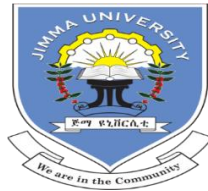


**The Impacts of ‘Women Economic Empowerment in Agriculture ‘on
Vulnerability to Food Insecurity in Tarcha Zuria district, Dawro Zone,
Southern Ethiopia**

*A Thesis Submitted to the School of Graduate Studies of Jimma University in
The Partial Fulfillment of The Requirements for The Award of The Degree of
Masters of Science In development Economics*

BY BARAMO BEYENE BETELA



**JIMMA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
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JIMMA UNIVERSITY, ETHIOPIA

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BY BARAMO BEYENE BETELA

Under guidance of

Main advisor: Mr. Teklu Tadesse (ass. Professor)

And

Co-advisor: Mr. Dereje Argaw (Msc)



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JIMMA, ETHIOPIA

DECLARATION

I hereby declare that this thesis entitled “Impacts of Women Economic empowerment in Agriculture on vulnerability to food insecurity” in Tarcha Zuria district has been carried out by me under the guidance and supervision of Mr. Teklu Tadesse (ass. prof) and Mr. Dereje Argaw.

The thesis is original and has not been submitted for the award of any degree or diploma to any university or institution.

Researcher's Name

Date

Signature

CERTIFICATE

This is to certify that the thesis entitled “*The Impacts of Women Economic empowerment in Agriculture on vulnerability to food insecurity in Tarcha Zuria district of Dawro Zone in Southern Ethiopia*’ Submitted to Jimma University for the award of the Degree of Master of Science (MSc) in development economics and is a record of Valuable thesis proposal work carried out by Mr. Baramo Beyene, under our guidance and supervision.

Therefore, we hereby declare that no part of this thesis has been submitted to any other university or institution for the award of any degree or diploma.

Main Adviser’s Name

Date

signature

Co-Advisor’s Name

Date

Signature

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Abstract

Women play a major role in ensuring households 'wellbeing in most rural areas of developing countries, thus their active and equal participation with men in any development strategies, policies, and other related goals realize economic growth and they have an important role in the reduction of vulnerability to food insecurity. The main objective of this study was to examine the impacts of women's economic empowerment in agriculture on vulnerability to food insecurity in the Tarcha Zuria district. A two-stage sampling survey was used to determine the targeted sample size (n=220) by selecting randomly from four sampled kebeles by using Kothari (2004) statistical formula. The study mainly used a cross-section research design by collecting necessary primary data from respondents through predetermined questionnaires and interviews. The study developed a methodology to measure the women empowerment index in agriculture by using the empowerment index (WEAI) which comprises five main domains of empowerment of women in agriculture. A result revealed that the majority (84.4 %) of a woman included in this study are empowered in agricultural sectors and active participation in production was dominant dimensions of women 's economic empowerment that is it highly explained the other domains in the model. The households 'vulnerability status had been determined by calculating mean household food expenditure per adult in birr that is used to determine the current food security status of a household. The binary logistic model was used to determine the factors of women 's empowerment in agriculture 'that reduce a household 's vulnerability to food insecurity. The income of women, non-farm activities, education level of women, and cultivated farmland have a negative and statistically significant impact that show higher levels of income, non-farm activities, education, the cultivated farm, and aggregate empowerment reduce the probability of likelihood of a female-headed household becoming vulnerable to food insecurity in the future. Family size and dependency ratio are positively significant that indicate households with larger family size and dependency ratio were more likely to be vulnerable to food insecurity than lower family members and less dependency ratio. Finally, it was recommended that government and other responsible bodies should encourage women to actively participate in productivity activities and assist them to acquire basic training in the use of irrigation systems. The study ought to be of significance to the community, next researchers, and the body of knowledge, policy makers, and other concerned bodies.

Key words: *women economic empowerment; empowerment index; vulnerability to food insecurity & impacts of women economic empowerment.*

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ACRONYMS AND ABBREVIATIONS

FAO	Food and Agriculture Organization
FCEA	Food consumption expenditure per adult
FGD	Focus group discussion
FSP	Food security program
ICRW	International center for research on women
IFRC	International Federation of Red Crescent Societies
OLS	Ordinary least square
PASDEP	Plan for Accelerated Sustainable Development to End Poverty
PCA	Principal component analysis
PCFCE	Per Capita Food Consumption Expenditure
SD	Standard deviation
SDG2	Sustainable Development Goal two
SDGs	Sustainable Development Goals
SNNPR	South Nations, Nationalities, and Peoples' Regional state
SPSS	Statistical Package for Social Sciences versions
UN	United Nation
UNFPA	United nation population fund
USAID	United States Agency for International Development
VFI	Vulnerability to food insecurity
VIF	Variance inflating factor
WEAI	Women's Empowerment in Agriculture Index
WEE	Women's economic empowerment
WFP	World food programs

CHAPTER ONE

INTRODUCTION

1.1 Background Study

The international development sectors recognize that the commitment to end poverty, defend the world, and ensure prosperity for all can only be fulfilled if development programs take into consideration women's and girls' specific needs, knowledge, and potential. Achievement of gender equality and the empowerment of all women and girls is one of the Millennium and Sustainable Development Goals of 2030, particularly Goal 5, which is a significant field of adding achievements in education, finance, advocacy, and alternative initiatives to “women empowerment” around the world that leads to economic development (Das et. al, 2020)

The concept of empowerment is now commonly used in a variety of disciplines to define the states, social structures of individuals and communities. It is broadly defined as power (control over one's own life and resources) and the capability to originate and direct actions for given purposes (Buvinic, 2020). Cambridge Dictionary's meaning of the word empowerment is that the process of giving power to a person or group and status in a particular situation. Theoretically, empowerment has no unique definition; various scholars interpret it differently. For example, according to (Mosedale, 2005) empowerment is a continuous process that is asserted on one's self in terms of making life decisions and carrying them out (as a reflection to them). Empowerment is applicable to both women and men, but it is more applicable to women since women account for nearly half of the world's population and they are more vulnerable to disempowerment than men. It is especially important for women because their disempowerment is more pervasive, cutting through various domains and social distinctions, and is formed more complicated by the fact that household and intra-familial relationships are a major source of women's powerlessness (Malhotra & Schuler, 2005). For this reason, any development strategies policies, and goals cannot be fully realized without equal participation of women and men.

Women empowerment is a process whereby women become ready to organize themselves, extend their self-reliance, say their independent right, create choices, and manage resources that can help in challenging and eliminating their subordination (Keller & Mbwewe (1991: 45). Women ‘s

economic empowerment is the process that increases their real power over economic decisions that influence their lives and priorities in society (Sharaunga, 2015). Women's economic empowerment is the process of ensuring that women have equal access to economic resources and that they have greater influence over other aspects of their lives (Neil and Valters, 2014). Women, who are economically empowered, according to Harrison (2011), have both the potential to succeed and advance economically as well as the capacity to form and act on economic decisions.

Women's equal participation with men in any development strategies policies and goals realizes economic development. Thus, they play a major role in ensuring households 'well-being in most rural areas of developing countries. But this role is not much understood by men in cultural, political, economic aspects in which most of the supremacy of men involved (Sharaunga, 2015) Rural areas where subsistence agriculture is a predominant source of livelihoods, women have multiple roles throughout the processes of production, handling, and preparation of food (Bob, 2002; Galie, 2013). They play a major role also in increasing food security and reducing vulnerability to food insecurity.

Food security has been defined as a situation when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food needed to maintain a healthy and active life (FAO, 2009). Ethiopia is one of the most food-insecure countries in the world, with a large proportion of the population living below the poverty line. This is due to their dependency on on-farm production, which is highly vulnerable to extreme droughts, population growth, city expansion, and is one of the world's most food-insecure countries (Abraham, 2020). Women's empowerment interventions can reduce households' being vulnerable to food insecurity might be of great value to the government, non-governmental organizations, and development agencies within the design of effective food security strategies. Thus, empowered women have an important role in the reduction of vulnerability to food insecurity (Shamsu-deen, 2014)

1.2 Statement of the Problem

Women's economic empowerment is the most important issue in enhancing both the standard and the number of human resources available for development. To verify the sustainable development of the country, women's economic empowerment and achieving gender equality are critical (Nengroo, 2020).

According to Bennet (2002), women play a much larger role in decision-making and improving household well-being. Women's skills to avail equal job opportunities, control over, power of achieving, status, decision-making abilities, and know themselves to be a productive participants for child growth, household caretaker, etc. deprived them to achieve knowledge and education due to lack of awareness and knowledge. The role of women in overall development had not been fully understood, nor had it been given its full weight in the struggle to eliminate poverty, hunger, inequality, and injustice at the national and international levels, according to (Rehman, 2011; Khan et.al, (2011) & Moindi, 2012)

Women were solely responsible for child-rearing and caring for the needs of their families as well as the prevalence of intra-household inequalities, place a huge burden on women's health and limited their opportunity to exchange in society's benefits. Rural women play a crucial and significant role in livestock rearing, agriculture, and other allied activities in rural areas of Africa, including Ethiopia, but their contribution has not been encouraged or given the due place they deserved. They always remain invisible workers and are only responsible for their own homes (Singh, 2020). As a result, this research raised women's awareness of the importance of their role in both personal and national growth that is why empowering women means encouraging them to be self-sufficient, autonomous (independent), have high self-esteem, and be confident in all aspects of their development.

Most of the previous studies (Sharaunga, 2015; Mulema, 2018; & Staples, 2020) demonstrated women's empowerment in several domains, like economic, political, agricultural, psychological. However, at both the national and international levels, the impacts of women's empowerment on food insecurity and vulnerability reduction were not enough studied.

Women are the key actors in ensuring rural household food security, according to (Moindi, 2012; Rehman, 2011, and Khan, et. al, 2011). They did not include different forms of women empowerment in models to study the vulnerability of rural households to food insecurity. As a result, the majority of the mentioned literature reviews related to this title were from Africa, with only a few related (but not identical) pieces of literature from Ethiopia and no currently published research in the Dawro zone on this topic. This demonstrates the lack of literature on women's roles outside of domestic responsibilities. Therefore, this paper provides additional knowledge and serves as a resource for future researchers and societies interested in women's empowerment in

reducing household vulnerability to food insecurity among female households in a smallholder farmer and governmental or non-governmental organization (NGO) employed women.

Women have a high contribution to accessing food security and reducing vulnerability to food insecurity, but as results of Shamsu-deen, (2014), Sharaunga, (2015) and (Sharaunga et. al, 2015) showed that these roles of women are hindered by various socio-economic factors like education, household incomes, health care, credit facility, and land. Which they pointed out that those socio-cultural inhibition affects women's participation in agriculture and makes their households vulnerable to food insecurity. An empirical result of further researches showed that women empowerment is the key issue concerning a household vulnerability in food insecurity. For instance, (Bushra and Wajiha, 2015a) concluded that contents of education, economic participation of women, poverty, and economic opportunity available to women increase their empowerment. Sharaunga et. al, (2016) has shown that empowering women by improving the sense of agency and strengthening their control over a variety of assets is critical for improving the food security status of their households and Sileshi *et al.*, (2019) concluded that about 42.64% of the whole household's suffered from food insecurity in future than the current. In this study, this figure comes up with about 54.09 percent vulnerability to food insecurity currently. Even though most of the literature reviewed was conclude on the results of women empowerment, their main roles, and affecting factors in different aspects, they have not focused on measurement of women empowerment index in agriculture sectors. As result, this paper mainly focused on women's economic empowerment factors affecting the vulnerability to food insecurity of female household heads in the research area, and analysis measuring women empowerment index in agricultural sectors with five main domains and its indicators.

As was recommended by (Sharaunga et. al., 2015) considerable attention has been given to the study of food insecurity that vulnerability of rural households to food insecurity is a progressive problem of the future. Currently, there has been increasing awareness on analysis of food insecurity which is not considered its current incidence but also more risk of future suffering. Since the probability of being vulnerable to food insecurity is a continuing issue, this paper investigated the impact of women's economic empowerment in the agricultural sector, which was important in reducing households' vulnerability to food insecurity in Tarcha Zuria district, Dawro Zone.

Finally, by collecting relevant cross-sectional data from targeted respondents and other secondary sources as well as assessing it significantly, the research filled all of the above (literature, area, factors(constraints), and measurement of empowerment index) gaps.

1.3 Research Questions

The research questions addressed in this study were:

1. What are the women empowerment factors affecting vulnerability to food insecurity and the current status of food insecurity among rural female households of Tarcha Zuria district?
2. How women's economic empowerment index in agriculture is measured?
3. What are the impacts of empowered women on vulnerability to food insecurity in the district?

1.4 The Objectives of the Study

1.4.1 General objective

The general objective of this study was to examine the impacts of women economic empowerment in agriculture on vulnerability to food insecurity in the Tarcha Zuria district of Dawro Zone, southern Ethiopia

1.4.2 Specific objectives

The research was focus on the following areas specifically:

- i. To assess the women's economic empowerment factors affecting vulnerability to food insecurity in the Tarcha Zuria district.
- ii. To analyze (measure) the women's economic empowerment index in agriculture across various domains for the women in the sample.
- iii. To examine the impacts of women's economic empowerment on vulnerability to household food insecurity in the Tarcha Zuria district.

1.5 Scope and Significance of the Study

The study was conducted in the Tarcha Zuria district, which is found in the southern nation nationalities and people's regional states. It mainly covers female societies who are productive household heads. As a result, the study's primary objective and target audience are women in the chosen region. The study's focus is on women in the district who may be vulnerable to food insecurity, as well as their impact on food insecurity vulnerability.

Women's economic empowerment is a global problem that has a significant impact on a country's political, economic, and social development. When women are empowered, they share knowledge about how to interpret their attitudes, beliefs, and actions concerning their interests, maintaining fair-mindedness rather than simply questioning and challenging male dominance. Empowered women aimed not to be superior to men, use their talents to live fulfilling lives in which they maintain their strength in the presence of pressures of family, religion, and work, and that they contribute towards the empowerment of all women (Sinha et.al, 2019).

It was now generally acknowledged that improving women's lives and promoting the benefits of their rights whole communities, not just women and girls. Accesses to sexual and reproductive health care and safety from gender-based abuse are among other important initiatives that increase family health and, community economic well-being. This study was focused on women's empowerment with vulnerability in food insecurity which was studied in previous researchers. But the impacts of empowered women on vulnerability to food insecurity are not adequately covered. Thus, one uses this study to explore this gap and it was used as a reference to the next researcher on the related issue. It gives additional knowledge to all society that is dis-empowered and empowered men and women in intra-national and international levels, and the study also showed the women's role in reducing vulnerability to food insecurity. The study was expected to give analytical clues for development and decision-makers as well as it was used in policymakers that concerning women.

1.6 Limitation of the Study

The scope of this study's targeted sample site decision was limited to only four kebeles in the district, which was its limitation. The study aimed to identify factors influencing women's vulnerability to food insecurity based on cross-sectional data from only four kebeles' worth of

women's households, which may not fully represent the entire population. Due to the wide geographical location and work busy of the respondent of the district, most of the questionnaire response was delayed and few of them refused to return of responded questionnaire on given time and lack of transformation due to problem of infrastructure, especially road. That is mainly constrained by limitations in labor power, time, and budget.

1.7 Organization of the Study

This thesis manuscript is comprised of five main chapters. The first chapter presents the introduction of the study that incorporates the background of the study, statement of the problem, research questions, and objectives of the research, significance of the study, scope, and limitations of the study. Chapter two illustrates a review of related literature comprising the concepts as well as the theoretical and empirical basis of the study. Chapter three presents the research methodology that mainly discussed the description of the study area, the research design, sampling techniques, and sample size determination, methods of data collection, model specification, and variables selection in detail. Chapter four presents an analysis of the results and discussion in a detailed manner. Conclusions and recommendations based on the findings of the research work are presented in chapter five. Finally, Appendix Tables present some of the outputs of the regression analysis, and conversion factors that may be used in the analysis of the data are assigned in the last part of the study.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Theoretical Literature Review

2.1.1 Overview

The literature review referred for this study in which gaps found in the research that needed were addressed in this chapter. Globally, the economic empowerment of women is a new concept. Since the second half of the twentieth century, the problem of women's empowerment has gained importance among scholars of universities, and on national and international platforms. But the concept was not deeply ingrained into the governments' policies and programs until the declaration of the 'Women's Decade' in 1975 (Mandal, 2013). This study mostly uses different types of published literature that are mainly related to women's empowerment in economic, political, and social aspects and their impact on vulnerability to food insecurity.

This section reviewed a variety of studies on women's economic empowerment to form some methodological points about the index measurement of women empowerment in agriculture and women empowerment factors that affect vulnerability to food security/increase vulnerability to food insecurity. The section also describes the frameworks that have been adopted to conceptualize and measure women's empowerment index as well as different factors concerning vulnerability to food insecurity.

2.1.2 Definitions of relevant terminology

This section reviews a number of the definitions of relevant features of empowerment and other related features which will be included in the study and identifies their characteristics additionally as areas of divergence.

2.1.2.1 Definition of women's economic empowerment

Women's economic empowerment could also be a multi-dimensional concept that covering many aspects of women's lives and their relationships to their families, communities, and broader contexts ((Buvinic,2020)). Economic empowerment is defined in several ways by different

researchers. Literature reflects considerable diversity within the emphases, agendas, and terminologies used to define women 's empowerment. The term 'empowerment' most frequently spans various definitions that refer to choose, power, options, control, and agency (van den Bold et al., 2013).

2.1.2.2 Empowerment as different aspects

Economic empowerment, according to some, is a political term involving a collective fight against patriarchal social ties. Others define it as people's awareness as well as their ability to specify and act on their desires. These differences stem from the different origins and uses of the term. As a result, there is a range of definitions and approaches used by different organizations to conceptualize and measure women's empowerment (Luttrell et al., 2009).

One aspect of empowerment defined within the World Bank's empowerment sourcebook (Narayan, 2002) is expanding poor people's capabilities. This shows that they lead to an increase within the welfare or well-being of the poor, as measured by standard socioeconomic indicators, or whether an expansion in these capabilities has value albeit they are doing not influence the other aspect of welfare and in another case, empowerment is defined as a component of an agent's welfare or utility (empowerment as an end), or whether it's true by causation, that is, empowerment influences a component of welfare like the agent's income or health status (empowerment as a way to an end) (Khwaja, 2005)

Some studies ((Rowlands, 1995; Oxaal& Baden, 1997; Kabeer, 2001) have defined empowerment as the process of removing the factors which cause powerlessness. Kabeer (2001: 86), whose definition is that the most generally accepted, defines empowerment as the expansion of people's ability to make strategic life choices during a context where this ability was previously denied to them. Bennett (2002) described empowerment as the enhancement of diverse individuals' and groups' assets and capabilities to engage with, control, and keep accountable the institutions that affect them. Keller and Mbwewe (1991: 45) described women empowerment as a process in which women learn to organize themselves to increase their self-reliance or independent rights. Rowland (1997) viewed empowerment as a dynamic process aimed toward finding more space for controll to encompass change at the personal and collective level.

Other authors (Narayan, 2005; Sharaunga, 2015) view empowerment from a workplace perspective and argue that women themselves must be significant actors within the process of change that is being described or measured. Other definitions of empowerment focus not upon the person's freedom to act, but upon the concrete material, social and institutional preconditions required to exert agency. A widely cited definition of empowerment of this sort is that of the planet Development Report (2000/2001), which views empowerment as the process of enhancing the capacity of the poor people to influence the state institutions that affect their lives, by strengthening their participation in political processes and native decision-making. According to (Mason & Smith, 2003), empowerment is about the extent to which categories of people can control their destiny, even when their interests are opposed by those of people with whom they interact. Finally, Sharaunga, (2015) defines economic empowerment as the process of accelerating the capacity of people or groups to make choices and to transform those choices into desired actions and outcomes. Consistent with Krishna (2003), empowerment means increasing the capacity of people or groups to form effective development and life choices and to transform these choices into desired actions and outcomes.

Brody et al. (2015) gave a dimensional definition of economic empowerment which is the power of women to access, own, and control resources (Economic empowerment), the ability to participate choose focused on access to resources, rights, and entitlements within communities. It includes legal rights also as outcomes like political participation (as Political empowerment), the power to exert control over non-economic deciding within the household (Social empowerment), and psychologically, empowerment is the power to make choices and act on them.

2.1.3 Concepts and definitions of vulnerability and food insecurity

2.1.3.1 Concept and definition of vulnerability

In the broad academic literature, vulnerability may be a term with a spread of discipline-specific implications. The concept of vulnerability as the risk of the shortfall can be expressed as a probability statement regarding the failure to attain a certain threshold of well-being in the future (Eyob, 2012). In Cambridge Dictionary the word 'vulnerable' is in a position to be easily physically, emotionally, or mentally hurt, influenced, or attacked and vulnerability is additionally the standard of being exposed to risk (able to be easily hurt, influenced, or attacked), or something

vulnerable. (Chambers 1989; Proag 2014) define vulnerability in terms of the extent of risk and capacity to recover and answer it. Thus, not only does vulnerability imply a measure of risk related to physical, social, and economic aspects, but also describes the power to address different risks and shocks. In the context of food insecurity, vulnerability is defined as a household's probability to fall, or stay, below the food poverty level within a given period (Sileshi, 2019).

In the widely used literature, the idea of vulnerability is used with different implications. A basic difference exists between vulnerability as defenselessness in respect of a harmful event (for example, vulnerability to drought) and vulnerability to a particular negative outcome, following a harmful event (for example vulnerability to food insecurity). Humanitarian aid and disaster management tend to focus on short-term responses targeted at people who require relief assistance following a natural hazard, these being vulnerable. Looking at vulnerability relative to a social welfare outcome, on the other hand, is concerned with guaranteeing a minimum welfare threshold in terms of food security, through short as well as longer-term measures (Eyob, 2012).

International Federation of Red Crescent Societies (IFRC) defined vulnerability as the characteristics of a person or group in terms of their capacity to anticipate, cope with, resist and recover from the impact of natural or man-made hazards. The vulnerability cannot be described without reference to a specific hazard or shock (IFRC 1999, 11).

Vulnerability denotes a negative condition that limits the abilities of individuals, communities, and regions to resist certain debilitating processes and improve their well-being (Yaro, 2004). Vulnerability though is not the same as poverty. It means not lack or want, but defenselessness', insecurity, and exposure to risk, shocks, and stress. It refers to exposure to contingencies and stress and the difficulty in coping with them. The vulnerability has thus two sides: an external side of risks, shocks, and stress to which an individual or household is subject: and an internal side which is defenselessness', meaning a lack of means to cope without damaging loss. (Chambers 1989, 1) defines vulnerability in three basic coordinates:

- ✓ The risk of exposure to crises, stress, and shocks
- ✓ The risk of inadequate capacities to cope with stress, crises, and shocks
- ✓ The risk of severe consequences of, and the attendant risks of slow or limited poverty (resiliency) from, crises, risk, and shocks (Watts & Bohle 1993, 45).

For the task at hand, vulnerability is defined relative to the negative outcome of food insecurity following Løvendal and Knowles (2005). Thus, vulnerability refers to people's propensity to fall, or stay, below this food security threshold within a certain timeframe. Since vulnerability is linked to the uncertainty of events, everyone is vulnerable to food insecurity, but some more than others.

2.1.3.2 Source of vulnerability

As it is indicated in literature like (Sharaunga et.al, 2016), (WFP-Ethiopia, 2009) the source of vulnerability is both natural and man-made factors. Naturally, society is vulnerable because of natural factors like death, crop damage, global climate change, land degradation, drought, erratic rainfall and erosion, pandemic diseases like HIV, and animal deaths are more of the smallest amount natural factors. Vulnerability is additionally occurred because of man-made factors like job loss, civil war, clan conflicts over resources, and other different problems that arise from society increase household vulnerability in different regions like Gambella, Somali, and Afar leading to the displacement of populations in Ethiopia. According to (Sharaunga et.al, 2016), also Vulnerability to food insecurity takes under consideration the various shocks and risks, such as, land degradation, drought, erratic rainfall, and environmental degradation, which will affect households and society within the future, determining if consumption will move below a given intensity.

2.1.3.3 Concepts and definition of food insecurity

According to FAO (2003), food security is a situation related to an individual, nutritional status of the individual household that needs to be pivotal for food security where the essential element, in this case, is the introduction of the social dimension of food security. Hence, 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” (Eyob et al., 2012). Previous studies on food insecurity in many developing countries, including Ethiopia, have mainly focused on current food insecurity, lacking the *ex-ante* analysis. An understanding of household vulnerability to food insecurity is critically important to inform the formulation of policies and strategies to enhance food security and reduce vulnerability to food insecurity among smallholder farmers (Sileshi *et al.*, 2019). According to Borre, (2010), food insecurity is a lack of access at all times to enough food for an active and healthy lifestyle due to socioeconomic and environmental barriers. Ana Staples defined Food insecurity because the

reflection of inequality which is an inability to supply enough food for yourself or your household to measure a healthy life (Staples, 2020).

Food insecurity incorporates low food intake, variable access to food, and vulnerability a livelihood strategy that generates adequate food in good times but isn't resilient against shocks. These outcomes correspond broadly to chronic, cyclical, and transitory food insecurity, and everyone is endemic in Ethiopia. The whole Ethiopian economy depends on low productivity rain-fed agriculture, and rainfall is that the single most vital determinant of Ethiopia's economic success or failure from year to year. The implications for food security within the long run are twofold. On the one hand, a structural transformation of agriculture is urgently needed as an example, through the promotion of technological inputs, or tenure reform, to raise yields. Food security has been defined as a condition when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food needed to maintain a healthy and active life (FAO, 2009). This definition introduces a stability dimension, which points to the need for understanding both current and future statuses of household food security. Moreover, FAO (2009) has shown that access to sufficient food in many countries is unstable. Many households frequently move in and out of a state of food security, suggesting that the notion of food insecurity is best approached in a dynamic sense. Therefore, a framework for analyzing food security must capture its temporal dynamics. Vulnerability analysis offers a solution to this problem by providing a quantitative estimate of the probability that a given household will lose access to sufficient food in the near future (Babatunde et. al, 2008).

2.1.4 Relevant features of women empowerment

2.1.4.1 Empowerment and economic development

Empowerment formally entered the domain of development economics with the work of Amartya Sen who stressed that true development has got to expand people's choices – their freedoms and he expressed as development is not just the augmentation of assets and income, it's an augmentation of what an individual can and can't do (Fox and Romero, 2016). The expansion of behavioral economics which tries to unify psychological and microeconomic concepts of human behavior about markets to provide better policy brought the concept of empowerment further into the mainstream of economic development thinking. The behavior of poor people may be a mirrored

image of their personal emotional experiences of lack of control over their environment of crop loss due to unexpected weather, of early and unexpected death due to disease, or of the social ostracism and economic hardship that comes from violating strict norms of women's voice and agency in economic affairs (World Bank 2016). Taylor & Pereznieto, (2014) specified that economic empowerment may be a process that ends up in women's control over other areas of their lives.

2.1.4.2 Women economic empowerment

The economic empowerment of women (WEE) is outlined by different authors in several manners. As an international center for research on women, (ICRW, 2019) definition of women's economic empowerment is usually touted because of the magic bullet that will answer gender inequality, reduce poverty, promote well-being and mitigate violence. Women's empowerment and economic development are closely related in one direction, development alone can play a significant role in driving down inequality between men and women, within the other direction, empowering women may benefit development. As it is concluded in (Ramanathan, 2014) women's empowerment and economic development are closely interrelated. While development itself will cause women's empowerment, empowering women will bring about changes in decision-making, which can have a direct impact on development. An out-sized part of literature recognizes women's economic empowerment as the key strategy in addressing gender inequality, and as a prerequisite for sustainable development and pro-poor growth (Dominic & Jothi 2012). According to the conclusion of Ramanathan (2014), economic development alone is insufficient to confirm significant progress in important dimensions of women's empowerment, in particular, significant progress in deciding ability within the face of pervasive stereotypes against women's ability. On the opposite hand, women's empowerment leads to improvement in some aspects of children's welfare (health and nutrition, in particular), but at the expense of some others (education). This shows that neither economic development nor women's empowerment is the remedy it is sometimes made out to be.

In recent years' women's empowerment has become a really important issue in the modern world. As united nation population fund (UNFPA) which works with men and boys around the world to advance gender equality and end violence reports globally, women have fewer opportunities for

economic participation than men, less access to basic and better education, greater health and safety risks, and fewer political representations. These programs are encouraging men and boys to abandon harmful stereotypes, embrace respectful, healthy relationships, and support the human rights of all people, everywhere (UNFPA, 1994; IMF, 2018)

Most of the literature published explains that women's empowerment is a crucial issue in developing countries like Africa. Women empowerment is one of the foremost important factors which are now being discussed in nearly all developing countries. Sharaunga, (2015) which is conducted in South Africa, suggested that women are major players in ensuring households 'well-being in most rural areas of developing countries, including South Africa. The capacity to improve the livelihoods of their households is hampered because they are dis-empowered economically, socially, in agriculture, and in civic arenas. Women need a sense of agency and more access and control of resources, which together constitute the empowerment capabilities, to enhance their livelihoods. The other study conducted in Pakistan showed that women's empowerment helps them to gain confidence, knowledge, and experience. Economic participation and economic opportunity available to females also show a negative relationship with determinants of women empowerment in Pakistan (Bushra, 2013; Bushra & Wajiha, (2015). In general women's empowerment just in the case of Africa is the most important issue in economic developmental aspects.

In Ethiopia, women traditionally enjoy little independence choosing most individual and family issues, including the selection to settle on whether to offer birth during a clinic or seek the assistance of a trained provider. Harmful traditional practices, including female genital cutting, early marriage, and childbearing, gender-based violence, forced marriage, wife inheritance, and a high value for large families, all impose huge negative impacts on women's Reproductive Health (RH). According to Bogalech & Mengistu,(2007),) Ethiopia has the second largest population in sub-Saharan Africa, and thus the average woman bears 5.4 children, placing an insupportable burden on families, communities, and a country facing chronic food shortages and environmental degradation. High maternal and infant mortality rates are inevitable results.

As the suggestion of Bogalech & Mengistu, (2007) from her birthday, an Ethiopian female in most families is of inferiority and commands little respect relative to her brothers and male counterparts. As soon as she is in a position, she starts caring for younger siblings(brother-sister), helps in food

preparation, and spends long hours hauling water and fetching firewood. As she grows older, she is valued for the role she goes to play in establishing kinship bonds through marriage to a special family, thereby strengthening the community status of her family. She is taught to be subservient, as a disobedient daughter may be a humiliation to her family. Low status characterizes virtually every aspect of girls' and women's lives. Given the heavy workload imposed on girls at an early age, early marriage without choice, and a subservient role to both husband and mother-in-law, girls and women are left with few opportunities to make and act on their own decisions.

In recent years, Pathfinder has initiated a powerful mentoring program introducing young girls in isolated communities to strong and successful women, who have successfully defied traditional gender roles and should inspire others to do a similar. more than 30 women leaders from around the country have visited groups of women in remote areas, speaking about their own families, education, and careers, and offering themselves as samples of what is possible. Their chief goal is to inspire girls to stay at school and develop their dreams and life goals (Bogalech & Mengistu, 2007).

2.1.5 Women's economic empowerment in different dimensions

Most of the literature reviews (Sharaunga, 2015; Sharaunga et al., 2015; Mulema, 2018) showed that women are empowered in different dimensions. An empowered woman was defined by women and men based on different dimensions. a woman who has the knowledge and is educated (as information and knowledge), leads other women and the community, attends public meetings, speaks in public meetings (as leadership), can generate income by diversifying activities such as crop production and brewing and selling local drinks (as Income), manages her household well, family plans and educates her children (as individual empowerment), live in harmony with husband (as harmony), has assets such as a house and can save (as resources), uses her time properly (as time), has good conduct, for instance, respect and does not drink alcohol (as behavior), can freely move and work outside home (as mobility), uses family planning (as reproduction), and has a say/voice in joint decision-making (as input in decisions). The women emphasized the ability to work outside the home (as mobility) as empowering, although there are factors raised by the control group in Adami Tulu, (such as poverty) that force women to work outside their homes not by choice but a necessity. The importance of the indicators, by rank, varied across groups and sites.

Empowerment also occurs across various domains, spheres, and levels. It identifies three kinds of empowerment that are inter-connected and iterative (Staples, 2020). According to this Economic dimension, empowerment is the capacity of poor women and men to participate in, contribute to and benefit from growth processes on equitable terms which are commensurate to the value of their contributions. Areas to focus on include: a) the promotion of the assets of poor people; b) transformative forms of social protection; c) the ‘decent work’ agenda’; and d) voice and organization for economic citizenship. Politically, empowerment refers to increasing equity of representation in political institutions and enhancing the voice of the poor and marginalized communities so that they can engage in making the decisions that affect their lives and finally in the social dimension, empowerment is taking steps to change society so that one’s place within it is respected and recognized on the terms on which the person themselves want to live, not on terms dictated by others.

Cornwall & Brock and Brody et al. (2015) gave empowerment dimensional definition empowerment is the power of women to access, own, and control resources (Economic empowerment), the power to participate in deciding focused on access to resources, rights, and entitlements within communities. It includes legal rights also as outcomes like political participation (as Political empowerment), the power to exert control over non-economic deciding within the household (Social empowerment), and empowerment is the power to form choices and act on them. Thus, the different dimensions of women’s empowerment, which can overlap include financial, human capital, material/physical, sociocultural, familial/interpersonal, legal, political, psychological, and agricultural (Malhotra, 2002; Mosedale, 2005; Kabeer, 2005; Alsop et al., 2006; Mayoux, 2006; Eyben et al., 2008;).

2.1.6 Women’s economic empowerment and its indicators

Most of the definitions of economic empowerment can be summarized as the process by which a woman achieves agency. This means Agency is “what a person is liberal to do and achieve in pursuit of whatever goals or values he or she regards as important. According to (Santoso et al., 2019) the indicators of women's empowerment are in 3 dimensions along the process of empowerment: resources, agency, and achievements. “Resources,” also called “preconditions” or “opportunity structures”, are the material, human and social resources and institutional environments that would allow one to make a decision. The common indicators of women's empowerment that would fall

within this dimension include women's education, social capital, and asset ownership. These empowerment indicators were then categorized into the appropriate dimensions and groups. Indicators encompassing multiple domains were marked “multiple which includes indicators on accessing resources for household (group membership, production decision) and material (income use decision), and time resource allocation (time use) and leadership in various dimensions.

2.1.7 Measuring women economic empowerment

Empowerment is difficult to measure due to its complexity and multidimensional nature. This is especially true in agriculture, where empowerment is still a relatively new concept. According to (Alkire et al., 2012) women’s empowerment is mainly measured by index methods. Several studies have attempted to measure women’s empowerment in agriculture (Alkire et al., 2013; Das et al., 2020). One significant effort towards this has been the development of the Women Empowerment in Agriculture Index (WEAI) by the US government’s Feed the Future Initiative in 2012 (Das et al., 2020). Women’s Empowerment in Agriculture Index (WEAI) evaluates five domains of empowerment: in production; in income; in resources; in leadership; and in time. ‘Production’ and ‘income’ measure decision-making power over farming, livestock, and fisheries, and control over income and expenditures. ‘Resources’ capture an individual’s ownership, access to, and decision-making power over productive resources such as land, livestock, agricultural equipment, consumer durable, and credit. ‘Leadership’ is measured through membership in economic or social groups and comfort in speaking in public. Malapit et al. (2019) propose that measuring WEE requires capturing three forms of agency: intrinsic agency (“power within”), instrumental agency (“power to”), and community agency (“power with”). In this case, the intrinsic agency includes many of the indicators we consider above as direct: self-efficacy, autonomy, attitudes. Their conceptualization of instrumental agency includes direct indicators (as control over the use of income closely related to the bargaining parameter itself), indirect indicators (as work-life balance or whether a woman owns an asset or not), and constraints (like access to credit depends on both women’s empowerment but also on market forces or asset ownership which is also a function of, for example, formal property rights).

As indicated in (Sharaunga, 2015), the processes of empowerment and exercise of agency cannot be easily observed, attempts to monitor and measure it has typically relied on proxy indicators (Jupp et al., 2010; Narayan, 2005). The main correlates or indirect measures of empowerment are

most frequently cited in the literature (with some overlap). Results of Sharaunga showed the indirect measurement of women empowerment that includes education achievement (like female literacy, female enrolment in secondary school, and maternal education), labor market status (like, childcare options, labor laws, female labor force participation, gender wage differentials, women's share of earned income), legal frameworks (as property rights law, marriage and family law, inheritance law, labor laws), marriage and kinship (as to whether marriage is endogamous or exogamous, the age difference between spouses, family structure, number of children, rates of female versus male migration), land ownership (like, the proportion of women who own land according to legal or customary tenure systems, control over income generated from land, legal reform on inheritance laws), social norms (as women's physical mobility), and political representation (like, the proportion of seats in parliament held by women). These clearly explain the empowerment status of women in society they are involved in and activities they participated in (Samman & Santos, 2009; Malhotra et al., 2002).

2.1.8 Women economic empowerment in food insecurity, and vulnerability situations

2.1.8.1 Food security and food insecurity situations

Food insecurity is an evolving concept. There are many definitions of food insecurity, which is a clear indication of Feyisa et.al, (2005) differing views and approaches to the problem. FAO defined food insecurity as "a situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life" (FAO, 2008; Marion, 2011). According to these authors, factors that may lead to a situation of food insecurity include non-availability of food lack of access, improper utilization, and instability over a certain period.

The concept of food security has been defined on numerous occasions by the international community, and it has evolved considerably over time. Ethiopia's economy is dominated by smallholder agriculture, which employed 89% of the working class and contributed 56% of GDP and 67% of export earnings. Rural Ethiopia is additionally unusually undifferentiated: small farmers account for over 90% of total crop area and agricultural output (Bollinger et al. 1999:3). Food production in Ethiopia is extremely variable and unpredictable, due mainly to erratic weather, which has triggered famines for hundreds of years. Food insecurity in Ethiopia derives directly

from dependence on undiversified livelihoods supported by low-input, low-output rain-fed agriculture.

The consensus that has emerged from the worldwide debate is that: “Food security, at the individual, household, national, regional, and global levels is achieved when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to satisfy their dietary needs and food preferences for a lively and healthy life” (FAO 1996). In contrast, food insecurity exists when all people in the least times haven't any physical and economic access to adequate, safe, and nutritious food to fulfill their dietary needs and food preferences for a lively and healthy life (Phillips and Taylor 1990). Food security may be a concept that encompasses four main dimensions, namely availability with sufficient quantity of food of an appropriate nature and quality altogether parts of the national territory, irrespective of its origin (local production, imports, or food aid), access by all people to the resources required to be able to acquire the food needed by them for a nutritionally adequate diet ((Jakhar & Devesh, 2018; Singh2, 2018). Food insecurity in Ethiopia is a serious problem facing humanity. Households face recurrent food shortages most of which threaten their livelihoods and impact negatively on their Welfare. Empirical findings have shown that access to sufficient food is unstable (Eyob, 2012).

An empowered woman would be self-confident, who critically analyses her environment, and who exercises control over decisions that affect her life. According to the previous study, women empowerment is defined in different ways and related to different factors like education, income, occupation with result in vulnerability to food insecurity. Theoretical women empowerment will be expressed by the feminist theory which is a collection of movements aimed at defining, establishing, and defending equal, political, economic, and social rights and equal opportunities for women and both mathematical and econometric models are mainly used because of the study target qualitative and quantitative aspects about women empowerment (Hadi,2001). The probability of becoming food insecure in the future is determined by the present conditions, risks potentially occurring within a defined period, and the capacity to manage the risks. At the household level, the major types of risk include health (illness, disability, injuries), life cycle-related (old age, death, dowry), social (inequitable intra-household food distribution), economic risks (unemployment, harvest failure, price changes) and threats related to the natural environment (Babatunde et. al., 2008). These risks cause food insecurity by lowering food production, reducing

income, reducing assets holding, increasing indebtedness, and reducing food consumption (Sharaungaa et.al, 2015).

The main causes of food insecurity in Ethiopia are prolonged drought, conflict, and insecurity, crop disease, etc. According to FAO (2018), in Ethiopia, prolonged drought conditions are severely affecting the livelihoods in most southern and southeastern pastoral and agro-pastoral areas of SNNPR, southern Oromia, and southeastern Somali Regions, where cumulative seasonal rainfall was up to 60 percent below average (Mebratu, 2018)).

2.1.8.2 Vulnerability to food insecurity Situations

Food insecurity, according to Grimaccia and Naccarato, is one of the most important factors in determining a country's level of development, as it is at the heart of sustainable growth. It has an impact on every country in the world because, even in countries with high current levels of income or food availability, food access and utilization can change over time. Food insecurity is at the core of sustainable development and one of the UN Sustainable Development Goals (SDGs) stated in its 2030 Agenda as SDG2: “End hunger, achieve food security, and promoting sustainable agriculture” (UN 2015). It involves people all over the world, even in richer and more developed countries, where food is currently available, because even in those countries the stability of access to food may change over time. Food insecurity is a concern in most developing countries, particularly in Africa, where one out of four people remain undernourished (FAO, 2017). It is estimated that in 2016 the number of chronically undernourished people in the world increased to 815 million, from 777 million in 2015, after a decade of decline (Grimaccia and Naccarato, 2018).

As the world food program of Ethiopia (WFP-Ethiopia, 2009) reports, food insecurity in Ethiopia is persistently caused by a combination of factors that include recurrent drought which has increased in frequency every 3 to 5 years; the flooding that has become more frequent flooding prone areas along the main river basins. Small landholdings with an average of 0.5 to 2 hectares per household associated with population growth have resulted in land degradation as one of the most critical problems, especially in the northeastern, south-central, and eastern highlands. In Ethiopia, food insecurity is quite prevalent with occasional or infrequent cases of acute food insecurity leading to malnutrition and deaths. Food insecurity continues to be the key factor that hinders the ‘Human Development’ of the country. Ethiopia is one of the most food-insecure

regions in the world as a large number of its population live at subsistence levels and are dependent on-farm production that is highly vulnerable to severe drought, population growth, expansion of cities. To minimize food insecurity and poverty, the Ethiopian government has issued Food Security Program (FSP) under the umbrella of the Plan for Accelerated Sustainable Development to End Poverty (PASDEP) and embarked on the preparation of a long term (2015/16 to 2029/30) national development plan that integrates SDGs. This addresses the supply and the demand of the food equation, from the national and household level perspective where there are no large-scale improvements in the living conditions (Abrham, 2020).

As result, the rural population is more vulnerable to food insecurity and poverty than the urban population. For instance, 83.5 percent of the total population of Ethiopia is multidimensionally poor while 22.3 percent of the total population is living below the income poverty line in 2016 (UNDP, 2018). The finding of the previous studies implied that food insecurity is a problem that the population is unable to meet their daily recommended caloric requirement which is 2200 kcal per day. In Ethiopia, 80 percent of the population resides in rural areas and women provide the majority of the agricultural labor in these communities. *United States Agency for International Development (USAID)* invests in empowering women and girls in Ethiopia across all of our programs by promoting equal access to education, health, and economic opportunities (Lynch, 2020).

According to the findings of (Fassil, 2020), Southern Ethiopia has a higher incidence (68%), depth (31%), and severity (18%) of food insecurity, with a mean vulnerability to food insecurity of 73.34 percent. Food insecurity is one of the world's most perplexing issues and one of the most difficult socio-economic problems for many countries today, particularly in developing economies. Indeed, various studies have been undertaken on food problems in Ethiopia but most of the studies focus more on population expulsion, colonial exploitation, and domination of multi-national interest, rural-urban migration as well as drought and famine as the core causes of this food problem. It is not a problem endemic to any one particular geographic region of the world. Thus, the higher the probability of becoming food insecure, the more vulnerable one is. While the vulnerable' in established practice are often implicitly understood to be those with a probability of becoming food insecure above a certain predetermined threshold, no standard exists that defines this threshold.

2.1.8.3 Methods of measuring vulnerability to food insecurity

Measurement of household food security is typically indirect and based on food balance sheets and national income distribution, and consumer expenditure data (Faridi, 2010). Consistent with Sharaunga et.al (2016), three different methodologies are commonly familiar with assess vulnerability and these include vulnerability as uninsured exposure to risk (VER), vulnerability as the low expected utility (VEU), and vulnerability exposure to say poverty (VEP). All these methods construct a measure of welfare loss attributed to shocks, but differ therein VER and VEU measure the ex-ante probability of a household consume future due to utility falling below a given minimum level within the future due to current or past shocks, while VEP measures ex-post welfare loss because of shocks (Hoddinott and Quisumbing, 2003). Therefore, this study adopted the VEP approach to measuring the ex-post probability of households becoming food insecure in the future. As outlined by Sharaunga (2015), Vulnerability is indicated mostly as the Expected Poverty approach that had been established using the household's vulnerability status and he used it to determine dimensions of women's empowerment in agriculture with reducing household vulnerability to food insecurity. A linking hunger with inadequate food intake allows the measurement of food insecurity in terms of the supply and apparent consumption of staple foods or energy intake. This type of measurement corresponds to the earlier narrower definitions of chronic food insecurity. The above measure is calculated as the percentage of households in a population group who do not consume sufficient dietary energy (Eyob, 2012).

2.2 Empirical Literature Review

Analytical works that examine food security and vulnerability in Ethiopia are scarce. Even the available ones are mostly descriptive focusing on explaining the extent of food insecurity and the determinants of food insecurity.

2.2.1 Empirical review on food insecurity and vulnerability

Food security is one of the major world agendas in 2018 in several contexts. Worldwide, in 2017 about 124 million people in 51 countries faced a food security crisis (FSIN, 2018). According to FSIN (2018), conflict and insecurity are the major drivers of food insecurity in eighteen countries, and the number of food-insecure people across the world has been increasing over time. In

Ethiopia, the number of food-insecure population was increased from 5.6 million in December 2016 to 8.5 million in August 2017(ACAPS, 2018). An estimated 3.6 million children and women in Ethiopia were acutely malnourished in 2017(IFRC, 2018).

Considering as a reference category the cluster of the least developed country, it emerges that a higher level of country development implies less vulnerability of the population toward the risk of food insecurity. Descriptive results of (Grimaccia & Naccarato, 2018) and (Sharaunga et.al, 2016) shown that explanatory variables like gender, age, number of kids within the household, marital status, location of the dwelling, and poverty are all significantly associated with the probability of experiencing food insecurity. For women and less educated individuals, people living in extremely poor households, or with a higher number of children, the probability of higher food insecurity increases.

An empirical analysis of the above study shows that education, the number of children in the family, and family income have a positive impact on vulnerability to food insecurity-y at every level of development, as in the global model. The factors that have a major impact on the danger of food insecurity include the level of education, number of children in the household, and site of the household. In this result women experience food insecurity during a significantly larger share than men: 45.3% of the feminine population presents a minimum of symptoms of food insecurity, compared with 43.3% of men. It also shows that age has a significant impact on vulnerability to food insecurity in that younger people present higher rates of food insecurity. The share of people younger than 35 years old that are food insecure is around 40%, while among elderly people 30% present symptoms of food insecurity. As the findings of (Mesfin, 2014), a combination of factors has resulted in a serious and growing food insecurity problem, affecting as much as 45% of the population. Food insecurity and poverty in Ethiopia are attributed to the poor performance of the agricultural sector, which successively is attributed to both policy and non-policy factors. The empirical results of (Eyob, 2012) showed that current food security and vulnerability to food insecurity are separate dimensions of wellbeing, and failure to account for food vulnerability might lead to substantial underestimation of people's nutritional wellbeing. The results of their study indicated that food vulnerability increases unambiguously with the number of children in the household.

The regressions result of Belay showed that the age of women, education, marital status, training, amount of credit, have a significant positive impact on women's economic empowerment (Belay, 2020). Women empowerment implies the establishment of an environment for females in which they need complete freedom of taking decisions of their life and have equal rights within the society and should not be any discrimination while giving jobs and other training. According to Shimelis et.al, (2009) empirical results estimated using the survey data to identify the determinants of food insecurity among rural households in the study among variables considered, family size, annual income, age of household head showed theoretically consistent and statistically significant effect and estimates of the logistic regression model showed that these variables were important factors identified to influence household food insecurity in the study area. However, estimated coefficients of the sex of household head, total income, education of household head, and amount of food aid received were not found to be statistically significant in determining household food insecurity in the study. The findings imply that improvement in the food security situation must build assets, improve the functioning of rural financial markets and promote birth control. At lastly, from the reviewed literature one may well see that there is a need to move a bit further in food security analysis to add other dimensions of welfare to identify and characterize the current food insecure as well as future food insecure (Eyob, 2012). Hopefully, this will add some insight that will help in designing ways to allocate scarce resources towards alleviating the problem of food deprivation and its associated evils.

2.3 Conceptual Framework

2.3.1 Conceptualizing women economic empowerment

The concept of economic empowerment is now widely utilized in a variety of disciplines to characterize states and the human process of people and communities. It is broadly defined as power (control over one's own life and resources) and agency (capability to originate and direct actions for given purposes). Women's economic empowerment is a multi-dimensional concept that covering many aspects of women's lives and their relationships to their families, communities, and broader contexts (Buvinic, 2020).

As Sharaunga (2015) study, the diversity in the definition of empowerment, it is beneficial to clearly define and conceptualize empowerment in each analysis. However, a concise analytical

framework is needed to conceptualize and precisely measure women's empowerment. The concept of women empowerment is crucial to analyze how individuals make a living and adapt it to propose a concise definition of women empowerment and a systematic methodology for its measurement. The concept of empowerment incorporates a long history in social change work. Feminist consciousness-raising and collective action informed early applications of the concept to international development in the 1970s and it came to be articulated within the 1980s and 1990s as a radical approach concerned with transforming power relations in favor of women's rights and greater equality between women and men (Cornwall, 2014 & Cornwall, 2020). The framework is useful for analyzing most of the culturally related gender concerns since they form part of the transforming structures and processes (Lakwo, 2006). The framework is also useful for evaluating how external factors as economic empowerment, intervention enables or constrains change within a given empowerment practice since they form part of the transforming structures and processes (Sharaunga, 2015).

2.3.2 Conceptual framework of women economic empowerment on vulnerability to food insecurity

Researchers (Zainab & Rashid, 2011) have analyzed women empowerment within the theoretical framework that enhancing socio-economic conditions of women through a participatory approach that can lead them to empowerment which in turn will reduce their vulnerability to poverty. According to Weinstein (2019) empowerment is a part of feminist theory because it stresses the need to increase the personal, interpersonal, and political power of marginalized and oppressed people, subsequently allowing them to join forces to improve their situations. The feminist theory relates to social change and the improvement of women's lives in conjunction with the empowerment theory. Turner and Maschi (2015) suggested that social workers could obtain the necessary knowledge, values, and skills by incorporating feminist and empowerment approaches in their practice.

Theorizing on food insecurity has proceeded in a somewhat linear fashion from Malthusian analytical scenarios involving shortfalls in food availability to theories of poverty that stress entitlements failures, and eventually to livelihood frameworks that maintain entitlements as the core explanatory force. Theories of food security can be categorized into food availability decline (deficit model of food requirements), entitlement failure, and livelihood failure. The second section provides an overview and critique of the

theories and approaches/to food insecurity. The third section outlines the proposed vulnerability framework for analyzing and researching food insecurity, using insights from the theories discussed and vulnerability studies (Yaro, 2019)). Varied ideological perspectives on women empowerment have been emphasized by researchers as empowerment is the capability to fulfill a person's capability set (Sen,1993); a process of internal change (Mayoux, 1998); capability, and the right to make decisions (Kabeer, 2001); meeting the strategic gender interests (Bali-Swain, 2006). The policy developmental approach to empower women is influenced by these ideologies and different policy interventions identified and followed by national governments to achieve women empowerment. These interventions include enacting laws to protect their rights, drafting policies to meet their gender-specific needs, designing special programs to ensure their share in development programs.

2.3.2.1 Conceptual framework of women economic empowerment and vulnerability to food security

Thus, the figurative implication of women empowerment with its external variables and the dependent variable is design in different forms accordingly. Conceptually, this study analyzes how different women's empowerment factors and vulnerability status and it shows that how factors of empowered women related in vulnerability to food insecurity in figurative form.

Thus, the effect of explanatory variables like Education, the income of the household, family size, marital status, age of household, dependency ratio, religion, cultivated land size, and other variables of women empowerment on outcome variables, vulnerability to food insecurity, and their relationship on vulnerability to food insecurity, are econometric and theoretically expressed. This may take the form of the following form which gives figurative knowledge on the impact of external variables on the internal variable.

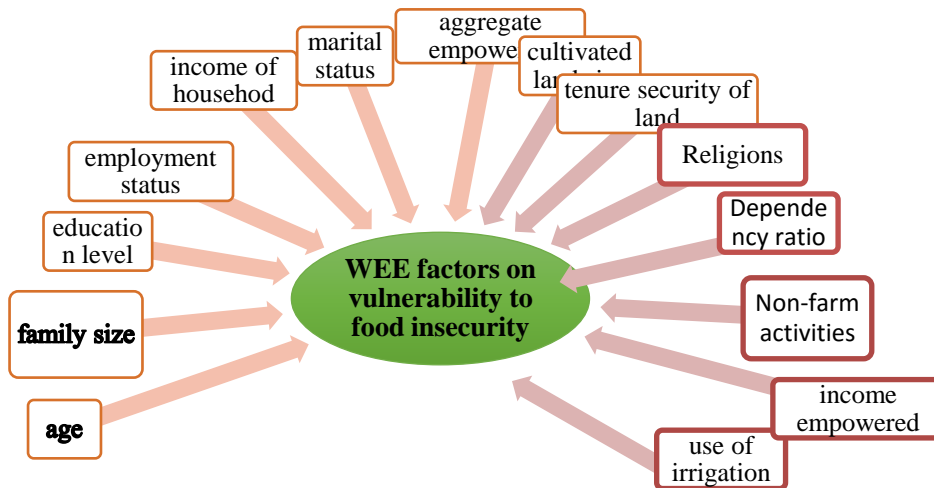


Figure 2.1 Different determinants of vulnerability to food insecurity of economically empowered women: inward arrow implies each external (explanatory) variable expected relationship with the impact of women economic empowerment to vulnerability to food insecurity.

Source: constructed from author’s survey,2021 & (Sharaunga, 2015; Sharaunga et.al, 2016).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter mainly covered materials used in this study and the method of the study in 4 sub-sections. These are about the study area, sample survey, research design, and methods of data analysis. The research methodology section largely explored the study area description, research design, sampling strategies, and sample size determination, data gathering methods, and model specification.

3.2. Description of the Study Area

This study was conducted in the Tarcha Zuria District of Dawuro Zone, Southern Region of Ethiopia. Dawuro Zone is one among the fourteen Zones in South Nations, Nationalities, and Peoples' Regional State (SNNPR). Dawuro zone lies in between 60 36' to 7021' north latitudes and 36068' to 370 52' east longitudes. Hence, Tarcha Zuria District is one of the ten Districts of Dawuro Zone which is newly organized and its administration town is Tarcha. The District consists of 18 kebeles, among which 1, municipal and 17 are rural kebeles. The District is bordered in North by Mareka, from East by Gena Bossa, from South Konta special District and West by Oromo region. The location lies between 60 09' – 70 2' N Latitude and 370 01' – 370 26' E Longitude, and its total area is 43,127.93 hectares (DZANRD, 2019). The elevation of the District Ranges between 650-2541 Masl and temperature ranged min 16.5°C and max 32°C annual rainfall also ranges 1,405 – 1,645 mm, accordingly Ashango and Alamerew (2017). The divisions of relief features in Tarcha Zuria District include plateau, plain, and valley. The study District is located at 524 km south of Addis Ababa across Shashemene entry and 466 km across Hosanna entry but by Jimma entry 490 km, 337 Km from Hawassa, city and 144 km distant from Jimma city. Tarcha Zuria District is grouped into two agro-climatic zones like Woyna-dega (11%) and kola (89%) in local terms (TZDANRO, 2019). Based on the 2007 census the projected total population of the district currently is 83,881 from this total female population of the district around 41093 are female residents. This was mainly targeted population in a sample of the district (Tarcha Zuria district plan commission office).

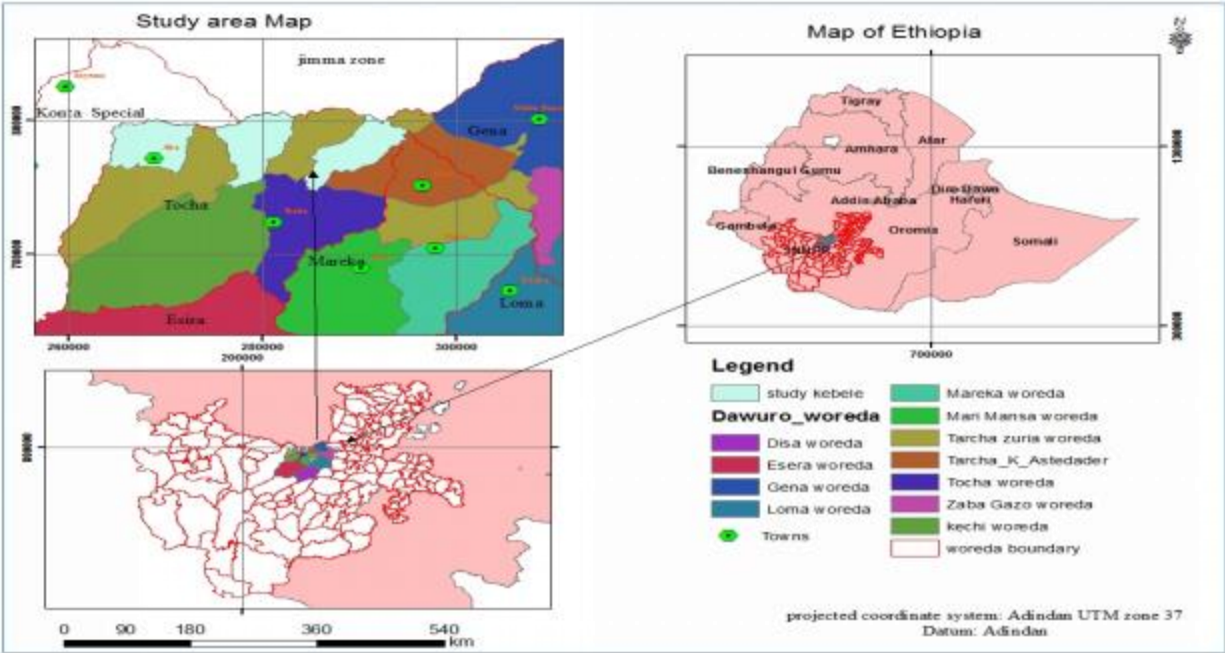


Figure 3.1 Map of Tarcha Zuria District. Source: Dawro Zone profile GIS Database (2019)

3.3 Sampling Design Techniques and Sample Size

A two-stage sampling survey which is the further development of the thought of cluster sampling was used in this study. This method is meant for big inquiries extending to a considerably large geographical area like the country's whole. Thus, the selected study area is geographically wide, this study used two-stage sampling techniques. Tarcha Zuria district is chosen reasonably, since, the population in the district has more opportunity to involve in agriculture and the district has more rural kebeles within which most of the female role is involved in.

The other purpose to select the district is one among currently nominated districts and no further study is currently conducted and kebeles contain representative populations from other surrounding districts like Mareka, Gena, and Tocha which expresses the reflection of the demographic characteristics of those districts and this area ecological suitable to agriculture. At the first stage, lists of a total of 18 kebeles data in the Tarcha Zuria District were obtained from the District office, and then four kebeles namely Wara wori, Bod'i Ara, Koysha, and Gozo Shasho were randomly selected among a total of 18 kebeles.

Lastly, to collect the required data, the female household head was chosen randomly under study. Therefore, the criterion to select the study population was systematic sampling to probability

proportional allocation. Thus, the number of female households in selected kebeles is determined. As result, the study was the Kothari formula to determine sample size, and proportional probability to the sampling size technique to select the sampled respondents from four kebeles total female household heads 515 divided into 4 kebeles in the proportion which is selected due to representativeness.

3.3.1 Sample size determination

The female population of the district is 41,093. The targeted population for this study is female household heads from selected kebeles which in total is 515. Since our N,515 is known, the Kothari Statistical Formula was employed for this study to determine the sample size of the study(Kothari, 2004)). A 95% confidence level and P =50% or p= 0.5 are assumed. As result, mathematically the researcher used this formula.

$$n = \frac{\left(\frac{Z_{\alpha/2}}{2}\right)^2 p(1-p)N}{[e^2(N-1) + \left(\frac{Z_{\alpha/2}}{2}\right)^2 p(1-p)]}, \text{ this formula is applicable.}$$

Where; N = the finite population (Total populations), N=515 Targeted female household heads taken from Tarcha zuria district plan commission office.

n = the required sample size

Z = standard normal deviates; usually set at 1.96 at $\alpha/2$ level of confidence (Z $\alpha/2$) which corresponds to a 95% confidence interval

P= proportion within the target population estimated to possess particular characteristics.

q = 1-p (proportion within the target population estimated to not having particular characteristics)

e = the level of significance or limit of tolerable error or is the sample and precision. After this formula was applied, we get.

$$n = \frac{(1.96)^2 * 0.5 * 0.5 * 515}{(0.05)^2 (515 - 1) + (1.96)^2 * 0.5 * 0.5} = \frac{494.606}{2.2454} = 220.275229 \approx \mathbf{220}$$

The study was analyzed by multistage sampling method the sample size of the selected kebeles respondents was calculated by proportion formula. So that for those selected individual kebeles sample population N_i was calculated to distribute questionnaires and interviews proportionally. The total population of female household head in each kebeles were obtained from Tarcha Zuria plan commission office and individually calculated by using proportion formula, $n_i = n \cdot \frac{N_i}{N}$, $i = 1, 2, 3, 4$, Were, $N_i \Rightarrow$ total female household head of i kebele, $n_i \Rightarrow$ Sample calculated from the total female household head of i kebele and N is the total population of female household

Table 3.1: Distribution of total female household and sampled female/women households in each study area(kebeles)

Total number of female households in four kebeles					Number of sampled respondents				Total	
	Wara wori	Bodi ara	Koysha	Gozo shasho	Total	Wara wori	Bod'ara	Koysha	Gozo shasho	
	330	26	138	21	515	141	11	59	9	220

Source: computed from Author survey data, 2021 & Tarcha zuria district, plan commission office.

Thus, n is the sum of a total sample from 4 kebeles which is $n = n_1 + n_2 + n_3 + n_4 = 141 + 11 + 59 + 9 = 220$

3.4 Research Design and Methods of Data collection

3.4.1 Research Design

A cross-sectional research design was mainly used for this study. The design needs data collected from a sample selected at a single point in time. The rationale for selecting this design is due to its suitability for description purposes and to the determination of the connection between the variables (Bryman, 2015). Thus, Cross-sectional data are taken directly, at a fixed moment from raw sources, and is better than other research designs for recent findings, and innovation studies.

In this study, both quantitative and qualitative structure of characteristics, which is appropriate depending upon the research questions and practical issues facing a researcher was applied according to the nature of variables. Thus, it is important to know both the subjective (individual), inter-subjective (language-based, discursive, cultural), and objective (material and causal) realities in our world (Hamza, 2015).

3.4.2 Data Types and Sources

Both quantitative and qualitative data types were collected from primary and secondary data sources to analyze the required information to solve the problems of this study with the essence of the nature of variables. Primary data was collected from respondents directly whereas; secondary data was obtained from both published journals used in literature and unpublished materials from concerning office (Tarcha zuria district, plan commission office) which are rather relevant study. Demographic, economic, other relevant, and other relevant factors related to the dependent variable were collected from the respondents.

3.4.3 Methods of data collection

Data collection is a systematic process of gathering observations or measurements which allows the researcher to obtain first-hand knowledge and original insights into his/her research problem. The task of data collection begins after a research problem has been defined and the research design/plan checked out. From several methods of collecting primary data, particularly in surveys and descriptive researches, the study techniques are surveyed, data collection tools like a structured questionnaire which contains an open-ended and closed-ended questionnaire that requires a person known as the interviewer to ask questions generally in face-to-face contact with the other person or persons and interviews.

Structured Questionnaire: This is applied and uses close-ended (predetermined) questionnaires to the sampled households to urge data regarding women's empowerment and vulnerability to food insecurity in the Tarcha Zuria district. The chosen respondents were interviewed with enumerators guided by a well-structured questionnaire on the description of the household characterization of women empowerment with the standing of vulnerability to food insecurity. The other method is personal interviewing which is asking predesigned questions generally in face-to-face contact with the other person or persons. Key informant interview is used that aimed to get detailed information on the problems and to possess a far better understanding of the condition of relevant information sources in women empowerment and vulnerability to food insecurity, the researcher may use semi-structured interview method due to its flexibility and makes clear any time when there is vagueness. Therefore, the researcher used both primary and secondary data sources to gather both qualitative and quantitative data. Primary data was collected through formal interviews using pre-designed

questions from selected female respondents in sampled kebeles while informal interactions and structured questionnaires were used accordingly.

Secondary data was collected through reviewing relevant literature from both published and unpublished possible sources and formats, like books, articles, and other related research documents which are relevant to the study was taken from the Tarcha Zuria plan commission office. Demographic, economic, and institutional factors related to variables relevant to the study were collected from the respondents.

3.4.4 Ethical Considerations in data collection of the study

As in every other aspect of the research, ethics have their important value-added to this research. While conducting interviews with the interviewees of this study, the following ethical procedures were considered:

- Proper official and unofficial consultations and great patience were made to obtain permission from the respondents to gain their trust and needed data.
- The purpose of the study was explained clearly and emphasized as well as desired information obtained.
- The questionnaires and the interviews of the study had organized in an understandable manner like clear language in which they can clearly explain their opinion and with easy words. The questionnaire was translated in Amharic language and distributed to respondents after printed necessarily.
- For the interview, the consent form was given to each participant individually and personally by the researcher. If they are willing to participate in the interview, they could write their name on the form patiently. Finally, acknowledgment of every work in the study was given to each respondent who participated in the study.

3.5. Methods of Data Analysis

3.5.1 Descriptive data analysis

Descriptive statistics is the study of the distribution of variables that describe characteristics of the location, spread, and shape. It mainly focused on the analysis of data without statistical

generalization or inference. The other statistic that brings analysis of data with the statistical conclusion is an inferential statistic. The inferential analysis includes two topics, estimation of population values and testing statistical hypothesis. In this study, the descriptive statistics mostly on measures of variation (dispersion) such as standard deviation, percentages, frequency, and graphs were used in analyzing the data.

3.5.2 Women empowerment index in agriculture

In this study, using smallholder farmers in Dawro zone Tarcha zuria district as a case study, we examined the paraphernalia of women's empowerment on the livelihoods of rural households. We proceed by employing a more inclusive measure of women's empowerment in the agricultural sector: The Women's Empowerment in Agriculture Index (Alkire et al., 2013). The Women's Empowerment in Agriculture Index measures women's empowerment in their roles and extent of engagement across five agricultural domains (production, resources, income, leadership, and time) based on household-level sample data (Melapit et al., 2017)

Each dichotomous needle measures whether an individual respondent has realized competence, grounded on the definitions shown in Table 2, with conforming weights that confirm that each domain obtains equal weight when the indicators are composed.

The Women's Empowerment Index in Agriculture functioned in two conducts. Initially, I fixed a woman's aggregate achievement of empowerment (i.e., her total empowerment score) across the six weighted indicators (notices Table.1 for indicator descriptions and weights). Second, we reflect a woman's level of empowerment in terms of each Woman's Empowerment in Agriculture indicator. A woman is defined or considered as "empowered" if she has accomplished adequacy in no less than 80% of the weighted indicators (corresponding to four out of the five domains) (Alkire et al., 2013).

Table 3.2: Explanations of domains and women empowerment indicators

Domain	Indicators	Definition of adequacy (= 1)	Weight
Production	Input in productive decisions	Sole or joint participation in at least one decision related to food and cash-crop farming, livestock farming, and fishery production	1/5
Resources	Asset ownership	Sole or joint ownership of at least one major household asset	2/15
	Access to and decisions on credit	Sole or joint control or participation in decision-making on credit from at least one source	1/15
Income	Control over the use of income	Sole or joint control over income for at least one of food and cash-crop farming, livestock farming, and fishery production	1/5
Leadership	Group membership	An active member in at least one formal or informal group	1/5
Time	Workload/leisure	Spent less than or equal to 10.5 hours on paid and unpaid work during the previous day	1/5

Source: [Alkire et al., 2013]

3.5.3 Econometric Analysis

3.5.3.1 Model Specification for impacts of Women's economic empowerment in Agriculture on Vulnerability to Food Insecurity

From the 1990s onward approaches for addressing global poverty have investigated the importance of empowering marginalized people to advocate for changes in their living conditions (Pandya, 2008). Increasing agricultural incomes and food accessibility by empowering rural women to produce enough food for local consumption and markets is thought to be the best way to reduce household vulnerability to poverty and food insecurity (Baiphethi and Jacobs, 2009). Women can play crucial roles in the accomplishment of all four pillars of food security in rural areas, as

producers of food, income recipients, and caretakers of household food and nutrition security (Galie, 2013).

3.5.3.2 An empirical approach to identify households' vulnerability to food insecurity status

For this sub-study purpose, food consumption is adjusted for the various calorie needs of different household members (for the age and gender of adult members). This change is made by dividing household food intake expenditure by an adult equivalent scale based on each family member's dietary needs. As a result, the calculation of household welfare used in this paper is food intake expenditure per adult equivalent per month. As a result, the measure of household welfare used in this paper is food intake expenditure per adult equivalent per month. According to Chaudhuri (2003), vulnerability to poverty is a forward-looking or ex-ante indicator of household well-being. Therefore, the researcher describes the degree of vulnerability to food insecurity at time t in terms of a household food consumption scenario. To separate the notions of vulnerability to food insecurity and food poverty, the researcher specified that the level of vulnerability to food insecurity at time t is defined in terms of a household food consumption scenario at time $t+1$.

For the drive of this sub-study, vulnerability is defined as expected food insecurity (VEFI) which has a measurement advantage for ex-ante information that measures vulnerability to food poverty using cross-sectional data. Also, this method has an advantage in identifying households at risk who are not food insecure that can be estimated with a single cross-sectional data. This approach is adopted by different researchers including (Dawit, 2015; Novignon, 2010; Imai et al, 2009; Jamal, 2009; Oni and Yusuf, 2007; Chaudhuri, 2003) estimate household vulnerability to poverty and food insecurity from a single cross-sectional data. To estimate the extent of rural household vulnerability to food insecurity, this study employed an approach developed by Chaudhuri et al (2002). This technique is frequently applied in many developing country frameworks when only cross-sectional data are accessible.

According to Sharaunga et al., (2015), the consumption from own food production, agricultural and non-agricultural incomes is influenced by many household socio-economic factors including women's empowerment in agriculture and women's economic empowerment. This suggests the following reduced-form expression for per capita annual value of food consumption expenditure which is expressed as $C_{ht} = C(X_h)$

Where, X_h represent a bundle of observable household characteristics including household size, age of the women, husband's income and employment status, woman's marital status, dimensions of women's economic empowerment, and, most importantly, dimensions of women's empowerment in agriculture, among other factors.

According to Chaudhuri et al. (2002), the measure of vulnerability as expected poverty is the probability of households, finding themselves to be food consumption insecure at time t+j is expressed as:

$$V_{ht} = \Pr(\ln C_h \leq \ln Z | X_h) \quad (1)$$

Where, V_{ht} represents the vulnerability of households to food insecurity at time t $\ln C_h$ measures households per adult equivalent food consumption expenditure at time t+j and Z is the food poverty line of household consumption. The current vulnerability of a household (V_{ht}) is determined by the likelihood that the future household food consumption expenditure (C_{ht+1}) was less than the threshold level (Z).

The likelihood of a household being food insecure in the future is determined by the predicted or mean food intake as well as the variance of its food consumption source. A household's food poverty vulnerability is characterized as a probability condition indicating that it was unable to meet a certain minimum level of food consumption in the future. To determine the level of a household's vulnerability to food insecurity, the expected food consumption and variance of that consumption are needed. Since VEP estimates are often a function of the estimated mean and variance of household Per Capita Food Consumption, we empirically estimate a variance of VEP from household's Per Capita Food Consumption Expenditure (PCFCE) Million et.al (2019) which the food consumption generating process is specified as;

$$\ln C_h = X_h \beta + e_h \quad (2)$$

Where, C_h is a log-normally distributed per adult equivalent food consumption expenditure, X_h represents a bundle of household characteristics, observed experiences of shocks and other covariates, and β is the $K \times 1$ vector of parameters of interest and e_h is $F \times 1$ vector of unobservable or error term. This error term is a mean zero disturbance term have that captured unobservable

household characteristics and idiosyncratic shocks, and covariate shocks that would have contributed to different per capita food consumption expenditures of households and assumed to be normally distributed.

Food-insecure households, on the whole, face a high risk of food intake uncertainty. As a result, Chaudhuri (2003) assumed that the variance of the disturbance term is not uniformly distributed across a household, but rather is dependent on certain measurable household characteristics. And this idea opens up the possibility of expressing heteroscedasticity. As a result, adding the variance e_h to the following (equation (3)) implies the functional form of heteroscedasticity e_h 's variance is thought to be expressed by:

$$\sigma^2 e_h = X_h \theta \quad (3)$$

Standard regression techniques can produce inefficient estimates in the case of the mean zero disturbance term, e_h which is heteroscedastic. To estimate β and θ a three-stage Feasible Generalized Least Squares (FGLS) procedure proposed by Amemiya (1977) is used. Equation (2) is first calculated using the Ordinary Least Squares (OLS) method, according to the FGLS procedure. Then the OLS estimation of residuals from equation (2) is used to determine the following OLS estimation of the residuals:

$$\hat{\sigma}_{OLS,h}^2 = X_h \theta + \mu_h \quad (4)$$

The predicted values from this supplementary regression $X_h \hat{\theta}$ are then used to transform equation (4) into:

$$\frac{\hat{e}_{OLS,h}^2}{X_h \hat{\theta}_{OLS}} = \left(\frac{X_h}{X_h \hat{\theta}_{OLS}} \right) \theta + \frac{\mu_h}{X_h \hat{\theta}_{OLS}} = X_h \hat{\theta}_{FGLS} + u_i \quad (5)$$

$X_h \hat{\theta}_{FGLS}$ is a consistent $\sigma^2 e_h$ estimate of the variance component from equation (3), and this transformed equation is again estimated using OLS, and the estimated coefficients from equation (5) are the asymptotically efficient FGLS estimator of the variance of household food consumption. Subsequently, the estimate from the variance can be modified as:

$$\sigma^2 e_{,h} = \sqrt{X_h \hat{\theta}_{FGLS}} \quad (6)$$

Then $X_h \hat{\theta}_{FGLS}$ is estimated variance can be used to transform equation (2) into:

$$\frac{\ln C_h}{\sqrt{X_h \hat{\theta}_{FGLS}}} = \left(\frac{X_h}{\sqrt{X_h \hat{\theta}_{FGLS}}} \right) \boldsymbol{\beta} + \frac{e_h}{\sqrt{X_h \hat{\theta}_{FGLS}}} \quad (7)$$

OLS estimation of equation (7) leads to a consistent and efficient estimate. Then after using the estimates of that acquired from the equation $\hat{\boldsymbol{\beta}}$ and $\hat{\theta}$ (7), it is possible to determine expected log food consumption and variance of log food consumption for each household.

The expected log food consumption:

$$\hat{E}[\ln C_h | X_h] = X_h \hat{\boldsymbol{\beta}} \quad (8)$$

The variance of log food consumption:

$$\widehat{Var}[\ln C_h | X_h] = \sigma^2 e_{,h} = X_h \hat{\theta} \quad (9)$$

And the log-normally distributed food consumption is an estimate of the probability of a household to either be food poor or not known as vulnerability as expected food poverty is specified by:

$$\widehat{V}_h = \Phi\left(\frac{\ln Z - X_h \hat{\boldsymbol{\beta}}_{FGLS}}{\sqrt{X_h \hat{\theta}_{FGLS}}}\right) \quad (10)$$

$\Phi(\cdot)$ shows the cumulative density of the standard normal distribution, Z represents the food poverty line, $X_h \hat{\boldsymbol{\beta}}_{FGLS}$ is the predicted mean of actual household food consumption, and $X_h \hat{\theta}_{FGLS}$ is the estimated variance in food consumption.

Consequently, the concept of household vulnerability as expected food insecurity is measured by the food poverty line chosen, the expected level of food consumption, and the expected variability of food consumption.

In addition, the researcher has computed a dichotomous variable indicating whether the female-headed household is vulnerable to food insecurity or not to identify the key women empowerment

factors affecting vulnerability to food insecurity. The binary logistic model is used to determine the marginal effect of the explanatory variable on a dependent variable, vulnerability, which is a dummy. The model is expressed in two forms the stochastic structure of the model and the deterministic structure. The subsequent mathematical formulation of the logit model is shown as follows is deterministic:

$$Y_i = E \left(Y = \frac{1}{X_i} \right) = \frac{1}{1+e^{\beta_0+\beta_i X_i}} \quad (11)$$

That is,

$Y_i = 1$, if the female-headed household is food insecure

0 , otherwise

Where X_i 's are the predictor variables, $i= 1, 2 \dots 18$, n is the total number of explanatory variables

The econometric model expression of the above model is: - The probability that a female-headed household is vulnerable to food insecurity set as:

$$Y_i = \frac{1}{1+e^{-Z_i}}, \text{ where } Z_i = \beta_0 + \sum_{j=1}^n \beta_j X_j$$

The probability that a female-headed household is not vulnerable to food insecurity is

$$1 - Y_i = \frac{1}{1 + e^{Z_i}}$$

The ratio of the probability that a female-headed household is vulnerable to food insecurity in the targeted population to the probability of household head that is not vulnerable to food insecurity can be:

$$\frac{Y_i}{1 - Y_i} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}}$$

Taking the ratio of the above equation and transferring it into logarithm, it can be:

$$L_i = \ln \left(\frac{Y_i}{1-Y_i} \right) = Z_i = \beta_0 + \sum_{j=1}^n \beta_j X_j + U_i \quad (12)$$

Where: -

$Y_i \Rightarrow$ a probability to a female-headed household is vulnerable to food insecurity ($Y_i = 1$, if women in the family are vulnerable to food insecurity and $\gamma_i = 0$ if not vulnerable),

$Z_i \Rightarrow$ A function of explanatory variables,

$L_i \Rightarrow$ Logit model

$\beta_0 \Rightarrow$ The intercept,

$U_i \Rightarrow$ The stochastic disturbance,

$\beta_1 - \beta_{18} \Rightarrow$ coefficient/parameters to be estimated in the study

3.5.3.3 Determination of a Food Poverty/insecurity/ Line in the Study Area

According to the World Bank (2000), the cost of basic needs (CBN) method is the most widely used method of estimating the food poverty line because the indicators were more illustrative and the threshold was more dependent on actual expenditure through time, space, and groups. In the CBN approach, the food poverty line is well-defined by selecting a package of food that is commonly eaten by the poor. Most practices use a nutritional average of 2200 kilocalories to provide an objective benchmark for what is considered a minimum in the case of food insecurity.

The food security status (i.e., monthly/annually food consumption expenditure per adult equivalent) is dependent on the household's self-production level and from food purchases from the farm and off-farm source as declared by (Sharaunga, 2015) and others like (Olayemi and Ayegbokiki, 2017) used the per capita household consumption expenditure of food method. From all these journals we used Olayemi & Ayegbokiki, (2017) by calculating mean per capita household consumption expenditure of food. As specified earlier, we the Per Capita Food Consumption Expenditure (PCFCE) by calculating household food expenditure used to determine the current food security status of a household, compared to the daily minimum dietary requirement (food poverty line) set in the literature for Ethiopia (Sileshi et al., 2019). As result, the average household food expenditure according to the response of the respondents was estimated using the monetary value of all food items that were consumed per day by the household (K_i) and the number of members in the household (H_i)(Olayemi & Ayegbokiki, 2017) and the estimation of poverty line estimated by Sisay&Efta, (2020) was used to the poverty classification benchmark criterion.

. The mean per capita household consumption expenditure(A) = $\frac{\sum_i^n K_i}{\sum_i^n H_i}$

3.5.4 Method of Data Presentation and Analysis

The study used both qualitative and quantitative data types and after collection, it was converted into computer language (necessary code was given like 0 &1) and verified. Then after data was coded necessarily, the Statistical tool STATA v13 was used to analyze data. Simple descriptive

statistical analyses like frequencies, percentages, Mean, SD, and Chi-square, F-test were used to describe different characteristics of the female households. The binary logit regression model is used to analyze vulnerability to food insecurity. Therefore, the model has the advantage that it provides both the influence of exogenous factors on the probability of the intensity of empowerment. The researcher used the binary logit model since the decision to the status of vulnerability within the study area is dichotomous. The other models may be involved accordingly to answer the research thesis and to solve problems specified in the objectives of the study.

Finally, the results of the software analysis were summarized and presented in a form of a table, in maximum, minimum, mean, standard deviation, chi-square, and the other tests with the p-value. In addition to these, qualitative data gathered from the interviews and document review is thematically presented and discussed thoroughly using the descriptive analysis method (Daniel, 2019). Another method of data presentation we used in this study was the empowerment index in which Changes in various economic and social phenomena in the agricultural sector were measured and compared. Thus, the level of women's economic empowerment was measured by index (table 4.3)

3.5.5 Description, Hypotheses of both Dependent and explanatory variables with their expected signs

The dependent variable in this study was the vulnerability of female households to food insecurity which is affected by different causative (independent) variables of empowerment. The nature of this variable is dichotomous that, household vulnerability to food insecurity, or not.

Independent(explanatory) variables in this study are age, education, marital status, religion, gender role, employment, stakeholder, family income, family size, farm size, dependency ratio, cultural attitude, ...etc. which are expected to be strongly or weakly affect the study variable.

One of the important parts of this section is to specify and hypothesize the dependent and explanatory/independent variables that will be used in the model.

The importance of continuous and categorical independent variables in this study are those variables, which are assumed to have an influence on women's economic empowerment and

impact on vulnerability to food insecurity of female households. These include female household-specific determinants or factors as described follows;

- i. **Age of the female household head:** - Age is a continuous variable means production case which expected to affect women empowerment in the production case, maybe in education(traditionally) or in other related cases
- ii. **Marital status of the family:** this variable is a nominal categorical variable that may be expected to affect women in gender gap, socioeconomic and political aspects which affects women empowerment positively (Sileshi et al (2019).
- iii. **Family size:** - This is considered a continuous variable and measured by the number of family members in the household. Thus, this variable is expected to adversely affect females to participate in economic empowerment with food insecurity. According to Sharaunga et. al, (2016) the larger the family size needed to be fed more from the available food this showed that there is a negative relationship between family size and food insecurity.
- iv. **The educational level of household head:** - This isa continuous variable that tells the number of years in which an individual attending the school. Generally, it is recognized that education enables individuals with the necessary knowledge of how to make living decisions. Thus, in this study, it is assumed that those who are literate and have at least some formal education chances been better to be empowered than those illiterates which are shown by (Moindi, &Deen, 2014)
- v. **Dependency ratio** Refers to the ratio of the total of the family under 15 and greater than 65 years (unproductive) to above 15 and below 65 years (productive people) (Diagne, 1999). This is the ratio of unproductive to productive ages. According to Sharaungaa et.al, 2015, it affects directly an increased probability of being food insecurity.
- vi. **Employment status:** - is the status that an individual has entered some form of verbal or written commitment with an entity, known as the employer, and is a continuous and categorized variable on which the household income is based and is expected to influence positively.
- vii. **The income of the family:** is money (or some equivalent value) of the family that an individual or business receives usually in exchange for providing a good or service or through investing capital. This is one of the primary indicators of women's economic empowerment and is expected to affect women's empowerment negatively (Sharaunga et.al, (2015).

- viii. **Religion:** - the belief in and worship of superhuman controlling power, especially a personal God or gods. It is a nominal categorized variable that may be expected to affect women in regarding leadership, job selection, decision making, or other related actions (sharaunga et. al, 2016).
- ix. **Cultivated land (farm) size:** is the farm size in hectares measured by the total land area under crop production. According to Sharaungaa et.al, 2015, this has a negative impact on vulnerability to food insecurity.
- x. **Land tenure security:** refers to the right of individuals and groups of people to effective protection by their government against forcible evictions. **Tenure** refers to the status of individuals or groups concerning property which can be freehold, leasehold, conditional, collective, and communal. In this study, it has a dummy nature which is as Land certification (1 = yes, 0 = no), it is expected to affect positively/negatively.
- xi. **Irrigation:** Irrigation is the artificial process of applying controlled key informant interviews verified the level of women empowerment and its role on vulnerability to food insecurity in study four kebeles. This is also taken as dummy yes or no (Access to irrigation facility =1=yes or no =0) and it has a positive/negative expected effect
- xii. **Non-farm activities:** these are value chain **activities out of the farm**, such as geoprocessing, transport, distribution, marketing, and retail, as well as tourism, manufacturing, construction, and mining, plus self-employment **activities** (handicrafts, bakeries, mechanics, kiosks, and so on). This uses 1 or 0 nature under this study that is if woman Participate in a non-farm activity, 1 otherwise 0 and it has may positive or negative expected effect.
- xiii. Empowerment in five domains (empowerment index): is empowerment factors(domains) where women sole or jointly participated in any production activities, asset ownership, time, use of income, and leadership that is expected to have a positive/negative effect.

Table 3.3 Clarification of explanatory variables and their predicted sign

Dependent variable	Nature of variable	Variable definition and measurement	Expected effect
Vulnerability to food insecurity	Dummy	1 if a female-headed household is vulnerable to food insecurity, 0 otherwise.	
Independent variables			
Age of the household head	Continuous	Age of the household head in the year	+

Marital status	Dummy	1 if a woman is “married” and 0 “Otherwise”	-
Farm size	Continuous	Farmland size in a hectare	-
Size of family	Continuous	Number of family members	+
Dependency ratio	Continuous	The ratio of the total of the family under 15 and greater than 65 years (unproductive) to above 15 and below 65 years (productive people)	+
Educational status of the household head	Continuous	Years of schooling	-
Participation in a non-farm activity	Dummy	Participation in non-farm activity (participating =1, 0, otherwise)	-
Income	Continuous	The income level of the female household of the family	-
Religion	Dummy/categorical	The religious status of female household (1=protestant,2=orthodox,3=muslim, and 4=others)	+
Employment status	Dummy	Employment status of female household (1=if employed,0 =otherwise)	+
Empowerment (aggregate)	Dummy	Aggregate empowerment in all the five domains (six indicators) with threshold of 0.8 (1 = Yes; 0 =	-
Empowered in production activities	Dummy	Assesses if the respondent is empowered in input in productive decisions (1 = Yes; 0 = No)	-
Empowered in asset ownership	Dummy	Assesses if the respondent is empowered in ownership of assets (1 = Yes; 0 = No)	+
Empowered in decision making on income and in credit	Dummy	Assesses if the respondent is empowered in Control over the use of income with access to and decisions on Credit (1 = Yes; 0 = No)	+
Empowered in group	Dummy	Assesses if the respondent is empowered in group membership (1 = Yes; 0 = No)	+
Empowered in workload sharing	Dummy	Assesses if the respondent is empowered in workload sharing (1 = Yes; 0 = No)	-
Tenure security	Dummy	Land certification (1 = yes, 0 = no)	+
Irrigation access	Dummy	Access to irrigation facility (1 = yes, 0 = no)	+

Source: computed from authors survey data,2021&(Sharaunga, et. al, 2015)

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

Both the descriptive statistics and econometric model results are discussed in this chapter. Therefore, the first section was descriptive statistics results and the main survey observations of households are studied and explained. Also, in the second section were the econometric model results for the impacts of women's economic empowerment on vulnerability to food insecurity presented and explained. The sample size of the survey determined was 220 female household heads. Out of the total interviewed female house head, 141 (64.09%) were from Wara wori, Bod'i Ara 11 (5%) Koysha 59 (26.82), and the remaining 9 (4.09%) were from Gozo Shasho kebeles accordingly total sample proposed.

4.2 Descriptive Statistics result of sampled Households in the study area

4.2.1 Descriptive statistics results of continuous variables

The key continuous factors of empowerment that affect vulnerability to food insecurity under this study were described in the following manner. The socio-demographic characteristics of the sampled female household heads and those of their households across the four study kebeles are summarized in (Table 4.1).

Age: The minimum age of respondent participated in this study was 28 year and maximum age of the respondent was 61 and overall average year in four kebele was 40.15(40) year. The women from Koysha kebeles tended to be younger (i.e., mean of 38 years) than the three kebeles.

Family size: Family size is considered as the number of individuals who exist inside the respondent's home. Large family size is expected as an indicator of labor availability in the family. In this study, the larger family size was 11 persons and the minimum family size was 2 persons the average family size of the sample households was 4 persons. The households sampled from Bod'i Ara had an averagely of few members while those from Wara wori and Koysha kebele had an averagely large family member. The effect of family size on vulnerability to food insecurity is

captured in the other variable dealing with household labor availability. Based on this study variable was hypothesized to have a positive and significant relationship with women's economic empowerment in reducing vulnerability to food insecurity. The results showed that there was a significant difference between vulnerability to food insecurity and family size. The p-value in table 4.1 also indicates that there was a statistically significant and positive relationship between family size and VFI. This indicates that the number of a family increases the probability of being vulnerable to food insecurity increases because larger family consumes the larger and vice versa. Thus, the finding result was confirmed with the finding conducted by Sharaunga et.al (2015) & Sharaunga et. al, (2016) the larger the family size needed to be fed more from the available food in current and in future.

Educational Level: The level of education women was assumed to increase women's ability to be empowered, and actively involved in reducing vulnerability to food insecurity. Thus, it is recognized that education enables women individuals to acquire the necessary knowledge on how to make living decisions. The average years of school women attended their education was 8.32 years with a minimum of 0 (no any attending of formal education) and a maximum year of the school attended was 17 years (college and above). The result of the output revealed that there was a significant negative relationship between education and the vulnerability to food insecurity. Hence, the significant p-value ($p=0.007$) of the result showed that educated women are better able to be involved in the reduction of vulnerability status of food insecurity and are better to be empowered than those illiterates which were confirmed with the study conducted by (Moindi, & Deen, 2014).

Dependency ratio Refers to the ratio of the total of the family under 15 and greater than 65 years (unproductive) to above 15 and below 65 years (productive people). Thus, the result showed that families with more unproductive aged (1.33) and average dependency ratio (the ratio of unproductive to productive ages) were 0.6 which has a positive relationship. The positively significant p-value(0.010) of the result showed that the probability of being food insecurity increased as the dependency ratio increased and which fitted with the study conducted by(Sharaunga et. al, 2015).

Income: - is money (or some equivalent value) of the family that an individual or business receives usually in exchange for providing a good or service or through investing capital and is the total

amount of annual income obtained by the family or woman. Thus, the average monthly income earned by female households was 3498.6 with a minimum monthly income of 753.00 and a maximum amount of birr 10895 as shown in table 4.1. Thus, this is one of the primary indicators of women's economic empowerment and it was negatively related to vulnerability to food insecurity. The significant p-value(p=0.000) of the result showed that women who had high-income levels are better able to be involved in the reduction of vulnerability status of food insecurity than others that lined with the results of (Sharaunga et. al, 2015).

Cultivated farmland size: Women who participated in this study had an averagely of 1.15 hectares of cultivated farmland and 128(58.18%) of them had certified land tenure and the remaining 92(41.82%) of them had no certified land tenure. The result shows that cultivated farm size has a significant (0.04) effect on vulnerability to food insecurity and has a negative relationship

Table 4.1: Socio-demographic characteristics of sampled female heads (continuous variables)

Characteristic	The kebeles population sampled				Overall (n= 220)	p- level
	Wara wori (n=141)	Bod'i ara (n=11)	Koysha (n=59)	Gozo shasho (n=9)		
Average age of women (in Years)	39.9	39.6	38.2	42.9	40.15	0.095
Average number of family size	4.4	3.5	4.4	4.3	4.15	0.017
Mean dependency ratio	0.56	0.61	0.58	0.65	0.57	0.010
The average years of respondent in school year	8	8	9	8	8.3	0.007

The average amount of income of the family in ETB	3472.89	3167.36	3530.53	3985.78	3539.14	0.000
The average Cultivated land in hectare of the respondent	1.09	1.43	1.08	0.99	1.15	.041

Source: computed from author own survey Data, 2021

4.2.2 Descriptive statistics analysis result of dummy variables

The important dummy (categorical) women empowerment factors that affect vulnerability to food insecurity under this study were described in the following Table 4.2. Among 19 explanatory variables, 12 variables have categorical nature (i.e. indicated as nominal and ordinal) and the rest 7 are continuous.

Marital status: Among sampled participants, 67.27% were married and the remaining 32.73% were not married. The result of the output revealed that the marital status of the respondent has a positive relationship with the vulnerability to food insecurity and is non-significant.

Employment status: In addition, most of the women (53.18%) were unemployed and the percentage of unemployed women was highest in Wara Wori kebele than others and the remaining 46.82 % of them were employed in different organizations. The result of table 4.7 showed that the employment status of the respondent has a positive relationship with the vulnerability to food insecurity and is non-significant.

Religion: Most of the women across four kebeles about (62.73%) were followed the protestant Christianity religion, 28.18% of respondents were Orthodox Christianity religious followers, 8.18% were Muslims and only 0.91% were other religious followers. The result of descriptive statistics showed that the religion of respondents has a positive relationship with the vulnerability to food insecurity and is non-significant.

Factors of Empowerment index: this was discussed in table 4.2 and descriptive results indicated were 124 women respondents (56.4%) had a high gender bias/workload in their family and the

remaining 96(43.6%) respondents were told that they have no more workload/burden in their family means their husband collaborated with them and they used their leisure time satisfied manner. 61.4% of total sampled women were empowered in five domains (aggregate empowered) and about 50.9% of the total sample did not participate in group and sole participation in public or private and only 49.1% participated. The result of descriptive statistics showed that the domains of empowerment of respondents in aggregate, in production, in time have a negative relationship with the vulnerability to food insecurity, and others have a positive relationship.

Land tenure: Among Women who participated in this study about 128(58.18%) had certified land tenure and the remaining 92(41.82%) of them had no certified land tenure. The result of descriptive statistics showed that the land tenure of the respondent has a positive relationship with the vulnerability to food insecurity and is non-significant.

Irrigation: Most respondents 145(66) did not participate in assessing the irrigation system or they used traditional (dry plow farming) by waiting rain season and 75(34%) were used small irrigation systems as occasionally (infrequently). The result of descriptive statistics showed that irrigation access of respondents has a negative relationship with the vulnerability to food insecurity and is non-significant.

Non-farm activities: Under this study majority of women 124(56.4%) actively participated in non-farm activities and the rest 96(43.6%) were not mostly participated in nonfarm activities thus they depend only on agricultural activities. The result of descriptive statistics that participation in nonfarm activities of the respondent has a positive relationship with the vulnerability to food insecurity and statistically significant p-value ($p=0.009$) show that positively significant impact on vulnerability to food insecurity.

On the other hand, households that were non-vulnerable to food insecurity had the largest proportion (63.4 % out of non-vulnerable) of women who were married concerning unmarried and vulnerable to food insecurity had a large proportion (70.6% out of vulnerable) were married women concerning unmarried and overall 45.9% were non-vulnerable and remaining 54.1% vulnerable in all four kebeles which was lined with Sharaunga et.al (2015).

Table 4.2: Descriptive statistical results for characteristics of dummy (categorical) variables.

Characteristic	The kebeles population sampled					p-value
	Wara wor	Bod'i ara (n=11)	Koysha (n=59)	Gozo shasho (n=9)	Overall (n= 220)	
Marital status in %						0.461
unmarried	47	4	20	1	72(32.73%)	
Married	94	7	39	8	148(67.27%)	
Employment status (%)						0.458
Unemployed	82	6	26	3	117(53.18%)	
Employed	59	5	33	6	103(46.82%)	
Religion status in %						0.184
Protestant	86	6	40	6	138(62.73%)	
Orthodox	44	3	14	1	62(28.18%)	
Muslim	9	2	5	2	18(8.18%)	
Others	2	0	0	0	2(0.91%)	
Land Tenure(security)						0.455
Woman has no land certification (=0)	66	7	15	4	92(41.82%)	
Woman has land certification (=1)	75	4	44	5	128(58.18%)	
Irrigation						0.392
No assessing of family in irrigation system	103	11	25	6	145(66%)	

An assessing of family in irrigation system	38	0	34	3	75(34%)	
Non-farm activities						0.009
woman who do not work non-farm activities (=0)	64	6	22	4	96(43.6%)	
woman who work non-farm activities (=1)	77	5	37	5	124(56.4%)	
EMPOaggregate						0.024
Aggregate empowerment in all the five domains (six indicators) with threshold of 0.8 (1)	89	7	32	7	135(61.4%)	
Not aggregate empowered	52	4	27	2	85(38.6%)	
EMPOproduction						0.200
women empowered in input in productive decisions	82	5	32	7	126(57.3%)	
Women not participated in empowered by input in productive decisions	59	6	27	2	94(42.7%)	
EMPOasset						0.172
The respondent is empowered in ownership of assets	87	2	29	5	123(55.9%)	

Respondent not empowered in ownership of assets	54	9	30	4	97(44.1%)	
EMPOincome						0.011
The respondent is empowered in credit and income decision making	75	6	36	7	124(56.4%)	
Not empowered in decision on credit and income	66	5	23	2	96(43.6%)	
EMPOtime						0.349
Respondent empowered in workload sharing	78	5	34	7	124(56.6%)	
respondent not empowered in workload sharing	63	6	25	2	96(43.6%)	
EMPOleadership						0.003
Empowered in group membership(leadership)	70	3	31	4	108(49.1%)	
Not empowered in leadership	71	8	28	5	112(50.9%)	

Source: author own survey Data, 2021

4.2.3 Estimating women empowerment index in agriculture

Dominant domains of economic empowerment index in agriculture in analyzed by using principal component analysis and WEAI methods by using weighted index calculation method. As it was indicated in chapter 3 the Women’s Empowerment Index in Agriculture measures women’s empowerment across five agricultural domains (production, resources, income, leadership, and time) based on household-level sample data with its weighted indicators (Melapit et al., 2017). As result, the paraphernalia of women’s empowerment on livelihoods of rural households was

examined by index by employing a more inclusive measure of women’s empowerment in the agricultural sector(Alkire et. al, 2012).

Women’s Empowerment Index in Agriculture (WEAI) was firstly examined by calculating the individual empowerment index (IEI) and calculating group empowerment. Based on (Roy et. al 2018), each woman involved in agriculture can be assessed separately in IEI. An individual empowerment score above 0.8 would be considered adequate empowerment. Thus, a woman with a score of 0.8 and above will have access to resources, will have a say in family affairs, and has a position to take decisions. After computing individual scores, ‘group empowerment’ was calculated. In computing so, following the method of construction of WEAI (Alkire et. al, 2012)we proposed the equation and constructed table that describe the main domains with their indicator factors as the following table

Table 4.3: Composition of empowerment Index for the Women in Agriculture and summary results

WEAI Domains (Ii)	Indicators (Iij)	Weight (Wk)	% of the woman did not participate in domains	% of women participate in domains	Results – gaps in empowerment (Evaluated indicators (1, if > 50%))
Product ion(I1)	Sole or joint decision-making over food and cash-crop farming, livestock(I11)	$W_{1(1/10)}$	40.5	59.5	1(40% of women reported inadequate input into production decisions and 59.5
	Autonomy in agricultural production Autonomy (I12)	$W_{3(1/10)}$	44.5	55.5	1(44.5% of women reported inadequate Autonomy in production)
Resources (I2)	Asset ownership(I21)	1/15	37.7	62.3	1(37.7% of women did not own any more assets

	Sale, purchase, or transfer asset(I ₂₂)	1/15	43.6	56.4	1 (43.6% of women lacked decision-making power in terms of purchases, sales or
	Access to and decision on credit(I ₂₃)	1/15	58.6	41.4	0 (Over 58.6 of women reported lack of access to and absence of decision-making power concerning credit)
Income (I₃)	Sole or joint control over income and expenditures (I ₃₁)	1/5	40	60	1 (Few women (40%) did not have control over the use of income within the household
	<i>Asses to credit from government or Non-governmental organization (NGO)</i>		51.8	48.2	
	Income-generating from Informal lender		35	65	1 (65 % of women uses income-generating from an informal lender)
Leadership (I₄)	Leadership in the community: membership in economic or social groups and comfort in speaking in public				

	Religious group credit or microfinance group, Civic groups (improving community) or charitable group (helping others) or insurance group	1/10	49.4	50.6	1(49.4% of women did not belong to any economic or social group or association)
	Speaking in public	1/10			
	Speaking public on home and community activity(infrastructure), financial activities, and control over misbehavior		59.1	40.9	0(59.1% of women were not comfortable speaking in public)
Time allocation(I5)	Allocation of time to productive and domestic tasks and satisfaction with the available time for leisure activities	1/10			
	Work-burden, a woman worked more than 10 hours in the previous day (adequate or inadequate)		41.8	58.2	1(About 58.2% of women worked more than 10.5 hours per
	Leisure time	1/10			
	Satisfaction with available time for leisure activities like visiting neighbors, listening to the radio, other hobby or doing sports		45.5	54.5	1(54.5% of women were satisfied with amount the time allocated for leisure activities within their day)

Source: computed from Author’s survey (2021) & [Alkire et al., 2013;Kosheleva *et al.*, 2019]

Individual Empowerment Index (IEI):

$$IEI = \sum_{i,j,k=1}^{2,3,1,2,2,15} (W_k I_{ij})$$

Where, $\sum_{i=1}^{15} w_i = 1$ and $w_1 = w_2 = \dots = w_{15}$

$I_{11} = 1$, if the woman participated in crop production; = 0, otherwise;

$I_{12} = 1$, if the woman involved in livestock rearing; = 0, otherwise;

$I_{13} = 1$, if the woman takes autonomy in production; = 0, otherwise;

$I_{21} = 1$, if the woman owned asset; = 0, otherwise;

$I_{22} = 1$, if the woman has right to sale purchase or transfer asset; = 0, otherwise;

$I_{23} = 1$, if the woman gets direct credit access, decides business resource utilization, and makes a decision on credit; = 0, otherwise;

$I_{31} = 1$, if the woman involved Sole or joint in control over income and expenditure; 0 = otherwise;

$I_{32} = 1$, if a woman has Access to credit from relative or Non-governmental organization (NGO), 0 = otherwise;

$I_{33} = 1$, if she uses Income from Informal lender or like idir ; 0 = otherwise;

$I_{41} = 1$, if she involved at least one of group membership on Credit or microfinance group, Civic groups (improving community) or charitable group (helping others) or insurance group; = 0, otherwise;

$I_{42} = 1$, if she participates in religious or local secular groups; 0 = otherwise;

$I_{43} = 1$, if she involves in at least one of Speaking public on home and community activity (infrastructure), financial activities, and control over misbehavior; 0 = otherwise;

$I_{51} = 1$, if she has work burden; woman worked more than 10 hours in the previous day, 0, otherwise;

$I_{52} = 1$, if she enjoys Satisfactorily with available time for at least one leisure activity like visiting neighbors, listening to the radio, looking movies, other hobby or doing sports; 0, otherwise;

Women Empowerment Index in Agriculture [WEAI] = $W_e + W_n(D_a)$

Where,

W_e = % of women with adequate empowerment;

W_n = % of women without adequate empowerment = (1- W_e)

Da = % of domains in which disempowered women have adequate empowerment

As result, according to (Roy et.al, 2018)the individual index and group member index for given survey data was calculated

$$IEI = 1 * \frac{1}{10} + 1 * \frac{1}{10} + 1 * \frac{1}{15} + 1 * \frac{1}{15} + 1 * \frac{0}{15} + 1 * \frac{1}{5} + 1 * \frac{1}{10} + 1 * \frac{0}{10} + 1 * \frac{1}{10} + 1 * \frac{1}{10} + 1 * \frac{1}{10} = 0.2 + 0.13 + 0.2 + 0.1 + 0.2 = 0.83$$

This shows the individual woman has adequate empowerment ($W_e=83\%$) which is above **0.8(80%)**.

$$5DE(WEAI) = W_e + W_n(Da) = W_e + (1 - W_e)(Da)$$

Where W_e (adequate empowerment) = 0.83

W_n = % of women without adequate empowerment = (1- W_e) =1-0.83 =0.17

Da = % of domains in which disempowered women have adequate empowerment, which is under domain I_2 and I_4 (41.4+40.9) =82.3, this implies non-empowered women still have adequate achievements in 82.3% in two domains and 18% achieved adequately in all 5 domains

Thus, the overall 5DE empowerment index score of the Tarcha zuria district is

$$5DE(WEAI) = 0.83 + 0.17 * 0.82 = 0.844$$

However, this constructed women empowerment index is different from International Food Policy Research Institute’s WEAI (Alkire et al., 2012), as the gender gaps or gender parity index are not included in this model. As women empowerment in economics is assumed to be a sole women's society, the measurement of the gender gap remained out of our presumption. This index would, at a time, help to ascertain whether women of the district are empowered or not. A result of the above index indicated that the majority (84.4 %) of a woman included in this study are empowered in agricultural sectors. Thus, according to (Roy et al., 2018;Kosheleva *et al.*, 2019), this study found that 84.4% of women were empowered across all five WEAI domains. As result, the objective analysis of economic empowerment of women in agriculture was achieved with this result.

To investigate the impact of women's empowerment on their vulnerability to food insecurity in the agricultural sector, principal component analysis (PCA) was constructed. PCA was used to identify and analyze a variety of domains of women's empowerment in each of the five major domains of empowerment in agriculture based on the level of participation in production, resource ownership, income usage, leadership activities, and time among the sampled primary female heads-of-households (SPRING, 2017).

According to (Sharaunga et.al, 2015) while PCA was applied to indicators of women's empowerment in agriculture, it provided 10 PCs and five major principal components (PCs) with Eigenvalues greater than 1 using the Kaiser criterion and jointly explained **59.9** percent of the total variance in the variables used. As a result, the first five PCs were included because they provided for a meaningful interpretation of the PCs from the remaining 10 PCs. The different factors represented the different aspects of economic empowerment in agriculture among women in the district, including participation in production, resource ownership, control over the use of income, involving leadership activities, and use of available time, with corresponding components/indicators (See Table 4.3.) which lined with PCA of Sharaunga, (2015).

Table 4.4 Dominant domains of women's economic empowerment in agriculture.

Indicators of economic empowerment of women in agriculture	Principal components (Eigenvalue)					
	Participation	Resources	Income	leadership	Time	
Participation in crop and livestock production	0.4223	-0.1321	0.0947	-0.4143	0.5255	
Autonomy in productions	0.3310	0.4480	0.3046	-0.0844	-0.0635	
Ownership of asset	0.5630	-0.1427	-0.3323	0.2558	0.2416	

PST (Purchase, sale or transfer of asset	-0.2114	0.1386	-0.3424	0.5537	0.2167
Access to and Decision on credit	-0.1480	0.2498	0.3938	0.3600	0.4651
Control over use of Income	0.0151	-0.4548	0.3044	0.4002	0.0584
Leadership in different group members	0.4916	0.0327	-0.0847	0.3147	-0.1043
Free participation in public organization	-0.1423	0.5029	-0.1724	-0.1137	0.4389
Workload/home burden	0.1466	0.1568	0.5892	0.1814	-0.1539
Satisfied with leisure time	0.2121	0.4408	-0.1969	0.1210	-0.4095
% of variation	13.78	13.17	11.81	11.00	10.13
Cumulative %	13.78	26.96	38.76	49.77	59.90

Note: PC loadings with a value ≥ 0.5 are indicated in bold.

Source: constructed by Author and Extracted from (Sharaunga, 2015) and (Sharaunga, Mudhara, and Bogale, 2015)

The findings show that involvement in productive activities is the most dominant area of women's economic empowerment in agriculture is the participation in productive activities that explained a 13.78% variation of the variables in the model. These activities mainly include crop production, livestock rearing, and autonomy (being self-governing participation in production). Thus, the dominating variables in the PC, which explained 13.78 percent of the variation in the variables, were ownership of an asset (0.5630).

Cumulative percent of 6th PC indicates that the first five principal component accounts 69.5 % of the total variation of variables within data. The eigenvalue 0.5630, shows that the good representation components. The sign of the value shows an increase in participation in productive activities increases empowerment on ownership of an asset

Similarly, access to and control of resources ownership is important, women need freedom in owning the resources in freely purchase, sale or transfer their resources without any external control and burden that explained 13.17 percent of the variation in the variables included in the model i.e. observable action in the exercise of choice within decision-making, protest, bargaining, and negotiation, as well as the motivation and purpose that women bring to their actions (Sharaunga, 2015).

The fact that women involved in control overuse of incomes had high levels of incomes could be attributed to the fact that different sources of incomes can be used to finance agricultural activities resulting in increased incomes which explained 11.81 percent of the variation in the variables included in the model, were home workload/home burden (0.5892) and women involved in sole or jointly in membership of GO or NGO explained about 11.0% and indicated by resources usage in 0.5537 value. This value and the positive signs suggest that women with very reliable and free communication on community, family, and country issues and deciding solution increases.

4.2.4 Estimation of the poverty line and vulnerability status

This section discusses the estimation of the food poverty line and the vulnerability status of the study population. Different scholars put different ways of estimation of food poverty as well as vulnerability to food insecurity. For instance (Sileshi et al., 2019) used the probability of household consumption to determine it, Bogale (2012)estimated poverty of food consumption by using the cost of basic need approach by pricing the basket of food items that every household ate in a day. The food security status (i.e., monthly/annually food consumption expenditure per adult equivalent) is dependent on the household's self-production level and from food purchases from the farm and off-farm source as declared by (Sharaunga, 2015) and others like (Olayemi and Ayegbokiki, 2017) used the per capita household consumption expenditure of food method. From all these scholars we used Olayemi & Ayegbokiki, (2017) by calculating mean per capita household consumption expenditure of food. As specified earlier, we the Per Capita Food Consumption Expenditure (PCFCE) by calculating household food expenditure used to determine

the current food security status of a household, compared to the daily minimum dietary requirement (food poverty line) set in the literature for Ethiopia (Sileshi *et al.*, 2019). This can be done by comparing the household dietary intake with the food poverty line for Ethiopia. As it was used by Bogale (2012), we used this approach CBN (cost of basic need) to determine the food poverty line (threshold), by first picking a ‘basket’ of the food items typically consumed by the poor. According to MoFED (2002), the predetermined minimum per capital calorie requirement was 2200 kcal per day. The researcher estimated the average household food expenditure according to the response of the respondents. As a researcher (Olayemi and Ayegbokiki, 2017) proposed the mean per capita household consumption expenditure is calculated by = $\frac{\sum_i^n K_i}{\sum_i^n H_i}$

Where: K_i is the monetary value of all food items that were consumed per day by the household, H_i is the number of members in the household.

Accordingly, the estimation of the poverty line estimated by (Sisay and Efta, 2020) the poverty classification benchmark criterion: birr 586 (Ethiopian currency) per month is the classified total poverty line. They proposed that, 11% poverty gap index which we used in the study area. This implies that the poverty gap index indicates that the minimum amount of money to lift all households to the poverty line shows every poor household on average needs to had 564.5 (0.11x586) birr per adult per month to be not poor.

Accordingly, the food poverty line was estimated at ETB 564.5 per month. In other words, a total of Birr 564.5 per month was needed to purchase food that could meet the basic daily food-energy requirements of an adult person. It was mentioned here that based on sex and age, each member of the household was assigned a specific adult equivalent figure calculated using standard conversion factors available in the literature(Sileshi *et al.*, 2019, & Claro *et al.*, 2010)

The result in Table 4.3 shows the mean food expenditure of the vulnerable/poor female was 560.87 birr per adult equivalent while the non-vulnerable/non-poor was 1428.10 birr per adult equivalent per month, respectively. Thus, in this study, the female household to be the non-vulnerable minimum needed to had birr 565 to fulfill monthly food consumption and below this value are classified as vulnerable.

Table 4.5 Summary statistics of food consumption expenditure of respondents

Summary Statistics of consumption expenditure						
Groups	Frequency.	percent	Food Consumption expenditure per adult per month (in birr)			T-test
			Minimum	Maximum	Mean	
Non-vulnerable	118	53.6	566.4	4505	1428.10	867.23
vulnerable	102	46.4	201.	562.4	560.87	346.84
Total	220	100	201.16	4505	970.20	778.67

This shows Food Consumption expenditure per adult per month has a significant impact on vulnerability to food insecurity.

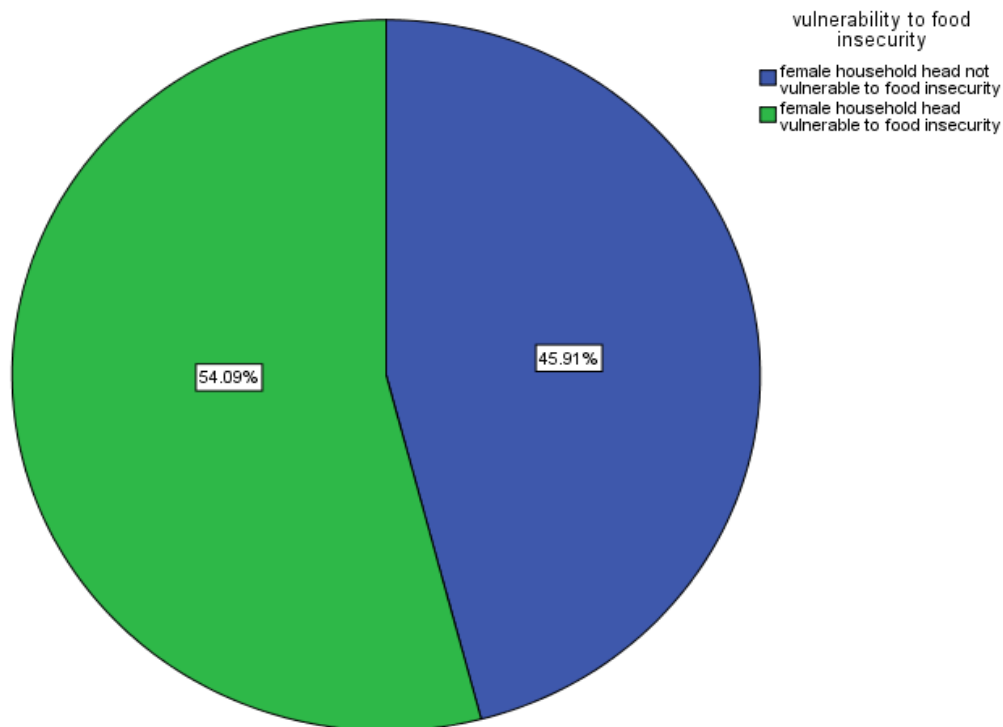


figure 4.1 (pie chart) shows the vulnerability to food insecurity status

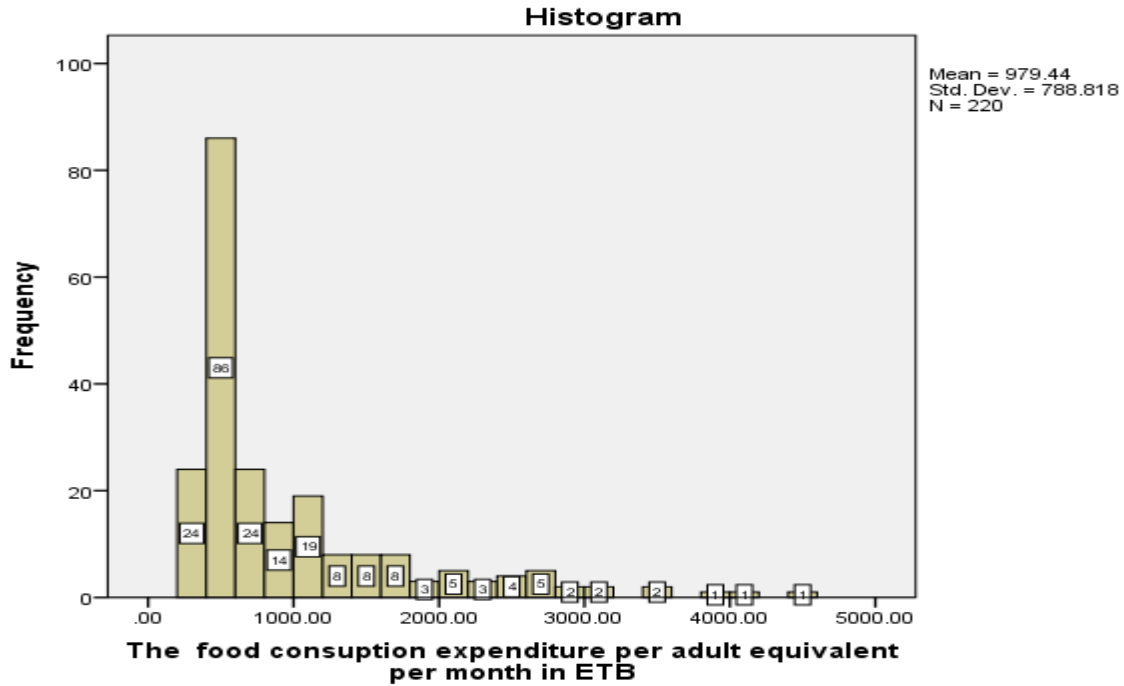


Figure 4.2 shows food consumption expenditure per month per adult and indicates that most of respondent participated in study was consumed below 1000 birr per month.

Table 4.6 Variable specification and summary statistics of household characteristics in computing vulnerability status

Variable	Viable label	Mean	Std. Deviation
LnFCE	Natural log of consumption expenditure per adult	6.64	0.66
Age	Age of the respondents in years	39.89	6.41
Family size	Number of a family of the respondents	4.39	1.76
Marital status	Dummy for Marital status of respondent (yes=1,0=otherwise)	.67	.47
Education level	The educational level of the respondent in school years	8.32	4.31
Dependency ratio	Dependency ratio of family	0.57	0.24
Monthly Income	The income of the family in ETB	3494.055	1654.65
Religion	Religion of the respondents in school year	1.47	.685
Farm size	Cultivated land in hectare (farm) size of the respondent	1.1	0.735

Tenure security	Dummy for women have Land tenure security(yes=1,0=otherwise)	0.58	0.494
Irrigation	Dummy for access of family in irrigation farm system(yes=1,0=otherwise)	.34	.475
Nonfarm activities	Dummy for participation of nonfarm activity (yes=1,0=otherwise)	0.56	0.497
EMPOaggregate	Principal component analysis of woman aggregates economic empowerment index (aggregated empowerment yes=1,0=otherwise)	0.61	0.488
EMPOproduction	The index of a woman empowered in input in productive activities and decisions making (empowered yes=1,0=otherwise)	0.57	0.496
EMPOasset	The index of Women empowered in credit and decision making on income (Empowered in credit decision yes=1,0=otherwise)	0.559	0.497
EMPOtime	The index of woman Empowered in workload sharing/work burden and satisfaction with free time (empowered in the time allocated yes=1,0=otherwise)	0.564	0.497
EMPOleadership	The index of a woman empowered in group membership and free public speaking (empowered in leadership yes=1,0=otherwise)	0.491	0.501

Source: computed from own survey data,2021

4.3 Econometric Analysis

4.3.1 Binary Logit model to estimate household vulnerability status

As proposed in chapter 3, this study used the Binary Logistic model since household vulnerability status was a dummy variable that takes a value of one (1) for vulnerable households and zero (0) for non-vulnerable households. The researcher computed a dichotomous variable to determine the marginal effect of the explanatory variable on a dependent variable to identify the key women empowerment factors affecting vulnerability to food insecurity. The empirical results (Table 4.7) on the Binary Logistic model were generated to identify the determinants of women ‘s

empowerment affecting their household vulnerability to food insecurity in the Tarcha zuria District.

4.3.2 Analysis of Determinants of household’s vulnerability to food insecurity in Study Area

Specifications of the explanatory variables hypothesized to affect the vulnerability of households to food insecurity included in the model are given in Table 4.7. These are economic and agricultural forms of women’s empowerment and other household socioeconomic characteristics. A household’s socio-economic characteristics that influence/have an impact on/ food insecurity include the age of the household head, family size, dependency ratio, income of the household head, food consumption expenditure per adult per month, cultivated farmland size, marital status, women education level, employment status, religion, land tenure, access of irrigation, nonfarm activities, domains of empowerment index (EMPOaggregate, EMPOproduction, EMPOasset, EMPOincome, EMPotime & EMPOleadership).

Table 4.7 Binary logistic regression result for the determinants of vulnerability to food insecurity (N=220).

VFI	Coef.	Std. Err.	z	P>z	[95% Confi Interval]		Marginal effects(dy/dx)
Age	0.0611436	0.0366428	1.67	0.095*	-0.01067	0.132962	.0152225
Family size	0.4864061	0.2041462	2.38	0.017**	0.086287	0.886525	.1210967
Marital status	-0.3478208	0.4714514	-0.74	0.461	-1.27185	0.576207	-.0859715
Women education	-0.1559137	0.0573221	-2.72	0.007***	-0.26826	-0.04356	-.0388166
Dependency ratio	2.397219	0.9301635	2.58	0.01***	0.574132	4.220306	.5968169
Employment status of women	0.3613244	0.4865984	0.74	0.458	-0.59239	1.31504	.0896464
Income	-0.0008475	0.0001902	-4.46	0.000***	-0.00122	-0.00047	-.000211
Religion	0.4313576	0.324687	1.33	0.184	-0.20502	1.067732	.1073917
Farm size	-0.6092216	0.2978712	-2.05	0.041**	-1.19304	-0.0254	-.1516731
Tenure security	0.3511041	0.4699848	0.75	0.455	-0.57005	1.272257	.0873331

Irrigation	-0.4112487	0.4804431	-0.86	0.392	-1.3529	0.530403	-.1023489
Nonfarm	-1.243138	0.4778933	-2.6	0.009***	-2.17979	-0.30648	-.2982029
EMPOaggregate	-1.092196	0.4839453	-2.26	0.024**	-2.04071	-0.14368	-.2625313
EMPOproduction	-0.5749694	0.4485213	-1.28	0.200	-1.45406	0.304116	-.1417446
EMPOasset	0.6264566	0.4590186	1.36	0.172	-0.2732	1.526116	.1550256
EMPOincome	1.149932	0.4536809	2.53	0.011**	0.260734	2.039131	.2796155
EMPOtime	-0.4134997	0.441554	-0.94	0.349	-1.27893	0.45193	-.1023958
EMPOleadership	1.407157	0.4727846	2.98	0.003***	0.480516	2.333798	.33646
_cons	0.4505253	1.846587	0.24	0.807	-3.16872	4.06977	
Number of observations = 220							
LR chi2(19) = 151.33							
Prob > chi2 = 0.0000							
Log likelihood = -76.092321 Pseudo R2 = 0.4986							

Source: computed from the author survey data, 2021

Note: *Significant at less than the 10% probability level., **Significant at less than the 5% probability level & ***Significant at less than the 1% probability level.

Table 4.7 shows empirical results of determinants of women's empowerment affecting household vulnerability to food insecurity.

Among the five main dimensions and aggregate empowerment that reflect women's empowerment in agriculture, two of them, empowerment in input productive activities (EMPOproduction), empowerment in time use (EMPOtime), and aggregate empowerment (EMPOaggregate, $p=0.024$) have negative coefficients estimates and three of them, Empowered in credit, and decision making on income (EMPOincome, $p=0.011$), empowerment in asset ownership and right on it (EMPOasset) and Empowered in group and participation on public issues (EMPOleadership, $p=0.003$) are positively statistically significant. This implies that female households head who was empowered in all five domains/aggregate, in their productive activities, and effective use of their allocated time, as well as work burden aspects that create hindrances to agriculture, were less likely to be vulnerable to food insecurity than the rest. Thus, these factors affect the empowerment of women likely also reduce vulnerability to food insecurity. The marginal effect for aggregate empowerment indicates that an increase in women's empowerment in all five domains decreases the probability of a household being vulnerable to food insecurity by

26.25%. Similarly, women empowered in income credit and Empowered in group and participation on public issues, have a significant impact on the probability of being vulnerable to food insecurity.

Economic empowerment in input productive decisions and time are concerned here, women with higher levels in productive activities and use of time (workload and leisure) are less likely to be vulnerable to food insecurity. The coefficient estimates for empowerment in participation in productive activities and empowerment allocation of time to produce, domestic tasks, and satisfaction with the available time for leisure activities were negative and statistically non-significant. This implies that primary female-heads-of households who were empowered in their productive activities and use of time (workload and leisure) alone which create hindrances to agriculture have a negative relationship with vulnerability to food insecurity and have a less significant impact. Women empowered jointly and sole involved in leadership activities like free public and group member participation has a positive significant impact on vulnerability to food insecurity. The marginal effect in table 4.7 indicates an increase in productive activities and use of time (workload and leisure), decrease the probability of vulnerability to food insecurity by 14.17 % and 10.24% respectively. The result was lined with the findings of (Kosheleva *et al.*, 2017) and it supported other related findings (Sharaunga, 2015; Sharaunga, et. al, 2015) but these findings did not use only empowerment index in five domains of agriculture.

The income of women, non-farm activities, education level of women, and cultivated farmland have negative and statistically significant coefficients. The results in table 4.7 revealed that higher levels of the education level (attending school) of women, reduce the probability of a household becoming vulnerable to food insecurity in the future by 3.9 percent that contradicts with the findings of (Belay, 2020) that indicates education has a positively significant impact which theoretically contradicts with these findings that is why vulnerability to food insecurity and education inversely related. Likewise, the negative and statistically significant coefficient for women's income (income) shows that higher levels of women's income reduce the likelihood of a household becoming vulnerable to food insecurity in the future and the marginal effects of the result showed that an increase in women income in 1 birr reduces the probability of likelihood of a household becoming vulnerable to food insecurity in the future by 0.02% that confirms the results

of (Sharaunga, et. al, 2015b), but this variable was non-significant in findings of Shimeles et.al, (2009). Similarly, results showed that increases in 1 hectare of cultivated farmland reduce the probability of households becoming vulnerable to food insecurity in the future by 15.17% and this confirms the results of (Feyisa, 2018). The marginal effects of the result also showed that an increase in participation in non-farm activities of a woman reduces the probability of the household becoming vulnerable to food insecurity in the future by 29.8%.

The positive and statistically significant coefficients of family size, and dependency ratio, indicated that households with larger family sizes and higher dependency ratio were more likely to be vulnerable to food insecurity than families with small family sizes and lower dependency ratio which supports the results of (Sharaunga,et. al, 2015;Feyisa, 2018).

Generally, statistically significant coefficients for women's educational attainment, farm size, overall empowerment, empowerment of income credit, and empowerment of leadership indicate that higher levels increase the probability of the likelihood of a household becoming vulnerable to food security in the future and decrease the probability of becoming vulnerable to food insecurity in the future. The estimates of marginal effects show that change in the family size and dependency ratio increases the probability of the likelihood of a household becoming vulnerable to food insecurity by 12.1% & 59.7% respectively. Thus, these results revealed that statistically significant variables had a significant impact on household vulnerability to food insecurity level and the results support the findings of (Sharaunga, et. al, 2015; Sharaunga et. al, (2016)&Sileshi *et al.*, 2019).

4.3 Diagnostic tests of the model in the analysis

Overall the model was well-fitted, as shown by the highly significant likelihood ratio chi-square value, (LR chi2 (19) =151.33, p=0.000). The average degree of multicollinearity among the explanatory variables used in the Binary logistic models was 1.29 (i.e., mean VIF less than 10), indicating that there was no significant correlation between the independent variables. The estimated standard errors for the estimated parameter estimates were all less than two, suggesting that sample size 220 (small sample size problem) was not an issue of the dummy variables in the model(Sharaunga, 2015)

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The study proposes a concise definition and develops a methodology to measure women's empowerment index in agriculture. It uses main domains (i.e., comprising of production, resource, income, workload, and time) as indicators of empowerment. Principal Component Analysis (PCA) was then applied to the levels of main domains at each of the six dimensions of women empowerment in agriculture (i.e., participation in productive activities, resources ownership, sale purchase or transfer asset & decision on the asset, use of income and decision on credit, leadership and time) and identify the dominant factors of women empowerment.

Principal component analysis (PCA) identified productive participation, Resources ownership, and income with credit decision as a form of empowerment as well as empowerment in aggregate 'as the dominant dimensions of women's economic empowerment that is, they highly explained the other domains in the model. The households 'vulnerability status had been established by Per Capita Food Consumption Expenditure (PCFCE) by calculating mean household food expenditure per adult in birr and this is used to determine the current food security status of a household, compared to the daily minimum dietary requirement (food poverty line) set in the literature for Ethiopia.

This study also examined the determinants of vulnerability to food insecurity of households in the rural area of the Tarcha Zuria district. As a result, the study's findings demonstrated that food insecurity continues to affect the Ethiopian population as a whole. The majority of the sample households (119 (54.09 percent)) were determined to be food insecure during the study's period. In this district female households averagely owned 1.15 hectares of cultivated land and 58.18 percent of the respondent had certified land (land tenure). The study area's food insecurity situation is challenging and frightening future, and it requires great attention especially in introducing extra agricultural systems like irrigation and technological tools, that is because the majority of people (65.9%) were not used irrigation instead they wait only for the rain season to farm. Several

variables have been identified as contributing to the study area in the declining food insecurity situation.

The binary logistic model was used to determine the factors of women 's economic empowerment in agriculture 'that reduce a household's vulnerability to food insecurity. All the analyses were based on cross-section data that were collected from 220 women in a rural area, Tarcha zuria district, and detailed information on the problems and better understanding of the condition of relevant information sources in women empowerment and vulnerability to food insecurity was obtained from key informant interviewers (some site profession of these kebeles). The Logit model having 18 explanatory variables was estimated, and the result of the regression is shown in Table 4.7. The explanatory variables are identified based on the previous empirical literature and the author's survey. From Table 4.7, we see that out of estimated explanatory variables included in the model, ten of them were found to be significant at 5&1 percent significance levels. These are family size, household's education level, dependency ratio, amount of income, farmland, nonfarm activities, empowerment in income and decision on credit, empowerment in leadership, and aggregate empowerment. Women's educational attainment, farmland size, nonfarm activities, income, and aggregate empowerment all had a negative impact on rural households' food insecurity. This means that an improvement in each of these variables reduces the likelihood of food insecurity in the future by 3.9, 15.17, 29.8, 0.02, and 26.25 percent respectively.

The results of the model reveal that the education level of the household head has a negative and significant impact on household food insecurity. Marginal effects in vulnerability to food insecurity of illiterate households are 3.9% much above that of literate female households, indicating that illiterate households are more food insecure than literate households. This reflects improvement in education contributes to food security significantly, which is according to our descriptive analysis. The possible explanation of this result's that literate household has more chances to use their knowledge towards the achievement of food security as compared to illiterate households. Similarly, (Sharaunga, 2015) found a negative and significant association between the education level of household heads and food insecurity.

Other significant characteristics found to have a positive impact are family size, empowerment in income credit choice, empowerment in leadership, and dependency ratio. The result obtained from the interview and structured questionnaire surveys also confirm this conclusion. The dependency

ratio on the result shows that there is a positive significant relationship between food insecurity and dependency ratio. The maximum likelihood estimate shows that the dependency ratio significantly influences food insecurity, and there is a positive association between them. As it is observed from Table 4.7, the marginal effects in vulnerability to food insecurity will increase by a percent of 59.7 as the dependency ratio increases by one unit. This finding is clear because the dependents contribute less labor force and income-generating to the family, which reduces the quantity of food available to each of the family members. This reflects the findings of others within which a household with large size, composed of mainly non-productive members is more likely to be food insecure due to the high burden levied on active labor (Sharaunga et al., 2015). Moreover, the positive relation between dependency ratio and food insecurity implies that birth prevention policies, which have an impact in reducing dependent household size, will increase the probability of a household being food secure.

The majority of people in developing countries depend on agriculture as their subsistence of life. Therefore, access to land for rural people is essential for food security and economic development in developing countries like Tarcha zuria district. The logit model regression result points out that the size of farm landholding is found to have a negative and significant impact on food insecurity. That is, the marginal effects of farmland showed that vulnerability to food insecurity will decrease by 15.17 percent as the size of farmland increases by one hectare. Households with large farmland produce more for household consumption and sale; thus, have a higher chance to be food secure than those having relatively small size of farmland. This also gives more opportunity to women to empower in production and landownership that helps in reducing vulnerability to food insecurity. This finding result shown in Table 4.7, support and is consistent with studies done by (Agidew and Singh, 2018; Sharaunga, 2015) indicating a negative association between farmland size and food insecurity. The other positively significant determinants were empowerment in credit decision with the use of income and empowerment in leadership. Generally, the results showed that significant factors in family size, education level, dependency ratio, income level, and cultivated farmland, participation in nonfarm activities, aggregate empowerment, income empowerment, and leadership had a significant impact on vulnerability to food insecurity of women.

It was concluded that the probability of a household becoming vulnerable to food insecurity in the Tarcha Zuria district decreases with increasing levels of women 's empowerment in aggregate, household income, participation in non-farm activities, women education level, owning a cultivated farm, family size, and dependency ratio. Thus, these factors had a significant impact on vulnerability to food insecurity, and a weighting the domains of empowerment that considers six indicating aspects of women empowerment is a more appropriate way to measure women empowerment index in agriculture.

5.2 Recommendation

This study has examined determinants of food insecurity among rural households in Tarcha zuria district, South-Western Ethiopia. The result of the study supports the worth of women's economic development and their human capital (education improvement) in improving food security in the study area. Therefore, rural development policies should encourage access to basic education to improve the food security situation by revealing the strong association between education and food security. In this study women are an important factor in reducing the food insecurity problem, they are half of the total population of the country. Their empowerment has also a great role in this issue. As the result showed in table 4.3 women empowered in aggregate had a significant impact on vulnerability to food insecurity. So that the government should give priority to encourage women in these domains in which they empowered and reduce the risk of food insecurity. This study analyzed the index of empowerment in agriculture with five domains that support the sustainable reduction in the probability of households becoming vulnerable to the poverty of food. Thus, future studies can bring more insights by conceptualizing empowerment as control over resources, income, decision making on credit, active participation in productive activities, and leadership for women in progressive economic development, structures and relations; assets, knowledge, will, and capacity, and compare results with this study. It is also important to compare levels of women's empowerment with the man in rural areas. Thus, future studies should also include men and women in the sample to allow comparisons across gender. It is also important to assess whether the same dimensions of empowerment significantly improve men's livelihood outcomes as they did with women's livelihood outcomes.

Moreover, the study found a positive relation among dependency ratio, family size, and food insecurity, implying family minimizing policies (birth control or contraception) should be

enhanced to minimize family size, basic education opportunities should be given since education, family size, and dependency ratio have a significant impact on vulnerability to food insecurity. However, empowerment in agriculture alone is not adequate to reduce household vulnerability to food insecurity sustainably. facilitated. As result, the next researcher should measure women's empowerment in agriculture and other economic and development issues. Finally, like many empirical studies, this study also found out that there is a significant relationship between the size of farmland and the achievement of improved food security. This implies that land markets should work efficiently to make land-constrained rural households access additional land for cultivation. Future research should focus on the current empirical evidence in the study area, to analyze concerns that were not covered in this study. Furthermore, it would be preferable if future research studies used panel data analysis to analyze the problem.

Since empowerment in agriculture alone is not adequate to reduce household vulnerability to food insecurity sustainably, the next researcher should measure women's empowerment in agriculture and other economic and development issues as well as examine non-significant predictors in this study. In general, the findings of this study imply that achieving food security in the research area necessitates the acceptance of a mix of policies and tactics that can bring improvement of household living standards and progressive economic development.

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Appendix I: Household Survey Questionnaire

Survey Questionnaire prepared to collect Data on *“Impacts of Women Economic empowerment in Agriculture on vulnerability to food insecurity* (Case of Dawro Zone, Tarcha zuria district)

The goal of the survey: - The main aim of this questionnaire will be to collect primary data to identify the factors of women's economic empowerment that affect vulnerability to food insecurity, the impacts of empowered women on it, and to measure women's economic empowerment indices. Although the researcher's primary objective is for academic purposes, it will be expected to give analytical clues for development and decision-makers. Therefore, the respondents will be kindly asked to provide his/her idea for the set of questions as it was organized.

Zone

District.....

kebele

Interviewer's Name.....

Date of interview

Position of interviewer:

Structured questionnaire

I. Respondent's demographic and socio-economic details

1. Age of respondent
2. Age of Household Head (if different from respondent)
3. Marital Status
 - 1) Married
 - 2) not married
4. Sex of the Household Head
 - a) Male
 - b) Female
5. What religion does your household follow?
 1. Christianity
 2. Muslim
 3. Orthodox
 4. Others
6. Number of household members (family size) -----
7. The number of household members in working age (from 15-64 age)
8. Number of household members in unproductive age (below 15 age ---- and above 64 ----)
9. What is the educational level that you attained in the school year so far? Put your appropriate ---
----year
10. What is your employment status? Choose one appropriate
 - a) Unemployed
 - b) Employed (governmental or NGO)

If you are employed, what is your monthly income you earn? Put your appropriate -----birr

11. If you are employed, what is your work position in your office?
 - a) Head
 - b) Vice head
 - c) Leader of the core process
 - d) Officer
12. What was your expenditure in food consumption that you fulfill your basic needs in last month?
----- birr
13. What is the core source of your household's income? please specify it

14. What is the main source of income for your home? Please specify
 1. My salary
 2. My husband's salary
 3. Agriculture
 4. Personal work
 5. Other work
 If not specify -----
15. How many people in your household contribute to the household income?
(.....)
16. Have you taken credit from any formal institution or informal institutes during the past three (3) years for your farming? Yes No
17. If your answer is yes, to question 17, in what form was the credit? Make √ for your preference
 1. In Cash -----
 2. In-Kind -----
 - c. Both cash and in-kind -----
 - d. Other (specify)_____
18. Do you have a savings account with any formal financial institutions? a) Yes b) No

II. Farm Characteristics

- 1) Do you have your land? a) Yes b) No
- 2) If your answer to the above question is “Yes”, how much was the land you have in hectare-----
-----?
- 3) How many hectares was the total size of land cultivated -----?
- 4) If No, what is the source of your income? -----
- 5) Do you use the irrigation system to farm? Yes ----- no -----
- 6) What are the core activities of the Household Head engaged (give 1, 2, 3 in priority order)?

S.No.	Activity	Rank
1.	Crop production	
2.	Livestock rearing	
3.	Mixed farming	

4. In the above question, if you are engaged in the non-farm activity, do you tell the activity you survive.....

III. Empowerment Questions

r/n	Questions	Options /activities employed in questions	In 2020	Now 2021
1.	What is your principal job, in last year and at current?	1. Not involved in productive work 2. Farming/gardening (e.g., growing rice, vegetables, etc.) 3. Rearing livestock like cattle, goats, chicken, pig 4. Producing livestock products like milk, eggs 5. Running an off-farm business like a shop 6. Casual laborer (daily hire) 7. Unskilled salary farm laborer, mine worker, etc. 8. A skilled formal job like teacher, carpenter, nurse, civil servant 9. Civil servant & 99 = Other (Specify)		
			Specify (if other)	Specify (if other)
2.	Did any member of your household engage in any of these productive activities during the past 12 months, as well as in this year?	Farming/gardening (e.g., growing rice, vegetables, etc.)	Past 12 months 1 = Yes 0 = No	In this year 1 = Yes 0 = No
		Processing of crops or natural products like making palm oil, milling rice, etc.		
		Rearing livestock like cattle, goats, chicken, pig		
		Producing livestock products like milk, eggs		
		Running an off-farm business like a shop		
		Casual work (daily hire)		
		An unskilled formal job like farm laborer, mine worker		
		A skilled formal job like teacher, carpenter, nurse		
3.	Did you personally engage in any of these productive activities during the past 12 months or in this year?	1. Farming/gardening (e.g. growing rice, vegetables, etc.)		
		2. Processing of crops or natural products like making palm oil, milling rice, etc.		
		3. Rearing livestock like cattle, goats, chicken, pig		
		4. Producing livestock products like milk, eggs		
		5. Running an off-farm business like a shop		
		6. Casual work (daily hire)		

		7. An unskilled formal job like farm laborer, mine worker		
		8. A skilled formal job like teacher, carpenter, nurse		
6.	To what extent do you agree with the following statements?	Public forums held in your village are quite intimidating – it is difficult for a woman like you to stand up and voice any concerns.	1 = Strongly disagree 2 = Disagree 3 = Agree 4 = Strongly agree	
		Nowadays, women’s opinions are valued in your community and are used to create more just policies. Men can make better decisions in community meetings than women.		
		If you wanted to participate in a group in the community, you would not have to seek permission from anyone.		
		Once a husband has paid his dowry, the woman should oblige and take care of all the household chores. You would be able to rely on others in the community for advice or support if you need it		
7.	Now, think about the rest of your day. I want you to tell me how much hours or minutes you spent on the following activities during a typical rest day:	Care for others (younger children, ill household members, elderly)	Time spent	
			Hours	minutes
		Fetching water/wood		
		Grocery shopping		
		Cooking		
		Cleaning		
		Laundry/ironing		
		Others		
8.	Did you involve participation in the following activities?	Indicators	1= yes if you actively participated, 0= otherwise	
		I participate in productive activities and make decisions concerning crop production or livestock rearing		
		I am free to choose what to produce on my plot		
		I involved in purchasing, sale, and transfer of agricultural assets or others		

		I have access to and make my own decision on credit			
		I have control over the use of household income and free to make a decision on it			
		Leadership I am confident to speak in public			
		I am satisfied with the time available for leisure activities			
		My agricultural work is not affected by the workload in my domestic tasks			
9.	To what extent do you agree with the following statements?	1) In meetings about development opportunities in your community, you generally feel comfortable lobbying for your priorities.	Put your degree of agreement (1-4)		
		2) Men are more important than women in ensuring that the food and income needs of the family are met.			
		3) Women now feel much more comfortable speaking openly and truthfully in public forums.			
		4) A wife should never question the decisions made by her husband.			
		5) Compared to a few years back, there are now more opportunities for women in your position to become influential actors in how your community is governed.			
		6) If a child falls ill, it is the mother's duty rather than the fathers to take time away from productive activities to look after the child, for instance: go to the office for work, gardening, etc			
		7) If you wanted to voice your opinion in public meetings, community leaders would encourage you to do so.			
11.	Of which type is the woman group you are currently most active in?	a. Agricultural b. Business group c. Financial d. Spiritual e. Other	How often you participated in meeting in this group? specify	What is your leadership position in the group? If any	Who is normally a decision-maker?

--	--	--	--	--	--

12. Now I am going to ask to list all the foodstuffs that you buy in the last typical month and how much you spent on every item

ITEMS of commodities	Quantity	Price
✓ cereals, root tubers such as maize, sorghum, wheat barley, yams, etc.? (main staples)		
✓ fats, oils such as vegetable oil, fats, butter, etc.? (oil)		
✓ fruits such as oranges mangoes, avocados, etc.?		
✓ legumes such as beans, peanut, cowpeas, lentils, etc.? (legume/pulse)		
✓ condiments such as coffee, tea, etc.? (condiments)		
✓ dairy products like milk, cheese? (milk)		
✓ Meat, fishes, eggs, etc.?		
✓ Vegetables such as spinach, tomatoes, onions, etc.? (vegetables)		
✓ Sugar and sugar products such as honey		
✓ Specify others		

13. How much does your household spent on the following commodities and services in a month?

commodity/services	Monthly expenditure/in birr	Contribution score
Electricity		
Water		
Rent		
Health		
Education		
Transport		
Clothes		
Entertainment		
Any other (<i>specify</i>)		

14. In your opinion, does a husband have the right to hit his wife? a) Yes b) No

Why do you say this? Give your suggestions -----

IV. Other open-ended questions

1. Please, could you tell the major problems encountering you in a way when you try to participate in empowering yourself in the following domains and which you actively participated
 - i. In productive activities -----
 - ii. In resource ownership and decision making -----
 - iii. In workload & satisfaction in free time -----
 - iv. In other domains -----
2. Do you have a contribution to agricultural activities? a) yes b) No
3. If you answer 'Yes' what are they? -----
-----If No, why? ---
4. Does the home workload (gender role) lie on you only? -----
5. What do you think the factors that hinder women's empowerment in this district?

6. Is there men supremacy in your village? What about your family? -----

7. Does your husband take home responsibility? A) Yes b) No
8. If Yes, which of the following?
 - a) Rearing child
 - b) Doing everything that I can do at home
 - c) Washing clothes
 - d) Cooking food
9. Have you faced food problems last 12 months? Yes ----- no -----
10. If yes, how much your minimum daily intake of food? -----
11. Did you worry that your [household] would not have enough food? -----

12. Were you or any household member not able to eat the [kinds of foods you preferred] because of a [lack of resources]? If yes what solution undertaken? -----

13. How often were you or any of your household members not able to eat the kinds of foods you preferred because of a lack of resources? If yes what solution undertaken? -----

14. Did you or any household member eat a limited variety of foods due to a lack of resources? If yes what solution undertaken? -----

15. In generally what think the role of women in food security and food poverty/insecurity in your family as well as in society whole -----

Thanks very much for expressing your experiences to me and giving me your precious time

Appendix II: PCA analysis of dominant dimensions of economic empowerment

PcaParticipaton autonomy Resources assetowneship SPT Income Leadershipingrouppublicparcti
workload Leisure

Principal components/correlation Number of obs = 220

Number of comp. = 10

Trace = 10

Rotation: (unrotated = principal) Rho = 1.0000

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.37837	.0611164	0.1378	0.1378
Comp2	1.31726	.136444	0.1317	0.2696
Comp3	1.18081	.0806788	0.1181	0.3876
Comp4	1.10013	.087156	0.1100	0.4977
Comp5	1.01298	.0517368	0.1013	0.5990
Comp6	.961242	.0876407	0.0961	0.6951
Comp7	.873601	.0482963	0.0874	0.7824
Comp8	.825305	.0848154	0.0825	0.8650
Comp9	.74049	.130687	0.0740	0.9390
Comp10	.609803	.00610	1.0000	

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
Participation	0.4223	-0.1321	0.0947	-0.4143	0.5255	.252
autonomy	0.3310	0.4480	0.3046	-0.0844	-0.0635	.4631
Resources	0.5630	-0.1427	-0.3323	0.2558	0.2416	.2748
assetownes	-0.1480	0.2498	0.3938	0.3600	0.4651	.3428
SPT	-0.2114	0.1386	-0.3424	0.5537	0.2167	.3899
Income	0.0151	-0.4548	0.3044	0.4002	0.0584	.4382
Leadership~p	0.4916	0.0327	-0.0847	0.3147	-0.1043	.537
publicparcti	-0.1423	0.5029	-0.1724	-0.1137	0.4389	.3944
workload	0.1466	0.1568	0.5892	0.1814	-0.1539	.4678
Leisure	0.2121	0.4408	-0.1969	0.1210	-0.4095	.4503

Component rotation matrix										
Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Comp8	Comp9	Comp10	
Comp1	0.3310	0.4223	-0.2114	-0.1480	0.4916	0.0151	0.1466	0.2121	0.5630	-0.1423
Comp2	0.4480	-0.1321	0.1386	0.2498	0.0327	-0.4548	0.1568	0.4408	-0.1427	0.5029
Comp3	0.3046	0.0947	-0.3424	0.3938	-0.0847	0.3044	0.5892	-0.1969	-0.3323	-0.1724
Comp4	-0.0844	-0.4143	0.5537	0.3600	0.3147	0.4002	0.1814	0.1210	0.2558	-0.1137
Comp5	-0.0635	0.5255	0.2167	0.4651	-0.1043	0.0584	-0.1539	-0.4095	0.2416	0.4389
Comp6	0.1547	0.2284	0.5276	-0.2951	-0.5419	-0.1292	0.3998	0.0131	0.1632	-0.2480
Comp7	0.0931	0.2256	-0.0637	0.2646	-0.3795	0.3665	-0.4129	0.6139	-0.0310	-0.1995
Comp8	0.5377	-0.1965	0.0413	-0.4108	-0.0933	0.5287	-0.1765	-0.1957	0.0216	0.3790
Comp9	-0.5018	0.0228	-0.2284	-0.1853	-0.1653	0.2674	0.4329	0.3218	0.1711	0.4921
Comp10	-0.1110	0.4530	0.3593	-0.2336	0.4080	0.1863	0.0359	0.1442	-0.6092	0.0664

Appendix III: Logit output of the stata results

logit VFI Age Fsize mstatus weducation ratio Employment income Religion farmsizeTsecurity Irrigation
 Nonfarm EMPOaggregate EMPOproduction EMPOasset EMPOincome EMPOtime EMPOleadership

Logistic regression Number of obs = 220
 LR chi2(19) = 151.33
 Prob > chi2 = 0.0000

Log likelihood = -76.092321 Pseudo R2 = 0.4986

VFI	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
Age	0.0611436	0.0366428	1.67	0.095	-0.01067	0.132962
Fsize	0.4864061	0.2041462	2.38	0.017	0.086287	0.886525
mstatus	-0.3478208	0.4714514	-0.74	0.461	-1.27185	0.576207
weducational	-0.1559137	0.0573221	-2.72	0.007	-0.26826	-0.04356
Dratio	2.397219	0.9301635	2.58	0.01	0.574132	4.220306
Employment	0.3613244	0.4865984	0.74	0.458	-0.59239	1.31504
income	-0.0008475	0.0001902	-4.46	0.00	-0.00122	-0.00047
Religion	0.4313576	0.324687	1.33	0.184	-0.20502	1.067732
farmsize	-0.6092216	0.2978712	-2.05	0.041	-1.19304	-0.0254
Tsecurity	0.3511041	0.4699848	0.75	0.455	-0.57005	1.272257
Irrigation	-0.4112487	0.4804431	-0.86	0.392	-1.3529	0.530403
Nonfarm	-1.243138	0.4778933	-2.6	0.009	-2.17979	-0.30648
EMPOaggregate	-1.092196	0.4839453	-2.26	0.024	-2.04071	-0.14368
EMPOproduction	-0.5749694	0.4485213	-1.28	0.200	-1.45406	0.304116
EMPOasset	0.6264566	0.4590186	1.36	0.172	-0.2732	1.526116
EMPOincome	1.149932	0.4536809	2.53	0.011	0.260734	2.039131

EMPOtime	-0.4134997	0.441554	-0.94	0.349	-1.27893	0.45193
EMPOleadership	1.407157	0.4727846	2.98	0.003	0.480516	2.333798
_cons	0.4505253	1.846587	0.24	0.807	-3.16872	4.06977

Appendix IV: Marginal effects after logit model

* Estimate Feasible GLS (FGLS) model

reg VFI Age Fsize mstatus weducationDratio Employment income farmsizeTsecurity Irrigation Nonfarm
EMPOaggregate EMPOproduction EMPOasset EMPOincome EMPOtime EMPOleadership

In short mfx, after regression

Marginal effects after logit, $y = \Pr(\text{VFI})$ (predict) = **.5322154**

Variables	Dy/dx	Std. Err.	z	P>z	[95% C.I.]	X
Age	.0152225	0.00913	1.67	0.095	-0.002672 0.033117	39.5318
Family size	.1210967	0.05043	2.4	0.016	0.022249 0.219945	4.35455
Marital status	-.0859715	0.11551	-0.74	0.457	-0.312371 0.140428	0.672727
Women education	-.0388166	0.01424	-2.73	0.006	-0.066722 -0.01091	8.30909
Dependency ratio	.5968169	0.23049	2.59	0.01	0.145074 1.04856	0.569045
Employment status of women	.0896464	0.11993	0.75	0.455	-0.145411 0.324704	0.468182
income	-.000211	0.00005	-4.49	0.00	-0.000303 -0.00012	3494.05
Religion	.1073917	0.08083	1.33	0.184	-0.051035 0.265819	1.47273
Farm size	-.1516731	0.07405	-2.05	0.041	-0.296807 -0.00654	1.09909
Tenure security	.0873331	0.11647	0.75	0.453	-0.140934 0.315601	0.581818
Irrigation	-.1023489	0.11898	-0.86	0.39	-0.335553 0.130855	0.340909
Nonfarm	-.2982029	0.10664	-2.8	0.005	-0.507205 -0.0892	0.563636
EMPOaggregate	-.2625313	0.10928	-2.4	0.016	-0.476726 -0.04834	0.613636
EMPOproduction	-.1417446	0.10837	-1.31	0.191	-0.354148 0.070659	0.572727
EMPOasset	.1550256	0.11206	1.38	0.167	-0.064601 0.374652	0.559091
EMPOincome	.2796155	0.10464	2.67	0.008	0.074528 0.484704	0.563636
EMPOtime	-.1023958	0.10829	-0.95	0.344	-0.314636 0.109845	0.563636
EMPOleadership	.33646	0.10393	3.24	0.001	0.132767 0.540153	0.490909

Appendix V: Diagnostic tests (multicollinearity tests)

The average degree of multicollinearity among the explanatory variables used in the Binary logistic models was 1.29 (i.e., mean VIF less than 10), indicating that there was no significant correlation between the independent variables. The multicollinearity problem checked by contingency coefficient ($\sqrt{\frac{\chi^2}{N+\chi^2}}$). That each value of contingency coefficient obtained from dummy variables all are less than 0.75 which shows there is no multicollinearity problem.

Run by mfx, after regression, reg variables, then mfx command

Variable	scores (VIF)
Fsize	2.35
FCEA	2.1
income	1.69
Employment	1.32
Irrigation	1.26
weducational	1.25
Tsecurity	1.2
Nonfarm	1.16
EMPOincome	1.14
EMPOleader~p	1.13
Age	1.13
EMPOasset	1.13
EMPOproduc~n	1.11
EMPOaggreg~e	1.11
farm size	1.1
mstatus	1.09
Dratio	1.08
EMPOtime	1.08
Religion	1.06
Mean VIF	1.29