TLU. Livestock ownership makes an extensive contribution to their livelihood security of poor households, in a number of ways; agricultural production, the source of income generation, improves household consumption, and are a way of increasing assets and diversify from risks (Maltsoglon and Taniguchi, 2004). The inability of the poor in this study to acquire more livestock assets could have been constrained by income and high maintenance costs, especially on ruminants.

3.3.3 Welfare indicators

Monthly consumption expenditure is a function of household income which determines the landscape of consumption patterns. In this study, the non-poor have a higher mean average total monthly income of USD 171.95 as compared to USD 34.11 of the poor households. The level of income indicates the ability or the inability of a household to consume food, meet contingencies and support a particular standard of living. The statistical mean difference between the poor and non-poor in relation to total household consumption expenditure per

capita per month (p<0.01) was a result of income at hand. On average, the non-poor were spending USD 111.38 per month on both food and non-food amenities as compared to USD 53.11, for the poor with a significant proportion spent only on food. The variation in expenditure clearly shows that well-up households are resourceful to meets their consumptions needs as compared to poor households. This is because the issue of food consumption and expenditure is of relative importance in developing countries because food expenditure accounts for a larger share of what depletes household income on a regular basis (Obayelu *et al.* 2009; Olubukunmi *et al.* 2016). The results show that the rural poor lack the minimal resources required to afford a minimum socially acceptable standard of living. Remittances as an adaptive capacity have the potential to increase per capita income as well as improving household consumption and expenditure.

Rural households especially those in villages use short and long-term consumption coping mechanisms, depending on the magnitude of the duration, severity of food insecurity and asset endowments at the disposition of households. The more distress coping means applied the poorer the household is regarded because some coping strategies are harmful to human health and future livelihood prospects. The results indicate that the poor have applied significantly higher coping means than the non-poor, with an average statistical (p<0.01) mean difference of 117.36 and 57.49 scores respectively. In a study in Zimbabwe, Busse (2006) found out that in order to protect themselves against shocks and risks, poor households develop and implement more coping strategies such as disposing of assets. As would be expected, the poor were less able to cope with shocks as compared with the non-poor who could lean on their resources to smoothen consumption. Hence, the poor were more likely to use coping mechanisms that were more damaging in the long run like selling assets.

3.3.4 Access to Services

The results of the study revealed that rural household access to credit is significantly lower amongst both the poor and non-poor (p<0.05). This means access to credit is a concern in rural areas, as only 12.3% of households in this study had access to credit or loans. This might be because the poor lack the relevant collateral security, credible payment plans, and skills that are required to manage credit facilities. Access to credit gives the household the potential to smooth consumption in a time of shocks and the possibility of being involved in income-generating activities.

There is a statistical difference between the poor and non-poor households in relation to access to agricultural extension services (p<0.1). About 63 % of the poor had access to the services as

compared to the 37 percent of the non-poor. These extension services can enable rural households to take up innovative skills, improve production, and protect the environment. However, in this study, the link between the poor and low food crop production, total livestock owned, might be primarily of drought not the ineffectiveness of extension services, even though an interplay of other factors such as land degradation, lack of certified seeds and fertilizers are considered important. Interestingly, the reason why fewer non-poor households have solicited extension services is likely because of livelihood diversification into other portfolios.

Marital status adds value to the landscape of household poverty. There is a statistical difference between the poor and non-poor relative to marital status (p<0.01). About 84.6 % of the poor were married heads of the households as compared to 15.4% of the non-poor. As expected, 65.3% of the poor were not married as compared to 34.7% of the non-poor. In other words, the results indicate that more married couples were non-poor compared to unmarried ones, but in terms of income and accumulation of assets, the married couples had few of such resources. This implies that the incidence of rural poverty differed with marital status. This finding is consistent with a study by Peterman (2012), in fifteen sub-Saharan countries, he found out that unmarried women enjoy higher welfare outcomes in terms of income and the value of household stocks.

Aggregate measures of poverty often overlook inequalities in the distribution of poverty among rural population sub-groups. This study revealed there was a statistical difference between the poor and non-poor in relation to the gender of the household head (p<0.05). To understand how gender shapes activities that influence poverty, it is necessary to examine, access to and control over key assets and authority to make decisions about resources and incomes between man and woman. About 80.6% female-headed households were poor as compared to 19.4% non-poor female headed. Typically, female-headed households have limited access to and rights over resources like the land they can utilise to improve their livelihoods. Hypothetically, male-headed households have better welfare than female-headed households. Nevertheless, in this study, poverty incidence in rural male-headed households might be because of lower levels of education, poor economic performance, and lower agricultural productivity because of drought.

As expected, there was a statistically significant difference between the poor and non-poor in relation to access to external aid (p<0.01). The external aid was in the form of monthly food aid, food for work and cash transfer to senior citizens from the government, donor community

and the Non-Governmental Organisations (NGOs). About 76.8 % poor households had access to external aid as compared to only 23.2% non-poor households. When it comes to external aid rationing, priority is given to poor households as safety nets, as non-poor households are deemed resourceful to fend themselves. External aid has been an important mechanism by which vulnerable households can bridge welfare gaps. It can significantly reduce poverty and improve well-being, by directly meeting the basic needs of the poor, for example, the provision of social safety nets for longer-term purposes and food aid for short-term consumption purposes. However, there was no statistical significant difference between the poor and non-poor households on access to water, occupation and access to input subsidy.

3.3.5 Assessment of the dimensions of Poverty

The measure of poverty involves the specification of income or consumption expenditure threshold level below which a household or individual is considered poor. In this study, monthly food expenditure of USD 31.00 was considered a household absolute poverty level. This means households that were unable to mobilise at least USD 31.00 of financial resources a month to meet their consumption needs remained relatively poor. The extent of household poverty across three wards in Rushinga district is estimated using the FGT poverty indices (*as described in section 3.2.4*). The FGT class of poverty measure, which is disaggregated by groups and sensitive to the incidence, depth, and severity of poverty within the poor, is used to calculate the dimensions rural poverty in the District. The use of FGT class measures assumes that dimensions of well-being, like income or consumption, are cardinally measurable and comparable across persons (Bennetta and Hatzimasoura, 2012).

The poverty incidence ($\alpha=0$), poverty depth ($\alpha=1$) and poverty severity ($\alpha=2$), as illustrated in Figure 3.3. These indices reflect not only the intensity but also understood the severity of poverty. The results indicate that overall, 70.3 % of the households in the study area were poor. The percentage of poor households measured in absolute headcount varies between the district, Ward 12 having the highest (88%), compared to Ward 9 (68%) and Ward 14 the lowest (53%). This means about 88% of the households in Ward 12, 68% of the households in Ward 9 and 53 % of the households in Ward 14 were found to subsist below their respective food poverty lines. These overall proportions of the sampled households in Rushinga District who were living below absolute food poverty line were 70 %. The incidence of rural poverty results from limited economic opportunities, poor education and households that remain trapped in unproductive subsistence agriculture as well as disadvantages rooted in social, cultural and political inequalities (IFAD, 2010). However, the incidence of poverty is one aspect of poverty (Delamonica and Minujin, 2007), not enough to explain household food expenditure

distribution among the poor households. Unlike the headcount, the poverty gap measure allows the estimation of the proportional deficit of poverty. In this case, it measured the average distance between the food expenditure of the poor and the poverty threshold; concurrently reflecting both the depth and shortfall as well as the incidence. A substantial decrease in the poverty gap indicates that the average distance of the poor from the poverty line has dropped and a decline in poverty severity indicates that the distribution of consumption among the poor has become more equitable (Rahman, 2012).
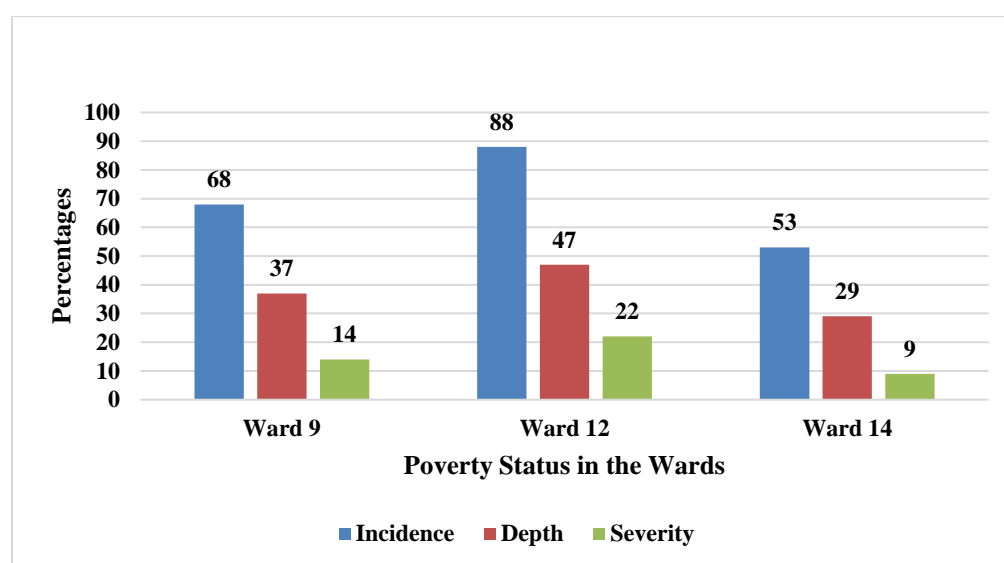
Figure 3.4: Household poverty dimensions

In the context of designing poverty reduction initiatives, it is important to know, not only the number of poor households but also the degree of their poverty. The poverty gap indices simultaneously measure the incidence and depth of poverty. On mean aggregate consumption shortfall relative to the poverty line, it was high across the entire sample, 0.37 in Ward 9, 0.47 in Ward 12 and 0.29 in Ward 14. The poverty gap is also interpreted as an indicator of the potential for eliminating poverty by targeting transfers to bridge the purchasing power deficit. The minimum costs of eradicating food poverty using targeted transfers become the sum of all the poverty gaps in the district, the poverty gap is filled up to the poverty line (Ravillion, 1992; Sekhamph, 2013). This means the percentage of food consumption resources needed to bring the entire population equilibrium to the food poverty line is 37% in Ward 9, 47% in Ward 12 and 29% in Ward 14. Putting it differently, if the three Wards mobilised resources that meet the caloric needs of 62 % of the poor households, then theoretically food poverty can be eliminated. Using the lower bound poverty line, on average poor households have consumption

deficit of 62 % off the poverty line. The depth of poverty in rural areas is primarily because of income variability from seasonal agricultural livelihoods, which are quite sensitive to frequent environmental inconsistency. In other words, purchasing power is a concern to many low income households, leaving the poor, with minimal or no options on how to acquire food.

The poverty gap measure captures the depth of poverty or poverty deficit in the entire study area, but cannot capture the sensitivity of poverty severity. The severity of poverty (the squared poverty gap, $\alpha=2$) is a sensitive measure that puts more weight on the distribution of consumption expenditure of poorest households that tumbles way below the poverty line. The results show that 14% of households in Ward 9, 22% in Ward 12 and 9% in Ward 14 had fallen deeper below the poverty threshold line. The severity followed the same pattern observed in incidence and depth, the greater the incidence, the higher the depth, so is the severity. On aggregate, the rate of inequality among the poor themselves in the district was 15%. In other words, the severity indices only thrive to measure the gravity of inequality, which is the total average of the squared gap found in the three Wards. This means there is severe inequality among poor households in the study area (Table 3.3).

Furthermore, the intensity of poverty was geographically concentrated, more pronounced in Ward 12 than in Ward 9 and 14. This shows the existence of "geographical poverty traps" resulting from a number of factors; less favourable agricultural land, accessibility of the place and terrain. Meaning a household's consumption level cannot rise over time, while other households within the same environment enjoy a rising standard of living (Jahan and Ravallion, 2002). However, the reasons for lower poverty concentration in Ward 9 and 14 stemmed from hidden indicators which need further interrogation in future studies, because these poor households uniformly derive their livelihoods from agriculture and shock like drought proportionally affected them. The variation in poverty concentration could be attributed to the efficacy of social capital, some households adapt quickly to socio-economic changes faster than others. The rural economy as a social entity has some benefits which cannot be measured in monitory value; they use 'social capital', especially the quality of leadership, administration and networking of relevant information. Consequently, inequality distribution among the poorest was too high in Ward 12, to the extent that all dimensions of social capital could not be utilised among the poor themselves to acquire food. The microeconomics of poverty should be debated around high inequality and resource distribution factor. If resources are equally shared or distributed among the non-poor and the poorest, poverty can be alleviated.

3.3.6 Determinants of Rural Household Poverty

Although poverty is measured as lack of adequate income to access minimum basic needs, it is a pronounced deprivation in well-being determined by both income and non-income components of the economy (Meena *et al.* 2012). A binary logistic model was applied to determine the probability of a household being poor (P(Y=1)), as illustrated in table 3.2 The results indicated that, collectively, all estimated coefficients are statistically significant in influencing poverty since the Wald χ^2 has a p-value (0.001) of less than 1%, suggesting the model has strong explanatory power. The pseudo R^2 value is about 55% which is high for cross-sectional data. The highly significant likelihood ratio chi-square (LR) value (-82.17) suggests that the model was well-fitting and correctly predicted about 55% of the cases, indicating the model fits the data well. The variables used in the model had a low average variance inflation factor (VIF) of less than 10 with an average mean of 1.63 (*see appendix 6*), indicating there was a low degree of multi-collinearity among explanatory variables. The results are simultaneously explained by variable coefficients and marginal effects. The marginal effects normally produce a reasonable approximation of the change in the probability of being poor or non-poor at a point, such as the mean of the exogenous variables (Bogale *et al*. 2005), when other variables are held constant at their mean values.

The geographical location of the three Wards has statistical significance to household poverty with a p-value less than 1%. The results indicate that households in Ward 12 had a positive statistical relationship with poverty (p<0.01), as compared to Ward 9 (p<0.01) and Ward 14 (p<0.01) which are both negatively related to poverty. This implies that, in Ward 12, the chances of being poor are increased by 18% if poverty reduction strategies are not taken in time. This explicitly means that poverty is not evenly distributed across the District, in an area with homogenous landscape pattern, natural and socioeconomic endowments, but a spatial distribution of geographical poverty traps. The result is not only unique in Zimbabwe, (Jalan and Ravallion, 2002) other examples are northern India, eastern Island of Indonesia, northern Bangladesh, northern Nigeria, southeast Mexico and northern Brazil. Geographical poverty traps may occur because of agricultural production on less favourable land subject to low yields, soil degradation, lack of access to markets and infrastructure that may constrain the ability of poor households to pursue their livelihood objectives (Barbier and Hochard, 2014). Surprisingly, Ward 12 is close to Rushinga Growth Point as compared to the other two wards, which gives it a comparative advantage for economic activities.

Table 3.2: Socio-economic determinants of rural poverty: Binary Logit results

Variable	Coefficient		Marginal Effects	
	Value	SE	Value	SE
Ward 9	-0.673***	0.232	-0.076***	0.028
Ward 12	1.910***	0.620	0.181***	0.048
Ward 14	-1.956***	0.510	-0.283***	0.092
Age	-0.020	-0.017	-0.002	0.002
Gender	1.194	1.898	0.161	0.143
Marital status	-2.100**	0.965	-0.175**	0.066
Dependency ratio	0.046***	1.012	0.005***	0.001
Education	-0.063	0.083	0.007	0.010
Farming occupation	-0.528	0.529	-0.060	0.060
Total monthly per capita income	-1.263***	0.322	-0.143***	0.040
Asset value	-2.446***	0.570	-0.277***	0.073
Total land utilised	-0.117	0.171	-0.013	0.020
Livestock hold in TLU	-0.137*	0.082	-0.016*	0.010
Access to credit	0.443	0.844	0.044	0.073
Coping strategy index	-0.191	0.405	-0.010	0.046
Access to Extension	-1.684***	0.525	-0.206***	0.071
Maize yield per hectare	-0.493*	0.270	-0.056*	0.030
External Aid	0.184	0.642	0.022	0.078
Input subsidy	0.550	0.491	0.062	0.054
Number of chronically Ill	0.455	0.391	0.052	0.045
Constant	2.258***	1.489		
Wald $\chi^2(20)$	98.60***			
Correctly predicted	54.68			
Pseudo R^2	0.5468			

Note: ***, ** and * means significant at 1%, 5% and 10% levels, respectively. **Source:** Household survey (2016)

In contrast, a slight improvement in the standard of living of households in Ward 9 and 14, have a 7% and 28% likelihood of them being non-poor. The major contributor to this state of affairs could be temporal economic opportunities brought in by the Ward councillors,

development agencies or Non-Governmental Organisations improving livelihoods in selected areas. This means more resources are required in Ward 12 to bring the poor households out of poverty than in Ward 9 and 14.

The coefficients of marital status have a negative correlation with poverty (p<0.05). If the head of the household is married, the likelihood of being poor decreases by 17%. This finding is consistent with (Heshmati, 2016), who confirms marital status as a major determinant of rural poverty. In this study, marriage has a significant effect on reducing the risk of rural poverty. Marital status of the household head reflects the merits linked to the role of spouses in pooling resources together in terms of household possessions and amenities to provide household sustenance (Mberu, *et al.* 2014). Marriage has an economic incentive of increment of on and off-farm labour. The economies of scale of consumption suggest that a married couple can achieve the same utility with less combined expenditure than the sum of their individual consumption if living apart (Anyanwu, 2013). In most cases, they have a higher probability of attaining wealth over their life course when compared to not being married (Grinstein-Weiss *et al.* 2006).

Dependency ratio, which reflects the proportion of household dependent members, is statistically significant and positively related to poverty (p<0.01), thus fulfilling the study *a priori* expectations. The dependency ratio is a proxy for household size; it increases for several reasons, likely having fewer members involved in economic opportunities, fostering grandchildren or orphans and limited resources. This implies that an increase in dependency depletes household living resources for catering for each dependent in the household. Holding other explanatory variables constant, the coefficients in this study indicates that as the household dependency ratio increases by 1%, the probability of a household being poor also increase by 5% (Table 3.2). Similar results by (Etimu and Udoh, 2013; Demissie and Kasie, 2017; Borko, 2017), indicate that a larger household size in poor households increases their vulnerability to poverty, as it could be associated with an increase consumption variance. However, the results only highlight that dependency ratio determines the probability of poverty incidence, not its depth and severity which are also important for policy consideration.

Household income as expected and agricultural livelihood activities contribute the largest share and have a negative statistical relationship with poverty (p<0.01). This means a unit increase of household income by a USD1, increases the probability of the household being non-poor by 14%. Income is the core indicator of any dimension of poverty as there is a strong correlation

between income and inequality. Thus, to increase income or bridge the inequality, rural households should consider other non-farming and off-farm livelihood portfolios as a potential supplement of conventional agricultural livelihoods. But firstly, there is need of information on how livelihood strategies between the poor and non-poor vary, in order to reduce income poverty. Livelihood diversification has become a useful technique for rural households to smooth their income and maintain a sustainable way of consumption (Xu, 2017). For example, households that derive income solely from rain-fed agricultural activities may be more vulnerable to droughts than households with a more diversified income portfolio that includes both farm and nonfarm portfolios (Lazarus, 2013). Rural households may diversify their income, by keeping different kinds of animals, growing different crops, participate in different natural resource-related activities and off-farm survival mechanisms with low entry constraints.

As expected, ownership of key livelihood assets such as agricultural implements, showed strong positive effects on the probability of households being non-poor ($p<0.01$). Singh *et al., (*2012*)* in their investigation of the determinants of rural poverty got similar results. Asset accumulation has been identified as the cause of social welfare improvement and poverty reduction initiatives. Since assets are key components for constructing livelihood strategies. For instance, a unit increase in value of household assets increased the probability of a household being non-poor by 27% (Table 3.2). This implies access to key assets could help poor households to overcome consumption shocks, as they can strategically deploy them in response to the challenge. Asset-holdings are considered to be a more stable indicator of the current welfare and future non-vulnerability especially in regions where households rely greatly on their physical assets for their livelihoods (Krishna *et al.* 2004; Barrettt and Swallow, 2006; Carter and Barrettt, 2006; Cooper, 2008; Muyanga *et al.* 2012). However, considering the persistent levels of poverty recorded in this study, significant questions; as to whether households were benefiting from their accumulation of asset endowments to successfully exit poverty need to be asked.

The role of both '*demand* and *supply driven*' extension services in improving rural livelihoods, promoting agricultural productivity, increasing food security, and reducing poverty in in Sub-Saharan Africa in gaining attention from rural developing stakeholders. Extension has the potential to reduce poverty if integrated into a broader policy context where the services tackle livelihood vulnerability, production efficiency and offer a range of innovations from which poor households can choose depending on their circumstances (Farrington *et al.* 2002). As

expected, extension facilities had a significant negative relationship to household poverty (p<0.01). Other factors being held constant, the value of the estimated coefficient indicates that the probability of being non-poor increases by 20% if a household had access to a single extension advice. The results are consistent to Owens *et al.,* (2003), they reported that access to agricultural extension services in Zimbabwe, in the form of receiving one or two visits per agricultural season, improved household crop production by approximately 15%. Also, Cunguara (2011), in rural Mozambique found out that a single receipt of extension increases household income by 12%. This suggests households with regular interaction with extension agents, by means of training or technology transfers, improve their production capacity and standard of living to greater levels. However, according to Wossen *et al.,* (2017), the impact of extension services on poverty reduction is systematically stronger for households with access to loans or credit, this gives them the capability to increase production than those without access. This means for the sake of productivity, extension services have to go hand in hand with access to credit.

Maize yield, the most important food crop grown in Zimbabwe is negatively related to poverty (p<0.07), which indicates that it was a weaker factor to hypothesise its efficiency in influencing household poverty status because maize yield in many households had failed due to erratic rainfall. Maize accounts 88% of course grain production in Zimbabwe (Valdes and Muir-Leresche, 1993), providing about one-third of the total daily calorie intake in Zimbabwe (Hachingonta *et al*. 2013). Stimulating agricultural growth through uplifting the capacity of small-scale or subsistence maize yields would potentially lead to poverty reduction and eventually enhancing food security. The value of the estimated coefficient indicates that a unit increase of maize yield per hectare decreases the likelihood of being poor by 5%. A study by Kassie *et al.,* (2014) in Malawi, Zambia and Mozambique revealed that livelihoods of poor in the rural districts surveyed were heavily dependent on maize production, to the extent that the quantity and quality of resources used for maize production determine the extent of household poverty. Also, results presented by Fischer and Hajdu (2015) in their study in South Africa, noted that a rise in maize yield would result in household poverty decline. Similarly, Benson *et al.,* (2014), in their welfare research across three cereals in Ethiopia, indicated that increased maize output has the greatest impact of reducing the incidence of poverty in rural areas. This implies that rural poverty to a certain extent is the result of impoverished livelihoods based on low maize productivity since its availability equates livelihood security. Thus, the potential for

poverty reduction can possibly depend on the extent at which maize yield is increased in the rural agrarian economy.

3.4 Summary

Household poverty in rural Zimbabwe is pervasive and deeply rooted. Given that 70.3% of the sample were classified poor and only 29.7% were non-poor shows that the extent of rural poverty is a serious case which warrants interventions. The level and scale of poverty are directly related to lack of key endowments such as productive assets to improve the livelihoods of the poor. Therefore, livelihood building interventions and resilience mechanisms are needed in rural areas to enhance livelihood security. Results from descriptive statistics indicated that poverty was correlated with multiple levels of social economic parameters; namely *household structure, level of education, age, asset endowment, production, livestock ownership, production, consumption score, coping means, consumption expenditure, gender and marital status*. This means poverty status differs in distinct ways, so proper understanding of the varying nature of poverty is critical when formulating poverty alleviation strategies at a micro level analysis. Geographic location and dependency ratio was positive determinants of poverty in the study, meaning improving rural household welfare requires a comprehensive approach given the multi-dimensional nature of poverty. Comparatively high poverty incidence, gap, and severity were observed in marginalised villages, meaning the level of geographical economic development has bearing on household poverty status. This calls for the strengthening of livelihood support institutions in relegated rural communities which face exclusion from participation in economic activities. Since dependency ratio causes vulnerability to food shortages and diminishes the household standard of living, family planning and health education should be prioritised through local level institutions. Marital status, total monthly income per capita, asset value, access to extension services and maize yield per hectare were negatively correlated with the probability of being poor. Extension services reduce poverty by providing a link between the transfer of improved agricultural technologies, research and dispensing of information at household level. The proliferation of non-farming portfolios, has increased productive assets holding, and improved maize yield, which lead to improved household welfare. However, there is need to find ways of improving maize yield production, such as increasing input subsidies in the villages seized with high poverty incidence.

CHAPTER 4: QUANTIFYING THE DETERMINANTS AND MAGNITUDE OF RURAL HOUSEHOLD FOOD INSECURITY IN RUSHINGA DISTRICT, ZIMBABWE.

Abstract

In examining the extent of household food insecurity, there is need to answer critical questions; how food insecure are the rural poor and what determines food security at micro-level analysis? Despite comprehensive approaches to combat the challenges of food insecurity in Zimbabwe, the problem is structural, pervasive and an interplay of multiple contextual factors. Therefore, this study endeavoured to identify household determinants and dimensions of food insecurity, in order to design appropriate, feasible and effective strategies and also coping and adaptive capabilities within their livelihood approaches. To achieve these objectives, multiple sampling procedures were used to randomly select 300 households in three distinct wards. The study applied the Foster Greer and Thorbecke (FGT) quantitative poverty indices, which is also compatible to examine the incidence, depth, and severity of food insecurity. The overall results demonstrated that the concentration of food insecurity was relatively high among female-headed households. The absolute cause was inequitable control and access to key productive resources to enhance their livelihoods. This is an indication that household level food insecurity has to be critically and adequately targeted on gender dynamics. A binary logit model was used to estimate the determinants of household food security. Household daily calorie availability per adult equivalence was adopted as the dependent variable to measure food security. The regression results showed that dependency ratio, per capita monthly income, the value of assets, total livestock units and maize yield per hectare were significant determinants of rural household food security. Hence, interventions aimed at improving rural food consumption has to focus on household demographic characteristics, livelihood diversification, own production and acquiring key resources.

Keywords: Food insecurity, Livelihoods, FGT, Logistic regression, Coping strategies

4.1 Background: Rural food security in local livelihoods

Globally, people face risks and vulnerabilities, but the poor, especially households in rural areas, who depend on agriculture and tropical ecologies for survival face consumption difficulties than others (Deressa, 2013). The constraints can easily be described as livelihood problems, lack of economic resources, intertwined with other factors; principally, external factors such as inadequate access to quality land, climate variability, land degradation, global food prices and macroeconomic instability. The way food security is theorised, measured and analysed affects the typology of policies that will be adopted (Burchi and Muro, 2016). Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life (FAO, 2003). The concept should not be treated in isolation of the wider livelihood consideration. Also conceptualised as the success of livelihoods to guarantee access to sufficient food at the household level (FAO, 2010; Moyo 2010; Moyo 2011; Lunga and Musarurwa, 2015). The concept of food security is anchored around the four important dimensions, in orderly of significance; availability, access, the stability of availability and accessibility and utilisation of food for a healthy living. A failure of one pillar has the potential to render households food insecure considering the way they are connected to each other. Even though all the dimensions are believed to be equally important, *availability* and *access* are fundamental benchmarks of household food security to low income households. However, food security is multifactorial that availability does not guarantee accessibility and vice versa. Availability deals with food production, supplies, distribution and storage stocks whereas accessibility is not only influenced by the availability of food, it also factors purchasing power, food prices, the capacity to import and access to resources that allow a household to meet its income and consumption needs. In Zimbabwe, rural food security can be conceptualised in different terms, such as the adequate production of both cash and food crops (i.e, maize, the country's staple food), equal participation in markets, availability of sufficient grain in stocks, consumption of nutritional food and ownership of endowments.

In contrast, food insecurity is when food is not available or cannot be accessed with certainty in terms of quality, quantity, safety and in culturally accepted ways (Gupta *et al*. 2015; UN, 1991). Within the poverty definitions and paradigms, food insecurity is often treated as either a characteristic or an outcome of poverty (Barrett, 2010; McCordic, 2016). It occurs, either chronically or transitory, gauged by its impact on people's ability to feed themselves in the short or long-term and its impact on livelihoods and self-sufficiency (Young *et al.,* 2001).

Chronic food insecurity reflects a long-term lack of access to adequate food, and is typically associated with structural problems whilst transitory food insecurity, by contrast, is sudden and temporal disruptions in availability, access or less commonly, utilisation (Barrett and Lentz, 2009). In simpler terms, food insecurity at household level should be clearly understood as a problem of food availability means, which lead to access constraints, leading to overall consumption deficits.

In livelihood analysis, food insecurity can be described as a possible outcome of entitlement failure, livelihood failure, food availability decline and access blockade. San's entitlement approach is another dimension of livelihood approach. He believes every individual or household is endowed with a bundle of resources or income, which he or she can exchange for food and other goods and services (Kakwani and Son, 2016). If the entitlement set does not include adequate quantities of food, it implies food insecurity since an entitlement failure has occurred (Yaro, 2004). Despite the availability of food, the rural poor and other vulnerable groups become food insecure as they cannot access adequate food because they lack appropriate entitlements. Household idiosyncratic or covariate shocks or a combination of both, cause entitlement failure, for example, sickness and food price spikes. The entitlement approach allows future deprivations to be predicted for example a smaller number of assets means that a household may have problems accessing enough food in the future (Burchi and Muro, 2016).

Rural livelihood failure is aggravated by a high incidence of poverty, which translates at the household level into low purchasing power and lack of access to food by the poor and vulnerable groups (Zakari *et al.* 2014). Food insecurity is determined by the interactions within and between livelihoods; which is the vulnerability context which the rural poor do not have control over. The dimension of food insecurity has two components, a household food insecurity as a result of shocks and its ability to cope with the shocks (WFP, 2006).The argument for this manuscript stems from the premise that the poor lack relevant endowments to pursue sustainable livelihood outcomes. Furthermore, rural economies in SSA are natural resource-based and easily be susceptible to environmental shocks. Agricultural shocks are a source of livelihood failure because volatility in rainfall patterns directly translates into crop failure and food insecurity. Household vulnerability to food insecurity in Zimbabwe is a manifestation of chronic poverty, inappropriate economic policies, physical and natural constraints compounded by the problem of HIV/AIDS as well as repeated livelihood shocks which have been mostly weather-related (Jayne *et al.,* 2006).

The context of vulnerability to food insecurity is changing across different regions of the world, but it still remains a rural and agriculturally phenomenon in developing countries (Bogale, 2012). If rural livelihoods are agricultural centred and depend on access to land and allied resources; (Yaro, 2004), the mode of production and structure of an economy is very relevant in determining whether agricultural growth has a direct bearing on the food needs of the population. The decline of availability constrains food supplies, distribution and production as causes of food insecurity. Even though Zimbabwe has great agricultural potential, low food production is trapped in subsistence levels, dry land rain fed, weak support institutions, lack of equipment, a high cost of inputs, recurrent droughts and emerging pests and diseases under climate change. Additionally, rural livelihoods, in particular, own production, is increasingly vulnerable to chronic diseases, in particular, HIV/AIDS. The major impacts of HIV/AIDS include depletion of the economically prime human resources, diversion of farm and non-farm income, productive time and labour is diverted to care for the chronically ill and other psychosocial impacts that affect production negatively (De Klerk *et at.* 2004; Abadalla 2007). Obstacles to food access result from a number of factors, i.e. declining remittances, macroeconomic instability and economic sanctions. The combination of poverty and high food prices are major drivers of access constraints, which directly translates to food insecurity (WFP, 2014; WFP, 2015).

Most of the existing studies that assess household food insecurity in developing countries fail to capture the incidence, depth, severity, and determinants in a cumulative way. Cross sectional data would analyse a cumulative effect of incidence, depth and severity of food insecurity. Against this backdrop, this paper aims to supplement existing information by examining the structural dimensions, and determinants of food insecurity on the socio-economic welfare of the rural poor in Zimbabwe. This can aid policymakers to formulate remedies targeting at reducing the persistence of hunger in rural areas.

4.2 Research methodology

4.2.1 Data

A total of 300 households were randomly selected for a multiple-stage sampling procedure, from the three distinct Wards in Rushinga Rural District of Mashonaland Central province, Zimbabwe. The household level data was collected using a structured questionnaire, which contained several components. The survey questionnaire captured the basic household demographics and socio-economic characteristics of the household, such as support services

available and resource endowment (e.g., assets, land and, livestock), agricultural production activities, and household income amounts and sources and crop production. The study chooses these variables as potential factors responsible for food insecurity. Most importantly the survey captured food consumption balance sheets, which were used as the threshold to measure household food security. Households were asked to recall a food consumption balance sheet for a period of twenty-four hours. Caloric intake per adult equivalence matrix was applied for each household before comparing to the threshold of 2100 kcal. The method was an appropriate way to explore the complex and multi-dimensional nature of food insecurity. The severity of food insecurity was also determined by the frequencies consumption coping means used.

4.3.2 The conceptual framework of rural micro level Food Security

Food security and livelihood approaches share many mutual features that point to strong conceptual connections and at the same time differentiate these concepts from narrower notions such as income and consumption poverty (Oni and Fashogbon, 2014). Conceptual analysis of food security draws on, not only a comprehensive understanding of rural food insecurity but also the livelihood vulnerability in the study area, as illustrated in Figure 4.1.

As diagrammatically illustrated in Figure 4.1, food security is a multi-dimensional phenomenon that reflects a multifaceted interface of multiple factors including ecological, institutional, socio-economic, biophysical, political and policy environment of the rural livelihoods (Misselhorn, 2005, Altman et al. 2009; Connolly-Bantin and Smith 2015). A combination of primary crop production, livestock nurturing, casual labour, remittances and extraction of natural resources form the basis of rural livelihood strategies. These livelihoods are susceptible to long and short-term shocks and risks, particularly climatic variability, institutional deficiency, epidemics and economic turbulence. The capacity to cope with and adapt to livelihood vulnerability is different, depending on available resources to match or offset the risks and shocks. The rural majority lack the requisite buffers to cope, even with predictable, moderate and repeated shocks and risks. This implies the livelihood security of the households to achieve food security to a larger extent is a function of sufficient and viable access to key production resources like land, infrastructure, machinery or transport to meet basic needs. Understanding these shocks, stresses and risks and their consequences are critical in identifying and modelling appropriate local level livelihood coping and adaptive strategies (Figure 3.1). The level or unit of food security analysis is critical. Most livelihood analyses take the household as an essential economic unit for food security analysis, as it is feasible to quantify food insecurity experienced by people identified by a single unit than at community

level (Levine, 2014). The household level offers some distinctive advantage over larger units of analysis, especially in the rural areas where households are the primary units of production, consumption and entitlement exchange (Joshi, 2011).This study considers micro level as the primary unit of assessment.
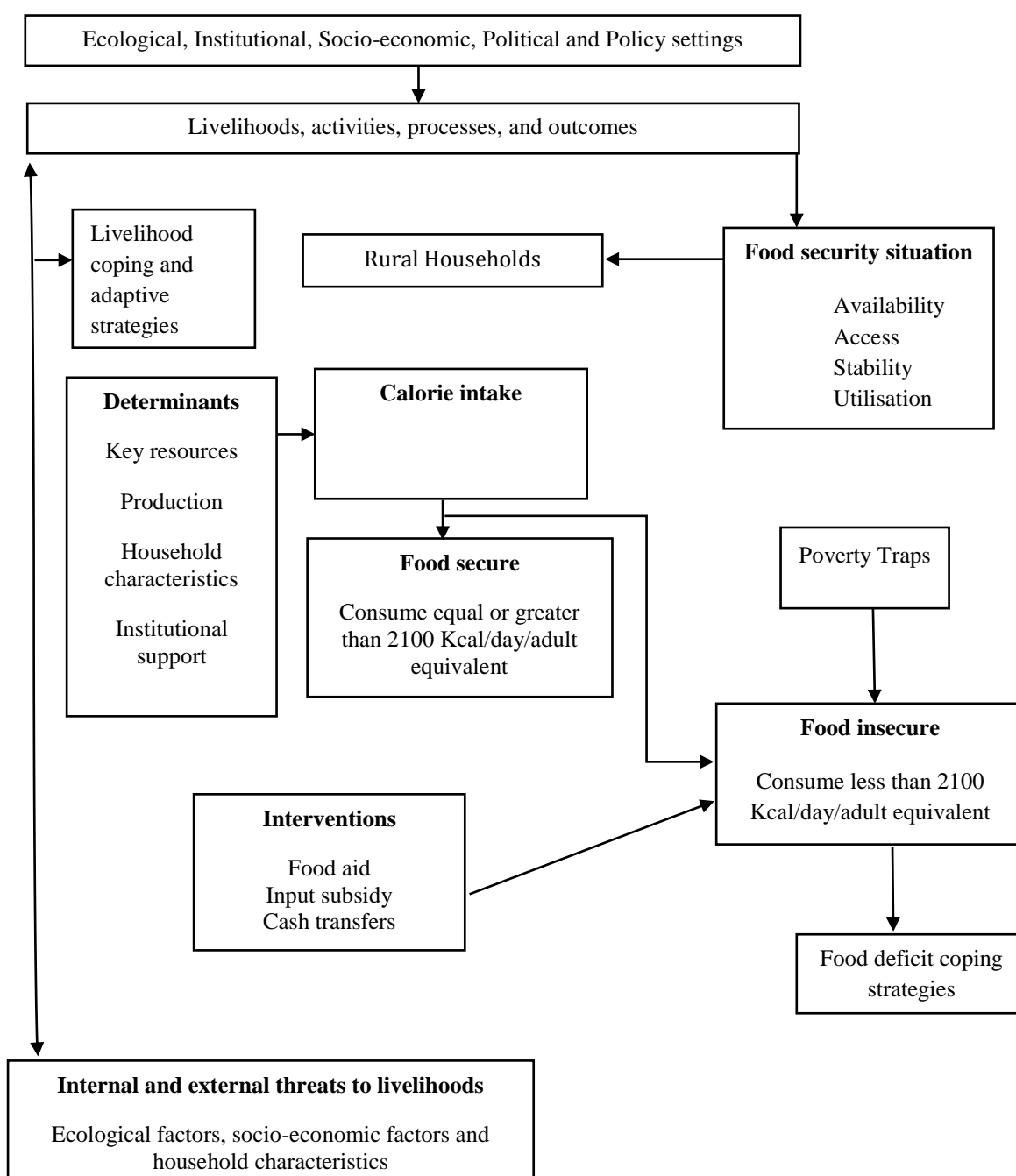
Figure 4.1: Food security conceptual framework developed for the study (Source: Modified from Tefera and Tefera (2014)

The definition of food security varies depending on the conceptual approach adopted to measure it. At the household level, food security can be defined as sufficient access to adequate

food and to supply the calories needed for all family members to live healthy, active and productive lives (Sahn, 2008; Sati, 2015). The aspects that enhance food security are broad but critically linked and influenced by factors within the wider policy and social environments (Sakyi, 2012). It is not only food availability from production, supplies from stocks or aspects of distribution but a set of entitlements that facilitates economic and social access to food (Ericksen *et al.* 2010). Food availability does not necessarily translate into accessibility and affordability to households (Ncube, 2011). Access to food, one of the critical dimensions of food security is a function of income, the prevailing food prices and purchasing power of the households (Onie and Fashogbon, 2013), but not a sufficient condition to realise food utilization (Pieters *et al.* 2013), to meet the required daily calorie intake of ≤ 2100 kcal per day per adult equivalence for a household to be food secure. The food system stability is determined by loss or gain of access to the resources needed to acquire adequate food; usually described as the stability of food access and availability (D' Haese *et al.* 2011). This means a household whose caloric consumption is greater or equal to 2100 kcal per day, per adult equivalence is categorised as food secure. Inversely, household food insecurity is a result of lack of income to access food in markets, lack of production resources like land and equipment to produce food; this is all driven by poverty traps (Asefa and Zengeye, 2003). In the form of subsistence agriculture, lack of education, asset poverty, poor health and adverse demographics. These poverty traps interact to deepen the severity of food insecurity and intensify household vulnerability, leading to households subsisting below the food security threshold of >2100 kilocalories per day per adult equivalent. This warrants the use of food deficit coping strategies as an expression of negotiated decisions to minimise the impact of food insecurity (Gupta *et al*. 2015). Interventions to food and nutrition insecurity in the form of food aid, input subsidy and cash transfers are important remedies to enhance household food security in short-term (Figure 4.1).

4.3.3 Food Security Measurement and Analysis

There are different methods commonly used to assess food security including individual dietary intake, anthropometry and experience-based food insecurity measurement scales (Perez-Escamilla and Segall-correa 2008). To directly measure food security, one needs to measure the extent to which people are able to acquire food that meets their nutritional requirements, to maintain a healthy living (Kakwani and Son, 2016). To identify the food secure and insecure households, this study adopted household caloric acquisition tool to establish if households in the study area were able to meet the required food consumption intake, using the food

consumption recall method. Dietary energy supply measured in kilocalorie (kcal) is used to determine food security of a household since it is the single most important indicator of food adequacy level (Qureshi, 2007; Berlie, 2013). A household is said to be food insecure when its consumption falls to less than 80% of the daily minimum recommended allowance of caloric intake for an individual to be active and healthy (Gebrehiwot, 2009). In this study, a minimum of 2100 kcal per capita per day in adult equivalence was used as the threshold to identify food secure and food insecure households. To obtain the daily caloric consumption, the household size was converted into adult equivalent, by age, household member activity level, the gender of both children and adults based on a requirement of 2100 daily calories (Broussard and Tandon, 2016). This adjustment is important to avoid underestimating the real calorie availability and demand per household composition. The daily net calorie available for the adjusted adult equivalent household size is divided by minimum daily calorie requirements, the difference is the household food security status. Households whose daily calorie consumption greater than or equal to 2100 kcal per day are categorised as food secure and those households whose caloric intake has fallen below the food security threshold is categorised being food insecure (Tefere and Tefere, 2014). Therefore, an assessment of calorie intakes provides the most useful way of studying the overall quantitative adequacy of diets in the area (Rose *et al.* 1999). The duration period for the recall of calorie assessment was twenty-four hours.

The food security index is expressed empirically as;

$$\text{HFS}_i = \frac{Household\ daily\ per\ capita\ calorie\ availability\ (A)}{Household\ daily\ per\ capita\ requirements\ (R)}$$

The reaction variable food security status of the ith household is a dummy variable:

$$\text{HFS}_i = \begin{cases} 1, Y_i < R (food\ insecure) \\ 0, Y_i \geq R\ (food\ secure) \end{cases}$$

Where, HFS$_i$ is household food security of the $_i$th household and $_i$ = 1, 2, 3………300. Y_i is the daily per capita calorie available and R is the minimum recommended calories intake per household per day

It is a fact that food insecurity measurements do not take the intensity of severity into account (Sarker and Karmaker, 2014). To estimate the food insecurity incidence, depth, and severity, the Foster Greer Thorbeck (FGT) index can be applied and specified as follows:

$$F(a) = \frac{1}{n} \sum_{i=1}^{m} \left(\frac{z - y_i}{z}\right)^a$$

$$= \frac{1}{N} \left[\frac{(Z-y1)^a}{z} + \frac{(z-y2)^a}{z} + - - \frac{(z-yn)^a}{z} \right]$$

Where *n* is the number of sample households, *m* is the number of households below the food security threshold, *Z is* the minimum requirements per day per adult equivalent (2100kcal/day/AE, Y_i is per capita calorie intake of the ith household, α is the food insecurity aversion parameter. In this model, the household is considered food secure if $Z \leq Y_i$ and food insecure when $Z > Y_i$. The model uses common class indices: the food security incidence, food insecurity depth, and the squared food insecurity gap. The aversion parameters or decomposition indices take the value of 0, 1 or 2. If α=0, this ratio measures the incidence of food insecurity shows the fraction of households below the distinct subsistence level of 2100 kcal (Shimeles *et al.* 2011). If α=1, it indicates the average kilocalories shortfall of the food insecure households from the food security threshold and the estimation of resources required to eliminate food insecurity in the area. The food insecurity gap measure discounts the effect of disparity among the food insecure themselves, some households fall much deeper below the threshold and some slightly closer the defined threshold. When α=2, the squared food insecurity gap which quantifies the severity of food insecurity, by giving those households further away from the least possible target a higher aggregation or weight. The greater the inequality of distribution among food insecure and thus the severity of food insecurity, the higher the value of the squared food insecurity index (Balisteri, 2006).

4.3.4 An Econometric Assessment of Household Food Security

Modelling food security and its determinants at household level require appropriate methodologies and techniques to achieve the objective. The endogenous variable food security being dichotomous, it can be measured as a function of 2100 kilocalories per adult equivalent per day per person, using a bid value of one and zero, which in this case are food secure (0) and food insecure households (1). Such that, a (Z_i =0) household is considered 'food secure' if ($C^*_i \leq 0$), while a household (Z_i =1) is observed 'food insecure' if ($C^*_i > 0$). The Binary logistic regression model is considered the most appropriate model for the econometric analysis of food security when the dependent variable has two possible outcomes, where the household is either food secure or food insecure (Garson, 2006; Maharjan and Joshi, 2011), and directly estimating the probability of an event occurring for more than one independent variable (Hailu and Nigan, 2007; Bashir *et al.* 2013). Since the observed dependent variable, Z_i is a discrete variable the

model is expressed as a qualitative response model where ϕ_i is the probability of the household's food security status, which is specified explicitly as:

$$\phi_i = Prob(Z_i = 1) = Prob(\sum \beta_j X_{ij} + \varepsilon_i > 0)$$

Following Farid and Wadood (2010), a logistic regression model of food security in terms of conditional probabilities can be specified as:

$$Ln\left(\frac{\phi_i}{1 - \phi_i}\right) = \beta_0 + \sum_{j=1}^{k=n} \beta j \ \chi_i + \varepsilon_i$$

Where ϕ_i is the conditional probability of being food insecure, β_j's are parameters to be estimated, k is the number of explanatory variables and χ_{ij} are exogenous variables.

The marginal effects in terms of each independent variable, following Wooldridge (2002; Matchaya and Chilonda 2012) can be calculated as:

$$\frac{\partial \phi_i}{\partial \chi_i} = \phi_i(1 = \phi_i)\beta_i$$

The marginal effect of a discrete variable is calculated by taking the difference of mean probabilities for the binary discrete variable, Xi=0 and Xi=0, holding all other variables at their means.

4.3.5 Coping strategies as an indicator to measure of food insecurity

Households employ short or long term coping strategies to ease the impact of food shortages. Maxwell *et al*., (2003) and Kedir, (2003) divide coping strategies into two basic classes practised to improve food security and sustainable livelihoods; these include *immediate* and *short-term* alterations of consumption patterns and long-term alteration of income earning of food production pattern. The merit of using coping strategies to measure food insecurity is that the methodology can capture important elements of vulnerability and the complexity related to food insecurity (Maxwell, 1996). These coping strategies are clustered as *least severe* (e.g. buy food on credit and buy less expensive food) which are reversible in nature, *moderate-severe* (e.g. reducing number of meals relying on less preferred or less expensive foods) and *more severe* coping strategies (e.g. borrowing food or money to buy food sending household members to eat somewhere else and spreading the whole day without eating). In this study, eleven relevant short term coping strategies *starting from the most severe to the least severe* were presented to the head of households during the survey, who were asked to rank them from '*never =0*' up to '*every day=5*'. There is weight attached to each coping strategy used; *severe coping strategies* carry more weight than least *severe coping strategies.* The coping strategy questions are a recall of seven days to inquire about situations when the household did not have

enough food or money to procure food. The idea is to quantify the *frequency* a particular household adopts a particular food deficit coping strategy in order to obtain the Coping Strategy Index (CSI). The coping strategy index is a rapid indicator of household food security status that provides real-time information to researchers (Zemedu and Mesfin, 2014). The quantitative score of the Coping Strategy Index (CSI) is obtained by multiplying the relative frequency (*number of days per week a household had to rely on the various coping strategies*) and the severity weight of the coping strategy used (Abdalla, 2010). The more frequent, any coping strategy is used, the higher the score and the more severe the coping strategy is on the people. However, many of the coping strategies that poor people employ to meet their short term-term food needs undermine their well-being, along with their ability to meet future needs and cope with future crises (WFP, 2003 and Sithole, 2011). The more coping strategies the households use, the more likely to be poor and more vulnerable to food insecurity.

4.4 Empirical Results and discussion

4.4.1 Household Demographics and socio-economic characteristics of rural households

Tables 4.1 and 4.2 present the demographics, assets and production and welfare characteristics of the sampled 300 households. Table 4.1 presents the continuous variables and their means, while Table 4.2 presents the categorical variables and their proportions. Table 4.1 indicates a high mean household size equivalent of 7.27, not surprisingly leading to a higher household dependency ratio of 55%. This implies more pressure on household resources for food security sustenance (Mpande, 2010). This decreases the ability of households to meet their consumption needs. Table 4.1 indicates that the average age of household heads was 48, suggesting that the rural households are headed by ageing people. Since age captures the level of productivity in rural livelihoods, it means, household heads that are young are more agile and active, thus enhancing their productivity level, the rate of adoption of new technologies and level of diversification, thus enhancing their purchasing power and invariably better opportunities to acquire food (Fawehinmi and Adeniyi, 2014). An ageing rural population typifies an array of factors including migration of younger people to urban areas and other countries, increase in life expectancy and a decreased fertility rate, creating not only rural livelihood challenges but also innovative adaptation challenges.

Table 4.1: Description and means of continuous variables

Variables (Unit)	Mean Value/ Dominant indicator	SD
Demographics		
Household size (AE)	7.266	2.640
Dependency Ratio	54.980	19.290
Age of Household Head (Years)	48.05	17.108
Education of Household Head(Years)	8.09	4.116
Assets and production		
Land size household has access to (Ha)	3.252	2.252
Land cultivated (Ha)	2.622	1.526
Maize yield (Ha)	0.757	0.974
Value of Household Assets(USD)	1177.3	2845.34
Total Livestock Units	2.025	4.824
Welfare indicators		
Total Monthly income (USD)	74.82	143.971
HH Calorie intake(kcal/day/AE)	1759.8	826.3
Per capita monthly consumption (USD)	70.398	51.677
Coping strategy Index	99.59	102.285
Number of chronically sick	0.447	0.793

Source: Survey (2016)

Table 4.1 indicates that the household heads attained moderate levels of education as indicated by a moderate number of years spent in school. The result is consistent with ZimStats, (2012), which reported that Zimbabwe has an overall literacy rate of 97%. Education is a key indicator of human capital, the highest level of education attained has a bearing to access higher returns, hence the possibility of escaping rural food poverty. In terms of land size, the households reported that they had access to about 3 hectares, on average land holding size. This had a direct implication on the size of land utilised in the previous planting season which stood at 2 hectares. Rural household food security is primarily enhanced through own production, which is characterised by land tenure, labour endowment, inputs and the ecological environment. This implies that inadequate access to land, the key production asset for their livelihoods, has a

significant bearing on the quantity of their produce or outputs as demonstrated with low average maize yield of 0.76 kilograms per hectare in the study.

The results also indicate that rural households own meagre livestock (TLU) and assets. Livestock ownership is critical for sustaining rural livelihoods, they provide draft power, cash income, social capital, manure, food, hauling purposes, and social status. Access or ownership to assets is key to any household welfare, they determine whether rural households stay or exit food insecurity. The endowment in this study correlates with low average household monthly income of USD 74.8 which was accounted mostly from seasonal agricultural activities and environmental resources. In times of income shortages, liquid assets such as livestock and accessories are often disposed by the poor households to obtain households food needs. During periods of cyclical and transitory food insecurity, poor and vulnerable households may consume the few-accumulated assets thereby depleting them and leading to chronic food insecurity in future (Chitiga-Mabugu *et al.* 2013).

The results in Table 4.1 highlight a low average household calorie intake of 1760 kcal than the recommended threshold of 2100 kcal per day per person in adult equivalent. This was a direct result of low mean per capita monthly consumption expenditure of USD 70 to procure enough food. Even though a higher proportion of rural income is spent on food alone, the household sizes are not equivalent to available food. As indicated by the results, low average monthly income is one of the important factors driving the calorie intake decline in poor rural households in developing countries. The low calorie intake observed was more related to the lean season (October) in which the survey was conducted when food availability is relatively low, coupled with high cost of products.

The results in Table 4.1 indicate a prevalence of short-term consumption smoothing strategies of varying degrees, with an average mean value of 100 coping scores per household in this study, the maximum scores for severely food insecure households was 134. This indicates that a bigger proportion of households in the study were food insecure and they employed severe coping strategies. This implies that the variation of coping strategies depends on available resources, as shown by the results, food insecurity coping strategies increase as household resources decrease. During the lean season (*time survey was conducted*) rural households face severe food shortages. This points to the crucial importance of other livelihood strategies to complement farming livelihoods to enable households to have enough food during the lean season.

This study showed that households had at least one member who was chronically ill, with a mean value of 0.45 in the whole study. This implies that since agriculture is the main livelihood activity of the rural poor, chronic human diseases such as HIV/AIDS, cancer, malaria, and high blood pressure among others affect the availability and accessibility of food. Human resource reduction affects the performance of agriculture through reduced labour and productivity when more time and resources are spent caring for the sick, especially, the young adults who are supposed to be economically active. In livelihood analysis, these chronic diseases can no longer be considered only human health phenomenon, but also social, economic and institutional problems (Masuku and Sithole, 2009), because the epidemic affects people, governments and other agencies in multiple ways and at multiple levels. For example, the economic cost of addressing the epidemic and its effects is high, food security is threated, poverty increases, demographic population structures are affected and under-resourced health institutions cannot cope with the demands of health care.

Table 4.2 show by descending order of the categorical variables, *household demographics*, *support services* and *welfare indicators*. The results indicate that male-headed households made up almost 70% of the interviewed rural households. In developing countries, especially in rural areas, male-headed households are by far higher in proportion than female-headed households. The rationale behind the concentration of male-headed households in rural areas is because men who are in their prime age lack quality education and relevant skills to secure jobs and other opportunities outside agricultural livelihoods. Due to cultural beliefs and other factors, *de-jure* female-headed households in rural areas are few and economically vulnerable. Predominantly, the head of the household is in advanced age, a single parent, widow and abandoned woman who were solely required to fend for themselves and children. However, they are *de-facto* female-headed rural households, when the men are absent, possibly working in urban areas, mines, a seasonal employee in commercial farms, who occasionally visit the households or on a lesser note the man is in prison.

On occupation, the results typify a pattern of gradual rural livelihood diversification outside conventional single portfolios into allied activities. Even though agriculture is the primary rural livelihood portfolio, unexpectedly, about 49 % of heads of households had to farm as their main occupation. This implies that seasonal agricultural livelihood alone is not enough to provide adequate means of survival, because of recurring environmental variability. This is consistent with a similar study by Mutenje *et al.* (2010) in Zimbabwe; who assert that rural households combine a number of livelihood activities to supplement income and subsistence

needs. However, this diversity is determined by differential household resources effective in reducing food insecurity

Table 4.2: Description and proportions of categorical variables

Variable Code	Variable name and description	Proportion (%)
GENDER	Household Gender(1=Male)	69
MARRIED	Household head marital status (1=Married)	74
OCCUPATION	Farming households(1=Yes)	49
CREDIT	Access to credit (1=Yes)	12
EXTENSION	Access to extension (1=Yes)	46
EXTERNAL AID	Access to external aid (1=Yes)	74
INPUT SUBSIDY	Access to input subsidy(1=Yes)	47
WATER SECURITY	Access to potable water(1=Yes)	65

Source: Survey (2016)

As expected the results revealed inadequate access to requisite support services such as credit or loans, extension, and input subsidy, to transform their livelihoods. Less than 50% of the surveyed households had access to extension services; this implies institutional failure to improve rural agricultural production. About 88% of the interviewed households in the study area lacked access to credit or loans. This might be because the rural poor lack not only the required physical collateral security to manage credit facilities but their income is not predictable. Agricultural inputs in the form of seeds, fertilizer, and pesticides are procured in small quantities because of their high prices, thereby not able to benefit every poor household in need.

External aid in rural context range from drought relief and recovery, child feeding programmes and rehabilitation for both crop and livestock production. The results of this study showed widespread access to short-term external aid in the form of direct food aid, food for work and cash transfers as drought relief to both chronic and transitory food insecure households. This suggests the magnitude of rural food shortage was rife (64.3% were food insecure), primarily because of drought which had caused large-scale crop failure. These instruments of external

aid, in particular, food aid resources has proven to be effective in improving household consumption needs of vulnerable groups in developing countries. However, external aid flows continue to be inadequate in relation to demands from the poor households.

The extent of water security is helpful for understanding its link to food security. Rural household water security is related to the proximity of poor households to water sources, the time taken to access and the right to claim sufficient water to meet their consumption needs. The results highlight an improved access to clean water to enhance household food security. Never the less, about 35% lacked access to safe drinking water. Considering water is fundamentally key to food and nutrition security, the proportion of water insecurity in this study was a health concern. This finding is consistent with a study by UNICEF (2016), which found out that about one-third of the rural population in Zimbabwe lack access to safe drinking water. The problem of water scarcity is closely linked to low income and food insecurity since it hinges on issues of inequitable resource distribution (Webb, 2006). Since groundwater supply plays a significant role in rural water security, the distribution is constrained by lack infrastructure development, poor resource management, dry spells and geographical location.

4.4.2 Assessment of Food insecurity coping strategies

Table 4.3 presents the relationship between household food security and coping strategies found in this study area. When a household faces acute food shortages, it develops different short-term coping strategies, depending on the context of severity, in some cases, the strategies bring negative consequences into its livelihood system. The higher the frequencies of the coping strategies, the more food insecure the household is likely to be (Batunde *et al.* 2010). The mean values of coping strategies used in the study are presented in Table 4.3. *An index for each coping strategy was computed to reflect the frequency a particular strategy was used within a week.* A t-test was used to profile how different coping strategies were applied between food secure and food insecure households. However, by virtue of using coping strategies does not necessarily mean they are the most suitable means to deal with food shortages because they are not sustainable since they are applied on a short term basis. In other words, coping strategies are not an accepted norm of household welfare.

In order to maintain food adequacy, the results showed a statistically significant mean difference (p<0.08), between the food insecure and food secure households on reducing the number of daily meals, which is a moderate coping strategy (Table 4.3). Even though food insecure households were eating less frequently than the food secure ones, the fact that some

pronounced food secure households used it too, implies that the coping strategy is an *ex-ante* mechanism against future food insecurity. This means food security has to be measured in an *ex-ante* term not only the current state. This is because households move in and out of a state of food security, meaning, food security should be explicitly measured in a dynamic and forward-looking sense of future access or incidence.

Table 4.3: Comparison of household food security status by potential coping strategies

Food Insecure =193			Food secure =107		T-test
Coping strategies	Mean	SD	Mean	SD	
Skip meals the whole day	4.477	9.826	2.935	7.977	-1.389
Limit size of meals	14.244	19.784	11.197	15.785	-1.369
Reducing number of daily meals	16.461	18.341	12.888	14.173	-1.746*
Borrow food	12.674	15	10.450	15.037	-1.230
Buy less expensive food	10.368	13.937	10.458	13.770	0.054
Buy food on credit	6.575	12.060	7.467	12.685	0.602
Gather wild fruits	5.922	11.817	4.880	11.075	-0.749
Eating somewhere else	4.456	9.643	2.450	7.932	-1.747*
Begging for food	4.430	9.643	3.450	8.541	-0.879
Reduce adult consumption	5.477	10.407	4.300	9.916	-0.955
Casual labour	11.928	17.232	8.065	13.176	-2.014**

Source: Survey (2016) Notes: ***, ** and * means significant at 1%, 5% and 10% significance levels, respectively

Typically, breakfast or lunch is the meal often omitted by the households (Shariff *et al.* 2008). Reducing the number of meals consumed a day increases the number of days the household has food in the future. This coping strategy could compromise the consumption needs of woman and children as compared to adult male household members. In actual fact, the mechanism can be regarded as a "negative coping" as it does not actually alleviate food insecurity but secures the continued existence of people under compromised living conditions (Adekoya 2009; Orewa and Iyangbe 2010; Ekerere *et al.* 2013).

 The results highlight a statistically significant mean difference (p<0.08), between the food secure and food insecure households on sending household members to eat somewhere else,

particularly children, this is a severe coping strategy. These are usually coping decisions that are approved by their parents but sometimes children decide to do it on their own, knowing there is no food at home (Bikombo, 2014). Because of vulnerability, the food insecure households applied this coping mechanism more frequently than food secure households. This seemed to be a popular coping strategy particularly in poor households with many people to feed.

Household application of casual labour as a coping mechanism had a statistically significant mean difference (p<0.05), between the food insecure and food secure in this study. As indicated by the results, this implies that casual labour was adopted more by the resource-poor households as a means of stabilising their consumption welfare during critical shocks like the drought that prevailed in the study area. In a similar study, Coulibaly *et al.,* (2015), asserted that casual labour paid in cash or maize grains was considered an ex-post food security safety net to respond to income shock and poor maize yield. Even though households in the study area had potential coping strategies at different levels of food insecurity, the results showed no statistically significant difference in the application of skipping meals for the whole day, limit the size of meals, borrowing food from friends and relatives, buying less expensive food, buying food on credit, gathering wild fruits, sending household members to beg for food and reducing adult consumption so that children can eat. The overall indication of the results in the study area was that the frequency of applying these coping strategies was evidently minimised by effective consumption interventions in the form of food aid from the Government and Non-Governmental Organisations.

4.4.3 The extent of rural food insecurity in Rushinga, Zimbabwe.

Food insecurity is conceptualised as a composite phenomenon with various facets (Faye *et al,* 2011). Its trajectories differ so that researchers need to look at the distinct dimensions of its incidence, depth, and severity in order to establish its magnitude within a certain group of society. The reason of examining the dimensions of food insecurity is the notion that the plight of households facing food shortages could be very different, depending on the deprivations households suffer which are often unevenly distributed from one household to the other. Some households could face transitory food insecurity which is temporal or seasonal whereas others face chronic which is perpetual and severe. Food insecurity *incidence* is the number of households identified as food insecure, *depth* is the resources needed to eradicate food insecurity and *severity* is the depth of food insecurity and inequality among the poor. Also, the determinants of food insecurity differ at micro and macro levels, the same applies to policy

interventions. This means food security interventions need to be tailored to specific contexts and problems. Policies aimed at addressing transitory food insecurity should differ with policies aimed to eradicate chronic food insecurity which is long term. The results in table 4.5 describe household food insecurity incidence, depth and severity disaggregated and analysed by location and gender of the household head. *The results were a conciliation of absolute and relative aspects of food insecurity; absolute food insecurity refers to the idea of subsistence and relative food insecurity refers to the idea of inequality*. The results showed that the calorie intake approach to the of incidence of food insecurity was about 60% indicating that only 40% of the households were able to obtain the minimum calorie recommended per day per adult equivalence. The result was greater than in a related study in the district (ZimVAC, 2013), which found 39.7% of households were food insecure in the 2013/14 consumption year. This high incidence could be attributed to the current El Niño drought which was further aggravated by the prevailing poor economic situation in Zimbabwe. The average calorie intake of the sampled households was 1767 kcal, which was 16% below the recommended daily allowance of calorie intake of 2100 kcal. The depth of food insecurity which measures the extent by which food insecure households were below the recommended food insecurity threshold, of 24%. This implies that on the average, a food insecure household will require 504 kcal per adult equivalence to recover from food insecurity. Expressing differently, food insecurity can be eliminated in the study area, if the rural District could mobilise consumption resources that meet 24% of the caloric requirements to lift the households up the minimum subsistence level. The results in Table 4.4 indicates that food insecurity severity (calorie shortfall) among the households was 13%. This inequality might be due to lack of productive resources like machines or equipment. The severity index or the squared food insecurity gap is a measure of food insecurity that calculates both the prevalence and depth of food insecurity in a household, community, country or region. The only difference is that the calorie shortfall below the food insecurity line is squared giving the food insecure more weight than those households only short of few calories below the threshold. The index reflects the actual severity of food poverty, the problem of inequality among the food poor and its distribution among households in the District. With respect to gender, overall, the result showed that on average female-headed households had a higher incidence, depth, and severity of food insecurity when compared to male headed households. Implying that food security situation among male-headed is better than female-headed. This is because men have more access to productive resources such as credit, equipment, land, farming equipment, inputs than female-headed households. This is consistent with similar studies by Hendriks, (2002; Ndiweni, 2015), who found that households

headed by woman tended to be more vulnerable because their access to livelihood opportunities was severely constrained by cultural, socio-economic and political factors, thereby increasing their vulnerability to food insecurity. For example, rural women are not allowed to own land or participate in opportunities reserved for men.

Table 4.4: Incidence, depth and severity of food insecurity by gender

Location	Incidence ($\alpha=0$)		Depth ($\alpha=1$)		Severity ($\alpha=2$)	
	Female	Male	Female	Male	Female	Male
Ward 9 (N=100)	0.63	0.69	0.37	0.21	0.23	0.11
Absolute contribution	0.15	0.52	0.09	0.36	0.06	0.08
Relative contribution	0.23	0.77	0.16	0.64	0.40	0.60
Ward FIS Prevalence	0.67		0.25		0.14	
Ward 12 (N=100)	0.82	0.75	0.43	0.25	0.30	0.11
Absolute contribution	0.32	0.46	0.17	0.15	0.12	0.07
Relative contribution	0.41	0.59	0.53	0.47	0.64	0.36
Ward FIS Prevalence	0.78		0.32		0.18	
Ward 14 (N=100)	0.52	0.51	0.26	0.17	0.17	0.08
Absolute contribution	0.14	0.38	0.69	0.13	0.04	0.06
Relative contribution	0.27	0.73	0.35	0.65	0.43	0.57
Ward FIS Prevalence	0.51		0.20		0.10	
Total (N=300) Index	0.60		0.24		0.13	

Note: 0= Female-headed households, 1 Male headed households

FIS =Food insecurity.

The disaggregation of food security typology by location and gender (table 6.5), revealed that Ward 12 was considered to be the most food insecure area, and, it had the highest concentration of poor households in the District, with 78% of the households unable to meet the daily minimum subsistence calories per adult equivalence. On average, the calorie availability to

food insecure households in Ward 12 was 1587 kcal per adult equivalent that is approximately 78% of the minimum subsistence calories, the lowest amount of calorie availability among the Wards. The households in the Ward 12 also experienced the highest calorie shortfall of 32% as well as the highest percentage of severity (18%) of food insecurity. The incidence, depth, and severity of food insecurity in Ward 12 were higher for female-headed households than male-headed households as compared to other Wards, pegged at 82, 43 and 30 %.

The physical settings specifically the natural phenomena such as accessibility of the area, the level of rainfall variability, natural fertility of soils, distance to markets and quality of infrastructure do influence micro level food security (Hoddinott and Quisumbing, 2008). Thus geographical location affects all aspects of food security such as access to resources which can smoothen consumption. While on average, a male-headed household would require 25% of consumption resources to exit food insecurity, a female-headed household, on the other hand, would require 43%. Female-headed households are assumed to have larger household sizes, lower education attainment of the household head and limited access to productive resources than male-headed households (Ndobo, 2013). In most cases, the head of the household is not married in female-headed households as compared to male-headed households, who are less susceptible to food insecurity because there is pooling of resources between the couple.

On average 67% of households in Ward 9 were considered to be food insecure, regarded as the second most food insecure area in the study area. These households on average could meet 83% of the daily minimum subsistence calories that is 1735 kcal per adult equivalent. On average, food insecure households fell 17% below the required subsistence level. The inequality (severity) among the food insecure households was approximately 14%, meaning these households cannot assist each other because they were regarded severely food insecure and poor. Unexpectedly, they were notable food insecurity variations in Ward 9, a slightly higher incidence of vulnerability to food insecurity in male-headed households as equated to female-headed was recorded. The result is not in agreement with previous and similar studies because the causes might be hidden, but pointing to structural indicators. The possible explanation could be attributed to pockets of woman empowerment initiatives in some villages or food aid priority given to female-headed households as a vulnerable group of people. Unexpectedly, in Table 4.5, the incidence of food insecurity was high (69 %) in male-headed households than female-headed households (63%). However, the depth and severity provide more compelling reasons for policy concern, because, expectedly, the caloric gap was high in female-headed households and well as the inequality among severe food-insecure female-

headed households in the Ward. Food shortages in female-headed households are explained by high dependency ratio of more mouths to feed against little food stocks. The inequality or food poverty among the food insecure themselves was caused by the poor harvest and increased food prices beyond their reach, relative to other goods and services.

Conversely, households in the Ward 14 had the lowest incidence (51%), depth (20%) and severity (10%) of food insecurity. On average the households could meet at least 94 % of the daily minimum subsistence calories required, that is 1980 kcal per adult equivalent; the highest amount of household calorie availability among the Wards in the District (Table 4.5). As expected, in this Ward, gender was not significant to explain any substantial variation in incidence, depth, and severity among households, for example, the incidence was almost the same 51% and 52%. Generally, household food insecurity in the study area is high, enough to warrant policy attention, and monitoring should be taken as key livelihood improving strategies specifically regarding household gender disparity.

4.4.4 Determinants of Rural Food Insecurity

The binary logit model was estimated to examine the socio-economic characteristics and resource endowments that predict household food insecurity. A household is considered food secure if it has enough food to feed its members at a given point in time. However, this study is launching an investigation on those households considered to be food insecure; looking at factors that caused the probability to be food insecure. The hypothesis was that household daily per capita calorie consumption failure is a function of geographical location, the age of the household head, the gender of the household head, gender of the household head, marital status of the household head, dependency ratio, value of assets, access to support services, production endowment, coping strategies and water security. These demographic, economic and institutional factors were assumed to either influence or inhibit household caloric intake in the study. The selection has been influenced by the available literature and data collected. Table 3.6 presents the results of the binary logit model. The results indicate that, collectively, the estimated coefficients are statistically significant, since Chi-square p-value is significant at less than 1%. The values of the variance inflation factor (VIF) of the continuous variables were found to be less than 10 and the contingency coefficient (CC) values of the dummy variables were more than 0.75 (*see appendix 6*). This means that there was no strong relationship between the independent variables used in the model. The model also correctly predicted about 98% of the cases, confirming that the model fits the data reasonably well in determining food security.

Nineteen independent variables hypothesised to have an influence on household calorie intake, of which five were found to be statistically significant. The positive and statistically significant (p<0.1) coefficient estimate for dependency ratio indicates that households with larger dependency were more likely to be food insecure. The estimates of the marginal effects, computed as sample means when other variables are held constant, shows that one adult equivalent increase in the household size and additional non-working member to the household increases the probability of the household being food insecure by 3%. This result is consistent with (Bogale, 2012; Kimani-Murage *et al.* 2014; Sharaunga *et al.* 2015), indicating the importance of household composition for the purpose of food security targeting. The possible explanation is that increased household size is synonymous with a dependency that hardly contributes to the income of the household (Amao and Ayantoye, 2017). The likelihood of a household being food secure proportionally decreases with an increase in household size to share limited resources. This implies large high dependency ratio tend to exert more pressure on food consumption than the labour it can potentially contribute to production (Endale *et al.* 2014).

The results indicate that monthly per capita household income was negative and statistically significant (p<0.05) to food insecurity. This conforms to prior expectations. Households with improved income from single or multiple sources have the potential to procure adequate food to meet the required consumption threshold. In contrast, poor households are typically characterised by few income earners and many dependents to feed, which makes them vulnerable to food shortages (StatsSA, 2012). The marginal effects indicate that increasing the household income by USD 1.00, reduces the likelihood of being food insecure by 10%. Low-income households are likely to be negatively affected by increases in food prices. This implies that household purchasing power is the most critical determinant of food security through access to the means to acquire adequate food (Ndobo and Sekhamph, 2013). This finding is similar to other household food security studies (Bashir *et al,* 2012; Jacobs, 2009; Bogale, 2009; Arene and Anyaeji, 2010).

As expected, the value of assets highlights a negative statistical significance (p<0.01), to household food insecurity. The current understanding of food security places emphasis on ownership and accessibility to assets, which rural households can use to reduce food insecurity (Ellis and Freeman, 2004; Maponya, 2008). Anyone can claim to own or have access to assets, but the assets accumulated should carry a certain value for exchange. The value of assets in this study is the sum of the value attached to productive and non-productive assets that the

households had at the time of the study. This implies the availability of key assets such as machinery, transport, and other accessories can help as safety nets to smoothen consumption during shocks. The findings are similar to studies by Bekele *et al. (*2015; Shobe *et al.* 2017; Tantu *et al.* 2017), who found that household assets were correlated with improved household consumption. The estimates of marginal effects indicate that a unit increase in the value of household assets reduces the probability of being food insecure by 26%. This means access to food is intimately related to access to the resources necessary for the procurement of food, which implies the command over goods and services is a necessity in the pursuit of household consumption security (Mbukwa, 2013).Thus, for a household to be guaranteed current and future food security, it has to be resourceful.

Livestock ownership in (TLU) tropical units is positive and significantly (p<0.06) related to the probability of a household being food insecure in the study area. Livestock ownership especially ruminants constitute one of the principal forms of durable assets in the rural economy as their lifecycles can straddle periods of scarcity and their reproductive capacities cause them to appreciate in value (Baro, 2002). In the rural context, livestock ownership means more than just household caloric acquisition. They are also closely related to production in the context of Zimbabwe where cattle are the main source of traction power for farming (Abafita and Kim, 2014). The variable coefficient of the model's marginal effects indicates that a unit decrease in livestock units increases the likelihood of being food insecure by 1%. This implies households who own more livestock could produce milk, milk products, and meat for direct consumption as compared to households with fewer livestock units (Mitiku *et al.* 2012). This result is similar to findings by (Ali and Khan, 2013; Smith *et al.* 2013), who assert that livestock assets contribute directly to household food security, but in different dimensions.

Agricultural livelihoods are not only determined by land-holding endowment but per capita aggregate production of staple foods. Reduced maize yield per hectare is positive and statistically significant (p<0.1) with the probability of a household being food insecure. This means that when productivity per unit area decreases for a particular household, food insecurity increases as this can trigger the prices of grain maize to increase. Magrini and Vagani, (2015; Omoyo *et al.* (2015); Stevens and Madani (2016), also find similar results; that maize yield variability would imply food insecurity to poor households.

Table 4.5: Factors determining rural household food security: Binary Logic results

Variable	Coefficient		Marginal Effects	
	Value	SE	Value	SE
Location	-0.224	0.175	-0.050	0.039
Age	-0.015	0.011	-0.003	0.003
Gender	0.594	0.537	0.136	0.126
Marital status	-0.843	0.552	-0.173	0.103
Dependency ratio	0.013*	0.008	0.003*	0.002
Education	0.044	0.050	0.010	0.011
Farming occupation	-0.337	0.322	0.075	0.071
Total monthly per capita income	-0.467**	0.190	-0.104**	0.042
Asset value	-1.193***	0.344	-0.265***	0.076
Total land utilised	-0.068	0.102	-0.015	0.023
Livestock hold in TLU	0.047*	0.024	0.010*	0.005
Access to credit	0.538	0.518	0.110	0.096
Water security	-0.047	0.321	-0.010	0.071
Coping strategy index	-0.172	0.248	-0.038	0.055
Access to Extension	0.017	0.330	0.004	0.073
Maize yield per hectare	0.270*	0.164	0.060*	0.036
External Aid	0.593	0.381	0.137	0.090
Input subsidy	-0.135	0.328	-0.030	0.073
Number of chronically Ill	-0.038	0.144	-0.008	0.032
Constant	4.265***	1.378		
Correctly predicted	0.98			
Wald χ^2(19)	43.3***			
-2log likelihood	-167.98			
Pseudo R^2	0.14			

Survey (2016). Notes: ***, ** and * means significant at 1%, 5% and 10% significance levels, respectively.

Even though other important food crops such as beans, groundnuts, soya beans, sunflowers, sorghum, and millet are grown, maize is the most consumed cereal on a per capita basis and provides the largest source of calories consumed in Southern African region (Abadalla, 2007). In Zimbabwe alone, evaluation of food security is based on the total amount of grain yields, specifically maize during a specified period in relation to demand (Jayne *et al.* 2006). This implies that extension workers should encourage households to use improved inputs to improve maize productivity which would contribute to the improved availability of maize and food in the household. The variable marginal effects revealed that a kilogram decrease in maize yield per hectare increases the probability of being food insecure by 6%. This means households who obtained lower maize yield per hectare in relation to household demand were deemed food insecure.

4.5 Summary

The results from the descriptive analysis suggest that 64% of the households in the study area were relatively food insecure, because of crop failure as a result of drought and minimal contribution of subsistence agriculture to adequately meet household food needs. Even though conventional agriculture is the main livelihood economy for rural households in developing countries, the results showed a paradigm shift into non-farming activities as only 49% were full-time farmers as compared to 51% who combined farming with other allied activities in order to bridge the uncertainty in farming caused by climate variability.

Generally, households applied minimal food deficit coping strategies, hence they have short-term consumption effects. There is need to scale up income generating activities that are more sustainable. The incidence, depth, and severity appeared marginally higher among female-headed households indicating they were more vulnerable as compared to male headed households. This is aggravated by their lack of productive resources essential for food production. The woman should be empowered in gender guided interventions which strive to promote the equitable distribution and access to key resources such as land, human capital development and livestock.

The results from the binary logistic regression suggest that dependency ratio, total livestock units and maize yield per hectare were identified as significant determinants of vulnerability to food insecurity, whilst monthly per capita income and value of assets were significant determinants of expected food consumption. Therefore, efforts at reducing food insecurity should be targeted towards households with these characteristics. Having more people in

households reduces the chance of obtaining adequate food. This means policies aimed towards the provision of family planning to optimise household size should be given priority. In order to reduce food insecurity problems confronting the poor, ownership of livestock should be encouraged since they are important sources of income, food and draft power for crop production. Interventions that contribute towards the improvement of non-farming activities are vital in reducing vulnerability to food insecurity since the buying power of households is the most critical determinant for food security through access to the means to acquire food. Ownership of productive assets is important in improving the welfare of the rural households, particularly the poor and vulnerable groups' such as female-headed households. The average maize yield in the study area was below the expected output to meet demand, owing to the high cost of inputs, limited access to land and erratic rainfall. Hence, in Sub-Saharan Africa food security is measured by maize production. This should trigger the development of scale-up approaches which increases own production through input subsidy programmes.

CHAPTER FIVE: ESTIMATING THE LEVEL OF RURAL LIVELIHOOD RESILIENCE TO FOOD INSECURITY: RUSHINGA RURAL DISTRICT IN NORTHERN ZIMBABWE.

ABSTRACT

In Sub-Saharan Africa, rural livelihoods primarily depend on fragile and poorly endowed natural resources which are vulnerable to environmental variability. Building rural livelihood resilience has become prominent *ex-ante* and *ex-post* strategies for households to cope with and adapt to risks, shocks, and stresses that affect food security. The study aims to quantitatively measure the resilience of rural households in the context of food security, based on the resilience framework analysis. To test the capacity of households to absorb negative shocks which threaten their food security, data from 300 randomly selected households in three distinct wards in Rushinga rural district were used. The concept of resilience in the domain of food security in this study is a function of the methodology used to measure it. The study applied a two-stage factor analysis using the Principal Component Factor method to estimate the resilience components in the dimensions and to create the resilience index. The model considers resilience as a latent variable built on eight livelihood dimensions or constructs; each showing components of resilience from the observable variables included. The validation of the resilience index indicates that access to natural resources was not significant enough to explain resilience to food insecurity, this is mainly attributed to degradation of the resources or inequitable access, i.e. land. The mean resilience index identifies non-farmers as highly resilient livelihood groups as compared to farming households. Analysing resilience by gender of the household headship, female-headed households were marginally less resilient to food insecurity due to inequality on livelihoods opportunities.

Keywords: Resilience, Drought, Food insecurity, Ecology, Principal Component Analysis

5.1 Introduction: The Concept of Livelihood Resilience in the domain of Food Security

Poor and vulnerable people in developing countries are susceptible to severe and more frequent human, physical, social, economic, natural, ecological and political shocks) with-far reaching impacts on their livelihoods (Nyamwanza, 2012). Among other vulnerabilities, climate variability is one of the pervasive stresses that households and communities in rural areas have to cope with (Ziervogel and Calder, 2003). Agricultural and hydrological drought, in particular, represent the most important natural factors directly affecting agricultural production, health, livelihoods, assets, and infrastructure contributing to food insecurity (Shiferaw *et al.* 2014). Drought subsequently affects crop and livestock production, which are critical in ensuring food and livelihood security. The effects tend to be more severe to poor people who depend heavily on rain-fed agriculture and other natural resources for their livelihoods (Gentle and Maraseni, 2012). One of the effects is food insecurity after large-scale crop failure. It is therefore important for households to build resilience against all these so that they will be able to overcome adverse shocks that will inevitably occur from time to time (Andersen and Cardona, 2014). However, their ability to act and manage these risks is often affected in part by poverty, weak institutions to fall back on, and limited risk management strategies (Connolly-Boutin and Smit, 2016). This can have devastating consequences on people's food security. An improvement in the ability to cope with and adapt to shocks could be a means of escaping the vulnerability of poverty and food insecurity in the future.

Increasingly the concept of resilience is being used to inform development initiatives aimed at building the capacity of rural households and communities to cope, adapt and transform in the face of adverse shocks, risks, and stresses (Pelletier *et al.* 2016). Resilience has different meanings in the ecosystem and in socio-economic contexts. The concept has gained traction in several disciplines and research domains such as ecology, disaster reduction, climate change adaptation, social protection and other domains in which shocks, risks, and vulnerability are being examined (Bene *et al.* 2012; Thulstrup, 2015). Resilience is described as the capacity of a socio-ecological system to manage shocks while simultaneously retaining function, structure, capabilities, and adapt to them (Walker *et al.* 2006, Walker and Salt 2006; Redman, 2014). In relation to poverty, food insecurity and livelihoods, resilience is essentially about the inherent abilities of individuals, households, communities, or institutions to withstand, cope and recover, adjust and transform in the face of shocks (RBAs, 2015). In the rural context, livelihood resilience can be understood as the capacity of the rural poor to sustain and improve

their natural resource livelihoods for their well-being, despite ecological disturbances. A resilience perspective recognizes that communities are diverse and have different ecological, social and institutional dimensions, in which they live and construct their livelihoods. (Maguire and Cartwright, 2008).

By virtue of rural livelihoods being natural resource-based, it means they are constructed in a vulnerability context, which often constrains their sustainability towards the household linear standard of living, in particular, the exposure to natural disasters, poverty and other human factors. Meaning that resilience has to be discussed with other important pursuits; the sustainability of the livelihood resources at the disposal of the poor and the vulnerability of their livelihood activities. Sustainability and resilience are considered as compatible and complementary approaches which share working principles and objectives based on the distinct operation of ecological, social, and economic systems (Redman, 2014). For example, in the ecological concept of resilience, it is not only about the ability of a rural system to bounce back or adapt to future risks, but for people to be resilient they need to conserve their livelihood resources for future use. Thus, sustainability is the ability of households to maintain their livelihood systems over time and to maintain utilization of natural resources on which these livelihood systems are depended on (Lee and Nerves, 2009). Sustainability of livelihoods comprises environmental and socio-economic sustainability; and the former concerns livelihoods internal capability to cope with pressure coming from outside and the latter concerns the external effects of livelihoods to other livelihoods (Nemiesto, 2011). Whilst resilience deals with adaptation, mitigation, and coping; sustainability examines and assigns a value to future options, for example, sustainable use of land, water, forest, and aquatic resources can contribute to livelihood resilience.

Conceptually, resilience is closely related and contrasted to vulnerability; resilience is the "ability to" and vulnerability as the "inability to" (Birkmann, 2006; Cutter *et al.* 2010; Mavhura, 2017); thus making vulnerability an interwoven function of exposure, sensitivity and adaptive capacity of a particular livelihood system (Adger, 2006; IPCC, 20114; Weldegabrial and Amphnne, 2017). In simpler terms, vulnerability is when livelihood strategies are exposed to contingencies, shocks or risks and the means to cope with them. In that sense, livelihood resilience of a community is inextricably linked to the condition of the environment and the status of the resources to cope and adapt (Bene *et al.* 2014). Incorporating vulnerability approach along resilience understanding of people's economic, social, cultural and ecological systems is a way to explore the risks, shocks and stresses that affect livelihood pathways and

find ways that can move households towards more resilience outcomes, ultimately enabling them to embrace change.

Since the rural livelihood activities in Zimbabwe are inextricably linked to the agro-ecological regions known as the natural regions (WFP, 2014; UNDP/WPF, 2016). The concept of resilience is discussed as the capacity of an ecological or social system to absorb changes, stresses, and shocks but still maintain its core functions of enhancing food security at the household level (Van Kien, 2011). Socio-ecological resilience refers to the integration of human social activities and the natural ecology into a single entity through management, adaptation and resource use that occur in multiple scales and cycles. Zimbabwe is an agricultural economy, which means farming households have to adapt to changes like very low rainfall, floods, high or low temperatures, outbreaks of pests, and animal diseases. Thus, approaching the subject of livelihood resilience from a perspective of socio-ecological systems creates the opportunity to analyse livelihood strategies and the ability of the rural poor to succeed in a complex and dynamic environment (Jansen, 2010). While ecological resilience is the degree of disturbance that an ecosystem could endure without changing its processes and structures, particularly climate variability induced disturbances (Gunderson, 2000).

Social resilience recognizes the potential of people to use their experiences to cope with disturbances and to maintain adaptive behaviour to interact with the social and physical environment (Maguire and Cartwright, 2008). This is the utility of social capital. In the rural context, it has various dimensions and differs from community to community. Social capital is the "glue that holds the society together", thus it is seen as the main aspect of social resilience, depending on its nature in dealing with change (Severi, 2016). Among other dimensions of social capital, the rural poor have common traits in the use of "bridged ties", and "bonded ties" as social networks and institutions of livelihood resilience. Bonding and bridging ties are essentially horizontal terms, implying connections between people who share largely related demographic characteristics, specifically, close social circle such as family members, friends and neighbours (Buchenrieder and Dufhues, 2006).

Social and ecological resilience may be connected through the dependence on similar institutions and ecosystems of communities and their participation in economic activities (Adger, 2000); meaning, social and ecological vulnerability and resilience to economic turbulence and environmental instability are inextricably linked and should be considered livelihood socio-ecological systems. Such, resilience linked socio-ecological systems can be

strengthened by adaptation initiatives such as natural resource conservation planning which could provide long-term resilience (Westerman *et al.* 2013). This means more resilient socio-ecological systems are able to absorb larger shocks without changing in their fundamental ways (Folke *et al.* 2002). Alexander (2013); Lisa *et al.,* (2015) assert that they are two dimensions of resilience drawn from ecology, namely the ability to bounce back quickly and the ability to withstand disturbances. Households that are able to bounce back to their original condition in the pre-livelihood crisis period, or even to improve their food security situation may be considered highly resilient (Fitzgibbon *et al.* 2014).

In rural areas, very few households are able to bounce back, because they lack safety nets to buffer their vulnerability to changes. Their capacity to maintain food security in the midst of disturbances significantly depends on their coping and adaptive capacity which is influenced by their access to and control over critical resources (CARE, 2011). Coping capacity expresses the understanding that people need more than access to resources to be less vulnerable, but also need active strategies to manage resources to maintain food and livelihood security as well as overall well-being in the face of risks (Barrett and Carter 2000; Ericksen 2008). At the same time, the adaptive capacity concept emphasizes a system of long-term response strategies against vulnerability more than just short-term coping actions (Nyamwanza, 2012). The rural poor who are resource constrained can only cope with short-term consumption difficulties, but not able to adapt to perpetual risks which cause long-term food shortages. In simpler terms, coping is the short-term reactive response of a system to mitigate the impact of specific vulnerability. For example, in response to short-term drought, households could sell livestock, equipment or sell labour to manage food shortages. Adaptation is the long-term capacity for a system to be flexible to address locally specific changing circumstances, especially when there are new initiatives to be adopted. Rural livelihoods can increase adaptation to rainfall variability by growing drought resistance crops or cultivars, as well as livelihood diversification. The promotion of productive and more resilient rural livelihoods require policy, support, capacity, and transformation in agricultural livelihoods and improvements in the management of natural resources, such as individual or household empowerment to respond to various stressors (FAO, 2013). The question on how vulnerable rural households who primarily depend on natural resources could increase their resilience against food insecurity is critical in this discussion. It is in this context that this paper objectively tries to capture the characteristics that make livelihood resilience or vulnerability effective in the domain of food security. This research focuses on the socio-economic factors important for coping or adaptation such as

livelihood strategies, safety nets, assets and how these effectively shape the response to different risks, shocks, and stresses in achieving food security.

5.2 The Resilience Conceptual Framework

Adoption of a resilient conceptual framework is important for understanding and demonstrating how socio-economic and ecological shocks, stresses and risks affect food and livelihood security of the poor at the household level. Within constantly changing natural, social and economic environments, the framework can help understand whether households and communities are on a trajectory toward greater vulnerability or greater resilience (DFID, 1999; Frankenberger *et al.,* 2007, Frankenberger *et al.,* 2012). It should be able to explain why certain households in similar communities are relatively resilient, whereas others, are less resilient, and on a descending pathway of vulnerability towards food insecurity (Frankenberger *et al*. 2013). The resilience concept needs to be understood contextually before practical implications can be drawn about building resilience in communities (Gwimbi, 2009). In the rural context, the stern connection between economic, social, and ecological dimensions appears particularly evident (Severi *et al*., 2012). The connection is when rural livelihoods become more vulnerability because they heavily depend on environmental resources and ecosystem services which are climatic sensitive, moreover, they easily bear the effects of external economic shocks which the poor cannot control because of socioeconomic instability. This means food security resilience analysis should be located in social, ecological and economic context but at different aggregations.

In this framework, Figure 5.1, the household is considered a component of the food system's complex adaptive sub-system and management unit for a range of relevant decisions (Ciani, 2012). Its resilience would be the capacity to withstand or adapt to exposure to shocks or disasters without becoming food insecure (Browne, 2011). Rural livelihoods with their high reliance on natural resources and ecosystem services for food security are known to be vulnerable to diverse risks, shocks and stress (IFAD, 2011; Pelletier *et al.* 2016), particularly external shocks such as drought (Fabricins *et al.* 2007; Nyamwanza, 2012). The system's response to change and disturbances depends on the level of vulnerability, exposure and sensitivity of their livelihoods. The exposure of agricultural livelihoods to climate-induced water stress is aggravated by the high levels of sensitivity of the social and ecological systems of the poor and their limited adaptive capacity to respond appropriately to these threats (Brown *et al*. 2012).
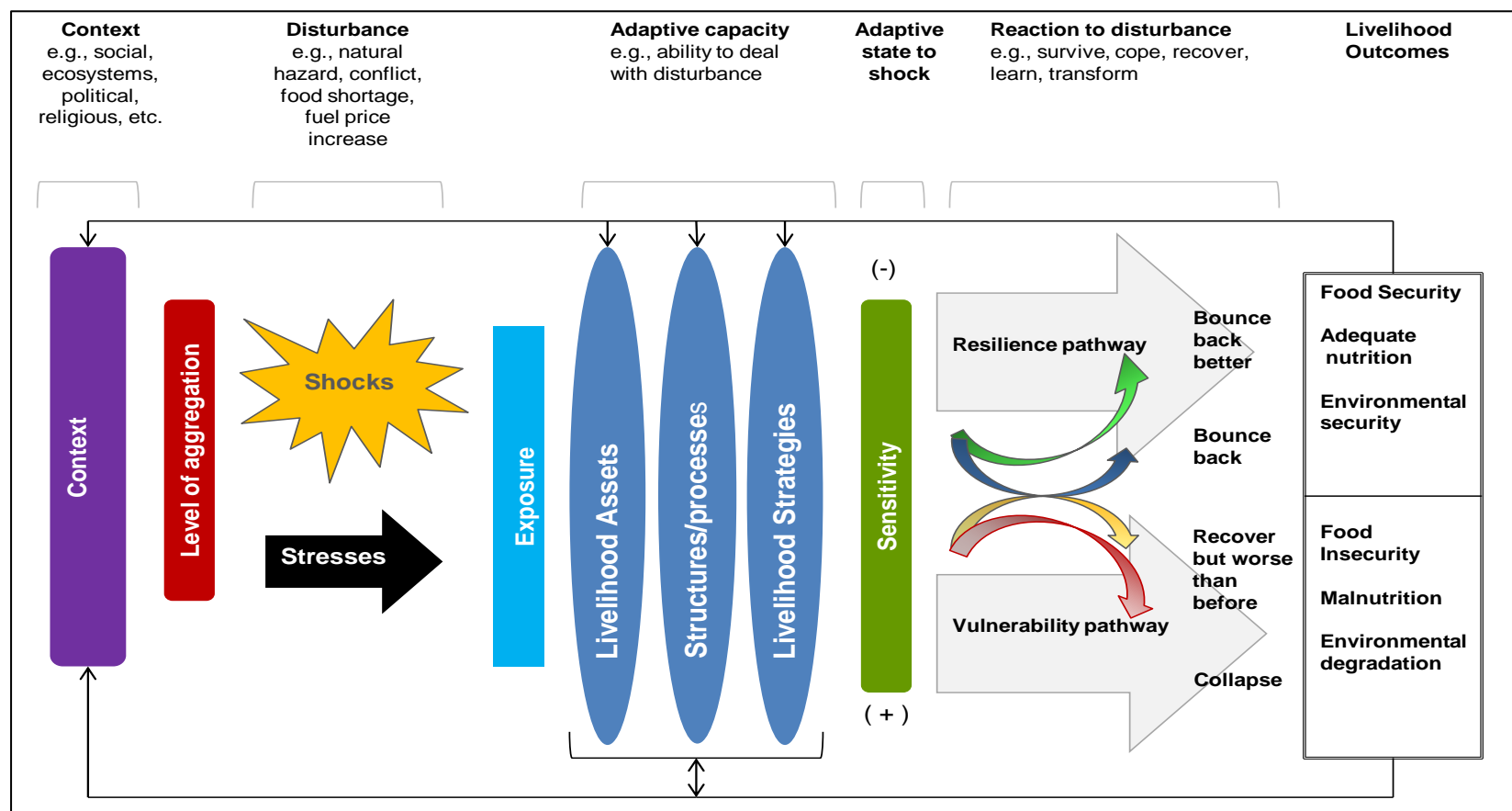
Figure 5.1: Resilience Conceptual framework. *TANGO 2012. Adapted from DFID Disaster Resilience Framework (2011), TANGO Livelihoods Framework (2007), DFID Sustainable Livelihoods Framework (1999) and CARE Household Livelihood Security Framework (2002*

Highly vulnerable households to food insecurity are also highly exposed and they are sensitive to risks and their adaptive capacity is constrained by many factors such as access to appropriate resources, institutional failure, cultural factors and human capital development (Kakota *et al*. 2011). In the worst-case scenario, the system might not bounce back at all, but rather ''collapse'', leading to a reduction in the capacity to cope in future (DFID, 2011). The way socio-economic units respond to vulnerabilities is a function of livelihood approaches and productive resources used to maintain or worsen their welfare. For example ownership of productive assets and livelihood diversification increases the adaptive capacity of a particular household through consumption smoothing, production increase and flow of income. The livelihood approach is a way of viewing how a social unit behaves under an external or internal context which may constitute an opportunity or weakness (Oparinde and Hodge, 2011).

Conceptualising food security as an integral part or an outcome of a livelihood strategy recognizes that a host of stresses can interact to affect food insecurity at the household level (Connolly-Biutin, 2016). Among them are the importance of access to productive assets, institutional structures and processes and the livelihood strategies pursued by households in order to regain food security (Frankenberger *et al.* 2012). In other words, a household's capacity to "bounce back or collapse" into food insecurity and poverty is located in the livelihood perspective. Households belonging to different socioeconomic groups, hence with different capabilities, assets and livelihood strategies which sanction different levels of resilience or vulnerability to food insecurity (Djogbenou, 2015). Assets are critical components of household resilience to food insecurity, as they support productive activities, livelihoods strategies or options pursued by households as well as offering the flexibility to well-being by widening subsistence options (CRS, 2013). But the extent to which asset holders can adapt to environmental changes matters (Ncube 2011). Households who own or have access to tangible or intangible assets have the capacity to diversify into other livelihood options and easily absorb social and environmental changes, whereas the poor remain trapped in asset poverty, thereby resulting in the widening of inequality. Livelihood diversification is an important risk-spreading strategy to enhance resilience from food insecurity, especially outside agriculture into non-farming options like transport, casual labour, informal trading, artisanal mining and cooperatives. This provides vital assets for buffering the effects of extreme livelihood shocks as a coping and adaptive strategy (Van Kien, 2005). This leads to self-organisation and elimination of food insecurity and poverty because of the availability of alternative resources and use (Jayaweera, 2010).

Diversification into non-farming economic activities outside agriculture strengthens the household adaptive capacity when agriculture is negatively affected (Kangalawe and Lyimo, 2013). However, the ability of rural households to manage livelihood risks is often hindered by poverty, limited livelihood options and the relative weakness of local institutions and structures to provide adequate social protection and early warning systems (IFAD, 2011).

For a food system to be resilient and be able to withstand economic and environmental shocks and stresses at different temporal and spatial levels (Methot, 2013), it has to be made of at least two constituents; the resource base that ensures food security over time and the socio-economic component that rely on this resource base to off-set vulnerability (Alinovi *et al.* 2010). In the best case, the reaction to a risk, shock or stress might be to '*bounce back better'* for the system or process to enhance food and livelihood security (DFID, 2011). Both the resilience and vulnerability pathways emphasise the combination of settings and resources as core determinants of livelihood strategies, for example, rural ownership of arable land or draught power and as a symbol of livelihood security (Hoddinott, 2014). Therefore, livelihoods are secure to enhance food security when households have secure possession of, or access to, productive resources and income-earning opportunities, including reserves of stocks and assets to ease shocks and meet contingencies (Baro and Denbel, 2006).

5.3 Methodology

5.3.1 The Quantitative Approaches to Measuring Resilience

On the whole, few studies have quantitatively tried to assess household elasticity against food insecurity due to the fact that resilience is not observable *per se* (Boukary *et al.* 2016). It is a multifaceted phenomenon which can be related to a number of context-specific dimensions. Among the limited set of examples that have attempted to measure resilience, are applied latent variable approaches which can reduce these dimensions into a single variable, by applying a data reducing technique such as Principal Component Analysis (PCA) and Factor analysis (Alfani *et al.* 2015). Using cross-sectional data, Alinovi *et al.* (2008; 2010) in their studies on household resilience to food insecurity in Kenyan and Palestinian households, they model resilience as a multidimensional latent variable. They estimated the resilience index using a two-stage factor analysis technique. In the first stage, the observed variables (assets, income generating activities, access to basic services, and safety nets) were used to estimate the first set of latent variables through factor analysis. In the second stage, the latent variables were, in turn, used to compute a resilience index using factor analysis again.

Using the data from the Ethiopia Rural Household survey to estimate household resilience to food insecurity, Demeke and Tefera, (2011) used Principal Component Analysis (PCA) to construct a resilience index on a set of observable variables namely: assets, education, access to food and social networks. Then a dynamic panel model was applied to establish the determinants of resilience. Boukary *et al.,* (2016) on analysing factors affecting rural households' resilience against food insecurity in Niger, created a resilience index using Principal Component Analysis (PCA) on income, food expenditure, duration of grain held in stock, Tropical Livestock Units (TLU) and the number of farms exploited. To identify the factors affecting household resilience against food insecurity, Alinovi *et al.* (2008; 2010) applied the structural modelling approach. This methodology is based on the assumption that at a given point in time (T_0), the food insecurity resilience of a given household depends primarily on the available options to that particular household to make a living or survive. The structural equation modelling approach uses a factor analysis-type model to measure the latent variables via observed variables, simultaneously using a regression-type model for the relationship among the latent variables (Bollen, 1989; Alinovi *et al.* 2008; 2010; Boukary *et al.* 2016). Interestingly, Alinovi *et al*., (2010), in Kenya used cluster analysis to check how different livelihood groups are related to different dimensions of resilience and how these dimensions are relevant in determining the resilience of various livelihoods. In a dynamic way, Ciano and Romano (2013), used a two-stage factor analysis on panel data to contruct a methodology to quantitatively measure resilience to food insecurity among rural households in Nicaragua. In the first stage, an index for each component was estimated separately using an iterated principal factor method over a set of observed variables. In the second stage, the resilience index was constructed using a factor analysis on the interacting components estimated in the first stage. In their study, resilience index seemed to be a key element describing households' food security status. The general idea of resilience against food poverty dynamics was that between at any particular time *t* and *t* +1 the household maybe hit by some shocks, risks or stresses. Then the level of food security at *t* + 1 is a function of the interaction between livelihood strategies and resilience, which determines the household ability to cope with shocks. It is the background of different empirical approaches on similar studies that directed this study to adopt two-stage Factor Analysis using Principal Component factor method.

5.3.2 Modelling Resilience to food insecurity

Although resilience is a dynamic multidimensional concept (Demeke and Tefera, 2013), it may be measured and represented as a composite that constitutes an index (FAO, 2016), showing which factors contribute to household resilience, in which context, to which type of risks or shocks. The resilience against food insecurity of a given household at a given point in time is assumed to depend primarily on the available options to that household to make a living, such as its access to living assets, income-generating activities, basic services and social safety-nets. These options, therefore, determine the household's ability to handle a given risk and attain well-being. Therefore, in this study, the food insecurity resilience index for a household i is expressed is as follows:

$$R_i = f (A_i, AFI_i, SSN_i, ABS_i, ANR_i, AC_i, SS_i, S_i) \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where R =Resilience, (A)= Assets, (IFA)= income and food access, (SSN)= social safety nets, (ABS) access to basic services, (ANR)= access to natural resources, (AC)= adaptive capacity, (SS)=support services and (S)= Stability. In this analysis, resilience is not observable *per se* and is considered a latent variable depending on the terms on the right-hand side of the equation (1). To estimate *R,* it is therefore necessary to estimate the different dimensions separately, assets (A), (IFA), (SSN), (ABS), (ANR), (AC), (SS) and (S), which are then latent variables because they cannot be directly observed in a given survey, but it is possible to estimate them through a multivariate techniques (Table 4.1). Each dimension is estimated at a given point in time (T_0) and then a composite index of household resilience is generated.

Hence, resilience index is quantified as the weighted sum of the factors generated and specified as:

$$R_i = \sum_{i=1} W_r F_r$$

Where W_r is the weight of variable r and F_r is the factor under consideration of the variable r. The weights are the proportions of variance explained by each factor. Food security strategies in developing countries often focus narrowly on agricultural production and markets, neglecting other important proxy dimensions which form the significant construction of resilience against shocks or risks (Methot, 2013). Asset (A) values could be used as a proxy of the ability of a household to cope with shocks, as ownership of assets is an important risk management strategy to smoothen consumption and influencing the ability to prevent, mitigate and cope with shocks (Lovendel and Knowles, 2005). Therefore, they have to be reflected as a

key factor in estimating resilience. In this study, productive and household assets were converted into monetary value (USD), Tropical Livestock Units (TLU) and the size of landholding.

Table 5.1: Composition of the livelihood Resilience Index

Assets (A)	Food and Income access (IFA)	Social safety nets (SSN)	Access to basic services (ABS)	Access to Natural resources(ANR)	Adaptive capacity (AC)	Support services (SS)	Stability (S)
Value of Productive assets(USD)	Per capita income	Food distribution	Access to education	Fishing, gardening and panning	Coping strategy index	Access to credit	Education
							Occupation
			Electricity				Age
			Information				Gender
			Sanitation				Marital
Value of non-productive assets (USD)	Expenditure on food	Input subsidy	Access to primary health care	Grazing pasture	Livelihood diversity	Extension	Dependency Ratio
			Distance to dip tank		Hh member, remitting		
Total livestock Units	Maize yield per hectare	Cash transfers	Access to markets	Firewood	Education of hh head	Malaria control	Income
Land size	Calorie intake	Food for work	Access to clean water	Forest	Max education in hh	In put subsidy	Assistance
	FIAS		Access to road infrastructure	Forest products	Health matters	Infra-structure	Healthy

Source: Survey 2016

IFA are facets of livelihood indicators, which shows a household's capability to absorb shocks. Food access is the economic capacity of a household to afford adequate food, which requires a household to have income for food consumption expenditure (Kebede *et al.* 2016). Since the, in general, the poor spend a whole lot of their meagre income on food alone. Even though rural access to food is primarily determined by own production, income determines the households' purchasing power of basic amenities. This study has calculated access to food and income using household per capita monthly income, expenditure on food, calorie adequacy at adult equivalence and Food Insecurity Access Scale (FIAS) to access to estimate the prevalence of food insecurity. Social Safety Nets (SSN) are meant to protect vulnerable populations from persistent impacts of shocks by providing livelihood support and contributing to immediate food security (World Bank, 2005b; Gautam, 2006; Shiferaw *et al.* 2014) in the form of relief assistance from international organisations, charities, non-governmental organisations. Therefore, social safety nets can be considered as an estimation of resilience as they represent a system's capacity to mitigate shocks. In this study, food aid is disaggregated into food

distribution, cash transfers, food for work and input subsidy are variables reflecting the component of social safety nets. Access to Basic Services (ABS), encompasses key public services that affect a household's capacity to deal with risks and respond to crises accordingly, at the same time enhancing resilience. In this study, observed variables considered for basic services are the distance to and cost of primary health care, the distance to and cost of education, information services, distance to markets, access to electricity and access to strategic infrastructure (i.e. roads, dip tanks). Access to Natural Resources (ANR): the extraction of freely available environmental services is considered as primary means of livelihoods for poor people in developing countries. Quite often a key element underlying lack of livelihood resilience is the poor status of the natural resource base and the overall delicacy of the ecosystems (WFP, 2013). The variables used to generate ANR indicator are access to water resources, grazing pastures, firewood, forest products and timber. Adaptive Capacity (AC) is another dimension of resilience which measures household's ability to cope, adapt and absorb *ex-ante* and *ex-post* shocks and risks and still perform its key functions. This means resilient livelihood systems with great adaptive capacity are able to reconfigure without significant declines in crucial primary functions after disturbances (Nyamwanza, 2012). In this study, Adaptive Capacity is measured by a diversity of income sources, coping strategy index, number of years spent in school by the household head and the health status of the household members. Support Services (SS) significantly enhance rural livelihoods particularly agriculture and sustains food security in long-term, thus mainstreaming the rural poor in the overall development process. In this study support services are captured in the form of extension services, credit facilities, and input subsidy. (S) Stability is an important group contributing to resilience which explains household's options and capacity to withstand as a whole to external shocks and stressors. This is because a households' food security depends on the interaction of components that enable them to react to such external stimuli and continue with their normal livelihoods functions. The following variables are used to quantify stability: dependency ratio, income stability (income discrepancy over the last twelve months), health stability (number of institutions providing medical care), educational level (average number of years of schooling of household members), and assistance stability (variation in the quality of assistance over the last twelve months).

Thus, this research applied Principal Component Analysis (PCA) to aggregate the different livelihood dimensions into food insecurity resilience index. Principal component analysis is a linear combination of optimally weighed observed variables, on which some are correlated to one another, frequently used in research to construct indices for which they are no well-defined

weights (Tesso *et al*. 2012; Lokosang *et al.* 2014)). Therefore, the model generates the weights based on the assumption that there is a common factor that explains food insecurity level of resilience in different livelihood dimensions. This is accomplished by converting the principal components to a new set of variables, which are uncorrelated, but sequentially ordered so that the first few retain most of the variation present in all the original variables (Jolliffe, 2002; Boukary *et al.* 2015). In simpler terms, principal components can be easily derived by finding the projection that maximises the variance.

5.4 Empirical results and discussion

5.4.1 Resilience of "What" to "What"?

Since rural livelihoods are natural resource-based, in particular, farming, the shocks the households encountered are described as within their 2015/16 agricultural season (Table 5.2). Households face an array of shocks, among others, rainfall variability at 94 %, was the worst livelihood risk faced in the district. The rural poor whose livelihoods depend on rain-fed subsistence agriculture are frequently exposed and vulnerable to the sensitivity of drought and are least able to buffer and absorb its impacts (Boto and Pandya-Lorch, 2013). In developing countries, rural food insecurity is not only caused by climate change and variability, they are notable macro- structural constraints. The rural poor lack enough income to procure agricultural inputs early in the cropping season due to high costs and low market prices of agricultural products. More than half, (58%) of households in this study identified the high cost of inputs as the second major food security challenge, for example, the high price of seeds, fertilizers, and herbicides (Table 5.2).

Some households end up using uncertified seeds, cropping without fertilizer and herbicides, resulting in low productivity. Even though subsidy programmes ease the problem, they are not able to sufficiently target every household due to poverty and increasing demand. Trends in agricultural prices are important economic variables which determine agricultural activity. Despite the inadequate rainfall, about 56% of households, more than half, highlight unfair market prices for their produce (Table 5.2). Rural livelihood implications are also structural constraints, as the rural poor face twin fronts, paying more for agricultural inputs and a relative fall in the prices of farm outputs. Severe market failures cause low levels of productivity, hence food insecurity. Consequently, most rural households face high prices of inputs and low prices of their produce, reducing their profit margins (Maumbe and Okello, 2013). Fair pricing of agricultural inputs and output markets are vital for rural households that receive part of their income from agricultural activities (Taylor, 2009). The relatively high frequency of increasing

food prices recorded (34%), especially maize grain the staple food, was because of low supply vs high demand (Table 5.2). Other shocks encountered were relevant but not significant to measure resilience against them. A hydrological and agricultural drought has the potential to absolutely discard the chain of rural livelihood approaches, causing a sprout of other secondary shocks. The link between exposure to drought and food insecurity is mutual, thus warrant an investigation into the nature of household resilience.

Table 5.2: Major shocks encountered by households during 2015/16 Agricultural season

Shocks	Number of households	Percentage
Stock theft	21	7.0
Erratic rainfall which caused crop failure	281	93.7
High costs of farm inputs	173	57.7
Low prices to farm outputs	168	56.0
Increase of food prices	103	34.3
Lack of draught power	82	27.3
Crop diseases and pest	41	13.7
Animal diseases	34	11.4
Food storage losses	22	7.33
Theft of production tools or equipment	18	6.0
Sickness/ exceptional expenses	16	5.3
Damage to infrastructure	15	5.0
Death of a family member	14	4.7

Source: 2016 Survey

5.4.2 Multivariate Statistical Analysis of Resilience

To assess the typology of resilience against food insecurity in eight livelihood constructs separately, the study again employed the multivariate analytical tool of PCA. To determine whether or not the dataset of 300 households could be factored, the Kaiser-Olkin (KMO) and Bartlett's sphericity tests were used to check the suitability of the variables for PCA (Hair *et al*. 2006; Field 2009; Naiggolan *et al.* 2011). The decision on the number of the components to retain is based on Kaiser's criterion, all factors exceeding an eigenvalue of one were retained. However, following other studies (ie Sharaunga, 2015), absolute PCA loadings greater than 0.50 are considered as dominating and indicating a strong association among the indicators used to generate a particular PCA. This is also applicable to this study.

Factors are rotated using Varimax with Kaiser Normalization rotation method to improve interpretation of the PCs. Table 5.3 shows the Eigen vector for estimation of the latent variable, which is the dimension of household asset holding. Household ownership of productive and non-productive assets was strongly related in the first component (PC1), explaining 47.05% of the variance in asset endowment.

Table 5.3: Principal component estimated loadings for Asset dimension

Component	PC1	PC2
Eigenvalues	0.90	1.12
% of Variance	47.05	28.0
Cumulative %	47.05	75.0
Constructs of Assets		
Value of productive assets	**0.940**	0.055
Value of non-productive assets	**0.935**	0.062
Land size	-0.128	**0.827**
Total livestock Units	0.253	**0.685**

NB: PC loadings greater than 0.5 are indicated in bold

This PC reflects non-farming households who use their assets for livelihood diversification. Hence, the PC was named "NON-FARMERS". Assets increase the likelihood of being resilient to food insecurity by ensuring economic participation and smoothing during food shortages. Component PC2 explained 28 % of the variance in asset dimension. The PC shows that landholding and livestock ownership measured in TLU significantly contribute to food insecurity resilience for rural farming households. Therefore, this PC was named "FARMING HOUSEHOLDS". This is because the combination of access to land and traction power is critical for rural livelihoods in particular own food production.

Table 5.4: Principal component estimated loadings for Income and food access dimension

Component	PC1	PC2
Eigenvalues	2.01	1.07
% of Variance	40.1	21.5
Cumulative %	40.1	61.5
Constructs of income and food access		
Per capita monthly income	**0.807**	0.101
Expenditure on food	**0.853**	-0.129
Maize yield per hectare	0.273	**0.805**
Calorie intake per adult equivalence	0.413	**-0.635**
Food Insecurity Access Scale	0.**615**	0.016

NB: PC loadings greater than 0.5 are indicated in bold

Table 5.4 shows the presentation of PCA on variables that indicate household food and income dimension. The model produced two principal components (PCs) that had eigenvalues greater than one and also allowed for meaningful interpretation of the PCs considering absolute PC loadings greater than 0.30. The two PCs jointly explained 62.1 % of the total variation in the variables used.

Dominating positive resilience indicators in the first PC were per capita monthly income, expenditure on food and security in access to food, a replica of well-off households, explaining 40.1 % of the dimension. The relationship between the three variables means high-income households are able to meet the required expenditure on food to meet dietary needs as compared to low-income households. Thus, the PC was named "HIGH-INCOME HOUSEHOLDS" as it demonstrated income as the critical necessity in food access. The second PC explained 21.5 % variance, highlighting that resilience to food insecurity can be enhanced if adequate resources are made available to the poor in order to improve own production of staple foods which translates into adequate calorie availability per adult equivalence. Hence, the PC was named "SUBSISTENCE FARMING HOUSEHOLDS". The correlation between the two variables is that an increase in maize production directly enhances household access to food and vice versa. In Zimbabwe and other Southern African countries such as Malawi, Zambia, Tanzania Botswana, and Mozambique food security or insecurity is measured by maize output against demand because of its increasing importance as a staple food crop in the region.

Table 5.5 shows two components that were retained, together they explained 65.5% of the total variation in the variables used. In the first PC, food distribution, cash transfers and food for work were positively correlated with SSN and played an important role in food insecurity resilience.

Table 5.5: Principal component estimated loadings for social safety nets

Component	PC1	PC2
Eigenvalues	1.43	1.19
% of Variance	35.8	29.7
Cumulative %	35.8	65.5
Constructs of social safety nets		
Food distribution	**0.518**	**0.648**
Input subsidy	-0.214	**0.864**
Cash transfers	**0.756**	-0.198
Food for work.	**0.719**	0.112

NB: PC loadings greater than 0.5 are indicated in bold

Even though external aid reduced food insecurity in short term, it created a dependency syndrome in the longer term. This, PC was named "AID DEPENDENT HOUSEHOLDS" The component explained 33.8 % of variance contribution of social safety nets to household resilience to food insecurity. When people rely on external aid for their food security it means they lack both coping and adaptive capacity because food aid is a short-term mechanism to ease consumption difficulties. The second PC explained 21.5 % variance, demonstrating that food aid and input subsidy were strongly related to enhancing household food security after disturbances. In other words, the households require input subsidies, but they do not produce enough food to meet their consumption needs, which warrant the need for food aid to bridge food deficit. Thus, the PC was named "POOR HOUSEHOLDS". In other words, in order for the rural poor to be resilient against food shortages, they need instruments of social safety nets and productive resources.

Table 5.6 shows five components that were retained, together they explained 57.08% of the total variation in the variables applied. The first component shows that distance to the dip tank and the cost of the service were correlated to the estimated dimension.

Table 5.6: Principal component estimated loadings for Access to basic services

Component	PC1	PC2	PC 3	PC4	PC5
Eigenvalues	1.65	1.48	1.17	1.06	1.0
% of Variance	15.02	13.44	10.62	9.62	9.10
Cumulative %	15.05	28.46	39.09	48.70	57.08
Constructs of access to basic services					
Distance to school	0.012	0.316	**0.693**	0.059	0.128
Distance to health care	0.064	**0.771**	-0.001	-0.065	0.009
Sanitation	-0.008	0.063	**-0.725**	0.112	0.202
Access to information	-0.014	-0.169	0.192	0.045	**-0.796**
Presence of road infrastructure	0.087	-0.458	0.290	0.063	**0.565**
Distance to clean water	0.430	0.278	-0.062	-0.094	0.028
Distance to markets	0.027	**0.549**	0.247	0.021	0.069
Distance to dip tank	0**.834**	0.113	0.049	0.031	0.102
Cost of healthcare	0.081	0.085	-0.091	**0.766**	0.120
Cost of basic education	-0.049	-1.148	0.036	**0.716**	-0.129
Cost of dip tank services	**0.806**	-0.208	0.037	0.093	-0.010

NB: PC loadings greater than 0.5 are indicated in bold

Animal health infrastructure is quite relevant for rural households, as livestock are critical assets in the rural economy. Households that accumulate and invest their wealth in livestock assets could use them as a buffer in difficult situations (Mutenje, 2010). Hence, this component (PC1) which explained 15.05% variance is named 'CATTLE RANCHERS'. The second

component which explained 13.44% variance, satisfies easy access to markets and primary health care services. Communities lying in the vicinity of growth points or small towns have a direct social economic connection which enables them to be resilient than those in marginal areas far from basic services. Conversely, this component is named "PERI-URBAN HOUSEHOLDS". The third PC which explained 10.62% variance, had positive loading on access to basic education and negative loading on sanitation. The positive sign indicates that most rural households are closer to primary and secondary schools but the negative signs indicate that sanitation is a cause of concern in rural economies. Therefore, the component is named "LITERATE UNHYGIENIC HOUSEHOLDS". This means these households are not resilient as they are susceptible to health risks because adequate sanitation facilities is an important component of the multi-faceted phenomena of food security. The dominant variables in the fourth PC include the cost of health care and education which were positively correlated in influencing resilience in this cluster. The quality of health services and education only increases as households afford the cost of access. Hence, this component which explained 9.62% variance is named "ECONOMICALLY WELL OFF HOUSEHOLDS". In other words, households who can afford quality services can as well afford to procure enough food. The fifth PC which explained 9.10% variance, highlights the importance of access to information and road infrastructure in constructing resilience. Positive loading on road infrastructure shows the presence of rural economic connectivity as this spurs agricultural production and facilitate trade flows. Access to information was negatively correlated with resilience, which impedes rural household's improved decision making and preparedness against potential future shocks and risks. According to Kamba (2009), having access to relevant information can address major problems that hinder rural economic development and this can also improve chances for livelihood opportunities. Thus, the component is named "REMOTE ROAD LINKED AREAS". Meaning resilience could be enhanced if rural people have access to infrastructure and relevant information.

Table 5.7 shows two dominant component loadings that were retained, combined they explained 59.54% of the total variation in the variables used. The first PC shows that households who have to find it easy to access the forest (0.738), also find it easy to get pasture for their livestock (0.803), they are the same ones who are able to collect firewood (0.828) as well. This PC explained 37.54% of the variation in the variables included in the model. According to Cotula (2002), the livelihoods of the rural poor without access to natural resources means they became vulnerable in obtaining food, accumulating assets and recovering from

environmental or economic shocks. Thus, this dimension was named "NATURAL RESOURCE EXTRACTS". Meaning, resilience against food insecurity can be enhanced if rural dwellers sustainably utilise the ecological resources in their midst.

Table 5.7: Principal component estimated loadings for access to natural resources

Component	PC1	PC2
Eigenvalues	1.88	1.10
% of Variance	37.54	22.0
Cumulative %	37.54	59.54
Constructs of Access to natural resources		
Access to water resources	-0.047	**-0.725**
Access to grazing pasture	**0.803**	0.044
Distance to the forest	**0.738**	-0.146
Access to firewood	**0.828**	-0.106
Access to other forest products	-0.046	**0.735**

NB: PC loadings greater than 0.5 are indicated in bold

The dominant variables in the second PC include access to water resources (water for gardening and animals, sand, reeds, alluvial, panning and fishing) and access to other forest products. The positive loading on access to other forest products shows that other households attract indigenous products (for example, medicinal plants) for domestic use. The negative sign shows limited access to water resources mainly because of hydrological drought on surface water bodies. This PC which accounts 22 % variance was named "DROUGHT RESISTANT FOREST PRODUCTS". Households can be temporarily resilient if they use forest products to generate income, but they cannot be resilient against food insecurity if they lack basic commodities like safe water to drink and for other livelihood purposes.

In Table 5.8 the model retained three components, jointly explaining 70.58% of the total difference in the variables included. The first PC highlights that in a bid to be food secure on short-term basis households with less income employ a number of food deficit coping strategies to maintain a healthy living. The combination of the loadings reflects a replica of food insecure households striving to be resilient. This PC which explains 28.51% of the variance is coded "LOW RESILIENT FOOD INSECURE HOUSEHOLDS".

The second PC indicated the importance of education as a construct of household resilience to food insecurity. Formal education improves human capacity and technical know-how, which aids the rate of adaptation, thus improving the production of such households and consequently their food security status (Fawehinmi and Adeniyi, 2014). This accounts 21.96 % of the variance is coded "HUMAN CAPITAL HOUSEHOLDS" The PC3 displayed the least amount

of variation (20.12%) in the rural household adaptive capacity scores and represents migrant household members sending remittances. Remittances in the form of food and income are common among rural households in Zimbabwe to aid food security. The migrants, either within or outside the country remain attached to their homes and send remittances (Camlin *et al.* 2014; Yobe, 2016). Therefore, this PC is named "REMITTANCES".

Table 5.8: Principal component estimated loadings for Adaptive capacity

Component	PC1	PC2	PC3
Eigenvalues	1.43	1.10	1.01
% of Variance	28.51	21.96	20.12
Cumulative %	28.51	50.46	70.58
Constructs of Adaptive capacity			
Coping strategy index	**0.803**	0.158	-0.115
Number of income sources	**-0.690**	0.440	0.092
Household health situation	**0.506**	0.490	0.397
Average household education	-0.015	**0.801**	-0.144
Migrants sending remittances	-0.133	-0.112	**0.907**

NB: PC loadings greater than 0.5 are indicated in bold

Table 5.9 shows two components retained in the dimension of support services. Both explaining less than fifty percent of the total variation of the variables used to estimate resilience (46.96%). The first PC indicates a positive correlation between extension services and input subsidies in constructing rural household resilience to food insecurity.

Table 5.9: Principal component estimated loadings for support services

Component	PC1	PC2
Eigenvalues	1.33	1.02
% of Variance	26.63	20.33
Cumulative %	26.63	46.96
Constructs of Support Services		
Access to credit or loans	0.275	**-0.533**
Extension services	**0.736**	0.098
Malaria control	0.372	0.082
Input subsidy	**0.757**	0.127
Infrastructure development	-0.062	**0.836**

NB: PC loadings greater than 0.5 are indicated in bold

According to Leuveld *et al.,* (2016), two primary tools for raising rural households' incomes and improving food security are input subsidies and agricultural extension services. They address the constraints of high input prices on poor households and the transfer of knowledge and skills. Therefore, this PC which accounts for 26. 33% variance is coded "FARMING HOUSEHOLDS". Erratic rainfall is perceived to be a potential trigger of increased food insecurity and impoverishment in most rural communities that rely on rain-fed agriculture for

their livelihoods. Hence, farming households cannot be resilient to climatic shocks and other changes (Ofoegbu, *et al.* 2017). The second PC which explained 20.33% of the variance, shows rural infrastructure development (water, road, social) and less access to credit or loans. Development of quality rural infrastructure is critical in spurring poverty and food insecurity in different ways. Access to credit or loans are limited in rural areas even though the demand for them exists (Sahu *et al.* 2004; Poliquit, 2006). This PC is named "INFRASTRUCTURE DEVELOPMENT FOR CREDIT CONTRAINED HOUSEHOLDS". The existence and operation of infrastructure increase people's resilience to environmental and socio-economic shocks, through their access to services and equal economic participation. There is an aggregate impact of infrastructure to the poor, for example, irrigation stabilises seasonal consumption through increased cropping intensity, crop yields, food availability, and household income.

Table 5.10: Principal component estimated loadings for Stability

Component	PC1	PC2
Eigenvalues	2.427	1.162
% of Variance	40.44	19.37
Cumulative %	40.44	59.81
Constructs of Stability		
Age of household head	-0.260	**0.767**
Dependency ratio	0.119	**0.629**
Occupation of household head	-0.233	0.082
Years spend in school by HH	0.440	**-0.739**
Gender of household head	**0.927**	-0.017
Marital status of HH	**0.923**	-0.107

NB: PC loadings greater than 0.5 are indicated in bold

Table 5.10 shows two components illustrated by the stability of the household demographics. The two components combined explains 60% of the total variation of the variables used to estimate resilience. Gender and marital status of the household headship positively influence resilience against food insecurity in the first PC. According to Kumba (2015), the gender of the household head influences production, organisation and income earning opportunities of a household which in turn determine household food security. In rural areas of developing countries, this implies that male-headed households build a greater household adaptive capacity than female-headed households. Women make up the largest proportion of the poorest people in developing countries, and they are more likely to be susceptible to environmental variability impacts than men because of conventional social and cultural conditions that influence access to resources and division of labour based on gender contracts (Kakota *et al.* 2011).

While confirming the significance of marital status on household resilience to food insecurity, married heads of household are more likely to be resilient against food insecurity than unmarried, single or widowed. This is because couples can share livelihood options and help each other in household decision making. Lacking a male partner, women are deprived of an adult male's earnings and unable to avail themselves of the non-market work that a wife usually provides in a male-headed unit (Felker-Kantor and Wood, 2012). Also, they have limited access to resources. Therefore this PC is named "HOUSEHOLD SOCIAL STRUCTURE". The second PC under Stability retained age of the head of household, years spent in school and dependency ratio. In short, the PC reflects aged head of households, who spend less time in school but have more dependants to feed. According to Starr *et al.*, (2015), aged head of households are more likely to be less resilient against food insecurity because the hypothesis is that they usually they live below the poverty line, with many grandchildren, unemployed dependents and have less than a high school education. Therefore, this PC is coded "LESS EDUCATED AGED DEPENDENT HOUSEHOLDS".

5.4.3 Validation of Resilience Index

It is assumed that all the estimated components are habitually distributed with mean 0 and variance 1, depending on the variance and covariance of the scored factors. It is easy to apply factor or principal component analysis to produce a resilience index. The variables in the previous constructs became covariates in the estimation of resilience index. In the first stage, an index for each dimension is estimated separately using an iterated principal component method over a set of observable variables. In the second order factor analysis, the resilience index is derived using a factor analysis on the interacting dimension estimated in the first stage. Here the resilience index is a weighted sum of the factors generated using Bartlett's (1937) scoring method and the weights are the proportions of variance explained by each factor.

The results in table 5.11 show that resilience cannot be a single dimensional concept. Therefore, using factor 1 alone, in this table, which explains less than 50 % of the variance is not satisfactory to explain household resilience to food insecurity. This means factors 2 and 3 have to be included in the estimation of resilience to gain a wider understanding. Asset (A) holding fairly represents a household level of resilience against food insecurity in the first factor and positively correlated to other dimensions. This is because resources play a significant role in a household ability to cope with risks and shocks, the result could be an indication of relative resilience against or vulnerability to food insecurity (Browne *et al.* 2014).

Table 5.11: Factor loadings of the resilience dimensions

Resilience Dimension	Factor 1	Factor 2	Factor 3
Assets	**0.793**	0.025	0.075
Income and food access	**0.891**	0.007	0.009
Social safety nets	-0.315	-0.184	**-0.557**
Access to basic services	-0.259	**0.623**	-0.115
Access to natural resources	-0.318	-0.464	0.357
Adaptive capacity	**-0.777**	0.021	0.032
Support services	-0.127	-0.141	**0.813**
Stability	0.122	**0.783**	0.167
Eigenvalue	2.350	1.327	1.063
% variance	29.38	16.60	13.30

NB: FA loadings greater than 0.5 are indicated in bold

Access to Food and Income (AFI) is a positive feature of resilience in the first factor. Theoretically, resilient households have sufficient income and resources to produce and procure enough food to feed their families despite natural, social or economic disturbances. Social Safety Nets (SSN) is not positively related to resilience in the first and second factor, but negatively related to the third factor. This is obvious given that social protection is not sufficient to increase resilience and food security when households are too poor to sustain themselves. Access to basic services (ABS) is positively related to resilience in the second factor; continuous access to basic services by the poor reduces household vulnerability to shocks and increases resilience and well-being. Even though rural livelihood strategies are intricately linked to natural resources, i.e. land use. Unexpectedly, in this study, ANS is not significant enough to influence resilience against food insecurity. This might be primarily attributed to natural resource degradation and inequitable access to these resources, which in turn has a negative impact on food production. Adaptive Capacity (AC) which measures the ability of a household to adjust to a new condition and develop new sources of livelihoods is negatively correlated with resilience in the first factor and not significant in the other factors (below the 0.5 threshold). This means, when a poor household becomes food insecure, it is difficult to acquire resources that can make them resilient. The capacity of households to manage and adapt effectively to risks and shocks is more influenced by their household characteristics. Support Services (SS) is positively related to the other variables in the third factor. Apparently rural support services are not adequate for households to adapt, anticipate and recover from the effects of disturbances, in a manner that protects their livelihoods, reduces food insecurity and facilitates resilience. Stability (S) an objective condition, which captures household options available over time, is positively correlated with other dimensions in the

second factor. This second factor probably captures household characteristics which determine negative or positive stability when a household is under stress. Household resilience depends on the interacting components of its stability for its well-being in order to react positively to external shocks and risks (Kebede *et al*. 2016).

5.4.4 Measuring Household Resilience

Figure 5.2 shows the estimation of food insecurity resilience index by household livelihood options. They were two dominant livelihood options in the study area; Farming (49%) and Non-farming (51%). Non-farming activities found in the study included artisanal mining, selling fire wood, brick making, construction, professional jobs, low caste jobs, buying and selling and beer brewing. The results show much diversification within the utility of natural resources. There is developing evidence suggesting that non-farming activities are becoming increasingly significant for food security, poverty alleviation and farm sector productivity (Davis, 2003). Economic household resilience and the sustainability of non-farming activities should be measured through the fulfilment of their consumption needs. The resilience of non-farming households in this study can be explained by their high adaptive capacity to food shortages by combining agriculture and other allied livelihood activities. In a similar study by Wang *et al.,* (2011), they agreed that in rural areas, non-farming activities are seen not only to offer resilience solutions but also help to reduce poverty, food insecurity and income inequality. Thus, in the midst of adverse trends and sudden shocks, like in this study with erratic rainfall, households with different sources of income were able to meet their consumption needs. This confirms that rural livelihoods are not limited to farming only, non-farming activities could offer alternative livelihoods in most rural areas of developing countries, especially during the lean season (van den Berg and Kumbi, 2006). Accordingly, a household with a single livelihood source is less resilient to food insecurity, than a household with diversified livelihood options, each proportionally contributing towards food security. The low resilience of farming households is attributed to high dependence on climate-vulnerable resources and environmental services supporting livelihoods. Limited resources and the capacity to cope with shocks significantly impact their food security, income, and well-being.
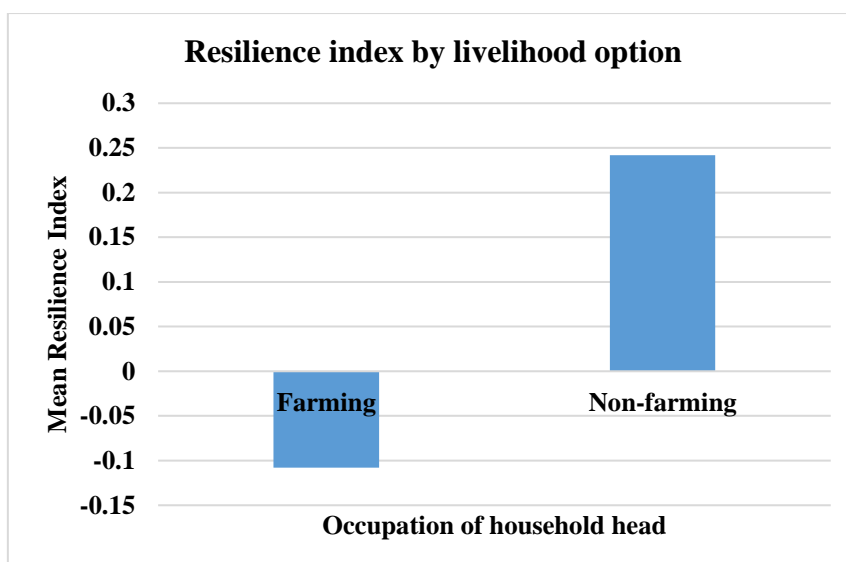
Figure 5. 2: Resilience index by household livelihood option

Agricultural livelihoods are by nature susceptible to risks and uncertainties of various natures, both, abiotic, biophysical, environmental, biotic and economic (Gitz and Meybeck, 2012). Household socio-economic and ecological systems become too vulnerable to absorb and cope with the disturbances because the agroecosystems which the rural poor rely on for their livelihoods are complex systems at which their interactions take place across multiple scales. Since the resilience index is higher for non-farming as compared to farming, in rural Zimbabwe, there is need to reconfigure policy and resources towards non-farm livelihood options suitable to the context of communal areas. In areas of low rainfall, high temperature and poor soil quality in Zimbabwe, farming, in particular, cropping, should not be considered a reliable source of livelihood because of climate chance and variability.

Households belong to different socio-economic groups and have different strategies to earn means of living, which in turn may achieve different levels of resilience against food insecurity. Female headed households are the sub-set of the different socioeconomic structure with different strategies and levels of resilience (Ahmed, 201). Gender is an important dimension of resilience, hence, understanding the variations and similarities between households on the basis of social structure is critical to capture the experiences they face in coping with different circumstances. As expected, measuring resilience by gender revealed that female-headed households were found to have lower scores on the resilience index than male-headed households, meaning male headed households were more resilient than female-headed households (Figure 4.3). This is linked to low adaptive capacity because of poverty, social exclusion because of cultural barriers, lack of education, lack of skills, higher dependency ratio,

and lack of access to or control over assets. The vulnerability of woman-headed households to food insecurity is significantly attributed to the way gendered livelihood opportunities are unequally structured, all which determine the limited extent to which they cope and adapt to external shocks (Zenebe, 2010; Akram, 2014). In other words, woman-headed households in the district were lacking both coping and adaptive capacities against food insecurity. This suggests that any resilience building initiatives for female-headed households should be done to scale up the capacities of these two resilience pillars.
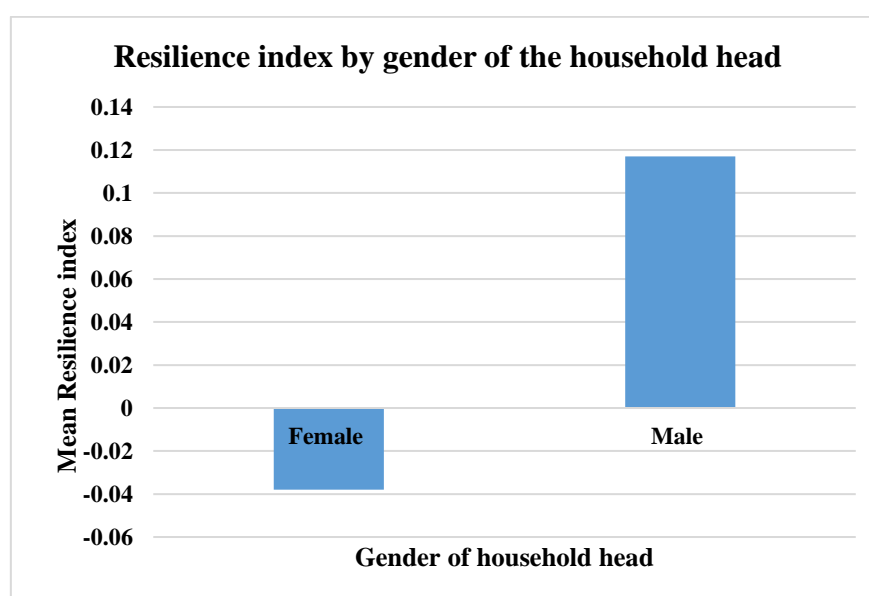
Figure 5.3: Resilience Index by gender of the household head

Similar observations have been made by Boukary *et al*., (2016), in Niger, Kakota *et al., (*2011), in Malawi, Nyangas and Chingonikiya (2017), in Tanzania, and Umetsu (2012) in Japan, that female headed households are more vulnerable to food insecurity than their counterparts because of their low ability to adapt to the impact of climatic shocks. This suggests that as long *de jure* rural female-headed households are more dependent on subsistence agriculture and other natural resource activities, they are likely to remain food insecure if adaptive strategies are not adopted (Tibesingwa *et al*. 2015). By nature, female-headed households are less resilient because they are physically incapable of performing ploughing activities, since '*de jure'* head of the household is either unmarried, divorced or widowed. Clearly, women need adaptation strategies such as skills, opportunities and empowerment that could ensure sustainable household food insecurity and build long-term resilience. Since gender differences in resilience levels are related to patriarchal norms that still govern access to resources in communal areas, in order to enhance livelihoods of the poor and consequently their resilience,

there is need to recognise the binary social difference, roles, and needs between men and women.

5.5 Summary

Household resilience in this study is the capacity to adapt, cope and recover from risks, shocks, and stresses without becoming food insecure for a given time. Thus, resilience to food insecurity is assumed to depend primarily on the available livelihood options such as the access to assets, income, basic services, natural resources, safety nets, support services, adaptive capacity, and stability. These options are known as dimensions or constructs which determine household resilience in dynamic components. Each construct becomes a latent variable, unobservable *per se*, but made up of observable variables. The result from each dimension becomes covariate in the measurement of the resilience index, based on the assumption that all constructs are normally distributed. The study applied a two-stage factor analysis using Principal Component Factor method to estimate the resilience of households in different dimensions and measure the resilience index. Access to natural resources was not significant to account for resilience in the index, mainly because of the current degradation and inequitable distribution of the resources.

The study shows that non-farming activities are more resilient against food insecurity as livelihood risks are evenly spread over a number of portfolios, compared to agricultural livelihoods which are susceptible and not resilient to climate variability. This calls for livelihood diversification in order to curb rural food insecurity. When analysing resilience by gender of the household head, the findings revealed that female-headed households are less resilient that male-headed. Indeed this is linked to structural poverty, cultural expectations, social exclusion, vulnerability, low adaptive capacity and lack of resources. This demands woman empowerment, in particular strengthening social safety nets to increase their adaptive capacity against risks, shocks, and stresses. Livelihood diversification was shown to be an important adaptive strategy as compared to relying on one livelihood option. Generally, the results indicate that to increase resilience against food insecurity, there is need to strengthen the livelihood dimensions or priorities that rural households might have.

CHAPTER SIX: THE TYPOLOGY OF RURAL HOUSEHOLD WELFARE: THE OVERALL DISCUSSION OF RESEARCH QUESTIONS, MAJOR FINDINGS, CONCLUSIONS AND RECOMMENDATIONS.

6.1 Summary of the study

The study was motivated by the need to assess detailed rural livelihood typology, specifically quantifying the dimensions and determinants of poverty, food insecurity and the impact of livelihood resilience on household well-being. The objective is to contribute towards appropriate local level models intended to curb poverty, enhance food security and stimulate sustainable livelihood resilience in rural areas of developing countries specifically Zimbabwe. This chapter gives a comprehensive discussion of salient and interesting findings as related to the overall scientific significance of the study in the broader understanding of the field. This is done by testing the relationship between what the literature revealed, theoretical, conceptual and empirical issues, to successfully fill the gaps in rural household welfare dynamics. In a bid to illustrate how livelihood approaches are fundamentally significant in explaining the gradient of poverty, food security, and resilience in rural areas. The study employed different methodologies to quantify and explore the relationship between the four concepts (livelihoods, poverty, food security and resilience). The argument is constructed as an interface of study research questions, major findings, methodologies, recommendations, further research and conclusions that reflect the overall purpose of the study. Since the study aimed at analysing the dynamic aspects of poverty, food security and resilience from a livelihood perspective, this chapter evaluates the study research questions asked were scientifically answered. To understand how livelihood approaches shape either positive or negative well-being, it is important to be cognisant of prevailing context-specific social, economic and environmental conditions within which livelihoods are constructed.

6.2 Major findings and conclusions of the study

6.2.1 Household vulnerability to poverty and food insecurity

The empirical results highlight that household well-being is potentially shaped by the nature of its livelihood activities. The concept of 'food poverty' as discussed in this analysis focuses on 'income' metrics (purchasing power) which has a direct bearing on 'food security' (food access). If a household has enough income to meets its consumption needs, in particular, the procurement of adequate food, it can take its daily calorie intake per adult equivalence to within or above the recommended threshold. At the same time, the resource-poor had difficulties to access enough food and acquire the recommended calorie intake. Food security was a function of enough purchasing power to meet necessities vs food insecurity a result of poverty. Overall,

the study showed that poverty and food insecurity were deeply rooted and widespread due to frequent livelihood insecurity, especially, a poor agricultural performance which is seasonal and highly dependent on unreliable ecological systems. The dimensions and determinants of food poverty in chapter two and three explained the structural nature of vulnerability in the rural domain. Because of seasonal and unreliable livelihoods, rural poor lack purchasing power to meet basic consumption needs, Mattos *et al.* (2017) and Aliu, (2016) also found similar results.

Hence, household characteristics and the level of access to services significantly stimulate the extent of poverty and food insecurity in almost a similar fashion in the study. This is because poverty and food insecurity are found to be the two sides of the same coin (Woldeamanuel, 2009). In economic theory, poverty is the major cause of food insecurity. Despite vast agricultural potential in Zimbabwe, this study in Chapter Two and Three indicated that rural households were trapped in poverty and insecurity cycles with few or no assets to transform their livelihoods into positive outcomes. Even though the poor could utilise varying degrees of both *ex-ante* and *ex-post* coping strategies at different levels of poverty to deal with unanticipated livelihood failure.

This study indicated that rural households exist on the margins if they don't access social safety nets in time. This implied a need to strengthen resilience capacity of their livelihoods in a sustainable way to avoid the use of detrimental coping strategies which can possibly distress their future food security and livelihoods. Especially, by encouraging livelihood diversification as an important risk-aversion strategy for rural households (Ndlovu, 2011). At the same time, intensifying critical awareness of households against overreliance to natural resources and external aid for their livelihoods and food security in long term.

6.2.2 Livelihood Transition

Interestingly, this study indicated a new paradigm shift from rigid and less dynamic conventional livelihoods. Rural households in Zimbabwe are gradually shifting their livelihood strategies from full time farming to include non-farming activities as indicated in Chapter Two. More than half of the households sampled diversified their livelihood strategies between off-farm and non-farming activities. This means the rural poor gradually moved towards a sustainable livelihood transition phase. Empirical studies by Barrettt *et al.* (2001a); Liu et *al.* (2008); Babatunde and Qaim, (2010); Bezu *et al.* (2012); Hoang *et al.* (2014); Gautam and Andersen, (2016) consistently show that diversification to non-farm livelihood strategies rather than relying only on subsistence farming enables households to have better incomes, and

enhance food security, by smoothing capital constraints and also to cope better with environmental stresses. Some even opted to lease out their tracts of land for income, the decisions were usually driven by many factors. Recurrent droughts, high input prices and the shortage of labour for agriculture were presumed push factors. However, access to credit and resource endowments were the pull factors scientifically recognized by the econometric model. Other factors also inhibit non-farming activities but rather promote on farm activities such as access to extension services, livestock holding and input subsidy. This lead to non-farmers being more often food secure than farming households because they could spread their coping with shocks into more than a single livelihood option. In a broader perspective, this finding informs rural development practitioners that relying on seasonal subsistence farming alone is a poverty trap, in which the poor should be helped to escape by means of livelihood diversification as a remedy of improving household well-being. In other words, the findings highlight important empirical contributions to livelihood policy and planning. The development of non-farm livelihoods should be recognised and policies adjusted to reflect suitable models which can support rural livelihood transition.

6.2.3 Gendered Vulnerability

There is a realisation that poverty and food insecurity are increasingly taking a feminine form, meaning women are bearing a disproportionately higher poverty burden than men in developing countries. As indicated in Chapter Three, female-headed households were poorer than male-headed households. Also in Chapter four, more female-headed households were food insecure than male-headed households, as well as in Chapter Five, male-headed households were more resilient than female-headed households. Women depend mostly on subsistence farming for survival and their overdependence explains why they are vulnerable to poverty and food insecurity (Mwawuda and Nyaoke, 2015; Mutavi *et.al.* 2013). Their vulnerability is reinforced by either being widowed or single as well as cultural barriers which limit their livelihood opportunities. Thus to address fundamental problems related to livelihood opportunities, female-headed households should become an easily identifiable group on which to target food security and poverty alleviation measures, such as the empowerment of households to control variables vital to social economic well-being as vulnerability to poverty, food insecurity and low resilience are skewed towards female-headed households. This means more work is needed to understand the relationship between forms of female headship on access to resources, and the consequential effects on the ability to improve the household's position (Horrell and Krishnan, 2007).

6.2.4 Geographical Vulnerability

The prevalence of vulnerability to poverty and food insecurity in a sub-geographical zone was a unique finding which needs further scrutiny. In a homogeneous area with uniform natural resource distribution (soil types, landscape, and rainfall) and few livelihood opportunities, only Ward 12 exhibited the highest food poverty severity in the district. This level of the differential with other wards takes into account various levels of inequality of infrastructure development, access to basic services which enhance livelihood strategies and human capital development. This calls for geo-physically even distribution of resources, equitable economic growth and investment in human capital, in particular, health and education. This is because one can easily conclude that agricultural production, access to resources and opportunities are skewed more towards specific areas at the same time overlooking specific locations in the same district. Thus in order to formulate effective policies directed at poverty reduction and improving food security, a thorough understanding of the location and the causes of vulnerability is critical (Smith *et al.* 2000).

6.2.5 The level of rural livelihood resilience in mitigating food insecurity

Even though the rural poor primarily rely on natural resources and ecosystems services for their livelihoods, they have the capacity to develop robust adaptive strategies which enable them to be resilient against food insecurity. Among other adverse shocks encountered in the district, drought significantly contributed to livelihood insecurity, its impact was felt on absolute crop failure. The context of resilience in this discussion is to test the capacity of the livelihood systems to enhance food security in the midst of a glaring drought spell, which caused their livelihood failure.

Resilience against food insecurity is considered as an option or strategy available to a household to attain its food security at a given point in time, meaning that increasing a household's livelihood options in particular access to an entitlement of assets, income, basic services, natural resources, social safety nets and adaptive capacity is strongly related to resilience against food insecurity. Not all livelihood options are sustainable to warrant resilience. Within these options are 'dynamic' livelihood components which indicate household pathway towards vulnerability or resilience. Adaptive capacity is the core dimension of resilience against food insecurity in the long term. This is because a loss of adaptive capacity would mean constrained options during and after the shocks. Thus, to build resilience for the rural poor, there is need to link interventions in agro-ecological and institutional systems capacity to enhance food security.

Analysing resilience and gender yields similar results as discussed earlier; low resilience of female-headed households indicates inequality and low bargaining power when it comes to livelihood opportunities. This is compounded by the extreme poverty in which they live, for example, high dependency ratio and low levels of education in rural female-headed households. Women's empowerment within the household is essential in improving intra-household resource allocation for resilience (Kiewisch, 2015). Similarly, non-farming households were more resilient than farming households. The resource-poor are particularly vulnerable against diversification because of a weak asset base, ineffective support services, fear of taking risks, poorly resourced training facilities, dysfunctional infrastructure and lack of sustainable opportunities in non-farming activities (Khatun and Roy, 2012). The choice of gender and household livelihood options as the point of resilience measurement against food insecurity is motivated by the fact that household decisions (eg, livelihood diversification) lie within the influence of household headship. This calls for building resilience as a multifaceted phenomenon. In particular, it includes investments in rural human capital, infrastructure and institutional innovations and the successful facilitation of strategies which empower the woman, for example, livelihood diversification and entrepreneurial practices. In the broader inquiry of livelihood approaches, it can be learnt that building the resilience of livelihoods against vulnerability is a sustainable way to eradicate food poverty in rural areas.

6.2.6 Methods and Procedures

The different methical approaches applied in this study significantly contribute to the understanding of livelihood typologies in the rural economy of developing countries. Cross-sectional data managed to capture important demographic and socioeconomic variables which depict rural livelihood construction, including access to and ownership of assets (machinery, transport, land, and livestock), age, production, expenditure, gender, household size, education access to support services, consumption, shocks, and income. But for the sake of further research of similar studies, time series data is compatible with resilience assessments, as it warrants tracking any changes and household behaviour in response to different seasons.

The selection of the head of the households as primary respondents is universally applicable in studies of this nature, because of their roles as decision makers, their knowledge of the local livelihood dynamics and the custodians of household dependents. However, the use of the household as the unit of analysis is appealing and justifiable. When it comes to income poverty, the pool of resources is typically collective, the household becomes the lowest feasible unit of inquiry (Greeley, 1994), and food scarcity is ultimately experienced at the household level

(Maxwell, 1996; Kirkland *et al*. 2013). This means to achieve the Sustainable Developmental Goals, in particular eradicating poverty and hunger in developing countries by 2030, the targets need to be narrowed and mirror the household economic dynamics.

This study adds novel information to literature and economic principles, even though income utility is an important dimension of poverty and food insecurity. The use of absolute consumption metrics such as calorie intake as thresholds that distinguish the poor from non-poor and food insecure from the food insecure successfully highlights the socio-economic deficits the rural poor face in acquiring essential necessities. This informs policymakers to enhance the factors which were associated with positive well-being such as ownership of assets and implement targets that sort to reduce factors associated with household vulnerability, for example, high dependency ratio in poor households. Conversely, the combination of the econometric models (Binary Logit, Foster Greer Thorbecke and Principal Component Analysis) adopted allowed for the generation of statistically robust and stable parameter estimates of poverty, food insecurity and livelihood resilience.

The Probit model successfully captures the correlates of farm and non-farm activities. This improves understanding of challenges affecting rural livelihood stimuli and the remedies needed to address the bottlenecks for the sustainable well-being of the poor. The logit model effectively explains the determinants of poverty and food insecurity in the study area. The use of a similar econometric model on poverty and food insecurity is justified; poverty and insecurity are believed to be causally linked. Interestingly, a relationship between the three regression models used in this thesis has been established; household resources (value of assets and Total Livestock Units) have statistically significant in all the three models. This implies that livelihood decision, poverty and food insecurity are all influenced by access to or ownership of resources. However, one limitation of these models is that although they are capable of finding the immediate or proximate causes of poverty and food insecurity, they are not effective at identifying the deep causes (Duate, 2015).

6.2.7 A Generic Micro Level Rural Livelihood Diagnostic Framework
In developing the broader hypothesis that the rural poor face complex circumstances to attain their subsistence well-being, the study employed the Sustainable Livelihood Frameworks, Food Security Frameworks and the Resilience Frameworks. These conceptual frameworks illustrated livelihood constructions, addressed the drivers and determinants of food security, poverty, and resilience at multiple levels of aggregation (Pieters *et al.* 2013). However, this

study endeavours to make critical use of the major findings and literature to configure a generic and comprehensive local level conceptual framework which exhibit the fundamental livelihood profiles and welfare of the people in the study area (Figure 5.1). The analytical framework is built on the significance of the results in light of rural livelihood approaches being investigated and to fill in the gaps with new insights against what is already known from the literature.

Micro-level livelihood strategies in the district are derived through a composite analysis of the socio-economic drivers, for example, intra-household characteristics, institutions, environment, assets, and infrastructure, upon which the poor develop their livelihood capabilities. The household level is the appropriate focal point for the investigations of livelihoods processes and outcomes. This is because the pervasive features of rural livelihood strategies are found on the aggregation and dynamic account of its individual members (Morris *et al*. 2001).

In order to cope and adapt to social, economic and ecological changes, the poor are required combine a range of livelihood resources (financial, physical, social, human and natural assets) within the limits of their context to pursue different livelihood strategies and achieve positive outcomes (i.e. food security). However, in this study households engage in two kinds of activities; the poor households rely on natural resource-based activities (crop & animal husbandry, fisheries, and forestry) whereas the non-poor prefer non-natural resource-based activities (supplementing agriculture with off-farm and non-farming activities). The implication is that the rural poor in the study area had limited livelihood options and the proportion is of critical concern for policymakers. This calls for mechanisms to develop resilience approaches to increase the overall sustainability of their natural resource-based livelihoods, for example, summer water conservation for winter irrigation.

Since the households' in this study exist in a similar environment, their livelihood options were susceptible to internal and external (i.e environmental variability) risks and shocks. The only difference was in their level of coping and adaptation to livelihood sensitivity and exposure to the vulnerability. Subsistence farming households who commonly lack productive resources to redeem themselves out of livelihood failure and often find themselves in a poverty trap. This casts light on the need to strengthen the capacity of rural institutions and effective social protection programmes that provides stimuli to rural economic growth.

Non-farming households employed risk aversion strategies to lean on and scale down the vulnerability in the form of multiplying income sources. In this study, livelihood diversification

via non-agricultural means represented a risk aversion strategy to achieve sustainable household subsistence needs, as it often took the form of micro-enterprises (Hussen and Nelson, 2002). In a positive way, livelihood transitions are gradually developing in rural areas considering the low fraction of non-farming households in the study area. As indicated by the outcomes of this study, non-farming households have livelihood options for the satisfaction of well-being, in particular, food security, resilient and more than one source of income, compared to subsistence farming households who were food insecure, non-resilient and poor.
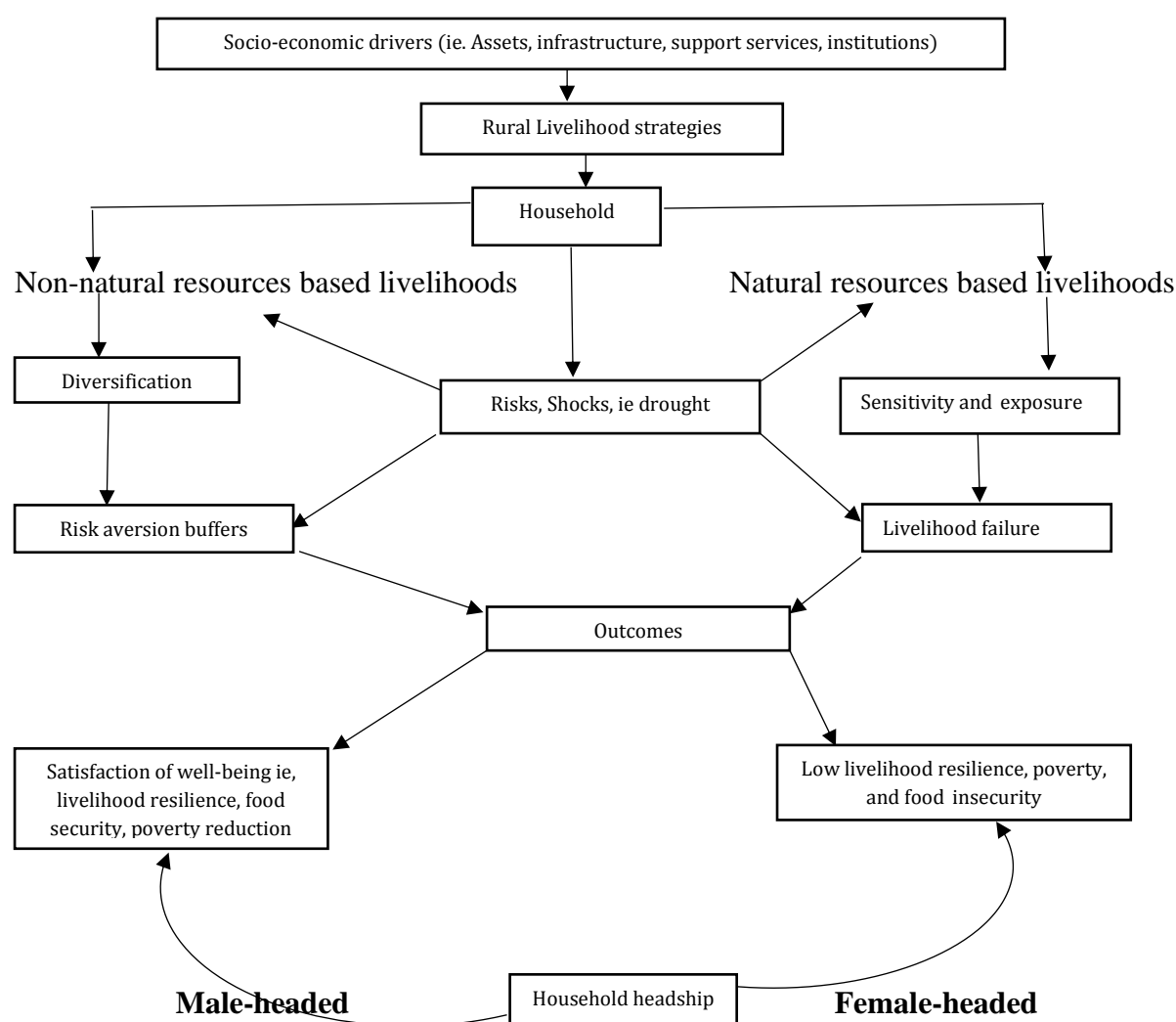
Figure 6.1: A heuristic rural welfare continuum in Rushinga District.
Source: Author's own presentation

However, to assess the difference and similarities between the literature reviewed and the findings of the study, Figure 5.1 in this Chapter has to be compared to Figure 3.2 in Chapter 3. To a greater extent, the Sustainable Livelihood Framework was applicable to this study, as it

explains the dynamics of rural household welfare and livelihoods of the poor in this study. Both frameworks encompass the assets, skills and approaches used by individuals, households and communities in order to survive. The SLF is a theory since it builds on a broader understanding of the basic principles of livelihood approaches and is used to understand the various factors which affect choices and subsistence and how these factors interact among themselves. However, Figure 6.1 managed to specify that the livelihoods in the study were constructed from natural resource use and non-natural resource uses. In other words, the households in the District combine their assets to facilitate natural resource and non-natural resource livelihoods. Non-natural resource livelihoods were seen as non-farming households who were the diversifying their livelihoods, meaning they do combine both farming and non-farming activities such as off-farm employment, small enterprises, remittances and skilled jobs. They were similarities and differences between the two frameworks. Figure 3.2 emphasise the strong interdependence between structures and process, the level of vulnerability in a given context, and the functions of assets that influence livelihood strategies, processes and outcomes. Figure 6.1 also illustrates that they were social economic drivers that influence household livelihood strategies, among them, assets, infrastructure, support services and institutions. The structures found in the study were the different agencies of the government (ie extension services) and Non-governmental organisations. However, unlike in Figure 3.2, the private sectors were not significantly contributing towards rural livelihood strategies and household welfare in this study. The difference was that policies found in Figure 3.2 were dormant in this study, but institutions were observed in the form of schools and clinics, as the providers of basic social services.

The vulnerability context was found in both the literature and the study. According to the livelihood framework, the vulnerability context, in general, includes natural and socioeconomic trends, shocks or risks that threaten livelihood approaches. In this study the vulnerability context was evidenced, it was the exposure and sensitivity to drought which caused large scale livelihood failure. On livelihood outcomes, this study went on the address one limitation of the SLF; the household social structure is critical in influencing livelihood approaches, female-headed households were found to be poor, food insecure and low resilient to livelihood change than male-headed households.

6.3 Overall recommendations for policy and planning

The study provided insights into rural livelihood approaches and their importance in explaining the rural household welfare. The results revealed that rural wellbeing is a function of different

socioeconomic factors. Traditionally, livelihoods of the rural poor were rooted in the utility of natural resources, from this study it is possible to understand that there is an existence of diverse livelihood options. This is because agriculture faces problems such as drought, shortage of land, and land degradation. By continuously depending on a single livelihood option, which is climatically sensitive, households will have problems of declining livelihood sustainability. In this study households experiencing the high levels of poverty and food insecurity are those involved only in agriculture as their primary occupation Thus, to enhance livelihood security, policymakers should encourage livelihood collaborative approaches, where households combine agriculture with other livelihood activities. Livelihood diversification has a positive impact on poverty reduction and achieving food security, for example, an increase in the number of livelihood activities proportionally increases the income of the rural households and invariably their purchasing power and welfare.

While this study has managed to find a sequence of gendered dimensions of poverty, food insecurity and resilience, it is important for policy and planning to focus on the dimensions of social construction as the basis at which livelihood policies should be developed. This is because there is a wide gap between livelihood strategies of men and women, in particular in rural areas where the society is patriarchal. Therefore, policies should advocate for social protection instruments to cater for vulnerable groups such as woman, children, the sick and disabled.

While there is an assumption that the state of poverty is relatively homogenous in rural areas because their similar livelihood activities, their values, and attitudes tend to be uniform. The study shows that poverty was geographically concentrated in some villages as compared to other villages within the same area. This means sustainable poverty reduction strategies should mirror suitable ways of reducing rural inequality in access to productive resources, levels of education, natural resource degradation, frequent vulnerability to livelihood risk, and gender disparity. The strategies must take into account the diverse needs of different social populations groups in rural areas, as well as the different dimensions of rural poverty in developing countries, such as low household income, unemployment, concentrated spatial poverty, and lack of health care.

The prevalence of food insecurity was high in this study, primarily due to erratic rainfall which led to reduced maize yield. Hence, measures which could make farming more resilient to climatic change and other shocks in the study area should be a priority. Since maize yield is not improving food security in the area, there is a need for improved maize seed varieties

suitable for the natural region IV which is characterised by low rainfall and high temperatures. However, in addition to maize, other food crops such as groundnuts, beans, sorghum, and millet are also important and, this points to the fact that extension services should also prioritise their cropping on large scale to enhance food security. However, alleviating the impact of drought seemed to be at the forefront of most strategies intended to curb the prevalence of food insecurity in rural areas in Zimbabwe. However, food insecurity is not only caused by rainfall variability but is linked to other social economic problems such as soil infertility, lack of draft power, the high cost of inputs and shortage of agricultural labour. Therefore, there is a need for comprehensive livelihood building interventions to be well-adjusted to tackle the multiple facets of rural poverty and food insecurity in a sustainable way. This means rural development practitioners, agencies and other stakeholders should model food shortage interventions from a livelihood approach perspective, beyond low rainfall, natural resource degradation and own production, to factor in household socioeconomic characteristics such as gender of household headship.

6.4 Areas for future research

Although this study focused on livelihood approaches in analysing poverty, food security, and resilience, further research is needed on how to minimise the impact of climate change and variability on natural resource livelihoods using Indigenous Knowledge Systems (IKS). IKS can reduce poverty by allowing communities to solve local environmental problems using endogenous solutions in which they have full control such as traditional food production. The best way is to incorporate IKS into modern technology, which is dynamic and continuously influenced by both internal and external factors which interact with other knowledge systems. Furthermore, there is need to investigate the sustainability of rural livelihood transitioning, especially to understand if the agricultural exit opportunities are able to reduce poverty and food insecurity in the longer term or livelihood diversification was only a temporary coping measure against crop failure due to drought. Liu and Liu, (2016) reported that (Mushongah and Scoones, (2012), used a combination of bi-temporal household surveys, in-depth biographical interviews, and wealth rankings to examine livelihood transition in Matabeleland provinces of Zimbabwe over a 20-year period.

6.5 CONCLUSION

The overall objective of this study was to investigate the significance of livelihood approaches in analysing poverty, food security and resilience in the rural Northern Eastern Zimbabwe. The empirical evidence from this study successfully raised a number of arguments about the socio-economic dimensions of livelihood approaches, poverty, resilience and food security in rural

economies in developing countries. The discussion combined empirical analysis, methodology, and recommendations to clarify that the typology of rural household well-being outcomes leans more heavily on the capability of their livelihood strategies. As discovered, deeply rooted poverty, food insecurity, and low resilience were influenced by fundamental characteristics of livelihood failure such as high dependence on agricultural livelihoods, lack of livelihood endowments and household social construction. Hence, livelihood diversification into non-farm sector remains an effective option for escaping livelihood insecurity entrenched in seasonal subsistence farming. Rural subsistence well-being in the study area was understood by severe social economic insecurity. This means improving the welfare of the rural poor requires an explicit understanding of the wider context in which they organise their livelihood strategies. Thus, rural development interventions should intensify gender sensitive policies to abate the gaps between male and female-headed households on livelihood opportunities. The results from the binary logistic model indicated that Dependency ratio, Household income, Value of assets, Total Livestock Units, Maize yield per hectare, Geographical location, Extension services and Marital Status were the determinants of poverty and food (in)security. This means policies and strategies aimed at improving rural household welfare should consider aligning the strategies around these variables.

Practically there are different ways that resilience can be understood; in particular, the complexity of the socio-ecological systems in which rural livelihoods are constructed on regular basis. Drought is one of the major shocks threatening global food security and livelihood security of rural dwellers who earn a living from farming. However, drought is a climatic shock that cannot be prevented but its impact can be mitigated in order for people to cope if flexible socio-ecological systems that can easily recover are developed such as the deployment of resources crucial for both rural agricultural innovation and robustness. Based on the finding of this study, managing expected and unexpected shocks efficiently require diversifying livelihoods, especially in female-headed households into non-farming enterprises and employment. Thus, to have sustainable livelihoods, the rural poor should increase adaptation strategies that are well rooted in ecological, social and economic sustainability. At the same, time resilience in the domain of food security can be enhanced by growing drought tolerant-crops, water conservation practices, and weather forecasting and early warning systems.

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APPENDICES
APPENDIX 1: HOUSEHOLD QUESTIONAIRE

University of KwaZulu-Natal
African Centre for Food Security
Questionnaire
The information captured in this questionnaire is strictly confidential and will be used for research purposes by staff and students at the KwaZulu-Natal only. Respondents can choose not to answer questions – answers are voluntary. The respondent should be a resident/household member in wards of Rushinga District area.
Do you have any questions? May I begin interview now? Are you willing to participate in the survey? Yes ……..
No…………………Date of survey……………………
Name of enumerator…………………………………
Ward ……………..Village …………………… Household head Age …………….Household ID ………..

SECTION A: HOUSEHOLD SOCIO-ECONOMIC DEMOGRAPHIC DETAILS

1. Gender of household head

Female(0)	Male (1)

2. Marital status

Not married (0)	Married (1)	Widowed (2)	Single

3. Household structure

Gender	**Total**	<12	13-17	18-35	36 to 65 adults	65> old age
Male						
Females						
Total						

5. What is the number of years spend in school by the head of the household? ………………

6. Number of family members who can read and write own language (**SHONA**) ……………

7. Number of children going to school ……dropped out of school …… If none skip Question 8 and go to section B.

8. Main reason for dropping out of school,

School fees (0)	Illness (1)	Walking long distance to school(2)	Family issues(3)	Personal issues(4)	Others specify(5)

SECTION B: OCCUPATION AND INCOME

1. The occupation of the household head

Full time farmer	Regular salaried job	Temporal job	Unemployed	Aged/permanent illness	Informal jobs	Others specify

2. Total household monthly income, excluding gifts, donations and remittances (USD)………………………

3. I will now ask about income that other household members obtain from other activities apart from farming, livestock sales,

and asset sales. Let the members who were involved in a given income generating activity answer questions on that activity.

Source of income	1. In the previous year, did any of the household member(s) obtain money through (state source)? Codes1…yes 2...No → skip questions 2 to 6	3. Normally the member(s) obtained money from this source at which frequency? Codes 1…daily 2…weekly 3…monthly 4…. quarterly 5…annually 6…other (specify)	5. How much money does the household obtain per year?
01 Hawking,			
02 Formal employment			
03 Casual work			

04 Remittances from relatives			
05 Gifts from non-relatives			
06 Gold Smith			
07 Mechanic,			
08 Petty trading,			
09 Tailor			
10 Beer brewing			
11 Tailor,			
12 Other sources (specify)			

SECTION C: LAND HOLDING AND UTILIZATION

1. Does your household engage in any crop production? (*0) No (1) Yes*

2. If yes to 2, how do you perceive the Importance of subsistence agriculture on household food and income?
(0)= Not that important, (1) = Break-even, (2) = Very important.

3. What is the total number of plots you have, their sizes and the type of ownership? Please answer these

questions by completing the table below.

Land type	Ownership (Ha)	Availability of such land Yes(1)/No (0)	Total HH quantity (Ha) *size of football pitch*
Dry-land			
1. Arable dry land	Owned		
2. Arable dry land	Rented		
3 Arable dry land	Leased		
4 Arable land	Borrowed		
5. Others specify			
Irrigation land			
6. Arable dry land	Owned		
7. Arable dry land	Rented,		
8 Arable dry land	Leased		
9 Arable dry land	Borrowed		
6.Others specify			

4. How much land was cultivated in the past 12 months? Dry land..............(Ha). Irrigated land………….(Ha)

5. A*re you leasing out any land? 0 = No, 1 = Yes*

6. If yes in 5, what are the main reasons for leasing it out?
(0) = Water shortages; (*1) = Unavailability of household labour; (2) = Lack of capital ;(3) = Problem of crop damage
by livestock other animals ;(4) = Unprofitability of farming ; (5) = Unutilized land, (6) Other (specify) …………………*)
7. If leasing out land, what is the rental? (*0) = Free , (1) = Cash tenancy, (3) = Sharecropping (share the produce),
(4)= others specify…………………………………
(5) = Non-cash benefits (specify)(..…………..………………………………..*)

SECTION D: CROPPING AND MARKETING SYSTEM

Please indicate the major crops you planted in the past summer (2015-16) rainy season, the area you planted, the output

you produced and the costs you incurred (Complete the table below). In the space provided, rank the **FIVE**

most important crops in terms of their contribution to annual cash income (from sales) from 1

(most important) to 5 (least important) and provide the rough proportion of cash income from each crop.

Crop name	Area planted (ha)	Quantity harvested *(specify units e.g., kg)*	Quantity sold *(specify units e.g., kg)*	Price per unit	Contribution to Cash Income	Contribution to Food Consumption
					Rank	Rank
Maize						
Cotton						
Beans						

Sunflower					
Millet					
Sorghum					
Tobacco					
Tomatoes					
Onions					
Spinach					
Cabbage					
Potatoes					
Sugarcane					
Soya beans					
Rape					
Butternuts					
Ground nuts					
Round nuts					
Water melons					
Pumpkins					
Others (specify)					

SECTION E: ACCESS TO EXTENSION SERVICES

I will ask questions about extension services and related activities if a different household member is

 more conversant with these questions he/she can answer the following section.

1. How many times have you engaged with an extension officer(s) in the past 12 months? …………………………

2. If you engaged an extension officer, did you invite the extension officers?
0 = No 1 = Yes
3. If you engaged an extension officer, what was the main reason for engaging them? Consulting on
(0) Inputs (1); Crop production issues; (2) Marketing (3). Livestock health; (4) Any other, specify ……………….)
4. Was the extension service helpful in the last growing season Yes 1, No 0
How can extension services be more helpful in your community?
5. Did, any member of your household ever receive any form of agricultural training in the past two years?
0 = No 1 = Yes
      6.   If yes in what area. *(0) Land preparation (1); Crop production issues; (2) Marketing (3).*
      7.   *Livestock health; (4)*
      8.   *Any other, specify (………………………………..)*
7. Did you receive any input subsidy in the past 12 months?
0 = No 1 = Yes
8. If yes in 7, what was the source of these inputs?
0 = Government/parastatal 1 = Non-governmental organization (NGO) 2 = Private company 3 = Others,
specify………………………………………………….

9. In what form or kind? 0= Seeds, 1= fertilizer, 2=Equipment, 3= Others specify…………………

Section F: Livestock ownership.

Do you own the following livestock? (*Indicate number owned in the appropriate box, zero if not owned. Complete table below*)

Livestock type	No. currently owned	Money spent on feeds, chemicals, vet services, etc in the past 12 months	Number sold in the past 12 months	Price per unit	Number slaughtered for family purpose in the past 12 months
Cattle					
Goats					
Sheep					
Pigs					
Poultry					
Other (specify)					

Animal Products How much of each of the following animal products were harvested in the last 12 months. (1).

Milk and milk products (Litres)………………(2)Eggs……………………..(3)Hides……………

(4) Other specify………………………………….

 How much money did the household obtain from sales of animal product in the last 12 months? USD
……………………………………………………………

SECTION G: HOUSEHOLD ASSET OWNERSHIP

Do you own the following physical assets? *(Indicate number owned in the appropriate box, zero if not owned.*

Also indicate the price you would charge now if you were to sell the asset).

Implements and tools	No.	Possible Asset value	Household assets	No.	Possible Asset value
Oxcart			Radio		
Ox-drawn plough			P- butter milling machine		
Wheelbarrow			Bicycle		
Harrow			Cell phone		
Cultivator			Solar panel		
Planter			Truck or lorry		
Hoes			Chairs		
Chains			Tables		
Knapsack sprayer			Protected well		
Water cart			Beds		
Spanners			Mattress/mates		
Pick,			Blankets		
Tools box			Motorcycle		
Tractor			Power generator		
Ridger			House/whole stand		
Maize shelling machine			Pots		
Pressure pump			Plates		
Shovels and spades			Sofas		
Hacksaws,			Wardrobe		
			Kitchen unit		
			Cooking oil milling machine		
Others (specify)		**Total**	Others specify		**Total**

SECTION H: ACCESS TO SOCIAL SERVICES AND INFRASTRUCTURE

I will ask you about access to services and infrastructure

Services/Infrastructure	(1).How do you normally go…..? 1……..walking 2….Cycling 3….Public transport 4. Driving	(2).How much time do you normally take to reach this service/infrastructure *(walking distance)* Distance (Kms)	(3).Is access free? Codes *1-yes* *2-No*	(4). If not name fees, restrictions and regulations?
Hospital				
Clinic				
Primary school				
Secondary school				
Growth point?				
Input market				
Output market				
Water point				
Dip tank				
Community Hall				

5. What types of infrastructure development initiatives have you experienced in the last3 years? (0)=Water;

(1) =Roads; (2) =Social Infrastructure (clinics & schools).

SECTION I: SECTION I: ACCESS TO CREDIT OR LOANS

1. Did you use any credit or loan facility in the past 12 months? *Yes=1 No=0*

2. If yes in 1, what was the main source of credit/loan? *Relative or friend=1; Money lender=2; Savings club (Stokvel)=3;*

Input supplier=4 ;Financial institution=5; (Specify name of financial institution………) Output buyer =6; Other=7(Specify)…………………….)

3. What do you use as collateral security? (0) Nothing ;(1) households assets; (2) crops to be harvested; (4) others specify…………………………….

3. What was the purpose of the loan/credit*? Family emergency=0, Agricultural purposes=1, Business= 3,*

Others (specify)… …………………………………..) =4

4. Were you able to pay back the loan/credit in time? *Yes=1 No=0.*

5. Did you receive funding or any other sources of credit support from government or any money lending

facility in the past 12 months? *Yes=1 No=0; , how much?*

6**.** Is there any time where assets were confiscated or threatened with legal action because of failure to pay the loan.

No =0; 1=Yes

SECTION J: ACCESS TO NATURAL RESOURCES

I will now ask you about access to services and infrastructure

Natural resources	**1.** How much time does it take you to walk to where you or other villagers normally…..? *Units codes* *1……minutes* *2……hours* *3….others specify*		**2.** State any rules and regulations that govern the use of this natural resource.	**3.** Since October 2015, How can you describe the availability of this natural resource? *codes* *1-decreasing* *2-Increasing* *3-Constant* *4-Other (specify)*	
	Time	**Code**			
Fish and panning				Fish / alluvial deposits	
Pasture				Pasture	
Collect firewood				Firewood	
Open access forest				Wild animals	
Other (specify)				Other (specify)	

SECTION K: WATER SECURITY

1. What is the household source of clean water to drink?

Tap =0	Borehole =1	Well=2	Dam =3	River =4

2. Indicate whether you agree or disagree with the following statement measuring your household water -use security levels

(Where; 0=Strongly Disagree; 0=Disagree; 1 =Neutral; 2=Agree, 3

Indicator	**Responses**			
	0	1	2	3
1. I am satisfied with the consistency availability of water for my household uses.				
2. I am satisfied with the quality of water for my household uses.				
3. I am satisfied with the distance I walk to source water for my household uses.				
4. I am satisfied with the claim or access to the water source at any time.				

SECTION L: FOOD CONSUMPTION, PURCHASES AND SHORTAGES

1. What is the daily staple food for your household?

0…Maize	1…Sorghum	2…Millet	3…Rice	4…Wheat	5…Other (specify)

2. How do you normally acquire this food?
(0)….Own production, (1)….Buying, if **the option is 1** then **go to question 7,** 3, (2) Other
(specify)……………………………………………………
3. If you produce your own food, in which month did you have your most recent harvest?
State month:…………………………………………
4. Do you still have this food in your storage? (1)…yes → **go to question 8….**No (0)
5. If no, in which month did the food finish?
State month:…………………………………
6. Since your food finished, what did your household do to survive? (*1)…Purchasing (2)…*
reduce quantities of food consumed (3)…reduce number of meals (4)…eat other non-traditional wild foods
(5)…participate in food for work programs (6)…casual work (7)…gifts from friends (8)…transfers from government
7. If you buy, what is the major source of money? *(1)… Sale of livestock (2)… Sale of other household assets*
(3)… Fishing (4)… Casual work (5)....Formal employment (6)… Cash for work programs (7)….
Social grants (8)…. Other (specify)
8. Beginning from this time yesterday to present, did you or anyone in your household consume…?

0=no meal	One meal=1	Two meals =1		Three meals=2	More than 3 meals =3
Food group		**Yes**	**No**		

01 Cereals (Rice, Sadza, Pasta etc)		
03 Roots/tubers (Potatoes, carrots, etc		
04 Legumes (beans, peas, nuts)		
05 Milk/milk products		
06 Eggs		
07 Meat/offal		
08 Fish/seafood		
09 Oil/fat/butter		
10 Sugar/honey		
11 Any Fruits		
12 Any Vegetables		
15 Other (specify)		

SECTION M: The Extent of Household Food (In) Security

9. In the past four weeks ……………….

0 = No (skip to Q2)1 = Yes

1 a .How often did the following happen? (1) = rarely (once or twice in the past four weeks), (2) = Sometimes

(three to ten times in the past four weeks), (3) = Often (more than ten times in the past four weeks)

Occurrence Questions	No	Yes	1	2	3
1. Did you worry that your household would not have enough food?					
2. Were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?					
3. Did you or any household member have to eat a limited variety of foods due to a lack of resources?					
4. Did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?					
5. Did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?					
6. Did you or any household member have to eat fewer meals in a day because there was not enough food?					
7. Was there ever no food to eat of any kind in your household because of lack of resources to get food?					
8. Did you or any household member go to sleep at night hungry because there was not enough food?					
9. Did you or any household member go a whole day and night without eating anything because there was not enough food?					

SECTION N: EXTERNAL FOOD ASSISTANCE

1. This year alone did your household or community benefited from any type of food aid assistance?

No (0)……1 Yes….. (Skip to next Section)

2. If yes how many times this year

Once (0)	Twice (1)	Thrice and more (2)

3 .Who was eligible?

0 = Everyone	1 = children	2 = the old	3=pregnant woman	4= people living with disability	(5)Others (specify)

4. What type of assistance? *(Circle all that apply)*

General food distribution (0)	Vulnerable group feeding(1)	School feeding(2)	Food for Work(3)	(4) Other (specify)

5 .Who was providing the food aid? *(Tick all that apply), Government (0)……..NGOs(1).....Churches (2)……..(3)Other (specify)*…………………………………………..

SECTION O: FOOD EXPENDITURE

1. Please indicate the food items your household bought, acquired, the frequency and the cost incurred

in buying the food items in the last month? (Complete table below, indicating where you normally get this item.

Where do you normally get this item? **0**…supermarket **1**…Vendors **2**…Own production **3**…Food aid **4**…remittances **5**…aid from neighbors	code	Quantity consumed (specify units e.g., kg, l) for whole family	Quantity bought (specify units e.g., kg, l)	Frequency of buying.Code;**1**…daily;**2** weekly; **3**monthly;**4** yearly	Price/unit	Total amount
1)Mealie meal, maize products						
2)Meat , fish, eggs						
3)Rice and Pasta etc.						
4)Wheat, flour, etc.						
5)Vegetables , tomatoes, onions						
6)cooking oil, Margarine						
7)Fish, meat, eggs						
8)Beans, peas, soya beans						
9) Fruits						
10)Salt, spices						
11)Milk and milk products						
12)Sugar, tea, coffee etc.						
13)Others (specify)						

SECTION P: NON FOOD EXPENDITURE: I now would like to ask you about non-food expenditures.
Let the member who has made the purchase give the monetary value

1 Did the household spend money on the following items? **Code**,1..Yes; 0..NO go to the next item	Code	**2**. If yes, frequency of purchasing.*1.d aily;2..weekly; 3..monthly;4.. quartely;5.anu ally*	**3.**Quantity bought (specify units e.g., kg, litres) (Monthly)	**4.** Monthly, how much is spend per each item?	**5.** Monthly total amount
Transport					
School fees					
School uniforms					
Paraffin, candles , matches					
Hospital bills, medicine					
Washing powder, soap, lotion etc					
Airtime					
Milling (yechigayo)					
Others (specify)					

SECTION Q: FOOD CONSUMPTION PATTERNS.   Day of the week ……………………………………

How many meals did?	None (0)	One (1)	Two (2)	Three (3)	Four (4)	More than four (5)
1.Children under 5 years eat yesterday						
2. Children between 5 and 13 years eat yesterday						
3. Older children (13+) and adults eat yesterday						

4. Have you been faced with a situation when you did not have enough food to feed the household in the last 12 months*?*
 (1)Yes (2) No
5. If yes to 4, when did you experience this situation? (tick as many as applicable)

Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec

SECTION R: HOUSEHOLD COPING STRATEGY:

Every household to answer this section relating to their consumption and coping strategies

1. In the past 30 days, how frequently did your household resort to using one or more of the following strategies in order to have access to food? *Codes: 1) Never 2) Seldom (1 – 3 days /month) 3) Sometimes (1 – 2 days / a week) 4) Often (3 – 6 days a week) 5) Daily*	
01 Skip entire days without eating?	*Code*
02 Limit portion size meal times?	
03 Reduce numbers of meals eaten per day?	
04 Borrow food or rely on help from friends / relatives?	
05 Rely on less expensive or less preferred foods?	
06 Purchase or borrow food on credit?	
07 Gather unusual types or amounts of wild food / hunt?	
08 Harvest immature crops (eg green maize)?	
09 Send household members to eat somewhere else?	
10 Send household members to beg?	
11 Reduce adult consumption so children can eat?	
12 Rely on casual labour for food?	
13 Other (Specify)	

SECTION S: RISKS AND SHOCKS

I will now ask you about the unfavorable events that have occurred to the household since January 2015 to this date.

1. Since 2015 was HH negatively affected by any one of the following events?	2 .Rank the 3 most significant shocks experienced. *codes 1 most severe 2 moderate severe 3 Least severe*	3. In which month(s) did this occur?	4. How big was the impact? *Codes 1.High 2.medium 3.low 4.no impact*	5.Estimate value of loss USD	6.How did the HH cope/ *Use the Codes Below*	7. How many months did it take for the HH recover after the shock?
Drought						
Flooding or Excess Rain						
Wind Damage						
Pests or diseases that affected almost all crops before harvest						
Pests or disease attack that led storage losses						
Pests or diseases for livestock						
Theft of livestock						
Theft of production tools and equipment						
Theft of cash						
Death of adult member(s)						
Disablement of adult household member						
Damage to crops by wild animals						
Increase in input prices						
Decrease in output prices						
Lack of capital						
Physical access to Roads or Transportation						
Social conflict						
Others (specify)						

Codes for question 6

1. Reduced consumption; 2. Work harder; 3. Took up additional occupation; 4. Household migrated to search for a job;

5. Took children out of school; 6. Use savings; 7. Sold assets; 8. Sold livestock; 9. Sold land; 10 .sold crops;

11. Formal insurance; 12. Borrow from money lander; 13. Borrow from relatives; 14. Borrow from non-relatives;

15. Borrow from Bank; 16. Gifts from relatives; 17. Gifts from non-relatives; 18. Help with labour from relatives;

19 .Help with labour from non-relatives; 20. Help from Government; 21. Help from NGOs, 22. Help from church;

SECTION T: HOUSEHOLD IDIOSYNCRATIC SHOCKS

I will now ask about illness and injuries household members have suffered since 2015

ID	1. Since 2015 did any member of the household suffer from any illness or injury? *Codes 0---no-skip to Q6 1----yes*	2. What is the illness or injury? Use codes for sickness and injury		3. What action was taken to find relief to the illness? *CODES 1.did nothing 2 .take drugs available in house 3 buy drugs from pharmacy 4,seek care at hospital/clinic 5Took traditional medicine and healer 6. seek care from Priests, Pastor or prophets*	4. How much money was spend in total on this individual for illness and injuries? USD	5. Did the member drop doing what he/she normally does due to illness? *Codes 1--yes 2--no--skip to Q6*	6. How many days did the member stay away from normal activities due to illness? Days
1			**Codes For Question 2** *1.--Malaria, fever 2--Diarrhea 3.--stomach ache 4--respiratory problems 5. --STI 6--Asthma 7--Headache 8--Mental problems*				
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16			*9--Skin disease 10 --Dental problems 11-- Eye/ear problems 12--Back ache 13--Heart problems 14--Maternity problems 15--Other (specify)*				

7. Number of people with disability or chronic ill-ness…………………………………………………….

8. How do you rate the state of your health over the past year on a five point scale *(where; (0)=Poor; (1)=moderate; (2)=Fine; (3)=Others (specify)…………………………………………)*

9. Is there any HIV/AIDS, Malaria and children health care programs in the community? *YES………1 NO……….2*

10. If yes who facilitates and fund them?

Government (0)	NGOs (1)	Churches (2)	(3) Others (specify)

10. Malaria control, how often do they came for spraying in your households this year **(2016),** (0) =monthly, (1) =quarterly,

(3) = once in a year, (4) yet to come.

SECTION U: INPUT USE

1.Crop	2.Seed				3.Fertilizer				4.Manure		5.Pests and herbicides		
			Amount Unit codes *1…bags(50kg)* *2..kilograms* *3..Baskets* *4..Other (specify)*	Cost					What was the type of manure? *1..compost* *2..wastes* *3..livestock* *4..green* *5..other*	typ e	Source *1..own* *2..bought* *3..recived* *4..others (specify)*		Cost
			Quantit y	*unit*	*USD*	*Quantity*		*unit*					
Ground nuts													
Peas													
Maize													
Cotton													
Tobacc o													
Beans													
Sunflo wer													
Millet													
Sorghu m													
Vegeta bles													

SECTION Q: ACCESS TO INFORMATION

1. Where do you access general information.(Rank 1-5).(*0)=Radio/TV;(1)=Social media/internet ;(2)=Print media;*
2. *(4)= Cell phones/SMS ;(5)= Word of mouth; 6= Other (specify)…………………………………………………*
3. How do you rank transmission/Network signal ?(*0)=Poor; (1)= Moderate; (2)= Good ;*
4. Do you understand the information disseminated by the main information source? Not at all=(0); Somehow=(1), Absolutely=(2)

Thank you for your participation.

APPENDIX 2: DETERMINATS OF LIVELIHOOD DIVERSIFICATION

```
. probit Non_Farming HH_Age Gender_hhd Mari_status  Dependancy_Ratio Yrs_spend_schl Ttl_mthly_hh_incm Asset_Value Ttl_lnd_sze Total_livestock
> _Units ACC_CREDIT_LOANS ACCESS_EXTEN_SERVICE Maize_Yield_per_Ha External_AID Input_SUBSIDY, vce(robust)

Iteration 0:   log pseudolikelihood = -198.72261
Iteration 1:   log pseudolikelihood = -166.13709
Iteration 2:   log pseudolikelihood =  -165.7124
Iteration 3:   log pseudolikelihood = -165.71083
Iteration 4:   log pseudolikelihood = -165.71083
```

Probit regression	Number of obs	=	300
	Wald chi2(14)	=	59.98
	Prob > chi2	=	0.0000
Log pseudolikelihood = -165.71083	Pseudo R2	=	0.1661

Non_Farming	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
HH_Age	.0027912	.006201	0.45	0.653	-.0093626	.014945
Gender_hhd	-.2086442	.2829153	-0.74	0.461	-.7631479	.3458596
Mari_status	.3008199	.3085812	0.97	0.330	-.3039881	.9056279
Dependancy_Ratio	.0034028	.0043129	0.79	0.430	-.0050503	.0118559
Yrs_spend_schl	.0041094	.0255698	0.16	0.872	-.0460064	.0542252
Ttl_mthly_hh_incm	-.0423429	.123815	-0.34	0.732	-.2850159	.2003301
Asset_Value	.6692041	.1906928	3.51	0.000	.2954531	1.042955
Ttl_lnd_sze	-.0056485	.0392876	-0.14	0.886	-.0826508	.0713538
Total_livestock_Units	-.0287246	.0161201	-1.78	0.075	-.0603195	.0028703
ACC_CREDIT_LOANS	.5787904	.2653911	2.18	0.029	.0586334	1.098947
ACCESS_EXTEN_SERVICE	-.6997226	.1665688	-4.20	0.000	-1.026191	-.3732537
Maize_Yield_per_Ha	.0179363	.0874409	0.21	0.837	-.1534447	.1893173
External_AID	-.3620306	.223003	-1.62	0.104	-.7991085	.0750472
Input_SUBSIDY	-.4085908	.1767519	-2.31	0.021	-.755018	-.0621635
_cons	-1.019548	.6578506	-1.55	0.121	-2.308911	.2698156

```
. mfx

Marginal effects after probit
      y  = Pr(Non_Farming) (predict)
         =  .65403442
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
HH_Age	.0010295	.00229	0.45	0.653	-.003455	.005514	43.62
Gender~d*	-.0755828	.10053	-0.75	0.452	-.272618	.121452	.69
Mari_s~s*	.1134886	.11845	0.96	0.338	-.118674	.345651	.74
Depend~o	.001255	.00159	0.79	0.429	-.001857	.004367	54.9798
Yrs_sp~l	.0015156	.00943	0.16	0.872	-.016971	.020002	8.08667
Ttl_mt~m	-.015617	.0457	-0.34	0.733	-.105184	.07395	.711342
Asset_~e	.2468175	.06964	3.54	0.000	.110334	.383301	2.62205
Ttl_ln~e	-.0020833	.01449	-0.14	0.886	-.030477	.026311	3.25233
Total_~s	-.0105943	.00593	-1.79	0.074	-.022216	.001027	2.0251
ACC_CR~S*	.1895541	.07465	2.54	0.011	.04324	.335868	.123333
ACCESS~E*	-.2563203	.0597	-4.29	0.000	-.373327	-.139314	.46
Maize_~a	.0066153	.03225	0.21	0.837	-.056602	.069832	.757096
Extern~D*	-.1278362	.07465	-1.71	0.087	-.274142	.01847	.746667
Input_~Y*	-.1530273	.0667	-2.29	0.022	-.28375	-.022304	.356667

```
(*) dy/dx is for discrete change of dummy variable from 0 to 1

. mfx
```

APPENDIX 3: DETERMINATS OF POVERTY

```
Logistic regression                          Number of obs  =        299
                                             LR chi2(18)    =     189.94
                                             Prob > chi2    =     0.0000
Log likelihood = -86.215382                  Pseudo R2      =     0.5242
```

Poverty_Status	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
Ward_9	-.7995774	7.053393	-0.11	0.910	-14.62397	13.02482
Ward_12	1.407039	7.080248	0.20	0.842	-12.46999	15.28407
Ward_14	-1.706997	7.068816	-0.24	0.809	-15.56162	12.14763
HH_Age	-.0044872	.0143987	-0.31	0.755	-.0327081	.0237337
Gender_hhd	.7721536	.9388501	0.82	0.411	-1.067959	2.612266
Mari_status	-1.427459	.9984408	-1.43	0.153	-3.384367	.5294487
Dependancy_Ratio	.0419537	.0103773	4.04	0.000	.0216146	.0622929
Yrs_spend_schl	.0407697	.0756778	0.54	0.590	-.1075562	.1890955
Occupation_Farming	.0560906	.4717909	0.12	0.905	-.8686025	.9807836
Total_Consumption	-.0186591	.0051441	-3.63	0.000	-.0287414	-.0085768
log_Assetvalue	-2.367051	.5552583	-4.26	0.000	-3.455337	-1.278765
Lnd_cultivtd_12_mnths	-.1976836	.1513968	-1.31	0.192	-.4944158	.0990486
ACC_CREDIT_LOANS	.3143539	.7509371	0.42	0.675	-1.157456	1.786164
Coping_Strategy_Index	.0028853	.0027448	1.05	0.293	-.0024944	.008265
ACCESS_EXTEN_SERVICE	-1.131459	.4899414	-2.31	0.021	-2.091727	-.1711916
Maize_Yield_per_Ha	-.0021948	.0018534	-1.18	0.236	-.0058274	.0014377
FOOD_AID	.2131163	.6065094	0.35	0.725	-.9756203	1.401853
Input_SUBSIDY	.2727952	.4710661	0.58	0.563	-.6504773	1.196068
_cons	8.208854	7.340785	1.12	0.263	-6.178821	22.59653

```
. mfx

Marginal effects after logit
      y  = Pr(Poverty_Status) (predict)
         =  .85194774
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
Ward_9	-.1008529	.90808	-0.11	0.912	-1.88065	1.67894	.367893
Ward_12*	.1538764	.65579	0.23	0.814	-1.13144	1.43919	.334448
Ward_14*	-.2617683	1.30216	-0.20	0.841	-2.81396	2.29042	.334448
HH_Age	-.000566	.00182	-0.31	0.756	-.004136	.003004	48.1104
Gender~d*	.1080498	.14582	0.74	0.459	-.177758	.393858	.688963
Mari_s~s*	-.1443456	.08642	-1.67	0.095	-.313728	.025037	.73913
Depend~o	.0052917	.00169	3.13	0.002	.001982	.008601	55.0523
Yrs_sp~l	.0051424	.00953	0.54	0.589	-.013537	.023821	8.07023
Occupa~g*	.0070737	.05947	0.12	0.905	-.109483	.12363	.494983
Total_~n	-.0023535	.00081	-2.89	0.004	-.003947	-.00076	70.2019
log_As~e	-.2985627	.0935	-3.19	0.001	-.481811	-.115315	2.62054
Lnd_cu~s	-.0249344	.01952	-1.28	0.202	-.063196	.013327	2.24582
ACC_CR~S*	.0364379	.08026	0.45	0.650	-.120863	.193739	.120401
Coping~x	.0003639	.00035	1.04	0.298	-.000321	.001049	99.9231
ACCESS~E*	-.1487355	.07156	-2.08	0.038	-.288983	-.008488	.461538
Maize_~a	-.0002768	.00024	-1.15	0.251	-.00075	.000196	58
FOOD_AID*	.027906	.08284	0.34	0.736	-.134457	.190269	.749164
Input_~Y*	.034247	.05938	0.58	0.564	-.082137	.150631	.471572

(*) dy/dx is for discrete change of dummy variable from 0 to 1

APPENDIX 4: DETERMINANTS OF FOOD INSECURITY

```
Logistic regression                           Number of obs   =         299
                                              Wald chi2(19)   =       43.38
                                              Prob > chi2     =      0.0011
Log pseudolikelihood =    -167.9822           Pseudo R2       =      0.1386
```

Food Sec	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf. Interval]	
Ward_s	-.2235737	.1750431	-1.28	0.202	-.5666518	.1195044
HH_Age	-.0151147	.0112363	-1.35	0.179	-.0371375	.0069081
Gender_hhd	.5938175	.5368592	1.11	0.269	-.4584073	1.646042
Mari_status	-.8431096	.5520361	-1.53	0.127	-1.92508	.2388612
Dependancy_Ratio	.0134282	.0077621	1.73	0.084	-.0017852	.0286417
Yrs_spend_schl	.043994	.0500959	0.88	0.380	-.0541922	.1421803
Occupation_Farming	-.3367206	.3219417	-1.05	0.296	-.9677147	.2942736
Ttl_mthly_hh_incm	-.4674721	.1898102	-2.46	0.014	-.8394932	-.095451
Asset_Value	-1.193409	.3439628	-3.47	0.001	-1.867563	-.519254
Lnd_cultivtd_12_mnths	-.0682772	.1018481	-0.67	0.503	-.2678957	.1313413
Total_livestock_Units	.0465357	.0244041	1.91	0.057	-.0012954	.0943668
ACC_CREDIT_LOANS	.5376929	.5179974	1.04	0.299	-.4775634	1.552949
WATER_SECURITY	-.0467696	.3209241	-0.15	0.884	-.6757693	.5822302
Coping_Strategy_Index	-.1720751	.2484089	-0.69	0.488	-.6589475	.3147974
ACCESS_EXTEN_SERVICE	.0173582	.3300694	0.05	0.958	-.6295659	.6642823
Maize_Yield_per_Ha	.2699906	.1636235	1.65	0.099	-.0507055	.5906868
External_AID	.5930678	.3805447	1.56	0.119	-.1527861	1.338922
Input_SUBSIDY	-.1347764	.3281459	-0.41	0.681	-.7779306	.5083777
Nmbr_chronic_Sick	-.0375377	.1442615	-0.26	0.795	-.3202849	.2452096
_cons	4.265231	1.378012	3.10	0.002	1.564377	6.966084

```
. mfx

Marginal effects after logit
      y  = Pr(Food_Sec) (predict)
         = .6663604
```

variable	dy/dx	Std. Err.	z	P>|z|	[95% C.I.]		X
Ward_s	-.0497059	.03899	-1.27	0.202	-.126116	.026705	.996656
HH_Age	-.0033604	.0025	-1.35	0.178	-.008253	.001532	48.1104
Gender~d*	.1358938	.1255	1.08	0.279	-.110082	.38187	.688963
Mari_s~s*	-.1725219	.1028	-1.68	0.093	-.374014	.02897	.73913
Depend~o	.0029854	.00173	1.73	0.084	-.000399	.00637	55.0523
Yrs_sp~l	.0097809	.01113	0.88	0.380	-.012043	.031605	8.07023
Occupa~g*	-.0747849	.0709	-1.05	0.292	-.213749	.064179	.494983
Ttl_mt~m	-.1039304	.04188	-2.48	0.013	-.186007	-.021853	1.0373
Asset_~e	-.2653236	.0759	-3.50	0.000	-.41408	-.116567	2.62054
Lnd_cu~s	-.0151797	.02266	-0.67	0.503	-.059598	.029239	2.24582
Total_~s	.010346	.00546	1.90	0.058	-.000347	.021039	2.03087
ACC_CR~S*	.1103741	.09626	1.15	0.252	-.078285	.299033	.120401
WATER_~Y*	-.0103735	.07106	-0.15	0.884	-.149641	.128894	.648829
Coping~x	-.0382565	.05524	-0.69	0.489	-.146526	.070013	1.61175
ACCESS~E*	.0038583	.07334	0.05	0.958	-.13989	.147607	.461538
Maize_~a	.0600255	.03621	1.66	0.097	-.010946	.130997	.759628
Extern~D*	.137025	.09026	1.52	0.129	-.039885	.313935	.749164
Input_~Y*	-.0299946	.07305	-0.41	0.681	-.173167	.113178	.471572
Nmbr_c~k	-.0083455	.03207	-0.26	0.795	-.07121	.054519	.448161

APPENDIX 5: EXTENT OF FOOD INSECURITY: STATA OUTPUT

. dfgtg Calories_daily_per_person, hgroup(Gender_hhd) hsize(Ward_9) alpha(0) pline(2100)

```
    Decomposition of the FGT index by groups
    Poverty index    : FGT index
    Household size   : Ward_9
    Group variable   : Gender_hhd
    Parameter alpha :   0.00
```

Group	FGT index	Population share	Absolute contribution	Relative contribution
0	0.629630	0.245455	0.154545	0.229730
	0.000000	0.042514	0.026768	0.059148
1	0.686747	0.754545	0.518182	0.770270
	0.071907	0.042514	0.083453	0.059148
Population	0.672727	1.000000	0.672727	1.000000
	0.056685	0.000000	0.056685	0.000000

. dfgtg Calories_daily_per_person, hgroup(Gender_hhd) hsize(Ward_9) alpha(1) pline(2100)

```
    Decomposition of the FGT index by groups
    Poverty index    : FGT index
    Household size   : Ward_9
    Group variable   : Gender_hhd
    Parameter alpha :   1.00
```

Group	FGT index	Population share	Absolute contribution	Relative contribution
0	0.365679	0.245455	0.089758	0.356782
	0.000000	0.042514	0.015546	0.022341
1	0.214458	0.754545	0.161818	0.643219
	0.028351	0.042514	0.012274	0.022341
Population	0.251576	1.000000	0.251576	1.000000
	0.027821	0.000000	0.027821	0.000000

dfgtg Calories_daily_per_person, hgroup(Gender_hhd) hsize(Ward_9) alpha(2) pline(2100)

```
    Decomposition of the FGT index by groups
    Poverty index    : FGT index
    Household size   : Ward_9
    Group variable   : Gender_hhd
    Parameter alpha :   2.00
```

Group	FGT index	Population share	Absolute contribution	Relative contribution
0	0.225395	0.245455	0.055324	0.404885
	0.000000	0.042514	0.009582	0.004246
1	0.107770	0.754545	0.081318	0.595115
	0.022840	0.042514	0.012652	0.004246
Population	0.136642	1.000000	0.136642	1.000000
	0.022234	0.000000	0.022234	0.000000

```
dfgtg Calories_daily_per_person, hgroup(Gender_hhd) hsize(Ward_12) alpha(0) pline(2100)

    Decomposition of the FGT index by groups
    Poverty index    : FGT index
    Household size    : Ward_12
    Group variable    : Gender_hhd
    Parameter alpha :   0.00
```

Group	FGT index	Population share	Absolute contribution	Relative contribution
0	0.820513	0.390000	0.320000	0.410256
	0.000000	0.000000	0.000000	0.000000
1	0.754098	0.610000	0.460000	0.589744
	0.000000	0.000000	0.000000	0.000000
Population	0.780000	1.000000	0.780000	1.000000
	0.000000	0.000000	0.000000	0.000000

```
. dfgtg Calories_daily_per_person, hgroup(Gender_hhd) hsize(Ward_12) alpha(1) pline(2100)

    Decomposition of the FGT index by groups
    Poverty index    : FGT index
    Household size    : Ward_12
    Group variable    : Gender_hhd
    Parameter alpha :   1.00
```

Group	FGT index	Population share	Absolute contribution	Relative contribution
0	0.432034	0.390000	0.168493	0.526059
	0.000000	0.000000	0.000000	0.000000
1	0.248852	0.610000	0.151800	0.473941
	0.000000	0.000000	0.000000	0.000000
Population	0.320293	1.000000	0.320293	1.000000
	0.000000	0.000000	0.000000	0.000000

```
. dfgtg Calories_daily_per_person, hgroup(Gender_hhd) hsize(Ward_12) alpha(2) pline(2100)

    Decomposition of the FGT index by groups
    Poverty index    : FGT index
    Household size    : Ward_12
    Group variable    : Gender_hhd
    Parameter alpha :   2.00
```

Group	FGT index	Population share	Absolute contribution	Relative contribution
0	0.302540	0.390000	0.117991	0.641361
	0.000000	0.000000	0.000000	0.000000
1	0.108162	0.610000	0.065979	0.358639
	0.000000	0.000000	0.000000	0.000000
Population	0.183969	1.000000	0.183969	1.000000
	0.000000	0.000000	0.000000	0.000000

. dfgtg Calories_daily_per_person, hgroup(Gender_hhd) hsize(Ward_14) alpha(0) pline(2100)

    Decomposition of the FGT index by groups
    Poverty index   : FGT index
    Household size   : Ward_14
    Group variable   : Gender_hhd
    Parameter alpha :   0.00

Group	FGT index	Population share	Absolute contribution	Relative contribution
0	0.518519	0.267327	0.138614	0.269231
	0.000000	0.000000	0.000000	0.000000
1	0.513514	0.732673	0.376238	0.730769
	0.000000	0.000000	0.000000	0.000000
Population	0.514852	1.000000	0.514852	1.000000
	0.000000	0.000000	0.000000	0.000000

. dfgtg Calories_daily_per_person, hgroup(Gender_hhd) hsize(Ward_14) alpha(1) pline(2100)

    Decomposition of the FGT index by groups
    Poverty index   : FGT index
    Household size   : Ward_14
    Group variable   : Gender_hhd
    Parameter alpha :   1.00

Group	FGT index	Population share	Absolute contribution	Relative contribution
0	0.257989	0.267327	0.068967	0.351339
	0.000000	0.000000	0.000000	0.000000
1	0.173790	0.732673	0.127331	0.648661
	0.000000	0.000000	0.000000	0.000000
Population	0.196299	1.000000	0.196299	1.000000
	0.000000	0.000000	0.000000	0.000000

. dfgtg Calories_daily_per_person, hgroup(Gender_hhd) hsize(Ward_14) alpha(2) pline(2100)

    Decomposition of the FGT index by groups
    Poverty index   : FGT index
    Household size   : Ward_14
    Group variable   : Gender_hhd
    Parameter alpha :   2.00

Group	FGT index	Population share	Absolute contribution	Relative contribution
0	0.165343	0.267327	0.044201	0.434304
	0.000000	0.000000	0.000000	0.000000
1	0.078579	0.732673	0.057573	0.565696
	0.000000	0.000000	0.000000	0.000000
Population	0.101774	1.000000	0.101774	1.000000
	0.000000	0.000000	0.000000	0.000000

. dfgtg Calories_daily_per_person, hgroup(Gender_hhd) hsize(Ward_s) alpha(0) pline(2100)

    Decomposition of the FGT index by groups
    Poverty index   : FGT index
    Household size   : Ward_s
    Group variable   : Gender_hhd
    Parameter alpha :   0.00

Group	FGT index	Population share	Absolute contribution	Relative contribution
0	0.645161	0.310000	0.200000	0.333333
	0.127366	0.046188	0.069282	0.057735
1	0.579710	0.690000	0.400000	0.666667
	0.089010	0.046188	0.034641	0.057735
Population	0.600000	1.000000	0.600000	1.000000
	0.103923	0.000000	0.103923	0.000000

. dfgtg Calories_daily_per_person, hgroup(Gender_hhd) hsize(Ward_s) alpha(1) pline(2100)

    Decomposition of the FGT index by groups
    Poverty index   : FGT index
    Household size   : Ward_s
    Group variable   : Gender_hhd
    Parameter alpha :   1.00

Group	FGT index	Population share	Absolute contribution	Relative contribution
0	0.330976	0.310000	0.102603	0.431922
	0.073403	0.046188	0.038042	0.073282
1	0.195574	0.690000	0.134946	0.568078
	0.027194	0.046188	0.009731	0.073282
Population	0.237549	1.000000	0.237549	1.000000
	0.047773	0.000000	0.047773	0.000000

. dfgtg Calories_daily_per_person, hgroup(Gender_hhd) hsize(Ward_s) alpha(2) pline(2100)

    Decomposition of the FGT index by groups
    Poverty index   : FGT index
    Household size   : Ward_s
    Group variable   : Gender_hhd
    Parameter alpha :   2.00

Group	FGT index	Population share	Absolute contribution	Relative contribution
0	0.222877	0.310000	0.069092	0.533279
	0.057863	0.046188	0.028232	0.088606
1	0.087636	0.690000	0.060469	0.466721
	0.010477	0.046188	0.003181	0.088606
Population	0.129561	1.000000	0.129561	1.000000
	0.031413	0.000000	0.031413	0.000000

APPENDIX 6: MULTI-COLLINEARITY

```
. vif
```

Variable	VIF	1/VIF
Mari_status	3.17	0.315720
Gender_hhd	3.08	0.324387
Yrs_spend_~l	2.31	0.432187
HH_Age	1.75	0.570659
Ttl_mthly_~m	1.75	0.571804
Coping_Str~x	1.62	0.615499
External_AID	1.57	0.637966
Input_SUBS~Y	1.36	0.737503
ACCESS_EXT~E	1.33	0.751756
Occupation~g	1.32	0.754952
Lnd_cultiv~s	1.32	0.755520
Maize_Yiel~a	1.31	0.762608
WATER_SECU~Y	1.26	0.795619
ACC_CREDIT~S	1.23	0.816185
Total_live~s	1.17	0.851490
Dependancy~o	1.12	0.890366
Nmbr_chron~k	1.11	0.904652
Mean VIF	1.63	

APPENDIX 7: Social Economic Demographics

Variable name	Variable description	Mean	SD
Age	Household head age in (Years)	48.05	17.108
Household size	Household size (Numbers)	7.266	2.640
Dependency ratio	Number of dependencies per household (Numbers)	4.913	2.418
Health status	Number of chronically sick (Numbers)	0.447	0.793
Gender	Household head gender (1=Male)	0.69	-
Marital Status	Household head marital status(1=Married)	0.74	-
Education	Household head education level (Years of schooling)	8.09	4.116
Occupation	Occupation of the household head (1=Farming)	0.49	-
Total Income	Total monthly household income (USD)	74.82	143.971
Expenditure	Per capita monthly consumption expenditure (USD)	70.398	51.677
Calorie intake	Household calorie intake (kcal/day/AE)	1759.8	826.3
Coping strategies	Average household coping scores (Numbers)	99.59	102.285
Credit	Access to credit or loans (1=Yes)	0.12	-
Assets	Total value of household assets (USD)	1177.3	2845.34
Livestock size	Household Livestock size (TLUs)	2.025	4.824
Water security	Access to Portable water (1=Yes)	0.65	-
Input subsidy	Household access to inputs (1=Yes)	0.47	-
External aid	Access to external aid (1=Yes)	0.74	-
Extension	Access to extension services (1=Yes)	0.46	-
Land size	Land size household has access to (Hectares)	3.252	2.252
Land Utilised	The size of land cultivated (Hectares)	2.622	1.526
Maize yield	Average maize yield per hectare (Kilograms)	0.757	0.974
Groundnuts yields	Average ground nuts yields	14.363	18.684
Sunflower	Average sunflower per hectare (Kilograms)	0.593	4.673
Millet	Average millet per hectare(Kilograms)	2.542	8.768
Sorghum	Average sorghum per hectare(Kilograms)	1.600	6.251
Soya beans	Average sorghum per hectare(Kilograms)	1.433	10.799
Beans	Average bean yield per hectare (Kilograms)	0.433	3.111