ADDIS ABABA UNIVERSITY

COLLEGE OF DEVELOPMENT STUDIES

CENTER FOR FOOD SECURITY STUDIES

THE FOOD SECURITY STATUS OF PEPPER PRODUCING HOUSEHOLDS IN SHASHOGO *WOREDA*, HADIYA ZONE OF SOUTH ETHIOPIA

MASTERS THESIS

BY

TESFASILASSIE GIRMA MUGORO

ADDIS ABABA UNIVERSITY

ADDIS ABABA, OCTOBER 2017

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TESFASILASSIE GIRMA MUGORO

A THESIS SUBMITTED TO THE COLLEGE OF DEVELOPMENT STUDIES OF ADDIS ABABA UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN FOOD SECURITY STUDIES

ADVISOR: MESSAY MULUGETA (PhD)

CO – ADVISOR: ADMASU SHIBERU (PhD)

ADDIS ABABA UNIVERSITY

ADDIS ABABA, ETHIOPIA

OCTOBER 2017

ADDIS ABABA UNIVERSITY

COLLEGE OF DEVELOPMENT STUDIES

This is to certify that the thesis prepared by Tesfasilassie Girma, entitled: **The Food Security Status of Pepper Producing Households in Shashogo *Woreda*, Hadiya Zone of South Ethiopia** perceptions and practice and submitted in partial fulfillment of the requirements for the Degree of Masters of Science in Food Security Studies complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

Signed by Examining Committee

ANDUALEM GOSHU (PhD)_____ _____

Name of External Examiner Signature Date

SOLOMON TSEHAY (PhD)_____ _____

Name of Internal Examiner Signature Date

MESSAY MULUGETA (PhD)_____ _____

Name of Advisor Signature Date

ADMASU SHIBERU (PhD**)** _____ _____

Name of Co - Advisor Signature Date

_____

Chair of the department or Graduate program coordinator

Abstract

Household Food insecurity is one of the major challenges of the country in general and the pepper livelihoods of the Southern Nations, Nationalities and Peoples these days. However, there is inadequate information on The Food Security Status of pepper Producing Households in Shashogo Woreda, Hadiya Zone of South Ethiopia. The purpose of this study was to investigate the food security status of pepper producing households in Shashogo Woreda: more specifically to status of pepper producing households' food security and to identify factors affecting of pepper production Shashogo Woreda. Cross sectional survey design was employed with prepared questionnaire to gather information required for the purpose of the study. The Woreda was selected purposively and the data from 322 sample households were collected from three rural kebeles were selected by using simple random sampling lottery method and the sample households in each kebeles were selected households data were analyzed through descriptive statistics and binary logistic regression model and food security status measurement models. The survey result shows that about 10.8% of sample households were able to meet the daily recommended caloric requirement while 89.2% of sampled households were not. Moreover, binary logistic regression model revealed that main factors which challenge households' food security status were sex of the households, age of the households, family size, access to credit, and livestock holding size, farm land size, drought and disease. Pepper producing the food security status of the household in the study area. Production incomes of pepper contributed to households' food security to the large extent in Shashogo Woreda.

***Keywords**: Pepper, household, food security**,** per capita kilocalories*

Acknowledgements

First and foremost, I give sincere gratitude goes to the 'Almighty *God*' who gave me life and strength during my stay and who made it possible for me, to start and finish my study successfully. I would like to extend my heartfelt thanks and appreciation to my major Advisor, Dr. Messay Mulugeta, for his earnest and constructive comments throughout the analysis and preparation of the manuscript. My thanks also go to my Co- Advisor to Dr. Admasu Shiberu for his comments. Special thanks to Addis Ababa University, the College of Development Studies, and Center for Food Security Studies for giving me the fund for study.

I would like to thanks Shashogo *Woreda* Trade and Industry Development Office offering for scholarship in M.Sc study program. My special thanks also goes to Ato Degefa Dolebo, head of Trade and Industry Development Office, and Ato Bahiru Nemana, the Shashogo *Woreda* chief administrator giving me the necessary opportunity and Development Agents who have provided and presented me all the necessary data. My deepest appreciation goes to Dr. SerawitHandiso who gives me comments that formed this thesis.

To my Mother Ayelech Hochoto, my brothers and sisters for their kind love, education and moral support starting from my childhood, during this study and all are giving morally, economical support and everyday prayer move of my academic success. Particularly, I would like also to acknowledge Ermias Haile, Dilamo Markos (a PhD candidate in AAU), Mutaye Shamebo and Iyasu Thomas. Lastly, I would like to show appreciation Christian Fellowship whom I am indebted to those who assisted me during the entire inception to completion of this research.

Declaration

I, Tesfasilassie Girma, hereby declare that this study entitled: **The Food Security Status of Pepper Producing Householdsin Shashogo*Woreda*, Hadiya Zone of South Ethiopia** is my own work and I have carried out it independently with the guidance and support of the advisor. Therefore, this study has not been submitted to any degree/diploma in this or any other institution. The thesis is submitted to College of Development Studies Center for Food security Presented in Partial Fulfillment of the Requirements for the Degree of Master of Science in Food security Studies.

TesfasilassieGirma

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Signature Date

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List of Acronyms

ADO: Agricultural Development Organization

CEDA: Caribbean Export Development Agency

CSA: Central Statistical Agency

DPPC: Disaster Prevention and Preparedness Commission

EEPA: Ethiopian Export Promotion Agency

EIAR: Ethiopian Institute of Agricultural Research

HDDS: Household Dietary Diversity Score

HFBM: Household Food Balance Model

HFIAS: Household Food Insecurity Access Scale

IFRC: International Federation of Red Cross

MARC: Melkassa Agricultural Research Centre

NMA: National Mapping Agency

SWANRO: Shashogo*Woreda* Agricultural and Natural Resource Office

SNNPRS: South Nations, Nationalities and Peoples Regional State

SPSS: Statistical Package for Social Science

TLU: Total Livestock Unit

USAID: United State Agency International Development

UNDP: United Nation Development Program

WFP: World Food Program

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CHAPTER ONE: INTRODUCTION

1.1. Back ground of the Study

Pepper*(Capsicum annuum)* is the world's most important vegetable after tomato and used as fresh, dried or processed products, as vegetables and as spices or condiments (Acquaah, 2004). They have become a component condiment as well as food by the indigenous Americas and form an essential part of human diet in Africa and other parts of the world (Tweneboah, 2000). According to Bosland and Votava (2000), pepper production has increased in recent years worldwide and this could be ascribed partly to its high nutritional value. Peppers*(Capsicum annuum)*it is an important cash crop for smallholder farmers in developing countries such as Ethiopia, Nigeria, Ghana, China, India, Pakistan, Bhutan, Indonesia, Cambodia, and Thailand (Sanjeet*et al*., 2013). Pepper is the world's most important vegetable next to tomatoes and among the vegetables; it is the rich source of vitamins A, C and E it can be consumed either fresh as vegetable or in powder forms (Bosland and Votava, 2000).It belongs to the family Solanaceae, which is an important group of vegetables cultivated extensively in Pakistan and also widely cultivated in almost every country of the world (Channabasavanna*et al*., 2000).

Pepper originated from America with their cultivation now grown all around the world because they are widely used as food and medicine (Mazourek*et al.,* 2009). Pepper was one of the first plants to be domesticated and cultivated in the western hemisphere. The total area devoted to pepper worldwide is estimated at 4 million hectare with an average annual increase of 5% (Weiss, 2002).World pepper production in 2004 reached 1.65 million hectare with more than 24 million metric tons harvested (FAO, 2005). China is the world's largest producer, with more than 33% of the total production area and nearly 50% of total world production (FAO, 2005). According to FAO (2009) report, the estimated productions of peppers were 220,791 ton 97, 712 ha in green form and 118,514 t of dry pepper from an area of 300,000 ha. Capsicum production especially the green one grew worldwide from 11 million in 1990 to 23.2 million metric tons in 2003 and 28 million metric tons in 2009 (FAO, 2009). World production of chili and pepper is 28.4 million tons both dry and green fruit from 3.3 million ha, with an annual growth rate of 0.5% (FAO, 2007).

A number of cultivated varieties are in existence in Africa including Ghana and species such as *Capsicum frutescens*, *Capsicumannuum*, and *Capsicum sinensis*are found (Tweneboah, 2000). It is one of the most important vegetables grown in Nigeria and other parts of sub-humid and semi arid tropics (Aliyu, 2000). Nigeria is known to be one of the major producers of pepper in the world accounting for about 50% of the African production (Idowu-Agida*et al.,* 2010). World production statistics in 2006 showed that Nigeria's pepper production of about 204,200 metric tons. Most of the world's pepper is produced by small landholder farmers, who sell their crops to middlemen or traders, who sell it to processors (Hay, 2009). Pepper is an important agricultural crop not only because of its economic importance but also due to the nutritional, medicinal value of its fruits as well as being excellent source of natural colors and antioxidant compounds (Howard *et al*., 2000).

It enhances agricultural production and improves, income of rural population, opening employment opportunities for the poor, supports national economy by producing industrial crops that are used as raw materials for value adding industries, exportable crops and sustainable strategy for increasing household food security. The climatic and soil conditions of Ethiopia allow cultivation of a wide range for growing pepper. Pepper covers 67.98% of all the area under vegetables in Ethiopia (CSA, 2011/2012). According to EEPA (2003), red pepper is a major spice and vegetable crop produced by the majority of producers in SNNPR, Oromia, and Amhara regions. Despite the significance of pepper in Ethiopian economy and current income generating capacity of pepper as compared to its magnificent potential in the country. The most commonly grown type is the Mareko Fana variety, a pungent long chili of dark-red appearance (pungency is at least twice as high as required for western food processors). In Ethiopia, the total area under hot pepper for dry pod (*Berbere*) and for green pepper (*Karia*) in 2008 was estimated to be 8,580.69 ha, and 11, 0405.89 ha respectively (CSA, 2009).

In southern region of Ethiopia the total area covered with pepper and total production in years 2005-2008 were 37,562 ha and 27,352 tons, respectively and the productivity of pepper in SNNPR was 0.73 t/ha, where as the average dried yield obtained in research condition 1.8-2.5 t/ha (OARD,2007). The world average yield of pepper is 3.75 t/ha (CSA, 2005). The share of the region in the total production of red pepper in the country constitutes 25%, next to SNNPRS,

which produces about 64% of the total production in the country (CSA,2001/2002).In 2008/2009 production year the total cultivated land and production in the region was 41,069 hectare and 530,466 quintal respectively (CSA, 2009). Rain fed pepper production in 2005/06 production was 777,602 quintals In SNNPRS. This accounted 43% of the country‘s production (CSA, 2006). In addition to having major role in Ethiopians daily dish it also plays an important role in the national economy. It is an important cash crop today; on average 79% of pepper production is for market in SNNPRS (CSA, 2003).

Hot pepper serves as one of the most important sources of food and income to smallholder farmers and as exchange earning commodity (Beyene and David, 2007). The backbone of its economy has been predominantly the agriculture sector when judging from the point of view of the people’s occupation, its contribution to GDP, export of commodities and orientation of the industries. In the southern parts of the country especially in Hadiya Zone Shashogo *Woreda* the crop is widely cultivated by farmers. The current development policy and strategy has also targeted the crop for poverty reduction and food security goals for resource poor farmers at household levels.

Pepper plays a crucial role in rural income generation, poverty alleviation, and food and nutrition security among producers (Adewoyin*et al.*, 2011). Shashogo *Woreda* is one of the thirteen *woredas* of Hadiya zone where pepper is highly grown and used for income generation making it among popular spice mainly chosen among traditional foods.

Its importance is not only limited on consumption point of view but also very prominent to farmers by generating income, creating employment opportunity and ensuring food security. In many household, pepper provides the only needed flavor to enhance intake of otherwise blend diets. It is also one of the major income generating crops for most households of the pepper producing areas and it plays a vital role in food security in Ethiopia (Roukens, 2005).

1.2. Statement of the Problem

However, production was hampered by a multitude of factors. Among these problems, shortage of varieties, type of cultivar, traditional and backward production methods, lack of proper and adequate inputs (fertilizers, improved seeds, pesticides, etc,), lack of research outputs and lack of extension services on production techniques, and many other problems are the main constraints that contributed for lower productivity in Ethiopia (Alemu*et al*., 2000). Moreover, the problem was shortage of varieties, water logging condition, lack of skill and knowledge management, traditional production methods and, pest and diseases. From the Shashogo*woreda* Agricultural and Natural Resource office information, this area is not self-sufficient in crop and livestock production. As a result, to improve the *woreda* food security status; governmental and non-governmental organizations supplied wheat, maize, millet and oil provided for chronic food insecure households by accomplishing development activities.

The *Woreda* is mostly affected by frequent flooding of Boyo Lake. Consequently livestock and human causality, damage to flora, damage to crop farms, famine and malaria infection are the major problems reported from SWANRO, (2016). The residents suffer from frequent flood that originating from highlands of neighboring zones during the rainy seasons (USAID, 2000). This source also explains about the factor that reduces agricultural productivity like erratic rainfall, soil infertility, pest infestation and population pressure the *woreda* food security situation.

However, required level of farmers produce enough pepper but as a SWANRO (2016), revealed that the household's food security status. Abinet (2011), had done the research on the impact of area enclosure on soil quality and farmers' perception in Hadiya zone, Shashogo *Woreda*. Besides, limited scientific document are not available on the food security status of pepper producing households in the study area. This study to fill the gap by household farmers with income of pepper production for alleviating rural household insecurity remains uninvestigated in the study area.

In Shashogo *Woreda* of south Ethiopia, information on the contribution of pepper in providing support for households. The overall economic conditions that characterize households with high food security status are not adequately supported through empirical research. Poor, pepper

producing households' challenges on inadequate or limited access to community resources that promote and support technology development and research center are not appropriately identified in the study area. Thus, this study attempts to explore the abovementioned research shortfall pepper production by the households in the study area.

1.3. Objectives of the Study

1.3.1. General Objective

The overriding objective of this study is to investigate the food security status of pepper producing households in Shashogo *Woreda*.

1.3.2. Specific Objectives

More specifically, the study aspired to:

- Study the status of pepper producing households' food security in Shashogo *Woreda*
- Identify factors affecting pepper production in Shashogo *Woreda*

1.4. Research Questions

Based on the above indicated objectives, the study planned to answer the following basic questions;

1. What does the food security status of the rural households look like in the study area?
2. What is the pepper producing households' food security in the study area?
3. To what extent of the pepper production contributes for household food security in the study area?
4. What are the factors affect rural household food security in the study area?

1.5. Significance of the Study

Developing an understanding on rural households' food security problems is of great importance as it gives a way to devise powerful strategies and interventions by different actors such as Government and NGOs and findings from the present research was also be used as baseline for further studies in the same field. Moreover, the result of this study is supposed to be essential inputs to the current governments and end over to improve the principal food security problem in rural and bring sustainable development. Particularly, concerned governmental and non-

governmental bodies at *woreda* and zonal levels can make use of this research output to plan for specific rural developmental and food security improvement strategies. Hence, this research work tends to investigate the pepper production and household food security nexus and prior experience or familiarities of the researcher to the area motivated to investigate the research. In addition, it may inform some realities both to the community and policy makers and implementers how to achieve success in the area of reduction of food insecurity.

The research paper aspires to examine the pepper production income on food security and nutrition among rural households in Shashogo *Woreda* of Hadiya Zone. As one of food insecure areas in Hadiya Zone, Shashogo *Woreda* can be taken as a sound and logical research site to investigate the nexus between pepper and food security notion. Not only is food insecurity widespread in the *Woreda, it* also produces a large number of pepper production. These pepper production are sources of income for majority of households in the *Woreda* and the income from pepper production has become a livelihood strategy for households in the *Woreda* to improve their living condition.

1.6. Scope of the Study

The study conducted in Shashogo *Woreda,* Hadiya Zone. In Shashogo *Woreda* there are 36 rural *kebeles* but the study only focused on three *kebeles* which are randomly selected *kebeles,* namely Kemacho Borara, Alage and Shayambe Wanchikota , since it is not possible to cover the whole aspects of the study area with the available time and resources, it is advisable to limit the study size and scope of the problem to a manageable size. Food security concept has geographical and time dimensions. The spatial dimension of food security consists of global, continental, national, sub-national, community, household and individual levels.

In addition, temporal dimension of food security has chronic food insecurity or lack of assets and inadequate access to productive or financial resources, and transitory food insecurity or short-term shocks and fluctuations in food availability and food access, including year-to-year variations in domestic food production, food prices and household incomes. However, this study is limited to identify challenges to food security issues at household level in selected *kebeles*.

1.7. Limitations of the Study

This study has encountered a number of limitations. One of the major limitations was that it didn't entirely consider respondents dwelling in the remotest parts of the *woreda*. Besides, data

on the status of households' food security while they are not producing pepper is not found. In collecting data, the lack of proper supportive written documents particularly in *kebele* level to further strengthen the findings of the research. Furthermore, data collection period is by mass yearly soil and water conservation period, the respondents have not spend more enough time with enumerators and which may affect data collection time.

1.8. Ethical Consideration

Respondents' consent was granted before conducting the study. Primarily, permission was secured from Shashogo *Woreda* Administration and Relevant offices. The research process was completely dependent on mutual respect and clearness. Consent was secured from study households by notifying the data to be gathered from them should be kept confidential and important for the study. Moreover, involvement in replying to questionnaires, any interviews and overall participation was based on voluntary bases. In such away participants freely participated without obligation or any inducement just on their consent. As far as possible, communication barriers were eased through avoiding technical terms and translating the questionnaire as well as discussion media during interview in to common language for mutual understanding.

1.9. Organization of the Thesis

This research is organized in five chapters. The first chapter introduces about the background, problem of the statement, objectives of the study, research questions, significance, scope and limitations, ethical consideration of the study. The second chapter covers literature review dealing with concepts and definitions of food security, marketable post harvest losses in pepper production, importance of pepper, factors affecting of pepper production and conceptual framework of the study.

The third chapter deals with methodology of the study a brief description of the study area, research design, data types and sources, sampling techniques, sample size determination, methods of data collection and techniques of data analysis. The four chapters encompass the result and detailed discussions of the study. In the last chapter conclusion of the overall parts and recommendations are indicated.

CHAPTER TWO: RELATED LITERATURE REVIEW

2.1. Definition and Concepts of Food Security

Food security has about 200 definitions (Hoddinott, 2001). This study, however, makes use of the definition given in the State of Food Insecurity 2010 report by the Food and Agricultural Organization (FAO) that defined food security as a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2010:8). Establishing food security, particularly household food security, is widely accepted as an important goal in advancing the living standards of the rural poor. One opportunity toward realizing this is through small-scale agriculture, which can be fostered through appropriate agricultural extension. However, food security programmes and extension approaches and agendas often are not well-matched.

Although, globally, sufficient food is produced to make it possible to attain food security (Islam, 1995), the number of hungry in the world has increased from about 840 million (FAO, 1996) to about 925 million in 2010 (FAO, 2010), with 98% living in developing countries (FAO, 2010). The United Nations Children's Fund indicates that at least 150 million children are undernourished, 32 million of whom live in Africa (UNICEF, 2001). This demonstrates that producing sufficient food globally does not necessarily mean equitable and proportionate distribution among people. Similarly, sufficient food production nationally may also not translate to food security at the household level, as is the case in South Africa (Van der Berg, 2006). Currently, in the third world where hunger and famine are uncontrolled, food security is a topic of considerable attention. Nearly thirty definitions of it have been well-known by Maxwell and Frankenberg (1992).

But food security definition has considerably been changed over the time and recently cited to have reached more than 250 (Degefa, 2008). In this respect, the definition formulated in the first world food meeting is "All people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and health life" (FAO,1996). This definition constitutes core elements such as

(i) Sufficiency of food which represents the calorie needed for an active and health life;

(ii) Access which refers to the ability to produce, purchase, exchange or receive food as a gift

(iii) Security that refers the balance between susceptibility, risk and assurance and,

(iv) The time dimension that deals with whether food insecurity can be chronic, transitory or seasonal.

A country could be food secure because it has the resource to provide sufficient food for its whole people, but could still have food insecure households who may not access to the food. In extreme cases, it may even be the reality that food insecure people could live in food secure households due to inequalities in intra- household distribution. Thus, genuine food security is achieved only when the concept is functional at the individual level (World Bank, 2000). In a given country, food security can be viewed from nationwide or household or individual perspectives. National food security is viewed as the ability of the country to produce, secure, and maintain adequate levels of supply to meet demand throughout the year, both through domestic production and imports. Food supply insecurity, also called national aggregate insecurity, arises when a country is unable to supply its aggregate food requirement either through domestic production, imports and reserves (World Bank, 2000).

2.1.1. Household Food Security

The concept of household food security is a more recent development and the bulk of literature dated from 1980s equating national food security with food self-sufficiency is a problem that needs to be clearly understood. Many countries those used to be considered as self sufficient in food were found to be food insecure due to the fact that they either lack an efficient food system or the capacity to the level of food entitlement. This indicates that attaining macro-level food self sufficiency does not ensure the achievement of household food security (Getahun, 2003).Studies on assessment of food security can take different level of unit of analysis, at national, regional, community, household and individual levels. Since collecting precise information for each individual might be impossible or too costly, especially in poor country like Ethiopia, there is an option which is widely practiced in food security research. This is a study starts at household level analysis by applying a weight (Adult equivalent scale or ratio) to adjust to its composition and drives weighted per capita estimate (Jacobs, 2009). Hence, it is worthwhile to look at the concept of household food security since this study's center of attention is at household level.

Therefore, food security strategy has to address household-level food production and investment in food production and storage. However, are essential but not sufficient vehicles for solving household-level malnutrition and household food insecurity problems (Rukuni, 2002).

Debebe (1995), as cited in Ayalew (2003), indicates that household food security mainly conditioned by factors, which are related to the process of acquisition, household procurement strategies and socio economic condition of the society. With regard to this, the key elements that are critical to household food security are availability and access. The former is further influenced by the different source of food and handling patterns which facilitate the time dimension of food availability in the household. Besides, household is identified as food secured if entitlements of demand for food security is greater than food needs, which is defined as the aggregation of individual requirements. At individual level, the definition is much more straightforward. An individual is food secure if his or her food consumption is determined by claim the individual has on household food source.

Entitlement, as Sen (1981) defined it, is a set of alternative commodity bundles that a person can commend in a society using rights and opportunities that he or she faces. This means, what can a person produce, buy or borrow, given what they own and what socially and state regulations allow them to do with that. He identified four main categories of entitlement, namely, trade based entitlement, which describes what an individual can buy with the commodities and cash they own; production based entitlement, which describes the right to own what one produces with one own resource; inheritance or transfer entitlement which refers to the right to own what is willingly given by others as remittance, bequest, as well as transfer from state such as social security, pensions and food distribution. All these entitlements give an individual control over resource which they can use.

2.1.2. The Dimensions of Food Security

The definition of food security adopted at the World Food Summit in 1996, four particular dimensions can be identified: availability, access, utilization and stability. Food security is realized, if all these four dimensions are fulfilled at the same time.

2.1.2.1. Availability

The availability dimension addresses the supply side of food security, thus, referring to the amount of food that is physically available in a population during a certain period of time (Pangaribowo*et al.*,2013). Depending on the level of analysis, food availability can be determined: On a international or national level, considering, domestic agricultural production, import capacities, food stocks and food aid using or the ratio of total exports to food imports (Pangaribowo*et al.,* 2013). On a household level, using quantitative indicators such as food availability per person or the average dietary energy supply adequacy, or qualitative indicators like the share of dietary energy derived from cereals, roots and tubers, per capita availability of fruits and vegetables, or protein availability (FAO, IFAD and WFP, 2013; Maxwell & Smith 1992).

2.1.2.2. Access

The access dimension to food security embraces the ability of households or individuals to access food from the market or from other sources (Webb *et al.,* 2006). According to the definition of food security adopted at the World Food Summit in 1996, access to food is determined by a physical and an economic component. Indicators for the physical component are related to the availability and quality of infrastructure, i.e. roads, railways, ports or communication networks as well as the accessibility of publicly provided services like health, education and social safety nets (FAO, IFAD and WFP, 2013). The economic component, on the other hand, refers to "any acquisition pattern or entitlement through which people procure their food"(FAO 1999, Article 13). An important factor here is the income of people and, in case of subsistence farm households, the assets necessary to produce sufficient food for consumption, such as land, labor, water, seeds or fertilizer (Ecker&Breisinger, 2012).

2.1.2.3. Utilization

The utilization dimension of food security is concerned with the questions of 'how much', 'what' and 'how' people eat (Clay, 2002). This third dimension basically embraces concerns about the diversity and nutritional value of food being consumed and in how far the micronutrients are being absorbed by the body. Important factors hereby include, for example, how food is being

stored, prepared and cook the intra-household distribution of food, education and information about health and nutrition, and health and hygiene conditions (Maxwell & Smith, 1992). According to Barrett (2010), the first three dimensions of food security are inherently hierarchical, in so far that food availability is a necessary but not sufficient condition to ensure access, and access, on the other hand, is necessary but not sufficient for effective utilization.

2.1.2.4. Stability

Stability is a relevant factor for all other dimensions of food security mentioned above. It encompasses considerations about the vulnerability to certain types of risks, thus, recognizing the temporal dimension of food security (Pangaribowo*et al.*, 2013). Sources of risks on a macro-level can be, for example, natural disasters (e.g. floods and droughts), macroeconomic shocks (e.g. global food price spikes) health-related shocks (diseases, epidemics) or political instability (Ecker&Breisinger, 2012).

2.1.3. Measuring Household Food Security

There is no single indicator to measure food security. Many different indicators are needed to capture the various dimensions at country, household and individual levels (Hoddinnot, 1999). Since food security is influenced by different interrelated socio economic, physical, institutional and political factors, it requires understanding of multidimensional contexts of the target area. Hence, combining both qualitative and quantitative household data sources in studying of food security activities allows knowing holistic nature of the study area comprehensively as argued by (Degefa, 2006) since some indicators only appropriate for assessing the process while others monitoring of the outcomes of certain project goals.

It is up to the researcher to select a combination of indicators that suit the objectives of the investigation, the level of aggregation and specific circumstance of the study and study area (Carletto& Morris, 1999). Generally, the most common indicators to household food security are food availability, food consumption or access and composite food security. Measuring food security in terms of food availability focuses on national or household agro food output or supply (Jacobs, 2009).

2.2. Marketable Post Harvest Losses in Pepper Production

Postharvest activities include harvesting handling, storage, processing, packaging, transportation and marketing (Mrema and Rolle, 2002). Postharvest losses lower the gains of the effort that was put into production and negatively affects marketing efficiency (Babalola*et al.,* 2010). Smallholder farmers lack an intimate knowledge of postharvest treatment such as cold chain management and traceability which is critical to prolong their short shelf life and reducing wastage (Louw*et al.,* 2008).Postharvest losses have been highlighted as one of the determinants of the food problem in most developing countries (Babalola*et al.,* 2010). Improving the income for smallholder farmers is a powerful tool in reducing poverty and food insecurity (Kirsten *et al.,* 2007). Smallholder crop production has the potential to contribute to the reduction of food insecurity and poverty in the form of household income generation and increasing food availability (Machethe, 2004).

Income for smallholder farmers can be improved by a number of ways, one of them being reduction in postharvest losses. Reduction in postharvest losses increases food availability, hence alleviation of food problems. Minimizing postharvest losses of fresh produce is a very effective way of reducing the production and/or increasing food availability (Kader, 2005). This situation deteriorates pepper product in terms of quality and quantity. The post harvest loss inadequate storage of pepper is abundant in Ogun states of Nigeria, about 87% of farmers. In Ethiopia, there is lack of proper means of postharvest handling of fruits and vegetables and generally, very little emphasis is given to postharvest handling of perishable produces (Taddese, 1991).

This huge loss is mainly attributed to poor storage facilities, poor means of transportation and handling (Kebede, 1991). According to Rehima (2006), the found about 79% asked respondents in silte store pepper product by filling in sack and retaining it at *kot* (shelf). In Halaba special *woreda* about 46% asked farmers store their pepper product by filling it in sack and placing it at *kot*. On the other hand, 18% of household from siltie and 48% of household from Halaba placed pepper product in traditional garner that is made from locally available inputs (store) or *gotera*. In addition to this, the farmer level storage capacity among the pepper growers is not adequate in the country. This problem of storage has crippled many pepper producing farmers' motivations in the study area.

2.3. Empirical Literature

2.3.1. Pepper Production

In China it was harvested that 15 metric tons per hectare in 2001/02; this shows that there is high productivity difference in China as compared to Ethiopia whose production is about 1.4 metric tons per hectare (CSA, 2003). According to CSA, (2015/06) of Ethiopia pepper product harvested on 142,795.16 hectare of land was 2,627,908.26 quintal. According to SNNPR, (2016/2017) the total pepper production covers 143,373 hectare of land was 286,799.35 quintal of land production and also Hadiya zone of the statistical information from the total covers land of pepper 3,775 hectare of land was 46,545.75 quintal of land productivity, respectively the researcher obtained from Shashogo *woreda* covers of pepper land 3,685 hectare was harvested 31,322.5 quintal of pepper production. In addition to this, in Ethiopia pepper product 2001/02 was only 77,962.4 metric tons harvested on 55,381 hectares (CSA). Smallholder farmers operating on by most estimates, an average of one hectare, account for about 95% of agricultural output (Pender *et al.*, 2004).

Pepper (capsicum) is an 'annual' plant which grows at altitude ranging from 1400 up to 2100 (m.a.s.l.) meter above sea level. Growing pepper requires soil that is well-drained and rich in organic matter, as well as 600-650 mm rainfall. It grows well on well prepared soil that is free from perennial weed. Pepper is propagated by raising seedlings in a nursery. Seedlings are raised starting April and transplanted as the main rainy seasons begins, which is June/July. Depending on the area, harvesting starts 4 to 5 months from transplanting. The seedlings are transplanted 40–50 days after planting. Planting is carried out in the beginning of the main rain season (Roukens, 2005). In areas where rainfall is inadequate, supplementary irrigation is required. About three weeding sessions are recommended during the growth period. The red pepper is harvested when it is fully red and starts to dry. After harvesting, pepper is dried. Shade drying is recommended for high quality oleoresin (Roukens, 2005).

Red pepper and chili are the leading vegetable and spices grown in the country. The central (Eastern and Southern Shoa), Western, North Western (Wollega, Gojjam) and the southern part of the country are the potential pepper producing areas. The plant requires a hot and dry climate free of frost and suitable agro ecological area. According to MoA (2009), suitable altitude range

for optimum production of pepper is between 1000 and 1800 meter above sea level (m.a.s.l). The total production of pepper in the country for the year 2015/2016 Ethiopian main cropping season was estimated to be 2,627,908.26 quintals. In addition to, SNNPR region the total production was 15,168 quintal for the same year. Therefore, the contribution of the SNNPR region for the country production was 35%. The production of pepper in the region is dominantly by smallholder farmers using rain by traditional farming practice.

2.3.2. Factors Affecting of Pepper Production

There are many challenges that farmers face in the pepper production. Due to this fact, pepper production challenges (shortage of seed, pesticide, fertilizer, labor, capital, lack of skill, shortage of ox, diseases problem, insects' problem, theft problem and adulteration (Worknehe*t al.*, 2014). Pests and disease attack are one of the major problem pepper farmer facing, has subsequently aggravate a reduction in the yield and income accruable to farmers (Chris, 2015).

According to Sanusi*et al.*, (2013), the study conducted in ogun state of Nigeria, shows that about 84.2% of sample household from 120 household interviewed, had problem in sourcing for inputs such as viable and disease resistant seeds, fertilizers, pesticide and insecticides for improved variety establishment and to prevent pest and diseases. Lack of storage facilities, poor traditional storage system, which are prone to storage pests and diseases, lack of on-farm storage system and absence of cool storage facilities are among the important limitation to the vegetable production sector of the country (Fekadu*et al.*,2006).

Other constraining factors include low production and productivity, lack of adequate pest control, poor soil fertility management practices, lack of attention to product quality and prevention of physical damage, as well as the lack of storage and packaging facilities (FAO, 2004). This challenge includes inadequate farm management, shortage of improved seed variety, inadequate fertilizer application, disease, absence of pesticide, lack of knowledge, absence of improved variety, and traditional production method. On the other hand, farm household was challenge land degradation and recurrent drought has been attributed as main factors for the low crop production in the Ethiopian agricultural system.

2.4. Conceptual Framework

Conceptually, food security is defined as access by all people at all times to enough food for an active and healthy life which comprises food availability and food access through home production, purchase in the market or transfer. As it is repeatedly mentioned, food security at the household level is conditioned by a household own production and household members ability to purchase food of the right quality in the market place. Hence, it encompasses food access, availability, utilization, and stability.

From food availability perspective it addresses the household adequate supply of food and is determined by the level of home production, purchase in the market or food transfer. Food availability can be affected by disruptions of food production due to bio-physical related problems, poor access to productive resources and rapid population growth.

In terms of food access, it refers to the way in which households acquire available food in different means. This include home production, purchase in the market, borrowing, gifts from relatives or friends, and provisions through relief systems or food aid. Access to food is depends on household's sources of income ventures and saving pattern, social capitals, access to road, and markets.

When food utilization is considered as a basis, it is the way in which people utilized food. It is determined by a number of consistent factors including eating habit, food preferences, the quality of the food and its method of preparation, food rationing, water supply, and the nutritional knowledge and health status of the household.

From perspectives of stability, itis consistently associated to food accessibility throughout the year without any anxiety of individual or household nutritional status which is determined by social, environmental, economic and political factors (FAO, 2008).

The conceptual framework of these study four variables adversely affecting household food availability, access, utilization, and stability which in turn determine the household's food security Status. These are factors affecting, contribution, and post harvest losses. Determining

factors comprise population density, landholding size, storage status, food preference and water supply. The issues of contribution are related to food, income and job opportunity.

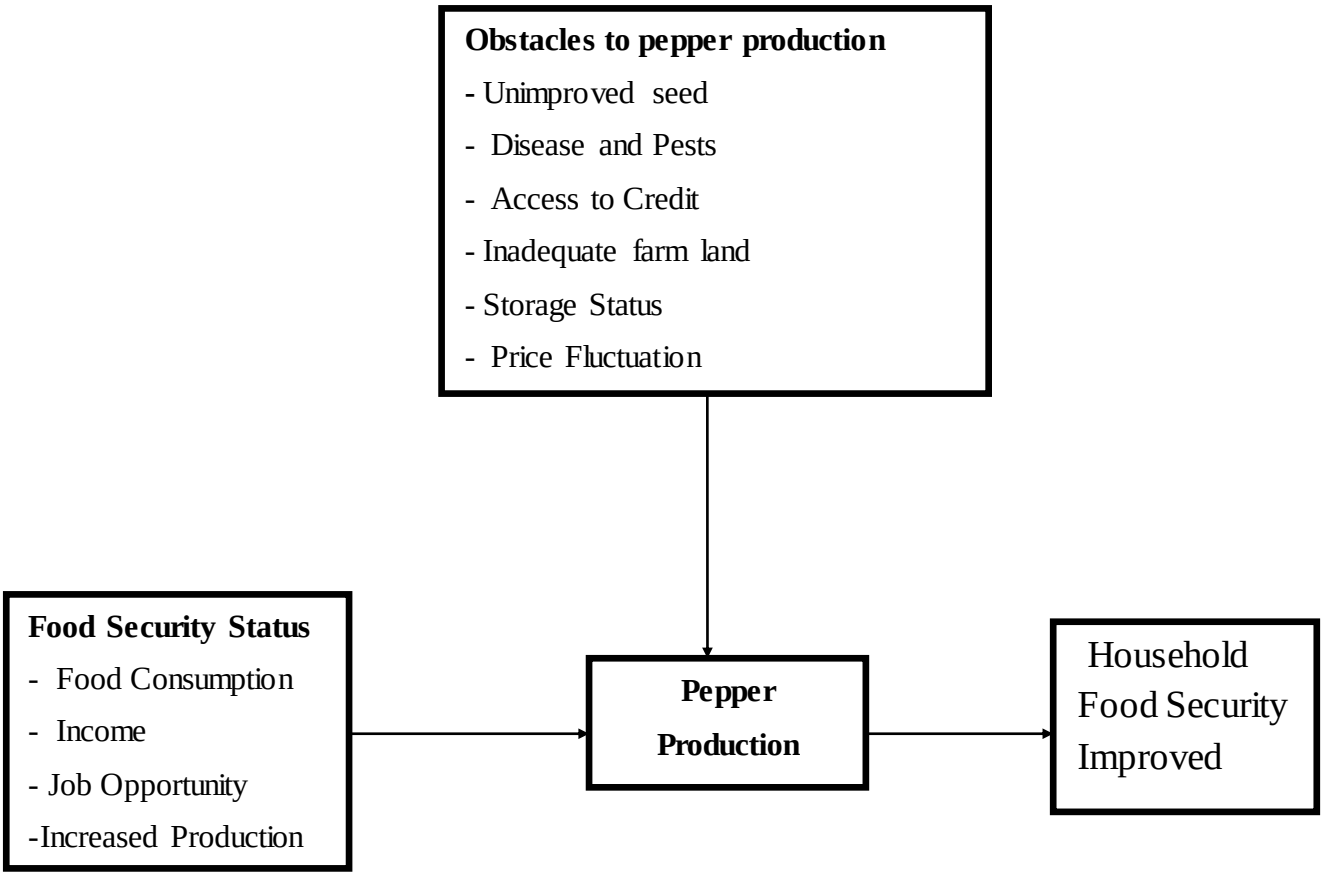

Figure 2.1: Conceptual Framework of the Study (Source: Constructed Based on Literatures, 2017)

CHAPTER THREE: RESEARCH METHODS AND DESIGN

3.1. Description of the Study Area

3.1.1. Location

The study was conducted in Shashogo*Woreda* is one of the ten *woredas* of Hadiya Administrative Zone in the Southern Nations, Nationalities and Peoples' Regional State of Ethiopia. Shashogo is bordered on the west by Lemo*Woreda*, on the northeast by Silt'e Zone, on the south by kembataTembaro Zone, on the southeast by Alaba especially *Woreda*, and on the northwest by Analemo*Woreda*.Bonosha is the main town of the *Woreda* which about 54 km from Hossana town, 140 km far from Hawassa town, and 291 km far from Addis Ababa, capital of Ethiopia. The study area geographically located between 7^0 25`- $7^0$35` N latitude and $37^0$55`- $38^0$5`E longitude (NMA, 2016).

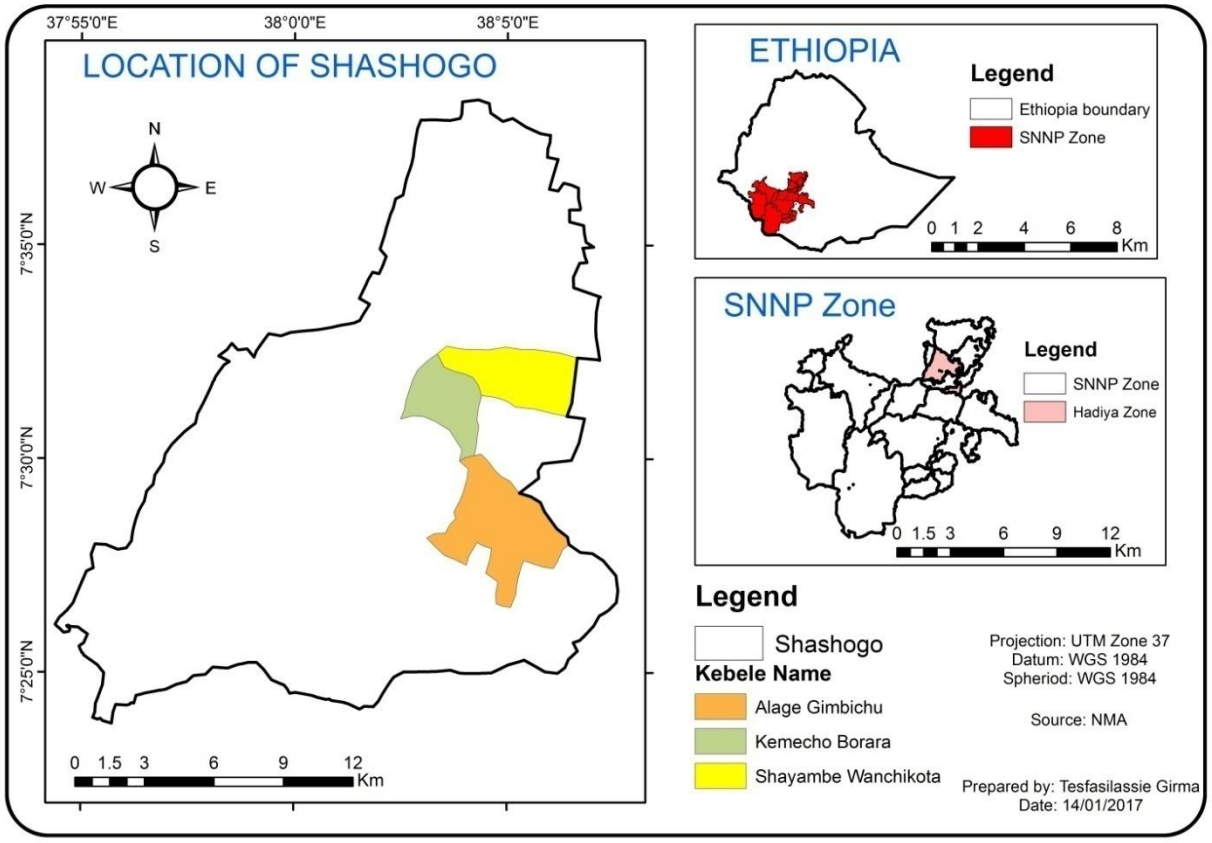

Figure 3.1: Map of the Study Area (Source: NMA, 2016)

3.1.2. Population

The total population of 125,273 Central Statistical Agency (CSA, 2016) in *Woreda* has an estimated were males population of 63,346 and 61,927 were females or 7.92% of its population are urban dwellers. With an estimated area of 314.88 square kilometers, the *Woreda* has an estimated population density of 397.8 people per square kilometer. Shashogo*Wored*a is one of the densely populated *woreda* in Hadiya zone. The *woreda* has a total of 36 *Kebeles*.

3.1.3. Rainfall and Temperature

The rainfall has a bimodal nature in which the months from March to May and June to September are marked by relatively higher rainfall records; while months from November to February are dry. The long rainy season in the area is between June and September, during which crop cultivation takes place in the area. The total annual rainfall reaches 1005.1 mm. The mean maximum temperature is 21.6 °C, occurred during February; while the mean minimum temperature is 18.5 °C occurred during July (NMA, 2016).

3.1.4. Topography and Soil Resources

The study area is in the rift valley floor bounded to the west by mountain *Ambericho,* to the north by Mugo ridge and to the east by mountain Dato. The physiographic set up of the area is the result of rifting, erosion and deposition processes. Most of the Boyo plain falls between elevations of range 1,807 m to 2,247 (m.a.s.l) meters above sea level. The area is surrounded by highlands and is prone to soil erosion at higher altitudes and deposition at the centre. This study was covers most part at Boyo plain. The altitude ranges from 1,876 m to 2,257 (m.a.s.l) meters above sea level.

According to the data obtained from the regional statistical and Shashogo*woreda* Agriculture and Natural Resources Office (2016). Soil is loose materials overlaying on the surface of the earth crust. It is very essential for plant to grow, animal and human get their food from those plants. Examining the type of soil helps for agricultural activities while observed from pollen carrying crops. The soil description for the study area is adapted from the SNNPR and FAO (1990), shape file. The types of soil distribution of the study area are dominated by a brownish alluvial, Vertisols and Acrisols.

3.1.5. Natural Vegetation and Water Resources

The spatial distribution of natural vegetation depends on many factors among which, climate, drainage pattern and soil types play a pivotal role. In Ethiopia, temperature and rainfall, which largely are altitude dependent, determine the type and density of vegetation(Tewolde-Berhan,1991). The commonly observed remnant tree species in the area are Acacia species, *Cordiaafricana,* and Eucalyptus species. These tree species are observed throughout the *Woreda* mostly scattered in the cultivated landscape.

Because of long history of agriculture and high population in the area, vegetation cover is very low. Consequently, erosion hazards on the steep slope areas are enormous. Huge gullies are observed towards the southern end of the *Woreda* and around Bilate River, where soils are totally removed beyond recovery. The *Woreda* has four rivers such as *Bilate, Guder, Metenchose,* and *Meranche*. All rivers (except, Bilate) are seasonal. Bilate is a perennial river, even though the volume of water decreases substantially during the dry season. Recent studies have indicated that the water table of the Shashogo*Woreda* is shallow. There is also Boyo lake swamp covering about 3,210 hectares. The remnant tree species in the study district witness the land cover/ land use change that occurred because of the impact of human activities (SWANRO, 2016).

3.1.6. Agriculture

In the study area agriculture is the main economic activity crop farming and livestock production. The major development challenges of the area include poor productivity due to soil degradation, dependency on rain fed agriculture, and poor socio economic services. The major crops grown in the area include Maize, *tef*, wheat, pepper, haricot bean, sorghum and millet are the dominant crops with regard to area coverage. Pepper is the main cash cropping system to strengthen food production and generating additional income in the study area (SWANRO, 2016). Livestock production is one of the components of agricultural development activity in the study area. Therefore, farmers in the study area livestock production such as cattle, equines(horse, mule and donkey) , shoat(sheep and goat), and chickens which serve the household as source of draft power, meat, milk, honey, income, manure and means of transportation. According to the information from SWANRO, the livestock production challenges are very low which is due to shortage of forage, poor health services, poor breeds, poor management and marketing problems. These agricultural production problems were enhanced with poor delivery of research technology and extension support. Cash income for

household financial requirements is mainly generated from sale of livestock, crop products and from the remittance. Households facing seasonal food shortage receive cash or food transfer, ether 'for work' (through a public work program to employ beneficiaries in soil and water conservation works, building roads and other infrastructures) or 'for free', from productive safety net program. According to (SWANRO, 2017), a total of 4,444 families have got support from food security program.

Table 3.1: Livestock Population of the Study Area

No	Types of livestock	Population in number	Tropical livestock unit
1	Cattle	183,870	317,518
2	Sheep	43,655	5,675
3	Goat	32,867	4,273
4	Horse	3,795	4,175
5	Mule	1,914	2,105
6	Donkey	16,579	11,605
7	Poultry	167,673	21,710
	Total	450,353	367,061

(Source: SWANRO, 2017)

3.2. Research Design

The research design employed in this study was cross sectional survey design which incorporates both quantitative and qualitative survey method. The rationale behind the choice of this approach was the short duration of the study which helps the collection of data to take place at one point in a time.

3.3. Data Types and Source

The research is based primary and secondary sources of data were used to gather reliable and valid information for the study. The primary data of the study was collected directly from sample households and key informants from Shashogo *Woreda* Agricultural development offices. Both qualitative and quantitative research approach were applied for this study. This study was primarily employed qualitatively because the researcher was assessed and gained feedback from

rural households about their perception, experience and knowledge. Also qualitative information of the study was obtained through using interview guidelines with the concerned government bodies and *kebele* administrative. Moreover, the researcher was employed quantitative research method to measure different food security variables. Quantitative data were collected directly from respondents using structured questionnaire. Basic information was gathered on demographic, social and cultural of the sample households.

3.4. Sampling Technique

For the qualitative data key informant interview were conducted and for the quantitative data sources household survey were conducted. According to Shashogo*Woreda* agricultural development office, currently the study area has total population of 125,273 people, of them 63,346 were males 61,927 were females (CSA, 2016). The study area is selected purposefully and carefully due to its known pepper production potential, Accessibility, diverse agro-climatic and socio-economic nature of the *Woreda;* and familiarity and personal observation of the researcher. The sampling design employed in this study involved a multi-stage sampling technique. In this study, stratified random sampling method was employed to identify sample households for inclusion in the study. Sample population was stratified into four groups, the high pepper producer, the medium pepper producer, the low pepper producer and the non income pepper producer the households. Then, sample has been drawn proportionately by using stratified random sampling technique. At the end, the sample households were selected randomly through simple random sampling method using lottery draw technique using probability proportional to sample size (PPS).

3.5. Sample Size Determination

Determining an appropriate sample size is a very important issue in such a research because samples that are too large waste resources, while too small samples may lead to inaccurate findings (Messay, 2012). The study was conducted at rural households' level. To do this, 19 % of the rural households were selected from the existing 1,664 rural households of the three *kebeles*. There are several approaches to determine the required sample size of the study population. For this study, size of sample was decided by using scientific statistical method. The sample size of this study was determined or calculated using the following formulas of sample size determination which were adopted from Yamane, (1967). The formula given as,

$$n = \frac{N}{1 + N(e)^2}$$

Whereas:

n = is the sample size,

N = is the population size, and

e= is the level of precision.

Therefore, the simplified formula to calculate the sample size used for this particular study was determined at 95% of confidence interval.

$$\frac{1{,}664}{1+1{,}664\ (0.0025)} = 322$$

For this study, in the selected three *kebeles* there are about 1,664 households (SWANRO, 2016). Therefore, n = 322 is the sample size of households for reliable results. Thus, the results of 322 households were analyzed, which is sufficient enough according to the sample size calculated above. Finally the sample size in each selected *kebele* made in proportion to the total household heads found in each *kebele*. The total sample size distributed into the sample *kebeles* proportional to the total size of households in order to select the sample households proportional to the size of households in each selected *kebeles*. Calculated sample size, all randomly selected *kebeles* were included in the study with their total number of households (i.e.1,664). In order to select study households the calculated sample size (i.e.322) of the study sample distributed to each *kebele* included in the survey using probability proportionate to their size. The total sampled households from each sample *kebele* are given in the following table.

Table 3.2: Sample Size Determination of Selected *Kebele*

Selected *kebeles*	No of household heads			Sample size
	Male	Female	Total	
KemachoBorara	618	89	707	136
ShayambeWanchikota	523	60	583	112
Alage	326	48	374	74
Total	1,023	197	1,664	322

Note, Sample size in each *kebele*= No of households in *kebele* calculated sample size (322)3*kebeles* of households (N), N = number of total population. **(**Source: SWANRO, 2016).

3.6. Methods of Data Collection

The information was collected from primary and secondary sources. Primary data were gathered by using structured household survey questioners, key informant interview and observation. To complement the primary data, secondary data was collected.

Primary Data: The primary data of the study was collected directly from sample households and key informants from Shashogo*Woreda* Agricultural development offices.

Household Survey: This method employed to collect quantitative data that are relevant to identify the magnitude of food insecurity problems. Since this is appropriate data gathering tool from respondents that were scattered over larger geographical area. The questionnaire was first prepared in English and later translated in to the local language so that the respondent can easily understand the questions. The data was collect from the respondents by enumerators who are familiar to the existing social settings. Finally, sample households were obtained from three selected *kebeles* on simple random sampling methods and was filled the questionnaires.

Key Informant Interview: Is one of the methods used to collect primary data in order to explore their knowledge, experience and information about their demographic change, economic and environmental factors problems of household food security. It is used to collect in depth information about the situation of pepper production and household food security continuously and related issues. The information was drown from knowledgeable rural households or elderly of selected *kebeles*, development agents, chairperson of each *kebeles*, Shashogo *Woreda* Agricultural Development Office coordinators and Disaster risk reduction and food security work process coordinator and experts.

Field Observation: Another data collection instrument employed for data collection was observation. The researcher observed the situation at field level and transect walk to observe the pepper and its contribution to employment, income, production and food security of households livelihood activities, way of life, their fight to cope up various factors that affect food security situation, and government support. During data collection period, the researcher was also conduct observation of *Woreda* demographic and natural situation that affects rural households' food security. This observation help for crosschecking the information gathered through household survey and key informant interview were dealt.

Secondary Data Sources The secondary data were collected: this type of data typically comes from other related studies done by other institutions or organizations. In this research, both published and unpublished materials like Central statistical agency, National mapping agency, and other relevant sources from Shashogo*Woreda* and Zonal offices were used.

3.7. Techniques of Data Analysis

The researcher basic information was gathered on demographic, factors affecting rural household's food security and food shortage. Moreover, qualitative data information obtained from focused household survey, key informant interview and field observation. To analyze quantitative data descriptive statistics were employed such as percentage, frequency and correlation coefficient. The study used multiple food security indicators to capture and analyze the food security has four main pillars such as availability, access, utilization and sustainability. These indicators are used food security measurement models such as Household Food Balance Model (HFBM), Household Food Insecurity and Access Scale (HFIAS), and Household Dietary Diversity Score (HDDS). Finally, binary logistic regression model analysis was used to analyze various factors that affect rural household food security.

Food Availability: Refers to the physical presence of food which may come from own production, purchases from internal market or import from overseas. Similarly, Gregory *et al.*, (2005), explained that food availability refers to the physical existence of food stocks for consumption be it from own production or on the markets. On national level food availability is a function of the combination of domestic food stocks, commercial food imports, food aid and domestic food production, as well as the underlying determinants of each of these factors.

Food access: Household food access is the ability to obtain sufficient food of guaranteed quality and quantity to meet nutritional requirements of all household members. Here, the food should be at right place at the right time and people should have economic freedom or purchasing power to buy adequate and nutritious food (Jrad*et al.*,2010). On the other hand, (Kuwornu*et al.*, 2011) explained that food access is determined by physical and financial resources as well as by social and political factors. Access depends normally on; income available to the household, the distribution of income within the household, the price of food and

other factors worth mentioning are individual's access to market, social and institutional entitlement/rights.

Food utilization: Refers to ingestion and digestion of adequate and quality food for maintenance of good health. This means proper biological use of food, requiring a diet that contains sufficient energy and essential nutrients as well as knowledge of food storage, processing, basic nutrition, child care and illness management (Jrad*et al.*, 2010).

Stability of food: Refers to the continuous supply of adequate food all year round without shortages (Jrad*et al.*, 2010). To be food secure a population, household, or individual must have access to adequate food at all times. They should not be at risk of losing access to food as a consequence of a shock (e.g., an economic or climatic crisis), or cyclically (e.g., during a particular period of the year, seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security. Food insecurity is a complex phenomenon attributable to a range of temporally and spatially varying vulnerability factors such as the socio-economic and political environment, the performance of the food economy, care practice and the health and sanitation situation (FIVIMS, 2003).

3.7.1. Descriptive Analysis

Descriptive statistics frequency, percentages and correlation analysis were used in this study. The household survey data analysis were carried out with entered data in to computer, using Statistical Package for Social Science (SPSS) version 20 software was used to analyze most of quantitative data collected in the survey. This study was generated through qualitative and quantitative method therefore, qualitative and quantitative techniques were used to evaluate data. Moreover, data collected through household survey and key informant interviews were analyzed using textual analysis.

3.7.2. Food Security Status Analysis

For analyzing food security situation of sample households addressing food security pillars are essential. Based on the following indicators the analysis was appropriately analyzed.

Table 3.3: Food Security Indicator and Techniques of Analysis

Indicator of Food Security		Techniques of Analysis
Four Pillars of Food Security	Availability of Food	Household Food Balance Model and Percapita food production per year
	Access of Food	Household Food Insecurity Access Scale and Household Food Consumption Score
	Utilization of Food	Household Food Consumption Score and Household Food Balance Model
	Stability of Food	By analyzing Asset possession: land holding size, oxen ownership, and labor availability and off-farm activities.

(Sources: Messay, 2012)

3.7.2.1. Household Food Balance Model (HFBM)

The model is originally adopted from FAO Regional Food Balance for the first time by Degefa (1996), to fit into the context of the households' under study. He used to estimate the amount of calorie intake generated in food grains. To this effect, he used the following major steps to compute per capita daily calorie intake; Calculating the differences between the total grain outputs and the sum of marketed outputs and amount utilized for seeds and post-harvest losses 10% to get net total food grains available for consumption, converting the net food available in kilograms into equivalent kilocalories, determining the per capita kilocalorie consumed per annum (the total kilocalorie divided by the total number of household members which is adult equivalent), and converting the per capita kilocalorie per annum into the average daily calorie intake was divided by the number of days in a year (365) to obtain daily per capita calorie consumption. finally, compare the daily per capita calorie consumption against the minimum requirement (2100 Kcal) and determine the food security status of the households under consideration, Above 2100 Kcal food secure, between 1800 Kcal – 2100 Kcal Marginally food insecure, between 1500 Kcal – 1800 Kcal Moderately food insecure and below 1500 Kcal severely food insecure.

Since the adoption of this formula was needed to calculate households daily per capita calories of grains (cereals, pulses, oilseeds, etc.) and animal products together. Recently, (Messay, 2012) adopted Degefa's equation and has used the model. For this paper adopted equation was used to analyze household food security situation by measuring households' daily per capita calorie intake. Each type of households annual available grain and livestock products were converted into dietary energy equivalent by using table of conversion factor. The obtained kilocalorie divided by the number of days during the year and for each household member.

A modified household food balance equation employed in this analysis is:

NFA = (GP + GB + FA + GG +FW + MP + DP) - (HL+ GU + GS +GV+SE) where,

NFA = Net food available (quintal/household/year) during the year

GP = Total grain production (quintal/household/year) during the year

GB = Total grain bought (quintal/household/year) during the year

FA = Quantity of food aid obtained (quintal/household/year) during the year

GG = Total grain obtained through gift or remittance (quintal/household/year) in the year

FW = Food for work (quintal/household/year) in the year

MP = Meat, meat based products and poultry (kilogram/household/year) during the year

DP = Dairy and dairy based products ((kilogram/household/year) during the year

HL= Post harvest losses due to grain pests, disasters, thievery (quintal/household/year)

GU = Quantity of grain reserved for seed (quintal/household/year) during the year

GS = Amount of grain sold (quintal/household/year) during the year

GV = Grain given to others within a year (quintal/household/year) during the year

GE = Given to social events within a year (quintal/household/year) during the year

3.7.2.2. Household Food Insecurity and Access Scale (HFIAS)

The recent version of Household Food Insecurity and Access Scale (HFIAS) is one of the most crucial techniques used in the investigation household food security status of households in the

study area. The HFIAS, is most up to date, comparatively simple to run and methodologically accurate (Swindale and Bilinsky, 2006) measure of food insecurity. The validity and reliability of the HFIAS in food security analysis have been tested by different researchers in different rural parts of the world (Coates *et al.*, 2003; Eldward&Nanama, 2004; Knueppe*et al.*, 2009; Messay, 2012). In this study HFIAS technique was employed to classify of rural households in to food secure and food insecure groups.

3.7.2.3. Household Dietary Diversity Score (HDDS)

Swindele and Bilinsk (2006b), defines household nutritional assortment score as the number of diverse food groups inspired over a given situation period. They quarrel that an average consumption of four different food groups per day is likely to offer some diversity in both macro-and micronutrients. Hence, the current data for this analysis was collected 24 hours recalling period as a reference. The food groups recognized during survey was cereals, vegetables, root and tubers, milk and milk products, fruits, oil/fats, meats and meats based products, sugar. Households' that have practiced special occasion, such as funeral and wedding feasts, within 24 hours was skipped during the survey. The person accountable for meal preparation in each household was asked 'yes' or 'No' questions.

Household Dietary Diversity Score (HDDS) simple and rigorous alternative technique for measurement of household food access which can be computed by using the simple equation here below:

$$\text{Average HDDS} = \frac{\sum \text{HDDS}}{\text{Total Number of Households}}$$

According to Messay (2012), it was confirmed that a more diversified diet is highly correlated with such factors as caloric and protein adequacy, percentage of protein from animal sources (high quality protein) and household income.

3.7.3. Binary Logistic Regression Model

Binary logistic regression was used to estimate the relationship between of the study. Therefore, binary logistic regression is the type of regression, which is used when the dependent variable

and the independent variables are any type. The odds of the event defined as: odds = P/1-P. Where, Pindicates that the probability of food insecurity occurring and 1-P is the probability of the event food secure.

3.7.4. Definition of Variables and Working Hypothesis

3.7.4.1. Dependent Variable:

In this study, households' food security situation which indicates food security (households can able to ensure their food status) and food insecurity (households cannot able to ensure their food status). Thus, it is hypothesized to be function of the following independent variables.

3.7.4.2. Independent Variables

Based on the available literature, the following independent variables are hypothesized to affect the households' food security situation.

Sex of the HH: Male-headed households are in a better position to pull labor force than the female headed ones. Moreover, with regard to farming experience males are better than the female farmers. The result was found to be consistent with the hypothesis showing positive influence of sex of household head on food security status at less than five percent probability level. This result is consistent with the findings of Guled (2006), Genene (2006) and Thewodros (2007).

Age of the HH: It measures age of household head in years. As age of household increases, they can acquire more knowledge and experience in farming and pre assume vulnerability and risk conditions of food insecurity. Mostly choice of crops to be grown is influenced by household heads; hence aged farmers were perfect in terms of preference of decision making. Thus, age of household head is hypothesized to affect food security status positively.

Family Size: Household size has its own influence on food security status of households. Family size affects household food consumption with regard to number of consumers (Meskeram, 2011). This is, because with large family size is increased competition on household food consumption and therefore cause the availability dietary energy of household to decrease. Thus, I expect that as the number of family in the household increases food security decreases as there are much more family who are going to share from the given yield or income.

Educational status of the HH: As the household heads education level increased their creative skills of productive income generating activities is also increase which leads to better income and food security situation (Haile *et al.*, 2005). Thus, education status is hypothesized to have a positive effect on household food security.

Farm Land Size: According to Foster (1992), in the world in general, poorest people are landless. The relation between food security and household production in a given land is mainly appropriate to farm households. According to Haile *et.al.*, (2005), also stated there is a positive and significant relationship between farm land size and food security. On the contrary, Altieri (2008), stated that there is inverse relationship between farm size and production indicating that as the farm land size is smaller the household tends to be more productive. In the current study, farmland size is a categorical variable representing the size of the farm land in hectares that the household cultivates. Based on the above argument thus, there could be Positive relationship has been established between farm size and improvement in households' income and food security. It is, therefore, household with a larger farm size to be more food secure than a household with a smaller farm size.

Livestock holding: It measured by Total Livestock Unit (TLU). Livestock is important source of income, food and draught power for crop cultivation in Ethiopian agriculture. Farm households accumulate their wealth in terms of livestock as they are prominent sources of wealth to them. Households with large livestock size are expected to be less vulnerable to food insecurity(Guled, 2006).Therefore, it is hypothesized that possession of large size of livestock (higher value of TLU) increases the likelihood of the household to be food secure.

Asset: This refers to the aggregate income from livestock (asset) and agricultural product. Assets are economic resources that have expected future benefits to the business. Farmers who have got better income can get agricultural inputs on time and they can also purchase food during dry season. It contributes directly and indirectly to food security by providing energy through consumption. Improve household benefit and assist in the exchange of information, thus facilitating decision making.

Total Production (Quintal per Hectare): Higher pepper production per acre typically help improve household food security as there is more food available, both for consumption and selling. The total quintal of pepper harvested to the size of pepper plots was used to the main

pepper produced and consumed. Improvement of production level per unit input. For instance, increase in yield per hectare as a proportion of input per unit area.

Total Income: Income determines the household's ability to secure food. It is an important variable which explains the characteristics of food secure and food insecure households. Income earned from any source improves the food security status of the household. High-income families are less likely to be food insecure. In other words, households who managed to secure higher income from any source have better chance to secure access to food they want than those households.

Source of Income: It is the most households' food security situation source of income in the study area from multiple sources (agriculture products, hand craft, petty trade, daily labor, remittance and government employment). There is also a higher propensity of households experiencing increasing income to spend a bigger proportion of the food budget on a diversified diet thus improving the nutritional status of the household members. Incomes earned from cash crop farming as well as on farm income presuppose this possibility.

Purpose of production: Refers to the process by which resources are transformed in to final goods and services. Production, more specifically, the technology used in the production of a good (or service) and the prices of the inputs determine the cost of production. The contribution of pepper producer to household food security increase in pepper production has clear and important in motivating food security.

Access to credit: Credit is very much useful to purchase inputs such as improved seeds and other important inputs. Hence, farmers who have access to credit would have positive effect on crop production due to use of agricultural inputs which enhance food production and ultimately increase household food security status that indicates the direct relationship of credit and household food security.

CHAPTER FOUR: RESULTS AND DISCUSSIONS

The chapter is divided into nine main sections. The first section demographic characteristic consists of sex, age, marital status, ethnicity, family size, educational status, and source of income of the household. In the second section is about contribution of pepper production to household food security. The third section covers of productive physical asset resources to household. The fourth section is the marketing and storage of pepper production. The fifth section deals with the factors affecting of pepper production. The sixth section describes food security status of the sample households. The seventh Section deals with household food insecurity access scale model of the sampled households. The eighth section household dietary diversity score of sample household. Finally, presents the econometric analysis of factors to households' food security status.

4.1. Demographic Characteristics of Sample Households

This section describes the demographic characteristics of sample households are discussed as follows. These are; sex, age, marital status, ethnicity, religion, family size, education status, sources of income.

4.1.1. Sex of Sample Households

Sex is an important demographic variable to analyze food security status at household level. This is because household food consumption capacities and daily available kilocalories depend on sex of households. The total samples of 322 household heads were involved in the study to investigate pepper production and food security in three identified *kebeles* of the study area. According to survey result indicates that out of the 322 respondents (Table 4.1), indicates that 93.5% (301) of the selected households were male headed, while 6.5% (21) of respondents were female headed households.

Table 4.1**:** Sex of sample households

Sex	Frequency	Percentage
Male	301	93.5
Female	21	6.5
Total	322	100

Source: Field survey data, 2017

4.1.2. Age of Sample Households

Age is an important factor in any agricultural activity. According to Agbo (2006), age is inversely related to performance. Pepper production, just like any other agricultural activity requires intensive labor. Such labor can only be sourced from the young and strong individuals in the populace. Majority of the respondents 193 (59.2%) are within the age group between 41-74 years, respondents 125 (37.1%) 21 – 40 years and the remaining 4 (3.7%) are the age more than 75 years. The implication of the results in table 4.2 is that the pepper production farmers are relatively result shows that age is one of important variable for household food security.

Table 4.2: Age of households

Age of Households	Frequency	Percent
21 - 40	125	37.1
41 - 74	193	59.2
Greater than 75	4	3.7
Total	**322**	**100**

Source: Field survey data, 2017

4.1.3. Marital Status of Households

According the result in table 4.3, from the sample households 96.6 %(311) were married, 3.1% (10) were widowed and 0.3 %(1) were unmarried. The import of this is that as majority of the respondents are married and widowed, they tend to have easy access to use land inherited or owned by their husbands.

Table 4.3: Marital status of the households

Marital of the Respondents	Frequency	Percent
Married	311	96.6
Unmarried	1	.3
Widowed	10	3.1
Total	**322**	**100**

Source: Field survey data, 2017

4.1.4. Ethnic Background of Sampled Households

Ethnicity is one of the demographic variable considered in the study, the results indicated (see Table 4.4 below), that the majority respondents 86% (277) were Hadiya, while Kambata accounts for 6.2% (20), Silte accounted for 4.7% (15) and remaining Hlaba accounted for 3.1%

(10). This composition shows how Shashogo*Woreda* is composed of diversified ethnic groups in the Hadiya Zone.

Table 4.4**:** Ethnic composition of sampled households

Ethnicity	Frequency	Percent
Hadiya	277	86
Kambata	20	6.2
Silte	15	4.7
Hlaba	10	3.1
Total	322	100

(Source: Field survey data, 2017)

4.1.5. Religious Background of the Sampled Households

As results revealed that the most dominant religion of the study area was Protestant Christians (see Table 4.5 below) which includes 46.9% (151) of the total respondents, while the Orthodox Christians accounted for 18.3% (59), and whereas the remaining religions including Muslim religions accounted for 34.8% (112) respectively.

Table 4.5: Religious composition of sampled households

Religion	Frequency	Percent
Protestant	151	46.9
Orthodox	59	18.3
Muslim	112	34.8
Total	322	100

(Source: Field survey data, 2017)

4.1.6. Family Size of Sample Households

The results revealed that family size is the most significant variable to indicate households' food security situation (Table 4.6). Based on size of family, sampled households were categorize into four groups such as less than or equal to 3, 4-6, 7-9, 10-12 and above 13 family size. Survey results further indicated that the greatest part of the family size of the respondents lies between 7-9 and 10-12 from the total sample which covers 47.8% (154) and 32.3% (104) respectively while less than 3 accounts 3.1% (10), 13.7% (44) and above 13 accounts 3.1% (10) family size of the sampled respondents.

Table 4.6**:** Family size of Sample Households

Family size	Frequency	Percent
<= 3	10	3.1
4-6	44	13.7
7-9	154	47.8
10-12	104	32.3
> 13	10	3.1
Total	**322**	**100**

(Source: Field survey data, 2017)

4.1.7. Educational Status of Sample Households

With regard to educational level of household heads, 322 households covered in the survey for this study, results showed that, 60.7% (194) of the household heads never attended any formal education (cannot read and write). The percentage of the sampled household which could read and write was only 24.8% (80). The respective percentages of the household head with primary educational level were 13.6 % (45), and secondary educational level attended 0.9 % (3) subsequently, this indicates that most of the respondents could only read and write.

Table 4.7: Education status of sample households

Education	Frequency	Percent
can't read and write	194	60.7
can read and write	80	24.8
primary school	45	13.6
secondary school	3	.9
Total	**322**	**100**

Source: Field survey data, 2017

4.1.8. Income Sources of Sample Households

The distribution of sample household size given below in Table 4.8 shows that the majority of household heads 311 (96.6%) were from farming, 5 (1.6%) household heads petty trade, 3 (0.9%) household heads monthly salary, 2(0.6%) household heads safety net and the remaining 1 (0.3%) household heads daily laborer. It is expected that the occupation of respondent should have a positive relationship with their farming activities. The assumption is that the respondents in farming related occupation should be more involved in the pepper production. The distribution of respondents according to their major occupations is presented in Table 4.8. The Table indicates that about 96.6% of the respondents have farming as their major occupation.

Table 4.8: Distribution of income sources to households

Income sources	Frequency	Percent
From Farming	311	96.6
Petty Trade	5	1.6
Daily Laborer	1	.3
Monthly Salary	3	.9
Safety Net	2	.6
Total	**322**	**100**

(Source: Field survey data, 2017)

4.2. Contribution of Pepper Production to Household Food Security

Contribution of pepper production to the household income generation from pepper play important role for households in the study area. According to the (SWANRO,2016), report from the sample population, pepper producer have generated income from their pepper.The study gathered information pertaining to household pepper production revealed different observations. Based on key informants who were agricultural extension officers the study revealed that the main pepper cultivated in the study area. Exchanging food item in household level normally based on availability of pepper in which not only obtained from home produce but from any other sources like purchasing food.

Farmers contact with development agents is one of the individual extension methods with strong power to bring behavioral change among farmers (Van Den Ban and Hawkins, 1996; as cited by Dereje, 2008). The potential explanation is that development agents are the major sources of information, provides technical support, advice on use of the availability of technology, facilitate the use of input to farmers, encourage for extension package participation and other development issues for rural farmer which have aggregated impact for enhancing production and productivities. Pepper production is one of the main activities of their livelihood that household engaged in the study area.

The contribution of pepper for your households in the study area is increased household income, increased agricultural production, and diversification of crops grown. Based on this, the study indicated that most respondents were derived 'their income mostly from pepper product relationship between household food security and pepper of production. According to the home consumption

survey undertaken, the study identified an average household home consumption. The researcher observed the situation at field level of the pepper and its contribution to employment, income, production and food security. A photograph was also taken by using digital camera.

Figure 4.1: Pepper production by households (Photo by the Researcher, 2017)

The data gathered from key informant shown that there is a low rainfall in pepper production and productivity between especially after two year disease and pest attack disappears of pepper product development was many times reported. According to Key informants, pepper production has increased due to the introduction of purchasing pepper from market and increased income from pepper to buy more exchanging food items. Key informants also said that with the introduction of food security, there emerged changes in the way they use to get pepper product for their household income.

These changes are advantageous because it has brought about easy access to food consumption. Therefore, this pepper production contributed to the improvement of household livelihood and food security in the study area. According to survey result most of the respondents replied that in the study area the peppers cover high proportions on contribution to household income generation of production was selected households head. Based on the observation, generally pepper has a vital contribution to household food security in the study area. However, the pepper

percentage contribution in household food consumption was almost the same in all three *kebeles* where the survey was undertaken (Table 4.9).

Table 4.9: contribution of pepper for households

Contribution of pepper for HH	Frequency	Percent
It Increase Income	150	46.6
It Reduces Purchasing Pepper from Market	35	10.9
It Increases Foreign Exchange Rate	4	1.2
All	133	41.3
Total	**322**	**100**

(Source: Field survey data, 2017)

4.3. Productive Physical Asset Resources to Households

4.3.1. Landholding size

Land holding size is considered as a critical production factor that determines the type of crops grown and the size of crop harvests. Moreover, availability of pastureland is an important issue for livestock rearing. Therefore, under subsistence agriculture land holding size is expected to play a significant role by influencing farm households' food security (Degefa, 2002). Land is one of the most important assets in the study area because of the major source of food obtained from own production. Hence, landholdings continually decline both in size due to redistribution among family members and quality is affected due to continuous cultivation leading to soil nutrient mining and erosion. Children share the holdings of their families as they get to adulthood. Due to population growth landholding size were reduced from time to time and considered as the major factor for food insecurity.

Table 4.10:Sample households land holding size

Total farm land size	Frequency	Percent
< = 0.5	32	9.9
0.51 – 1	126	39.2
1 - 1.5	83	25.8
1.5 – 2	42	13.0
> 2	39	12.1
Total	**322**	**100**

(Source: Field survey data, 2017)

As in most of the highlands of the country the landholding of the farmer in the study area is very small. Survey result indicated that from the total 322 sampled households 9.9% (32) have less than 0.5 hectare, while 39.2% (126) sampled households have between 0.51-1hectare, 1-1.5 25.8% (83), 1.5-2 13% (42) and sampled households have above two hectares account only for 12.1% (39) (See on Table 4.10 above). During the key informant interview in that was realized a study area *kebeles*, it was noted that the areas are characterized by very small and highly fragmented landholdings that derived from the higher density of population. Therefore, average landholding sizes have been steadily going down. All secondary information sources also confirm such finding. For instance, the *Woreda* Agricultural Development Office estimates the average landholding of Shashogo*Woreda* to be 0.5 hectares. Responds of sample households informed that population pressure consisted the major cause for the reduction of farm lands in the study area.

4.3.2. Cultivated Farmland Holding Size

The results indicated that from the total sampled households 4.3% (14) had cultivated land size of less than or equal to 0.25 hectares, from the total sampled household 31.4% (101) had cultivated land between 0.25-0.5 hectares, 40.4%(130) 0.5-1 hectares, 13% (42) 1-1.5 hectares, and 10.9% (35) greater than 1.5 hectares. Survey result indicated that from the total 322 sampled households cultivating land holding size hectare in the study area. This reveals that land size in the study area considered one of the main factors as it consists the requirement to produce adequate amount of food items. This indicates that shortage of land for farming consists one of the most important challenge households' food security in the study area.

Table 4.11**:** Distribution of cultivated land size

Total land area cultivated	**Frequency**	**Percent**
< = 0.25	14	4.3
0.25 - 0.5	101	31.4
0.5 – 1	130	40.4
1 - 1.5	42	13.0
> 1.5	35	10.9
Total	**322**	**100**

Source: Field survey data, 2017

4.3.3. Land Productivity

Land productivity is one of the most necessity for growth in agricultural sector particularly, crop production. Land productivity is major determinant variable for agricultural productivity to the amount of yield obtained per unit of land. When, the amount of yield harvested from a plot of land rises without expanding of landholding. Food production could also rise through time. Hence, not only access to farm land matters, but also the quality of farm is important.

The level of the farm land fertility determines crop productivity which also determines food status of the rural farmers. If we examine soil fertility condition, from the fertile soil, farmers are able to get more product than poor fertile agricultural land. Soil fertility highly affects agricultural production. Some of these thoughts were also highlighted by the survey respondents. Where sampled respondents were asked to give their land productivity condition depending on their different crop production, from the total sampled respondents only 4.7% indicated that their land was fertile while the 80.7% respondent indicated medium land soil fertility, 10.9% respondent said less fertile and remained 3.7% respondent said their land fertility was poor.

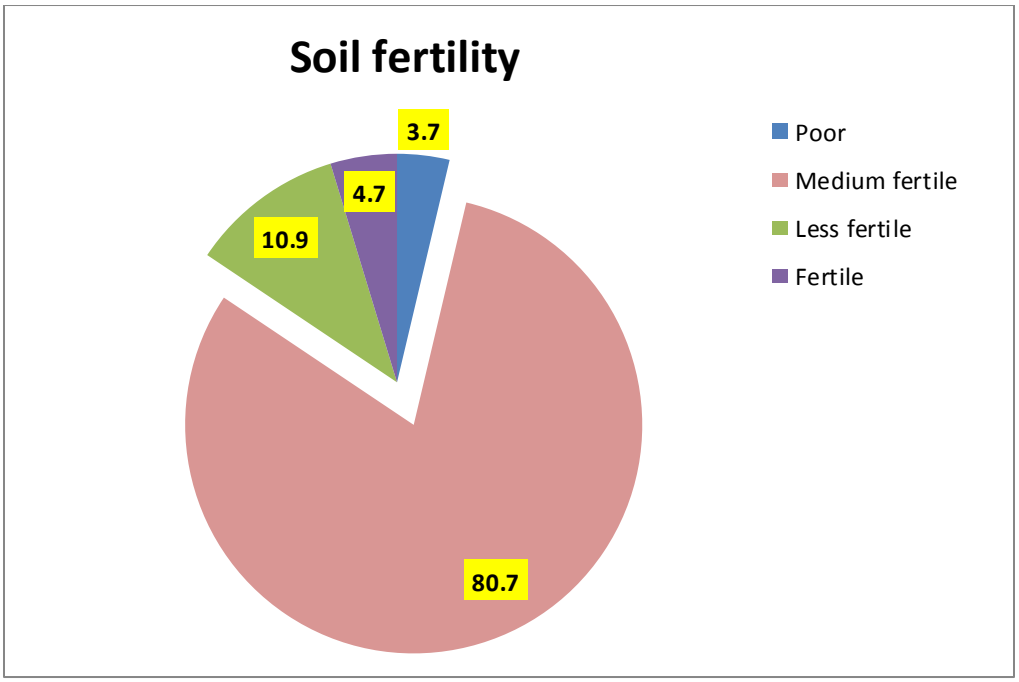

Figure 4.2: Distribution of soil fertility condition. (Source: Own construction based on field survey, 2017)

4.3.4. Access to livestock and farm oxen ownership

4.3.4.1. Livestock Ownership

Livestock sub-sector determines the food security position of the peasants serving as a source of food, draft and transport purpose, cash earning sources, means of assets and manure as well as a means of crop production. In addition farmers use livestock to safeguard for sudden cash requirements to purchase food at the time of food shortage, to pay credit payment, for taxes and other purpose. The possible explanation is that livestock is the most important assets in the study area for different purposes. However, a significant number of the community had no adequate number of livestock population which could be one of the major challenges for food security in the study area. The Shashogo*Woreda* office of agriculture reported that livestock and livestock products contribute 35% for the annual cash income of the households.

Particularly from the livestock possession oxen are one of the critical assets in the study area but the oxen ownership is limited due to poor household economic status. According to the KIIs in the sampled *kebeles*, households who have no oxen are considered as poor, as a result the *kebele* administrators and different governmental and non-governmental organizations used the oxen possession for aid selection criteria. The main livestock types in the *woreda*are cattle, shoats, equine and poultry also the product like meat, milk, butter, and egg. To compare the flock size between the samples household groups (food secure and insecure), the herd size was changed in to Tropical Livestock Unite (TLU) based on Stock *et al.*, (1991), conversion factor.

Table 4.12: Livestock ownership of sampled households

Variable	No of food secure HH	No of food insecure HH	Total No of Sampled HH	Mean difference	t-value	P-value
Livestock possession	35	287	322	2.27166	4.916	0.000

Source: Computed based on field survey data, 2017

Accordingly, the represent holding of livestock in food secure households were 3.6939 TLU with the Std. deviation is equal to 2.4866 and food insecure households were 2.2667 TLU with the Std. deviation is equal to 1.67. The t-value for this value (4.916) revealed that there is significant difference between food secure and insecure households at (p-value = 0.000) and the mean difference is equal to 2.27 (see on Table 4.12 above). This clearly shows that there is significant role of livestock holding in food secure and food insecure households. This means that the

ownership of more livestock increases the probability of improve food security. Livestock increases households income from sale of animal and farmers can finance their agricultural requirements easily from livestock income.

4.3.4.2. Limited Access and Supply of Agricultural Input

Inappropriate technological application and poor input use contribute a great share to low agricultural productivity. Therefore, it leads to low food production and erodes the capability of households to feed their family from own production. According to survey results showed on (see on Table 4.13 below), from total sampled households in 2016/2017 production year lack of improved seed access 37.3 % (120), lack of income sources 24.2% (78), lack of fertilizer access 18.3% (59) and lack of farm oxen 20.2 %(65).

Table 4.13: Rational agricultural farm input of sample households

Rational agricultural input	**Frequency**	**Percent**
Lack of income sources	78	24.2
Lack of farm oxen	65	20.2
Lack of fertilizer access	59	18.3
Lack of improved seed access	120	37.3
Total	**322**	**100**

(Sources: Field survey data, 2017)

On the other hand, the reports obtained from the Shashogo*Woreda* Agricultural and Natural Resources Office also depicted that unsuitable application of limited access agricultural farm inputs such as lack of fertilizer access, lack of improved seed access, lack of income sources and lack of farm oxen rural household's agricultural production and productivity. But the agricultural inputs that used for their farm in the study area are not enough. Key informant interview the problems of sample households to use modern agricultural inputs to enhance better productivity for their households, such as extension services and lack of improved seed access were inadequate to rural farmers enable to access credit service to purchase agricultural farm inputs. The main reason for this problem is not enough household lack of income sources, lack of fertilizer access, poor rural credit system and high modern agricultural input costs.

4.4. Marketing and Storage of Pepper Production to Households

A market is any one of a variety of different systems, institutions, procedures, social relations and infrastructures where by persons trade, and goods and services are exchanged. Most of them sell their product on the local market by bringing the entire product at once.

4.4.1. Transporting used to sample households

Means of transport of produce to the market is by walking due to the short distance from the farm gate to the market. Maalekuu *et al*., (2010), indicated that transporting is often the most important factor in the marketing of fresh produce and that losses directly attributed to the transport conditions can be high, hence produce should be kept in the best possible conditions during transport. As results revealed that the most dominant transporting of the study area was animal power (see Table 4.14 below) which includes 96.3% (310) of the total respondents, while the human power accounted for 3.1% (10), whereas the remaining transporting including motor vehicle and car transporting accounted for 0.3% (1) and 0.3% (1).

Table 4.14: Distribution of transporting using to households

Use for transporting	Frequency	Percent
Car	1	0.3
Motor vehicle	1	0.3
Animal power	310	96.3
Human power	10	3.1
Total	**322**	**100.0**

(Source: Field survey data, 2017)

4.4.2. Packaging Material of Sample Households

The packaging material used should be acceptable to the farmer, middle-man and consumer, as well as extending the shelf life of the produce and should be easy to handle (Bleasdale and Salter, 1991). However, personal interaction with the traders and my own observation revealed that pepper packed in sacks and loaded in vehicles encountered bruises and deformities when loaded due to stacking, this reduces the shelf life. According to the household survey result indicated on Table 4.15, 280 (87%) of surveyed areas respondents were in sack, 1(0.3%) were basket and wooden tray box 41(12.7%).

Table 4.15: Packing transportations of sample households

Means of Packing the Produce for Transportation	Frequency	Percent
In sack	280	87.0
Basket	1	0.3
Wooden trays/ box	41	12.7
Total	**322**	**100.0**

Source: Field survey data, 2017

4.4.3. Storage of pepper to sample households

According to the study finding these factors are due to low yield, improper storage by farmers, and plant diseases. Selecting storage system is a major farming activity in order to avoid post harvest losses. The data shows that the storage system in the study area. The total sample households 121(37.6%) of placed their pepper in store or '*gotera*'. The rest stored their pepper on the floor and in a large basket '*kefo*'. About 138(42.9%) of the total sample households indicate that they put their pepper by filling in sack and placing it at '*ko*t' (shelf). The distribution of sample household size given below in Table 4.15 shows that the inside of house 63(19.5%).

Table 4.16: Storage of pepper to sample households

Storage of pepper	Frequency	Percent
Filling in sack and placing in*'Kot'*	138	42.9
In store/*'gotera'*	121	37.6
Inside of house	63	19.5
Total	**322**	**100.0**

(Source: Field survey data, 2017)

4.5. Factors Affecting of Pepper production

The contribution of pepper production to household food security and income generation has been affected by surveyed different factors affecting of pepper production including drought, lack of market information, inadequate transportation facilities, inadequate government support, inadequate storage facilities, shortage of improved seed, disease and Pest attack, access to credit and price fluctuation. According to (see on Table 4.17 below), indicates households respond by saying yes or no on these factors of pepper production. Among this, factors particularly shortage

of rainfall amount, drought, diseases and pest attack are dominant and respectively factors affecting of rural households' food production and food availability as respondents gave information in the study area. Because, this factor directly affect pepper production and decreases households' food availability situation.

Table 4.17: The factors affecting of pepper production

Factors affecting	Response			
	Yes		No	
	Frequency	Percent	Frequency	Percent
Rainfall shortage/Drought	302	93.8	20	6.2
Lack of market information	209	64.9	113	35.1
Inadequate transportation facilities	162	50.3	160	49.7
Inadequate government support	173	53.7	149	46.3
Inadequate storage facilities	175	54.3	147	45.7
Disease and pest	322	100	-	-
Access to credit	199	61.8	123	38.2
Price fluctuation	270	83.9	52	16.1

(Source: Field survey data, 2017)

From KemachoBorara*kebele* key informants indication, the most factors to produce adequate amount of crop production is drought, insufficient rainfall amount, inadequate landholding size, shortage of improved seeds, poor income access to purchase adequate amount of inputs and access to credit. Agriculture dominates the Ethiopian life to the extent that little progress can be made unless agriculture is attacked directly, by and large, agriculture in Ethiopia is subsistence. This is particularly true to the major food crops grown in the country. The major food crops are produced in almost all regions of the country in spite of the variation in volume of production across the regions. The variation may be attributed to the extent of area devoted to each crop type, weather change and a shift in preference for the crops grown (CSA, 2014).

According to Shaymbe Wanchikota *kebele* key informant interview participants, the major food insecurity factors are recurrent drought and shortage of rainfall amount, because in 2016/2017 production year rain fall amount was very little than the other times even different crop types were burned out immature as a result of insufficient rainfall amount, because of Shashogo*Woreda* peasants almost all depend on natural rainfall amount to produce particularly sufficient amount of crop products and Shashogo*Woreda* located in topographically lowland area, which is not that insufficient irrigation purposes.

4.5.1. Drought

Erratic rainfall are the most critical environmental factors that affect food security in the study area and rain starts late after the normal planting season has already gone and stops early when the cultivated crops are at their vegetative stages of growth. Unpredictable weather conditions are important natural factors that make households vulnerable to food shortage. However, these resources are getting depleted over time at an alarming rate and affects farmers' agricultural production and productivity. According to survey result table 4.17 above indicates households yes 302(93.8%) households no 20(6.2%). In general, the ecology in the area has become more fragile than ever resulting in a decline in agricultural production and productivity, frequent food shortage during June, July August and unpredictable weather condition.

4.5.2. Lack of market information

A market is traditionally defined as a specific geographical area where buyers and sellers meet for exchange of goods and services. According to the KIIs of the survey area, the most common way they obtain goods and services they do not produce ourselves is to buy them from others who specialize in producing them. Marketing information can help predict, strategize, plan and act expediently, rationally and efficiently, thus reducing business risk, transaction costs and enabling market participants to explore business opportunities (Odendo and De Groote, 2007).Survey result show table 4.17 above indicates households yes 209(64.9%) households has no 113(35.1%).In the study area, farmers marketing decisions are not based on market price information. Poorly integrated markets may convey inaccurate price information, leading to inefficient product movement. The key informant interview result showed that lack of market information is the most important factor that determines whether to continue or quit the pepper production business. Thus, lack of commitment by the local and regional governments in establishing effective information system for improving time and situation specific information is the critical food security challenge in the *woreda*.

4.5.3. Inadequate Transportation Facilities

Poor transportation is another most important factor in the marketing of fresh produce in the *woreda*, as reported by the majority ofkey informant interview members. Ideally, transport would take produce from the grower directly to the consumer, as in many faraway *kebeles*. However, harvested farm produce are transported with great difficulties from the farms to market

or points of processing. It was reported by the KIIs that the farm products are mostly transported to the market for sale. From the result it was seen that in the *woreda's* marketing systems (serving towns, cities or distant regions) the cost of transport contributes significantly to the price paid by the consumer, and sometimes exceeds the value of the raw produce. Households' survey result table 4.17above indicates households yes 162(50.3%) households no 160(49.7%) According to Maalekuu *et al.*,(2010), losses directly attributed to transport can be high, particularly in developing countries. Damage occurs as a result of careless handling of packed produce during loading and unloading; vibration (shaking) of the vehicle, especially on bad roads; and poor storage, with packages often squeezed in to the vehicle in order to maximize revenue for the transporters. In another KII with *woreda* experts, transport using closed vehicles with no ventilation; stacking patterns that block the movement of air; and using vehicles that provide no protection from the sun. Breakdowns of vehicles can be a significant cause of losses in some *kebeles,* as perishable produce can be left exposed to the sun for a day or more while repairs are carried out. Overall result showed that produce are not kept in the best possible conditions during transport and that the haulage of produce is not quick and efficient. Yet produce are not properly packaged and loaded on a suitable vehicle. Thus, lack of transport is one of the major challenges that hinder household food security in the *woreda*.

4.5.4. Inadequate Government Support

The informants said that the Shashogo*Woreda* Agricultural Natural Resource Office is not providing the intended support for managing all problems related to agricultural production, including red peppers. According to *woreda* officials, major problems are outdated management techniques, appliance of old varieties, build-up of plant diseases, and insufficient motivation from the side of the farmer. The households' survey result indicates table see above 4.17 households' yes 173(53.7%) households has no 149(46.3%). Marketing experts of agricultural products are providing market information, organizing and giving trainings and raising awareness on the functioning and purpose of farmer cooperatives. According to the experts, the major problem is small amount of farmer cooperatives that work with red pepper. Thus, inadequate government support in terms of expansion of farm land and provision of farm inputs is hindering their maximum productivity household food security.

4.5.5. Inadequate Storage Facilities

As to the informants, inadequate storage facilities are affecting pepper production for it is bulky and perishable, farmers and producers face storage loss and quality deterioration. To solve these problems, farmers construct local storage and processing facilities at household levels while the support by the government was insignificant. According to survey result show table 4.17 above indicates households' yes 175(54.3%) households have no 147(45.7%). Storage facilities are very important for marketing and to make them available at required season. However, households in the study area store pepper by preparing a local above ground*Kot*. Despite the fact storage services help for smooth and continuous flow of products marketed and create time utilities, there is no well structure storage system in the *woreda*. That contributed a lot for household food insecurity.

4.5.6. Disease and Pest Attack

Informants argue that non-hygienicseed-bed, improper watering, disease infected seeds, and lack preventive chemicals are the major reasons for diseases and pest prevalence in the*woreda*. This was directly related to agricultural input access problem. Unavailability of pesticide and herbicides mainly create these problems in addition to the problem of accessing to improve and diseases resistance seeds. This shows most farmers are using poor quality seeds, as high quality seeds are often not available at planting time and are expensive. The other reason for this problem is the problem of management skill. Inadequate farmer skills and knowledge on production and farm management creates such problems. According to the survey result table 4.17 above indicates majority of the respondents' yes 322(100%). This is mainly related with poor extension service in the pepper producing areas of the *woreda*.

4.5.7. Access to Credit

Credit facilities are important institutional services to finance poor households for input purchase and ultimately for utilization of new technologies. However, from household survey 199 (61.8%) households have yes access to credit while 123 (38.2%) respondents have no access to credit (seen on table 4.17 above). *Woreda* food security work process expert who explain about credit facilities.

> *In this Woreda the main sources of credit for rural households according to their level of importance, are Household Asset Building Programme ,Omo Micro Finance*

Institution and Rural Saving and Credit Cooperatives and other private money lenders who provide credit based on local interest rates.

Moreover, the *Woreda* food security coordinators strengthen the expert idea by saying: "*many rural households have improved their livelihood system by using credit services."* However, most sample *kebeles* key informants indicate that the credit services are not accessible to improve their livelihood system. That means the availability of services and the rate of interest could not attract to use the credit services. Market facilities are the process of production and distribution of agricultural communities but poor market access affects households.

4.5.8. Price Fluctuation

Farmers prioritize the development of low price inputs to increase crop productivity, price bargaining power. Even though, the regional government tried to provide agricultural inputs at reasonable price, some farmers of the *woreda* are still complaining on the price of agricultural inputs. On the other hand, non-governmental organizations, cooperative organizations and private institutions are not providing proper attention on the supply of these inputs on low price, on time and in adequate amount. According to survey result indicates above table 4.17 household yes 270(83.9%) household has no 52(16.1%). The government left agricultural products to the interplay of market forces since it is often affected by the fluctuating market price. In this regard, there are no practically applied policies that support farmers to get reasonable price for their perishable vegetable produce to stay and invest more in the sector the price an indication of the extent of the price fluctuation. As a result, household food insecurity rises to chronic levels.

4.6. Household Food Security Situation

4.6.1. Food Security Status of Rural Households

Household dietary energy supply measured in kilocalorie (kcal) was used to determine food security situation. During survey period the necessary data were gathered from sample households concerned on each type of annual grain and livestock products, it was converted from kilogram to kilocalorie by using Household Food Balance Model (HFBM) to quantify the net available grain and livestock products. Household food balance model is a simple numeric tool

used to quantify net food available at household level for a specified period of time, usually one year. It measures daily per capita calorie consumption among household members.

Then, calculated kilocalories were compared based on the national average daily calorie requirement, which is 2100 kcal as of Ethiopian Health and Nutrition Institute (EHNI, 1997) developed for Ethiopia. According to Devereux (2006), households food security status classification with caloric consumption per person per day like households can consume consistently above 2100 kcal which indicates food secure, between 1800-2100 kcal consuption indicates marginally food insecure, between 1500-1800 kcal moderatily food insecure and less than 1500 kcal consumed by households severly food insecure. Hence, household member who obtain on average more than 2100 kilocalorie were classified as to be food secured whereas compared to those who obtained less than 2100 kilocalories who were classified as to be food insecure.

As indicated in Table 4.18 below, the results of household food balance model calculation shows that from the total sampled 322 households, only 10.8% (35) households were able to assure adequate daily per capita dietary energy supply and 89.2% (287) of the surveyed households were found to be food insecure compared with the national recommended minimum daily requirement which is less than 2100 kcal per day per person. The HFBM results indicate that majority of sample households in the study site were exposed to the problem of food shortage. According to survey results majority of the study area respondents were not able to meet the minimum dietary energy requirement were not able to reach dietary daily per capita threshold meaning (2100 kcal), respectively. Accordingly from the each *kebele*respondents were able to meet the minimum recommended dietary requirement Percentage distribution.

4.6.2. Availability of Daily Dietary Energy of Sample Households

The household food balance model computation result revealed that from total sample households, 69.9% (225) had intake of less than 1500 kcal, 10.9% (35) of the households had intakes ranging from 1500-1800 kcal per day, 8.4% (27) households fall in the range of 1800-2100 and the remaining 10.8% (35) of them have a daily per capita kilocalorie available within the greater nationally recommended value of 2100 kcal.

Table 4.18**:** Distribution of daily per capita kilocalorie of sample households

Categories by Kcal	**Frequency**	**Percent**
<1500	225	69.9
1500-1800	35	10.9
1800-2100	27	8.4
>2100	35	10.8
Total	**322**	**100.0**

Kcal = kilocalories (Source: Field survey data, 2017)

In general, from total sample households of the study area only 10.8% (35) households ensured minimum recommended allowance of daily per capita kcal, this indicates that from the total households of the sample, small proportion were food secured and they could get sufficient amount of food but the majority of the sample households 89.2% (287) of the surveyed households were found to be food insecure compared with the nationally recommended minimum daily requirement which is less than 2100 kcal/day/ person.

4.6.3. Food Sufficient Months of Sample Households

According to the survey result shown below on Table 4.19, in the last twelve months sample households were vulnerable to food shortage. From total respondents 28 (8.7%), 16 (5%) , 18(5.6%), and 207 (64.2%) obtained enough amount of food from all year round, from 9-12 months, from 6-9 months ,and 3-6 months respectively. The remaining less than 3 months 53(16.5%) sample households were getting adequate amount of food for more than 3 months in the year.

Table 4.19: Sample households by food sufficient months

Household sufficient food	Frequency	Percent
All year round	28	8.7
From 9-12 months	16	5.0
From 6-9 months	18	5.6
From 3-6 months	207	64.2
Less than 3 months	53	16.5
Total	**322**	**100.0**

Source: Field Survey, 2017

Households with large household size have also to bear with large period of food gap and have positive and significant relationship with food security. When we observe in the above table, food deficiency period increased with an increasing of household size. By looking the table in another angle, household size have positively related to food insecurity, which means the larger households have vulnerable to food insecurity than the smaller household size.

As it is indicated on Table 4.19, education was found to have a significant and positive relationship with household food security. From total respondents 28 (8.7%), 16 (5%) , 18(5.6%), and 207 (64.2%) obtained enough amount of food from all year round, from 9-12 months, from 6-9 months ,and 3-6 months having less than six months food sufficient but more than six months they were exposed to food deficit.

4.6.4. Food Insufficient Months of Sample Households

The key informants of the study area explained that the majority of households obtain adequate amount of food particularly during harvest and post-harvest season, which is from November to February. This indicate that, the opportunity of household's food availability and accessibility start from November and reach climax in the months of December and January then in February start to decline at decreasing rate. From each sample *kebele* areas food insufficiency problem as follows: The crop and livestock production could not cover yearly food need of our family. In our*kebele* case, different factors attributed for food insufficiency.

were facing severe food insufficiency for more than three months. As shown in table 4.20 below, almost the entire respondents (N = 322)were facing severe food insufficiency for more than three months.The respondents said that there is a chronic food shortage from September to December 2(0.6%), from January to April 22(6.8%), and from May to August 298(92.6%). These occur due to different environmental, demographic, economic and socio-cultural factors of food security in which the majority of sample households were vulnerable to food insecurity.

Table 4.20: Distribution of households by food insufficient months

Food insufficient year	Frequency	Percent
None	0	0
From September- December	2	0.6
From January- April	22	6.8

From May-August	298	92.6
Total	**322**	**100.0**

(Source: Field survey data, 2017)

From the experience, our household members most of the time exposed to food deficit from May to August. Maize products covered more than three months food gap. This product is very familiar food in our society and covers half of our land. Even at severe hunger season from other areas especially from the drier area as our relatives send their children to live through the food crisis and for the remaining relatives we provided maizeproduct specially *Qita*as a gift. The other most significant problem that reduces the production in our area is sale of maize in order to purchase coffee, salt, oil and soap but this cause's maizedisease, due to this factor the maize production and productivity reduced. Even now, those who do not have maize products are exposed to food insecurity where as those who have maizeproduct owners are better food secure.

4.6.5. Main Food Sources of Sample Households

Most of the time access of food is depends on whether households has enough income to purchase food at existing price or has sufficient land and other resources to grow its own food.

Table 4.21: The main food source of sample households

Main food source	Frequency	Percent
Own Production	214	66.5
Purchased From the Market	39	12.1
Aids From the Government	69	21.4
Total	**322**	**100.0**

(Source: Field survey data, 2017)

As it is indicated on Table 4.21, from total sample households majority 214 (66.5%) of them were get their food through own farm production and 39 (12.1%) respondents also obtained food through purchasing from market. From key informant point of view, in order to purchase the right amount of food, income level affects households' access of food, even those who obtain income from different angles were not cover their yearly food requirement and spent great proportion of their income to purchase food items and they were exposed to price shock. The remaining amount of 69 (21.4%) respondents obtains their food through transfer of gift or aid, respectively.

4.6.6. Food Shortage of Sample Households

However, most of the farmers are experienced food shortage every year; there is a difference in duration for which households have out in the open to the problem. The main economic base of the study arealies on a survival rain-fed agriculture, with high rainfall unpredictability in occurrence, spatial and temporal distribution of rainfall. Dependence on unreliable and low productivity, rain-fed agriculture was the primary determinants of household's food insecurityin Ethiopia (Devereux, 2000). Even under normal rainfall distribution, agricultural production often fails to sustain life of the community for a prolonged period throughout the year. Farm management system in the *Woreda*follows traditional method and the irrigation practices are very limited due to scarcity of surface and ground water in the area, and agriculture is dependent on rain-fed farming for this matter.The survey result shown on (see table 4.21 below), from total sample households 322 food shortage.

Table 4.22: Food shortage of sample households

Food shortage	**Frequency**	**Percent**
Yes	212	65.8
No	110	34.2
Total	**322**	**100.0**

(Source: Field survey data, 2017)

The information forward, from key informant interview, indicated that household's waste grain, remittance and other income capital during good or grain harvesting seasons' (December to February) then, majority households faced in food shortage for nine months especially, march to November. The study results show that, households face food shortage in the year under study. Amongst to majority of households respondents "Yes" food shortage 212 (65.8%) and 110(34.2%) the respondents facade food shortage for about "No" relatively long period of time.

4.6.7. Stable Foods of Sample Households

According to results found out that the major crops produced in the study area were the data from the office of agriculture revealed that cereals constitute the vast proportion of crops grown in the area maize, sorghum, wheat, barley,*teff*. Maize cereal crop is the most food in the study area; all most all households use maizeas main stable food, the reason to grow most households

maize crop as a major staple food. Sorghum is a very important cereal in the study area and is essential for improving food security since it is highly consumed. Wheat is the single most important productive cereal in the study area as compared to other cereals. Because wheat is used as a cash and food sources to the households, for example farmers sell wheat grain to pay credit, to buy farm inputs such as chemical fertilizer and to cover other households' expenses. According to (see Table 4.23), from total sample households 322 produced at small scale not because they are needless but due to the scarcity of farmlands on which they are to be cultivated and because the peasants give priority to stable food crops. Also as observed from survey result, generally sampled households produce different crop products.

Table 4.23: The major staple foods of sample households

Food type	Yes		No	
	Frequency	Percent	Frequency	Percent
Maize	322	100	-	-
Sorghum	321	99.7	1	0.3
Wheat	126	39.1	196	60.9
Barely	42	13	280	87
Teff	85	26.4	237	73.6
Oil seeds (linseeds, noug and sesame, etc)	3	0.9	319	99.1
Vegetables (onions, tomatoand cabbage, etc)	133	41.3	189	58.7
Fruits (Orange, Banana and *Papaya*, etc)	105	32.6	217	67.4

(Source: Field survey data, 2017)

4.7. Household Food Insecurity Access Scale /HFIAS/

4.7.1. Household Food Insecurity Access Scale to Sample Households

Food security is widely defined as the ability of all people to access enough food for active and healthy life. Food insecurity on the other hand is the inability of households or individual to meet required consumption levels in the face of fluctuating productions, prices and incomes. According to Sen (1981), in his concept of entitlements, he explained that the production and income level determines the ability of household or individual's access to food. Entitlements encompass two dimensions: endowment and exchange. Endowment includes all forms of capital (natural, physical, human, financial and social) and that has an exchange value. On the other hand, household's socio-economic characteristics indicate level of resources endowment and capital and capacity of exchange to food in the community. Inequality in assets ownership

(particularly size and type of land ownership, livestock holding), human capital (e.g. number of adult educational level) as well as other form of capital can affect the food production and access to off-farm income, which can enhance the ability of households to acquire food.

According to the survey result shown below on table 4.24, from that among 322 households involved in the surveyed 21.7% (70) was food secured including both food secure and moderate while the remaining 78.1% (252) households were classified as food insecure and comprised both mildly food insecure and severely food insecure. The classification was done based on the answer to a set of 9 questions by households that are combined to produce the Household Food Insecurity Access scale as proposed by FANTA (2007). Those questions are designed to indicate three levels of food insecurity namely Anxiety and uncertainty about household food supplies, insufficient quality (including food variety and preferences) and insufficient food intake and physical consequences.However, as this study is concerned about chronic hunger, food insecure households were determined based on answers to the question in the category of insufficient food intake and physical consequences. Therefore, a household was classified as food insecure if it answers yes to at least one question under the category that indicates insufficient food intake and physical consequences.

Table 4.24**:** Distribution of HFIAS to sample households

Four level of HFIAS	**Frequency**	**Percent**
Food secure	35	10.8
Mildly food insecure	27	8.4
Moderately food insecure	35	10.9
Severely food insecure	225	69.9
Total	**322**	**100**

(Source: Field survey data, 2017)

4.7.2. Household Food Insecurity Access Prevalence

According to Coates *et al.,* (2007), the HFIAS prevalence indicator categorizes households into four levels of household food insecurity (access): 1) food secure, 2) mild, 3) moderately 4) severely food insecure. Households are categorized as increasingly food insecure as they respond affirmatively to more severe conditions and/or experience those conditions more frequently.

A food secure household experiences none of the food insecurity (access) conditions, or just experiences worry, but rarely. A mildly food insecure (access) household worries about not having enough food sometimes or often, and/or is unable to eat preferred foods, and/or eats a more monotonous diet than desired and/or some foods considered undesirable, but only rarely. However, it does not cut back on quantity nor experiences any of three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating). A moderately food insecure household sacrifices quality more frequently, by eating a monotonous diet or undesirable foods sometimes or often, and/or has started to cut back on quantity by reducing the size of meals or number of meals, rarely or sometimes. But it does not experience any of the three most severe conditions. A severely food insecure household has graduated to cutting back on meal size or number of meals often, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating), even as infrequently as rarely. In other words, any household that experiences one of these three conditions even once in the last four weeks (30 days) is considered severely food insecure (Coates *et al.*, 2007).

4.8. Household Dietary Diversity of Food Security

Dietary diversity is defined as the number of different foods or food groups consumed over a given reference period (Sthapit, 2004).Data on household dietary diversity was collected using 24 hours recall dietary intake. Respondents were visited at their homes during the survey. For this study, the twelve food groups that included cereals; white root and tubers; vegetables; fruit; meat; eggs; fish; legumes, nuts and seeds; milk; oil and fats; sweets; spices, beverages and miscellaneous, recommended by Food and Agriculture Organization of the UN (FAO, 2007) were used to assess household dietary diversity scores (HDDS). Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods and is also a proxy of nutrient adequacy of the diet of individuals (FAO, 2011).

Table 4.25: Dietary diversity of sample households

	Sample households	**Mean**	**Std. Deviation**
HDDS	322	12.71	3.590

(Source: Field survey, 2017)

Dietary diversity shows the different types of foods consumed and reflects the consumption of a wide variety of food across nutritionally diverse food groups (Kennedy *et al.*,2010). It is measured as the number of foods or nutritionally significant food groups that a household consumes (Ruel, 2002; Smith &Subandoro, 2007). Hoddinott&Yohannes (2002), maintain that dietary diversity is an attractive indicator of food security for several reasons. According to survey results showed from total sampled households 322 were the Std.devation 3.590 and the mean difference is equal to 12.71(see on table 4.25 above). In Shashogo as elsewhere in many parts of Ethiopia, dietary diversity is affected by cultural and religious practices such as fasting and dependency on limited staple foods. The survey results below show that almost the same dietary diversity (Table 4.25). Furthermore, a small standard deviation indicating small deviation of the values from the mean which implies that the households were having almost similar food consumption pattern. During this a long period fasting 40 days for Orthodox Christians who were preparing for '*Fasiga*people do not consume animal source foods, including milk (goat, cow, etc.), cheese, butter, eggs, meat, and fish. On one hand, fasting encourages people to feed on other variety of food such as vegetables, pulses and fruits for rich families with the ability to reach the market to buy them.

4.9. Econometric Analysis

4.9.1. Factors of Household Food Security by using Binary Logistic Regression

Based on the contribution of pepper production on household food security, the study revealed information concerning the contribution of the pepper factors to household food security using binary logistic regression analysis, using binary indicators food security which is: 1-household food security, 2-household food insecurity. Binary logistic regression model was used to identify factors which affect food security in Shashogo*Woreda*.The systematic association between each predictor variables and household food security situation was conducted by cross tabulating each predictor variables against the outcome variables. The selection process was beginning with a careful analysis of each variable. Therefore, the previous section dealt mainly with a description of the sample population and test of the existence of association between the dependent and explanatory variables to identify the factors that affecting pepper production and their affecting households' food security situations using descriptive statistic. Nevertheless identification of factors by these descriptive analysis alone is, not enough unless the relative influence of each factor is known for priority based intervention.

Before running the binary logistic regression model with all hypothesized explanatory variables to check each independent variable. Coefficient of contingency was computed using SPSS version 20 software which used to check correlation between independent variables. For this reason, all of the explanatory variables were included in the final binary logistic model analysis.

4.9.1.1. Assessment of Goodness of Fit of the Model

To determine the significance of logistic regression model or goodness of fit there are several techniques involved to assessing the appropriateness, adequacy, and usefulness of the model. The person's Chi-square, the likelihood ratio test, Hosmer and Lemeshow goodness-of-Fit test (assesses the fit of the model by comparing the observed and expected frequencies); and Nagelkerke R-square are the most commonly used measures of goodness of fit for categorical data (Hosmer and Lemeshow, 1989).

4.9.1.2. Likelihood Ratio Test

The likelihood ratio test is commonly used for assessing the overall fit of the logistic regression model. The likelihood ratio test uses the ratio of maximized value of the likelihood function for the full model over maximized value of the likelihood function for the restricted (smaller). That means, which is defined as ($L_0 - L_1$) where L_0 and L_1 are the maximized log-likelihoods under the null and alternative hypothesis, respectively (Menard, 2002). In this study, the result of likelihood test statistic (LR= 411.836) significant at 1% level.

4.9.1.3. Hosmer and Lemeshow Goodness of Fit Test

Hosmer and Lemeshow goodness of fit statistic measures the correspondence between the actual and predicted values of the dependent variable. Hosmer and Lemeshow person Chi-square statistic is used to test the overall model of goodness-of-fit test of the null hypothesis that the model adequacy fit the data. The result presented in Table 4.26 shows that Hosmer and Lemeshow goodness-of-fit test statistic is not significant.

Table 4.26: Hosmer and Lemeshow Goodness of Fit Test

Chi-square	df	Sig.
6.278	8	0.616

(Sources: Model output, 2017)

The null hypothesis that the model fits the data against the alternative that the model does not fit was tested using Hosmer-Lemeshow test. A non-significant Hosmer and Lemeshow means that the observed and predicted counts are close to each other and the model describes the data well. The measures of goodness-of- fit indicated in Table 4.27 are R-square indices defined by Cox and Snell and Nagelkerke. Nagelkerke R square is 0.126 (13%) and the Cox and Snell R square are 0.95 (95%).

Table 4.27: Model Summary

Cox and Snell R square	**Nagelkerke(R square)**
0.95	0.126

(Sources: Model output, 2017)

In binary logistic regression analysis, 12 variables were hypothesized as factors that affects household food security situation, of which seven variables were found to be statistically significant at different levels (1% and5%) significance level. The maximum likelihood estimates of binary logistic regression model shows that the variables that are found to be significant are age of households, family size, farm land size, tropical livestock unit (TLU), total production, source of income and access to credit found to be significant to affect the households food security situation in the study area at 1% and 5% significant level (see Table 4.28). While the remaining five variables sex of households, educational status, asset, total income and purpose of production were not significant in explaining the variations in the dependent variable at 1% and 5% significant level.

Out of the variables that significantly affect the households' food security situation in the study area, tropical livestock unit (TLU), farm land size and total production have a positive and significant influence on the households' food security situation. On the contrary, age of households, family size, access to credit and source of income has a negative significant influence on the households' food security situation. A positive estimated coefficient in the model indicates food security increases with an increased in the value of the explanatory variables. However, negative estimated coefficient in the model implies households' food insecurity with a decrease in the value of the explanatory variables.

Table 4.28**:** Logistic model result of factors affecting household food security

Variables	S.E.	Sig.	Exp(B)
Sex of the HH	.816	0.167	0.324
Age of the HH	0.408	0.001***	0.266
Family size	0.350	0.002***	0.258
Education status	.650	0.736	.803
Farm land size	0.412	0.095*	1.990
TLU	0.078	0.001***	1.280
Total production	0.361	0.037**	0.472
Source of income	.439	0.025**	2.672
Asset	.816	0.167	.324
Total income	0.342	0.719	1. 131
Access to credit	.662	0.028**	4.291
Purpose of production	.263	0.754	1.086

Pearson chi-square	6.278
-2Loglikelihood	411.836
Correctly predicted food secure	15.8
Correctly predicted food insecure	91.5
Overall prediction	63.1
Sample size	322

Note: *** and ** are significant at 1% and 5% significance level, respectively.

(Source: Model output, 2017)

4.9.2. Analysis of the Significant Explanatory Variables

Age of household head: the result of the logistic model output revealed that age of household has negative and strong significant association with households' food security situation. This variable refers to the sequential age of the respondent at the time of the survey, measured in

years. Age of a farmer can enhance or prevent the retention of food production scheme. The effect of age of the farmer on food security is found at significant level.

Family size: The logistic regression model analysis result shows that household size was found to be strongly significant and negatively related with households' food security at significance level. Large family size creates more pressure on household food security because more food and nonfood expenditure is spent for them increases.

Farm land size: was positively related to households' food security situation similar to the hypothesized effect and it has significance level. The logistic model result suggests the larger the land size, the better food secure state of the household. Moreover, the result implies that the smaller the farm size, the more likely is the household to be food insecure and also those households have no enough land to obtain enough production.

Tropical livestock unit (TLU): It is the total number of livestock holding of the households measured in tropical livestock unit (TLU). The model result indicates it has positive and significant relation to households' food security at significance level. This implies that an increase in livestock number increases the households' food security status. Livestock serves as food, draft power, manure source, cash income source and live animals in times of food shortage to buy grains, which ultimately helps farmers not to lose productive assets which will have significant impact on subsequent year production and productivities. The household having larger size of livestock can have better food security status.

Total production: It has highly significance level on household food security situation the farmers were intended to increases their expenses leads to increases their production capacity of pepper and enhances to ensure food security and to increase their income.Thus, the model results show that those farmers with relatively total production are more food secured in area. The result implies that hypothesis is one of the production and productivity.

Access to credit: It was also found the source of credit in the study area is (OMFI) Omo Micro Finance Institution. The study revealed that some households said that they don‘t want credit and the rest complained about high interest rate but others said the availability of agricultural credit to the subsistence farmers who have little or no capital to invest in farming is a paramount

important. The possible explanation is that assumption was access to credit service helps the farmers to purchase agricultural inputs such as fertilizers, improved seeds and oxen, and which in turn increases production and contributes to food security. If farmers perceive they have access to credit, they can get more production from a given plot of many.

Source of income: The result of binary logistic regression reveals that income has significantly affect household food security at significance level. Thus, it demonstrates to the relationship with a household food security similar to the hypothesized effect. It is an important variable which explains the characteristics of food secure and food insecure households. Income earned from any source improves the food security status of the household. Source income families are less likely to be food insecure.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

The purpose of this study was to investigate the food security status of pepper producing householdsin Shashogo*Woreda*, Hadiya Zone of South Ethiopia. The research design employed in this study was cross sectional survey design which incorporates both quantitative and qualitative survey method. The data were collected from primary and secondary sources. Primary data were gathered by using structured household survey questioners and key informant interview. For this study, data from 322 sample households were collected from three rural *kebeles* namely: KemachoBorara, ShaymbeWanchikota and Alage. The data were analyzed by using SPSS software version 20 employing descriptive statistics, logistic regression model and food security measuring models household food balance model, household food insecurity access scale, and household dietary diversity model were used to analyze food security status of households.

The study revealed that less proportion of the sampled households could ensure their daily recommended kilocalories, but high proportions of the sampled households were not able to meet their daily recommended kilocalories as household food balance model analysis indicated that only 10.8% sampled households could ensure their daily recommended kilocalories, but 89.2% respondents could not. Among this, 8.4% sample households were marginally food insecure, 10.9% moderately food insecure and 69.9% severely food insecure as household food balance model analysis revealed. Households with various income sources have a chance to improve household food consumption and are less vulnerable to food insecurity. As the area is prone to drought in different seasons creating alternative sources of income and diversifying it was enhance farmers' food security status. For many years farmers were exposed to a flood which displaces them from their land during the water logging at summer season. Pepper is also one of the incomes earned by farmers to overcome their food shortage problem in the area.

In addition to this helping the farmers to focus on pepper production and raising its productivity wasserving as insurance for shortage of cash and lack of food during the drought season. As it is indicated by the study results, large amount of households was not food self-sufficient. Depending on their food self-sufficiency observation, from the total sample respondents'

majority of households about does not produce their own food sufficiently for their family in the study area. Therefore, sample households suffer from transitory and chronic food insecurity problems. Furthermore, the logistic regression model study has shown that the major factors affecting the food security situation of rural households were sex of the households, age of the households, family size, total farm land size, drought, disease and pest condition, livestock holding condition and shortage of improved seed were identified as a major rural households' food security problem in the study area. Study also indicated, livestock holding, land holding size and disease and pest condition have a significantand positive influence on the state of household food security.

It is also observed in the study that, livestock rearing has a vast contribution for rural households food security situation while, different challenges prevent farmers to rear different variety and to possess sufficient number of livestock to fill their household food gap. Therefore, harms like shortage of grazing land, shortage of rural credit and disease prevalence problems considered as a livestock rising challenges and significantly associated with households' food security situation. Similarly, survey result indicated that, a number of problems rural households' crop production and productivities are drought, disease, poor improved seed, and low rainfall amount, insufficient land holding size and price fluctuation have statistically significant association with households' food security situation. In conclusion, food security models relate to food availability identified by using household food balance model, food accessibility by using household food insecurity access scale model and food utilization through using household dietary diversity score models are addresses the rural household food insecurity level of the study area.

5.2. Recommendations

Theupshots of the research showed that food insecurity is one of the major problems of the households in the rural households of the Shashogo*Woreda*.Based on the finding of the study the following issues are forwarded as recommendations to enhance rural households' food security situation in the Shashogo*Woreda:*

To reduce the problem of moresever land scarcity in the Shashogo*Woreda*to where there is available land within the region. Hence, Shashogo*woreda's* government bodies should take this action into consideration. It is deem necessary to enhance farmers' indigenous knowledge on preservation and storage of food, post harvest period, saving and diversifying income sources. Storages were also recommended to culminate the existing household food security problems.To maximize agricultural production, the government should facilitate access of agricultural inputs in credit basis.

Livestock holding is one of the factors affecting the food security status of households in the study area. Therefore, based on the results of this study to improve production and productivity of the pepper, this was eventually increase food security situation of the rural households.

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Appendices

Appendix 1: Conversion factor for computing calorie intake

Food item	Unite	Calorie	Food item	Unit	Calorie
Maize	Kg	3560	Onion	Kg	480
Teff	Kg	3589	Avocado	Kg	1650
Wheat	Kg	3574	Mango	Kg	630
Barley	Kg	3723	Banana	Kg	1160
Sorghum	Kg	3805	Meat	Kg	1148
Bean	Kg	3390	Milk	Lit	737
Pea	Kg	3553	Egg	No	61
Enset	Kg	2000	Cheese	Kg	340
Potato	Kg	750	Butter	Kg	7363
Tomato	Kg	2000			

Source: Disaster prevention and preparedness commission (DPPC, 2007)

Appendix 2: Conversion factor for adult equivalent (AE)

Age group	Male	Female
<10	0.6	0.6
10 - 13	0.9	0.8
>13	1	0.75

Source: Storck, *et al.*, 1991

Appendix 3: Conversion factor of TLU

Livestock Category	TLU
Oxen	1
Bull	0.34
Cow	1
Heifers	0.75
Calves	0.25
Sheep	0.13
Goats	0.13
Donkey	0.7
Hours	1.1
Mule	1.1
Poultry	0.013

Source: Storck*et al.*, 1991

Appendix 4: Composition of major foods commonly consumed in the area

Crop type	Description of major food kinds in the area	Average calorie (kcal/100 gram)
Maize	(1)cooked maize flour with salt and water(porridge), (2) cooked maize flour with milk, saltand water (porridge), (3) split boiled maize withsalt (*qinche*) cooked maize flour with meager saltand water (bread), (4) cooked maize flour,fermented (*buddena*)	127.83
Sorghum	(1) Boiled red sorghum (*mullu*), (2) sorghum + emmer wheat + water (*buddena), (3) pure* sorghum + water (*buddena*), *(4)* sorghum + tef + water (*buddena*).	185.83
Tef	(1)tef flour + sorghum flour + birds eye chili (*buddena*), (2) pure tef flour + water (*buddena)*, (3) tef flour + sorghum flour (*buddena)*	161.20
Wheat	(1)boiled wheat (*mullu*), (2) wheat flour + maize flour + water (*buddena*), (3) wheat bread, (4) wheat flour + water (*buddena)*, (5) porridge	170.18
Barley	(1) roasted barely flour + salt + water *(basso)*, (2) barely flour + water *(buddena)*, (3) barley flour + water *(bread)*, (4) whole roasted barley *(akawi)*	226.27
Potato	potato + shallot + garlic + chili + oil + ginger + salt (sauce or *itto*)	63.00
Bean	(1)split broad bean + butter + chili (sauce or *itto*), (2) split broad bean + shallot + oil + chili + garlic + ginger + salt (sauce or *itto*), (3) split broad bean + roasted pea flour + oil + chili (sauce or *itto*), (4) split broad bean + pea flour + shallot + chili + butter+ garlic + fenugreek + salt (sauce or *itto*)	75.00
Chick	(1)split chick pea + shallot chili + oil + garlic + salt	227.00
Pea	(1) roasted pea flour + butter + chili + shallot + salt + spices (sauce or *itto*), (2) roasted pea + salt *(qolo)*, (3) roasted pea flour + shallot + oil + turmeric + salt (sauce or *itto*)	138.00
Lentil	(1) split lentil + butter + shallot + chili + salt (sauce or *itto*), (2) split lentil + chili + shallot + oil + salt (sauce or *itto*)	93.50
Beef	(1)Minced raw beef + butter + birds eye chili (main dish or *kitfo*), (2) Beef + tripe + tomato + potato + oil + chili + fenugreek + shallot + garlic + salt (sauce or *itto*)	191.00

Source**:** Organized based on EHNRI/FAO (1998), food composition table and survey data

Appendix5: Questionnaires for Structured Household Survey

Dear respondents,

The purpose of this questionnaire is to collect data on the pepper production and household food security nexus in Shashogo*Woreda* which is required for the partial fulfillment of the requirements for the degree of masters in Development Studiesfor Food Security Studies in Addis Ababa University. The information gathered through this questionnaire is confidential and anonymous. Your participation is voluntary and you have the right to refuse if not to be the part of this study. If you agree to be included in the study I will start my question by asking general identification point. May I continue? If yes, continue the questionnaire.

Name of the researcher: TesfasilassieGirma

Thank you in advance for your cooperation!!

Part I. Household DemographicCharacteristics

Name of k*ebele* Administration _____

Name of Respondents_____

Date of interview_____

Name of enumerator_____ Signature_____

1. Sex of the household head 1) Male 2) Female

2. Age of the household head 1) ≤ 20 2) 20 – 40 3) 40 – 74 4) > 75

3. Marital status of the household head

1) Married 2) Unmarried 3) Divorced 4) widowed

4. Ethnicity: 1) Hadiya 2) Kambata 3) Silte 4) Alaba 5) Other, specify

5. Religion: 1) Protestant 2) Orthodox 3) Muslim 4) Other, specify

6. Family size 1) ≥3 2) 3-5 3) 5-8 4) 8-11 5) >11

7. Educational status of the household head?

1) Can't Read and Write 2) Can Read and write 3) Primary school

4) Secondary school 5) Higher education

8. What are your major income bases? 1) From farming 2) Petty trade 3) Daily laborer

4) Remittance 5) Monthly salary 6) Safety net

Part II. Contribution of Pepper Production to Household Food Security

1. What is the contribution of pepper for your household's?

   1) It increase income 2) It reduces purchasing pepper from market

   3) It increases foreign exchange rate 4) All

2. For what purpose, normally produce pepper product? for

   1) Home consumption 2) Cash earning 3) Exchanging food items

3. Do you think that pepper production have contribution on household food security?

   1) Yes 2) No

4. If your answer is yes, what are the major contributions?

   1) Increased household income 2) Increased agricultural production

   3) Diversification of crops grown

Part III. Productive physical Asset Resources

1. Do you have own land for agricultural use? 1) Yes 2) No
2. How much is your total farm land size hectare? 1) ≤ 0.5 2) 0.51-1 3)1-1.5 4) 1.5-2 5) >2
3. From your total land area how much you cultivated in 2008 E C, in hectare? 1) ≤ 0.25
   2) 0.25-0.5 3) 0.5-1 4) 1-1.5 5) > 1.5
4. How do you plough your land?
   1) Using own Oxen 3) Using daily human labor force
   2) Pairing Ox with relatives 4) Using family members
5. How do you observe your land productivity?
   1) Fertile 2) Medium fertile 3) Less fertile 4) Poor
6. Do you rent out your farmland? 1) Yes 2) No
7. If your answer is 'yes' give your reason 1) Lack of income sources 2) lack of farm oxen
   3) Lack of fertilizer access 4) lack of improved seed access
8. How do you get agricultural input? 1) From co-operatives 2) From market retailers

3) from government bodies

9. Do you have own livestock? 1) Yes 2) No

10. If your response is 'yes' how many livestock do you have? In number

S/N.	Types of Livestock	Number owned in number
1	Oxen	
2	Cows	
3	Bulls	
4	Heifers	
5	Calves	
6	Sheep	
7	Goats	
8	Horses	
9	Donkey	
10	Mules	
11	Chickens	
12	Bee hives	

Part IV. Marketing and Storage of Pepper Production

1. Do you produce pepper seeds for sale on your farm land? 1) Yes 2) No

2. Have you sold pepper products in the year? 1) Yes 2) No

3. If yes, in which form? 1) Fresh pepper 2) Dry pepper 3) Prepared form

4. How many times do you produce seed or seedling in a year?

1) Once 2) Twice 3) Three times

5. Is there a nearby market place? 1) Yes 2) No

6. Where do you sell your farm products?

1) On farm (local assembler) 3) Through service cooperatives

2) Taking to the local market

7. From where you receive price information? 1) Mobile phone 2) Media 3) Agents

4) from market

8. What means of transport do you normally use for transporting your product to the buyer?

1) Car 2) Motor vehicle 3) Animal power 4) Human power 5) Public transport

9. To whom did you sell pepper in the year?

1) Market price 5) Miller

2) Small collector (Broker) 6) Retailer

3) Farmer cooperative 7) Government enterprise

4) Wholesaler

10. How do you normally sell your pepper?

1) As an individual 2) With an informal group 3) With farmer association

11. Do you store pepper? 1) Yes 2) No

12. If yes, why? 1) Expecting high price 2) Lack of market demand

3) Saving strategy 4) Transportation problem

13. Is there any change in stored pepper? 1) Yes 2) No

14. If yes, how? 1) Quality decrease but quantity remains the same

2) Both quality and quantity decreased 3) Quality remained the same but quantity decreased

4) No change in quality and quantity

15. How do you pack the produce before transporting? 1) In sack 2) Basket

3) Wooden trays/box 4) Polyethylene sacks

16. How do you store your pepper? 1) Filling in sack and placing in *'Kot'*

2) In store/ *'gotera'* 3) Inside of house 4) Basket

Part V. Factors Affecting of Pepper Production

1. Is your harvest of pepper affected by disease? 1) Yes 2) No

2. If yes, what factors affect? Please put 'X' mark in your answer

No	Factor Affecting of Pepper Production	Yes	No
1	Rainfall shortage/Drought		
2	Lack of market information		
3	Inadequate transportation facilities		
4	Inadequate government support		
5	Inadequate farm land		
6	Inadequate storage facilities		
7	Shortage of improved seed		

8	Disease		
9	Price fluctuation		
10	Lack of technology		
11	Pest attack		
12	Access to credit		
13	Capital shortage		
14	Technical trading		
15	Lack of demand (Low price)		

Part VI. Food security status of household

1. What are the main sources of food to your family?

1) Own production 3) Aids from the government

2) Purchased from the market 4) Remittances

2. Do you household suffer from any shortage of food to eat? 1) Yes 2) No

3. What are the major staple foods that your household consumes?

NO	Crop type	1)Yes	2)No
1	Teff		
2	Wheat		
3	Barely		
4	Maize		
5	Sorghum		
6	Oilseeds (linseeds, noug, sesame, etc)		
7	Vegetables (onions, tomato, cabbage, etc)		
8	Fruits(orange, banana, papaya, etc)		

4. Is enough the main food source to cover whole year food need? 1) Yes 2) No

5. If your answer is 'yes' how many months your household feed sufficient food?

1) All year round 3) From 6-9 months

2) From 9-12 months 4) From 3-6 months 5) Less than 3 months

6. If your answer is 'No' which months of the year are foods insufficient?

1) From September –December 2) From January- April 3) From May- August

7. What were Household crop production and consumption pattern from February 2016 to January 2017 G.C? by Kg.

S/N	Crop types	Total grain produced	Total grain	Received from food for work	Received through gift	Post-harvest losses	Grain used as a seed	Total Grain sold	Given to others	Used to social events	Net grain available for hhs
1	Wheat										
2	Teff										
3	Maize										
4	Barley										
5	Sorghum										
6	Bean										
7	Peas										
8	Potato										
9	Tomato										
10	Onion										
11	Cabbage										
12	Avocado										
13	Mango										
14	Banana										
15	Papaya										
16	If other specify										

8. What was Household Livestock production and consumption pattern from February 2016 to January 2017 G.C? by Kg.

S/N	Ls product Types	Unit	Total Ls product produced	Total Ls product purchased	Post-harvest losses	Ls products used as a seed	Sold Ls products	Used to social events	Given out to Relatives	Net Ls product available to hhs
1	Meat									
2	Cheese									
3	Butter									
4	Milk									
5	Egg									

9.How much quantities of grain did you produced during last crop year?(2008/2009 E.C) How much did you sell from each of this yield?

No	Gain type	Quantity produced (Qtls)	Quantity sold (Qtls)
1	Maize		
2	Sorghum		
3	Wheat		
4	Barely		
5	Teff		
6	Beans		
7	Peas		

10. Did you or anyone in your household eat anything (meal or snack) OUTSIDE the home yesterday?

No	**Food group**	**Example**	**YES=1 NO=0**
1	Cereals	Any bread, rice, pasta, Injera, biscuits, or other foods made from Teff, barley, millet, sorghum, maize, rice, wheat?	
2	White Roots And Tubers	Any foods made with potatoes, yams, sweet potatoes, irish potatoes, manioc, cassava, kocho, godere, *Anchote, Amicho, Boina*and *Boye*, or*Bula*?	
3	Vitamin A Rich Vegetables And Tubers	Any food made with vegetables such as onions, cabbage, green leafy vegetables, gathered with green leaves, tomato, cucumber, pumpkin, mushroom, kale, leak, green pepper, beat root, garlic, or carrots?	
4	DARK GREEN LEAFY VEGETABLES	Dark green leafy vegetables, including wild forms + locally available vitamin A rich leaves such as amaranth, cassava leaves, spinach,etc?	
5	VITAMIN A RICH FRUITS	Any food or fruit juices made from fruits such as mango, banana, orange, pineapple, papaya, guava,	

		avocado, wild fruit, or apple?	
6	ORGAN MEAT	Liver, kidney, heart, or other organ meats or blood-based foods	
7	FLESH MEATS	Any food made from beef, lamb, goat, rabbit, chicken, duck, or other birds, camel, other meat?	
8	EGGS	Any egg?	
9	FIDH AND SEA FOOD	Any fresh fish, fish soup/sauce or dried fish?	
10	LEGUMES, NUTS AND SEEDS	Any foods made from bean(white, brown, horse),peas, lentils, chick peas, rape seed, linseed, sesame, sunflower, vetch soybean flour or nuts (ground nut flour)?	
11	MILK AND MILK PRODUCTS	Any cheese, yogurt, milk, powder milk, butter milk or other milk products?	
12	OILS AND FATS	Any foods made with oil, margarine, fat, or butter?	
13	SWEETS	Any sugar, sugar cane, or honey?	
14	SPICES,CONDIMENTS, BEVERAGES	Any other foods, such as condiments, traditional beer, beer, wine, coffee or tea	

11. HOUSEHOLD FOOD INSECURITY ACCESS SCALE (HFIAS) (FANTA, 2007)

No	Type of indicator	Answer & code
A	Anxiety and uncertainty about household food supplies	
1	In the last 4 weeks, did you worry that your household would not have enough food?	1=YES 2=NO
	If YES, how often did this happen?	1=Rarely (1-3 times) 2=Sometimes (3-10 3=Often(more than 10)
B	Insufficient quality (including food variety and preferences)	
1	In the last 4 weeks, were you or any household member not	1=YES 2=NO
	If YES, how often did this happen?	1=Rarely (1-3 times) 2=Sometimes (3-10 3=Often(more than 10)
2	In the last 4 weeks, did you or any household member have to eat a limited variety of foodsdue to a lack of resources?	1=YES

		2=NO
	If YES, how often did this happen?	1=Rarely (1-3 times) 2=Sometimes (3-10 3=Often(more than 10)
3	In the last 4 weeks, did you or any household member have to eat some foods that really did not want to eat because of lack of resources to obtain other types of food?	1=YES 2=NO
	If YES, how often did this happen?	1=Rarely (1-3 times) 2=Sometimes (3-10 3=Often(more than 10)
C	Insufficient food intake and physical consequences	
4	In the last 4 weeks, did you or any household member have to eat asmaller mealthan you felt you needed because there was not enough food?	1=YES 2=NO
	If YES, how often did this happen?	1=Rarely (1-3 times) 2=Sometimes (3-10 3=Often(more than 10)
5	In the last 4 weeks did you or any household member have to eat fewermeals in a daybecause there was not enough food?	1=YES 2=NO
	If YES, how often did this happen?	1=Rarely (1-3 times) 2=Sometimes (3-10 3=Often(more than 10)
6	In the last 4 weeks, was there ever no food to eat of any kindin your household because of lack of resources to get food?	1=YES 2=NO
	If YES, how often did this happen?	1=Rarely (1-3 times) 2=Sometimes (3-10 3=Often(more than 10)
7	In the last 4 weeks, did u or any household member go to sleep at night hungrybecause there was not enough food?	1=YES 2=NO

	If YES, how often did this happen?	1=Rarely (1-3 times) 2=Sometimes (3-10 3=Often(more than 10)
8	In the last 4 weeks, did u or any household member go the whole day and night without eating anything because there was not enough food?	1=YES 2=NO
	If YES, how often did this happen?	1=Rarely (1-3 times) 2=Sometimes (3-10 3=Often(more than 10)

Appendix 6: Check list for Key Informants

Good morning/Good Afternoon. I am a student of Masters Degree in Food Security studies. So I am now working my graduation thesis on pepper production and household food security nexus in Shashogo*Woreda* in three *kebele* such as KemechoBorara, ShayambeWanchikota and Alage. Are you Volunteer to involve in the interview? Thanks!

A. Checklist for Shashogo*Woreda* Agricultural and Natural Resource Head Office and Disaster Risk Management Coordinators

1. How to understand food security with pepper production nexus to household?
2. What are major pepper production activities in the *Woreda*?
3. What are the main staple food sources?
4. Do you observe food surplus or deficit *kebele*?
5. Which period in the year is high in food insecurity?
6. What are the major factors to crop and livestock production to enable household's food self-sufficiency?
7. Which community development projects/ public worker support pepper production in the *Woreda?*

8. What is the overall pepper production factor of the *Woreda?*

9. Which governmental organization is more responsible for the pepper production in the *Woreda*?

10. How is the trend of peppers production?

11. How is the marketing situation (price and supply stability) storage and transport etc)?

12. What are the situations of the household food security before the pepper production?

13. What marketing of peppers production looks like?

14. What do you suggest to promote pepper production and reduce food insecurity of the Community?

B. Checklist for Kebeles Administrators

1. Is food supply for most households adequate? If not, why?

2. What are the causes of food production failure?

3. Who supplement food by purchasing? What are the sources of income?

4. When does the *woreda*(selected *kebeles*) face food insecurity? What will happen during drought seasons?

5. What is the situation with the extension services your community receives?

6. What do you suggest to promote pepper production and reduce food insecurity of the Community?

C. Checklist for *Kebele* Developmental Agents (DAs)

1. What are main sources of household income: mixed farming, off-farm activities, remittance income?

2. Do you observe household farm production covers their household food need throughout the year? If no, how they cover the other month's food gap?

3. What are the main challenges expose people's to be food insecure

4. What are the factor for pepper extension service and input supply?

5. What are the most important constraining infrastructures affecting peppers production?

6. What is the role of FTCs on pepper production? How?

7. What are the roles of pepper production for food security at household and community level?
8. What are the factors affecting for pepper production in the area?
9. What are the factors of the people's participation in the pepper production?
10. What do you suggest to promote pepper production and reduce food insecurity of the Community?