



**COLLEGE OF DEVELOPMENT STUDIES  
CENTER FOR FOOD SECURITY STUDIES**

**THE EFFECT OF NON-FARM ACTIVITY ON FOOD SECURITY IN  
GANTA-AFESHUM WOREDA, EASTERN ZONE OF TIGRAY, ETHIOPIA**

**BY  
WELAY GEBREMARIAM ABAY**

**JUNE 2019  
ADDIS ABABA**



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**ADDIS ABABA UNIVERSITY**  
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**Declaration**

This thesis is the result of my own work and that all sources or materials used in this thesis have been properly acknowledged. I confidently declare that this thesis has not been submitted to any other institutions anywhere for the award of any academic MA/MSc degree.

Declared By: Welay Gebremariam Abay

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# Approval Sheet

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As supervisor of the thesis I certify that we have read and evaluated the thesis prepared by Welay Gebremariam Abay entitled “*The Effect of Non-Farm Activity on Food Security: in Ganta-Afeshum Woreda, Eastern Zone of Tigray, Ethiopia*” and recommend for open defense as fulfilling the requirement for the degree of Master of Science Degree in Food Security and Development Studies.

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As members of the examining board of the final MSC open defense, we certify that we have read and evaluated the thesis prepared by Welay Gebremariam Abay, entitled “The Effect of Non-farm Activity on Food security: in Ganta-Afeshum Woreda, Tigray Region, Ethiopia” and recommend that it to be accepted as fulfilling the thesis requirement for the degree of Master of Science in Food Security and Development studies.

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**Dedication**

I dedicate this thesis to my father (*Keshi* Gebremariam Abay Gidey), my mother (*W/r* Simret Gebre-egziabher Kabsay), and my all brother and sisters for tending me with love and for their dedicated parenting in the success of my life.

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*Welay Gebremariam  
JUNE 2019*

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## **Abbreviations**

CSA	Central Statistical Agency
DA	Development Agents
FANTA	Food and Nutrition Technical Assistance
FAO	Food and Agricultural Organization
FGD	Focus Group Discussion
GFSI	Global Food Security Index
HDDS	Household Dietary Diversity Scores
HFIAS	Household Food Insecurity Access Scale
KII	Key Informant Interview
NGO	Non-Government Organization
PSNP	Productive Safety Net Program
RNFE	Rural Non-farm Economy
TNRS	Tigray National Regional State
TLU	Tropical Livestock Unit
SSA	Sub-Saharan African

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## **Abstract**

*Ethiopia is one of the Sub-Saharan African (SSA) countries affected by chronic and transitory food insecurity problems. Ganta-Afeshum Woreda is among the most food insecure areas in Ethiopia. Research shows that participation in rural non-farm activities exerts a pronounced impact on agriculture, household farm decisions, rural development, income and welfare as well as household food security. This paper investigates the effect of participation in non-farm activities on household income and food security among rural households in Ganta-afeshum Woreda, Tigray region of Ethiopia. Non-farm activity is believed in helping to address this problem thereby reducing rural poverty, food insecurity as well as improving the overall contribution to the national economy. Both primary and secondary data were collected and used in the study. Data were collected from 181 household heads. Household sample were stratifying into two households who participated in farm activities and households who were not participated in farm activity and random sampling techniques were employed to select the sample respondents. Secondary data were collected by reviewing different documents. Descriptive statistics, inferential statistics and ordered logistic regression were used for analyzing quantitative data. In the econometric analysis factors that affect the household food security is analyzed using the ordered logistic regression. The descriptive statistics revealed that 23% of the households participated in farm activities and 61% of them were not participated in farm activity were found to be food secure while 77% of households participated in farm activities and 39% were not participated in farm activity were found to be food insecure. The major findings of the study indicate that educational status of household head, TLU, non-farm activity, access to credit, skill status and marital status condition of household heads were positively and significantly affected household food security. The study concluded that were not participated in farm activity is one of the viable solutions to secure household food needs and diversify their diet composition in the study area.*

*Finally, it is recommended that governmental and non-governmental organization should expand access to households who were not participated in farm activity by encouraging households to improve their food security.*

**Keywords:** *Food security, Dietary diversity, Non-farm activity, Household*

# 1. CHAPTER ONE: INTRODUCTION

## 1.1 Background of the study

One of the greatest challenges still facing most countries in sub-Saharan Africa is how to feed their populations. Agriculture which is the main source of income for about 90% of the rural population in the region, has not been a sufficient vehicle for solving household-level malnutrition and food insecurity, because of low productivity and hostile agro-ecological factors Victor et al.,(2010). Reducing hunger and food insecurity has therefore remained an essential part of the international development agenda since the World Food Summits in 2001. Food security exists when 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 healthy life. As noted by Rukuni (2002), food security at the household level is a balance between availability and access to sufficient food.

Ethiopia is one of the most food insecure countries in the world. Hunger and famine results of food insecurity have been always problems in the country. Many Ethiopians live in conditions of chronic hunger with both a low average daily energy supply (kcal/capita/day) of 1880 and a very high (44%) prevalence of undernourishment Adnew (2004). The country is renowned for its highly dependent on agriculture. According to the 2007 population census 83.8% of the population of the country derives its livelihood from agriculture, which is entirely dependent on rain fed. Of the 4.3 million hectares of the potential of irrigable agriculture only 5% is currently utilized Kebede, H (2003) and small peasants also dominate the sector. Smallholder farmers cultivate about 95% of the land Adenew (2006). Indeed agriculture is the main source of income and employment but it has been highly constrained by various constraints and thus leaves the country to remain food insecure. To address the food security problems, the government designed different interventions, among other things to improve agricultural productivity through irrigation schemes and food security packages. But in drought prone and degraded areas the government stand is non-controversial as it clearly stated in its five year strategic plan (PASDEP), to promote nonagricultural activities so as to sustain the rural livelihoods Bereket and Zenebe (2011).

Barrett et al., (2001) have noted that one of the possible pathways out of the vicious circle of food insecurity in sub-Saharan Africa is the promotion and establishments of non-farm work in the rural sector. Evidence provided by Haggblade et al., (2002) suggests that most rural communities in Africa

derive about 42% of their income from rural non-farm activities and a high share considering that only about 10% of the rural labor force is employed in the rural non-farm sector.

Non-farm work offers the poor a potential escape route from poverty, since they usually require little capital or training to set up and are labor intensive. Several studies have examined the nature and determinants of non-farm work in rural areas of developing countries Abdulai and Delgado (1999); Abdulai and CroleRees (2001); Barrett et al., (2001); Canagarajah et al., (2001). Studies examining the impacts of non-farm income on household incomes have focused on the income-equity effects of non-farm income e.g., Deininger and Olinto (2001). However, work on the direct impact of non-farm work on household income and food security is quite scarce Lanjouw (2001); Holden et al., (2004); Chang and Mishra (2008). Moreover, most of the studies that have examined the relationship between non-farm work and household income have normally analyzed correlations rather than causal effects e.g., Lanjouw (2001).

The rural labour force in most of developing countries is growing very rapidly, but employment opportunities are not growing in the same rapidity Senadza (2012). According to Scharf & Rahut (2014) as land available for farming activities becomes increasingly scarce, non-farm activities must expand in order to reduce rural poverty in developing countries. Non-farm activities in the rural households has a great potential to upsurge rural employment, improving income distribution, contributing to economic growth, and poverty reduction Katega & Lifuliro (2014). Therefore it is important to determine how non-farm activities can be promoted, given the importance of non-farm income as a mechanism whereby rural households can sustain and improve their living standards and as a possible path out of poverty FAO (2002).

Prior to 1995 E.C, Tigray regional government had identified 16 Woredas as food insecure. However, the number of food insecure Woredas increased from 16 to 31 as reported by the food security office of the region Bereket and Zenebe (2011). According to recent data obtained from the Tigray Bureau of Agriculture, out of the 34 woredas of the region only three woredas are food secure. The remaining 31 woredas are classified as food insecure WFP (2009). Therefore, agriculture alone cannot provide sufficient livelihood opportunities to achieve food security. There are other methods to cope-with the problem of food security like, rural non-farm activity. This study contributes to the literature by empirically examining the effect of non-farm activity on household income and food security status

## 2 Statement of the problem

The problem of food insecurity is widespread in many developing countries of the world. Although emerging economies are experiencing rapid economic growth, resulting in increased food security scores, the gap between developed and developing countries is still wide. The situation is more acute for Sub-Saharan Africa (SSA), with the region taking bottom spot in the 2015 Global Food Security Index (GFSI) rankings. Economist Intelligence Unit (2015) shows that agriculture powered growth have played a key role in tackling food insecurity and improving the economies of many Latin American and Asian countries, the same cannot be said to have happened in Africa Davis, J.R. (2004). According to Gladwin, C.H., Thomson, A.M., Paterson, J.S. and Anderson, A.S. (2001) addressing food insecurity in Africa through increased food production alone may be inadequate. Undoubtedly, agricultural development is essential for reducing hunger and poverty in rural areas, but non-agricultural growth is important as well Diao, X., Hazell, P., Resnick, D. and Thurlow, J. (2007). This brings into sharp focus on the role of non-farm activities.

Tigray Region is one of the food insecure regions of the country. Ganta-Afeshum Woreda, which is located in Tigray region is one of the Woredas which is most affected by recurrent drought and food security problems Bereket and Zenebe (2011).

Farming, which is the main source of livelihood of the people in the study Woreda, is largely dependent on rain fed, and the pattern of rainfall is erratic, short and one season (usually from June to September). In the absence or little rainfall farmers constantly faced with food shortages and crises. Even in a good season, the onetime harvest or produce is too little to meet the yearly household needs as a result the majority of these rural people remain food insecure Bereket and Zenebe (2011).

Literature supports the fact that participation in rural non-farm activities exerts a pronounced impact on rural agriculture Reardon, T., Crawford, E. and Kelly, V. (1994) and Barrett, C.B., Reardon, T. and Webb, P. (2001) household farm decisions Reardon, T., Crawford, E. and Kelly, V. (1994) and Ellis, F. (1998), rural development Food and Agricultural Organization (2013), income and welfare Katera, L. (2013). But, there is no research done in the effect of non-farm activities on food security in the given study area. Hence, the contributions and effect of involvement in non-farm activities on household food security are issues that deserve investigation particularly in Ganta-Afeshum Woreda which is viewed as the most food insecure *Woreda* of the Eastern Zone of Tigray. In such area; merely

depending on agriculture is not a solution, therefore to reduce dependency on subsistence farming on fragile land, nonfarm employment could be an option and thus the study is aimed at investigating the effect of involvement in nonfarm activities to household food security in the *Woreda* and its determinants. This study will also address the potential incentives that promote household's participation to food security and the constraints or barriers that hinder participation in non-farm activities. Addressing the effect of non-farm employment activities on the households' food security and incomes from them will serve as a source of information for policy makers, administrators and donors in general, and benefit the rural households in particular.

### **3 Objective of the study**

The main objective of the study is to examine the effect of non-farm activities on household food security in *Ganta-Afeshum Woreda*, Tigray Region. Specifically, the study intends to;

- determine the food security status of household's participating in farm and non-farm activities in the study *Woreda*;
- identify factors that influence farm households' involvement in non-farm activities in the study *Woreda*
- explore the determinant factors that affects the household food insecurity

### **4. Research questions**

At the end, this paper will try to answer the following research questions:

- What are the food security status of non-farm households and household participating in farm activities in the study area?
- What factors influence farmers' involvement in non-farm activities in the study area?
- What are the major factors that affect the household food insecurity?

### **5. Significance of the study**

The study is significant for it increases individuals' understanding regarding the effect of farm household's participation in non-farm activity and corresponding benefits obtained from them and the importance of non-farm activity incomes across the different income groups. The outcome of this study could also be useful for local administrators and NGOs in order to devise interventions that could improve the livelihoods of the rural poor. Particularly this paper could serve as a source of reliable information for farmers and policy makers regarding the actions that should be undertaken so as to improve households' participation in different non-farm activities and incomes earned from them. The findings could also use as reference for researchers who are interested to conduct further study on the field.

## **6. Scope and limitation of the study**

The study was conducted to examine the effect of non-farm activities on household food security in Ganta-Afeshum *Woreda*, Tigray Region. The study covered only *Ganta-Afeshum Woreda* and three *Tabias* among 19 rural *Tabias*. Moreover, the study dealt with a limited number of households; applied household dietary diversity score (HDDS) and Food insecurity experience scale (HFIES) to evaluate food security status of non-farm participant households. The researcher encountered a number of problems during data collection period. Some of the main problems were inaccessibility of respondents because they engaged in different social duties and marketing activities. Moreover, the study areas predominantly were a rugged topography with very poor road infrastructure has constrained the transportation facilities and the research team was enforced to walk longer distance on foot. This made the data collection process longer than it was planned.

## **7. The research ethics**

The researcher recruited the respondents of the study in Ganta-Afeshum *Woreda* of the study by maintaining assents of the participants by explaining the objectives and the study and how the findings of the study would be used. According to Levine, 1988 assent is a term used to express willingness to participate in research by persons who are by definition too young to give informed consent but who are old enough to understand the proposed research in general, its expected risks and possible benefits, and the activities expected of them subjects. In this study the researcher explained the overall objectives of the study and how the data might be used for the participants. In every stage of the data collection, analysis and reporting the anonymity of the participants of the study was kept.

## **8. Organization of the study**

This research thesis organized into five chapters. The first chapter introduces the background information, statement of the problem, objectives of the study, significance, scope and limitation and organization of the study; second chapter covers literature review concerning concepts and issues on non-farm activity and food security. Chapter three is about methodology, which consists of description of the study area, research design, sample size, Sampling techniques and procedure, data collection techniques and data analysis. Chapter four presents the study results and discussion part of the research, and finally conclusion and recommendation are presented in chapter five.

## **CHAPTER TWO: RELATED LITERATURE REVIEW**

### **2.1. Concept of food security**

Food security has been defined as a situation when all the people, at all times, have physical and economic access to sufficient, safe and nutritious food needed to maintain a healthy and active life (WB and FAO, 2010). The concept of food security is built on four pillars: Food availability refers to physical presence of sufficient quantities of food at a household level, whether from production or markets. Food access refers to people have sufficient resources to obtain appropriate food for a nutritious diet.

Food utilization is understood as people have sufficient knowledge of nutrition and care practices and have access to adequate water and sanitation. Food stability refers to the need to assess food in both short and long term Hartwig et al., (2011) and Babatunde et al., (2008). The above discussion relates household food security to the ability of the household to secure food, either from own production or through purchase of adequate food for meeting dietary needs of its members Nyange (2001). When analyzing food security at household level we have to look at food supply and distribution, effective access to food by households and effective consumption by individuals World Bank (2003).

Household food security implies that each member of the household in general has access to food. Although food availability at the household level is a key issue, there are intra-household factors that may affect equitable and adequate access to food by all members Maxwell and Frankenberger (1992). Maxwell and Frankenberger (1992) indicated that household food security has social linkages including access to health services and good healthy environment, education and adequate care of children and women. These non-food linkages influence households' decisions regarding livelihood resources, such as income and labour which are direct determinant of household food security.

### **2.2. Determinants of household food security**

A study conducted by Ephrem (2008) household food security in the north eastern part of Ethiopia are strongly associated with various socio-economic and bio-physical factors that influence the food security status of households were age of household head, dependency ratio, size of cultivated land, total number of livestock owned, manure application, land quality and farmer's knowledge on the

effect of land degradation on food security. According to studies conducted in Ethiopia, ownership of livestock, farmland size, family labor, off farm income, market access, use of improved technology, education, health status, amount of rainfall and distribution, crop diseases, number of livestock, and family size are identified as major determinants of household food security Regassa (2011) and Bedeke (2012).

The study conducted in Nigeria by Oluyole et al. (2009) using probit model found out that sex of household, educational level, age of household head and income have positive influence on food security; whereas, households size has negative influence on household food security. However, study, by Sikwela (2008) in South Africa using binary logit model showed that per aggregate production, fertilizer application, cattle ownership and access to irrigation have positive effect on household food security; whereas, farm size and family size have negative effect on household food security. On other hand, Fekadu (2012) using multivariate logistic regression analysis indicated that dependency ratio, household family size and market accessibility have showed significant and negative effect on food security; whereas cultivable land size, access to irrigation, number of livestock showed positive role for food security. Other similar, study conducted by Bogale and Shimelis (2009) using binary model reveals that age of household head, cultivated land size, livestock ownership, total income of the household, irrigation and amount of credit receive have negative and significant effect on household food security.

Similarly, as studied by Beyena and Muche (2010) using binary logit model showed that age of the household head, size of land cultivated, livestock ownership, soil and water conservation practice and oxen ownership have positive and significant relationship with household food security; whereas, education of household head, household size and off-farm/non-farm income have negative and significant influence on household food security

## **2.3. Activities concepts and definitions of non-farm**

### **2.3.1. Concepts of non-farm activities**

Rural households are increasingly earning for their livelihoods from different activities other than farming. The rural non-farm economy (RNFE) is growing through times. Effective development of the RNFE can make important contributions for the economic growth and poverty reduction in rural

area, often by supporting multiply and spread the benefits from growth in sectors such as agriculture, and by linking urban to rural areas Wiggins and Hazell (2011). Different literatures have shown that agriculture is not the only important sector in the rural economy. Studies in different developing countries have shown that the non-farm sector plays a significant role in contribution of employment and income in the rural areas Lanjouw (2001), and Haggblade et al., (2007). Apparently Wiggins and Hazell (2011) indicated that nonfarm activities are increasingly important in rural areas.

A growing share of households participate in them, while they provide increasing proportions of rural household income. The scale of individual rural non-farm activities varies enormously from part-time self-employment in household based cottage industries to large scale agro-processing and warehousing facilities operated by large multinational firms. Often highly seasonal, rural non-farm activity fluctuates with the availability of agricultural raw materials and in rhythm with household labor and financial flows between farm and non-farm activities Wiggins and Hazell (2011).

Poor people dominate many of the low return activities such as cottage industries, small-scale trading and unskilled wage labour used in construction, and many personal services. Wage labour, in both agriculture and non-farm business, also accrues primarily to the poor. In contrast, white collar jobs such as medicine, teaching, accounting and administration figure most prominently among higher income households. Poor households tend to dominate those types of non-farm businesses that are labour intensive and can be conducted competitively on small scales and with limited capital. For this reason, many policy makers view the rural non-farm economy as a potentially important contributor for poverty reduction. Others, however, fear that an abundance of labor-intensive, low-return rural non-farm activities may signal distress diversification and an absence of more productive opportunities given that low capital frequently translates into low productivity and low returns to labour Shand (1986) and Islam (1987).

### **2.3.2. Definitions of non-farm activities**

There are broadly two categories of non-farm activities being pursued by the households. One form is the non-farm proper, which includes the livelihood sources namely, artisans/service, trade and white-collar jobs. These are either activities which are being pursued by households on a regular or seasonal basis within the village to meet the local demand or government jobs pursued regularly

within or outside the village, or manufacturing or service sector jobs undertaken in the village regularly. The second form of non-farm activities is what may be called non-farm migratory. This activity is classified under wage labor in activities like construction, earthwork, factory work and loading Shylendra and Thomas (1995). According to Woldenhanna (2000), non-farm activities in which farm household participates can be categorized into wage employment and self-employment activities. Three types of wage employment can be distinguished, namely paid development work, manual non-farm work, and non-manual (skilled) non-farm work. Paid development work involves jobs in community micro dam construction, community soil and water conservation works such as construction of terraces and afforestation, and other community works done under the food-for-work program.

Defined in another way, non-farm activities include all secondary and tertiary sector employment of both permanent and casual nature. Since these activities are quite diverse, a number of different terms are used in the literature to refer to non-farm employment. Broadly speaking, non-farm activities in the rural areas can be divided into the following categories Meyer, R. L, (1991):

- A. Small-scale industrial activities such as food processing (flour milling, oil processing, soap making and food processing)
- B. Cottage industries (handicrafts, spinning of cotton or wool, cloth weaving and dyeing, pottery, leather tanning and distilling local brews)
- C. Artisan activities (blacksmiths, masonry, wood work/carpentry, house construction, repair services and fabrication of farm tools)
- D. Commercial activities (trade and transportation)
- E. Infrastructure development activities (special public works, feeder roads and irrigation works, and food-for-work programs) and
- F. Formal employment including professional and administrative jobs.

#### **2.4. Literature review of participation in non-farm activities**

Over the last two decades, the non-farm economy has increasingly become the central focus of attention in rural development policy, due to its positive contribution to poverty reduction and food security (Reardon 1998; Ellis 1998; Lanjouw and Lanjouw 2001; Davis 2003). Participation in non-farm activities is one of the livelihood strategies among poor rural households in many developing

countries (Mduma and Wobst 2005). Empirical research has shown that nonfarm sources contribute 40–50 percent to average rural household incomes across the developing world (World Bank 2008a). In Ethiopia, according to Davis (2003) and Deininger et al. (2003), some 20 percent of rural income originates from nonfarm sources. In some parts of Ethiopia, off-farm or nonfarm labor income accounts for up to 35 percent of total farm household income (Woldehanna 2000).

The rural nonfarm sector plays a critical role in promoting growth and welfare by slowing rural-urban migration, providing alternative employment for those left out of agriculture, and improving household security through diversification (Lanjouw and Lanjouw 1999). For example, Barrett et al. (2001) found that nonfarm activity typically correlates positively with income and wealth (in the form of land and livestock) in rural Africa, and thus appears to offer a pathway out of poverty if non-farm opportunities can be seized by the rural poor. However, this key finding appears to be a double-edged sword. The positive wealth–nonfarm income correlation may also suggest that those who begin poor in land and capital face an uphill battle to overcome entry barriers and steep investment requirements to participation in nonfarm activities that are capable of lifting them from poverty. Decisions by rural households concerning involvement in nonfarm activities depend on two major factors: incentives offered and household capacity (Reardon et al. 2001).

Some poor rural households will make a positive choice to take advantage of opportunities in the rural nonfarm economy, taking into consideration the wage differential between the two sectors and the riskiness of each type of employment. Rising incomes and opportunities off-farm, however, reduce the supply of on-farm labor. Other households are pushed into the nonfarm sector by a lack of on-farm opportunities, for example, resulting from drought or small size of land holdings (Davis 2003). Hagos (2003) looked at the effect of program credit on participation in off-farm employment. He found that the effect of program credit was positive and statistically significant in the case of change in the level of income derived from self-employment, but that it had no significant effect in the case of wage employment. He also emphasized that this underscored the heavy impact of lack of access to capital on self-employment.

Different studies have investigated the determinants or factors that most influence the decision to participate in nonfarm activities and the choice of activity, as well as the extent of rural household participation. For example, Mduma and Wobet (2005) found that education level, availability of land, and access to economic centers and credit were the most important factors in determining the number of households that participated in a particular rural local labor market and the share of labor income of total cash income.

Bezu et al. (2009) also looked at the activity choice in rural nonfarm employment. They found education, gender, and land holding to be the most important determinants of activity choice. In sum, involvement in rural nonfarm activities, as a livelihood strategy among poor rural households, plays a vital role in promoting growth and welfare and offers a pathway out of poverty, if nonfarm opportunities can be seized by the rural poor. Second, both “push-and-pull” factors appear to be involved in decisions by rural households to participate in rural nonfarm activities. For example, some might be attracted by the incentives offered and labor availability (when households have more than enough laborers for their farm), whereas others might be pushed into the nonfarm sector due to a lack of opportunities on the farm (for example, from drought or insufficient land holdings).

## **2.5. Different studies of non-farm in many countries**

Different evidences document showed that nonfarm activities in rural areas have surfaced much earlier than the theoretical and policy recognition of the nonfarm economy. The data collected to investigate the surplus labor assumption of the dual economy model in the 1970s showed large size of nonfarm labor use in developing countries initiating interest in small scale and rural nonfarm business activities Haggblade (2007). The studies on micro and small scale industries on income diversification give some insight in to the rural nonfarm economy in developing countries.

## **2.6. Impact of rural non-farm economy**

Several cross-sectional studies in Africa and Latin America show a positive correlation between non-farm participation and total income Reardon et al., (2001). Some studies also found non-farm employment contributing to increase in agricultural investment Ruben and Van den Berg (2001); Bezu and holden (2008). These findings suggest that, expansion of nonfarm economy may play a positive role in reducing poverty. Nonfarm Expansion can play a significant role in reducing poverty if most of the poor have access to employment in the sector. But it is not always the case that the nonfarm sectors are more inclusive of poor. In east Africa household members from low-agricultural potential are found to be more likely to be engaged in the nonfarm sector than those in high-agricultural potential Matsumoto et al., (2006). While there is evidence of positive correlation between nonfarm participation and total income across several countries, the relationship between the share of nonfarm income and total income or wealth is not so uniform. In some cases the poor get a higher share of their income from non-farm activities Janvry and Sadoulet (2001) thereby expansion of the nonfarm sector contributes to greater equality while in others, as shown for most of African studies Reardon (1997), the rich and wealthy get a higher share of their income from nonfarm activities implying an inequality increasing non-farm economy.

Determinants of participation in Rural Non-farm Employment (RNFE) in Ethiopia The studies that examine the factors that influencing participation in nonfarm employment used different methodologies and different units of analysis, due to this condition comparison of results difficult. Still some common features arise such as negative effect of agricultural production or income and positive effect of family size and being male (or male headed household) Tefera et al., (2005) using logit model, analyzed nonfarm participation decision of households. They found that nonfarm participation to be negatively correlated with agricultural income and Self-sufficiency and positively correlated with adult male labor. In their participation analysis, Matsumoto et al., (2006) set out to estimate multinomial probit model of occupational choice for individuals in farm, local nonfarm, and migration activities in Ethiopia, Uganda and Kenya. However, because of the number of migrants in the Ethiopia sample was very low (only 15 individuals in the members of 420 household), they combine local nonfarm and migration activities in the Ethiopia data which effectively makes the regression a binary model. The result shows that men are more likely to participate in nonfarm

employment. Participation increases with age and the number of local language the respondent can speak and decreases with years of schooling.

Nonfarm income decreases with the number of children in the household. Woldenhanna and Oskam (2001) estimated tobit modes for household labor supply to nonfarm employment, separately for wage and self-employment. They found upward sloping labor supply curve for both types of activities. Moreover, they found that labor is negatively correlated with agricultural land, livestock and non-labor income. They also estimated a multinomial logit model to analyze the choice between the two types of nonfarm employment. They found that nonfarm wage employment increases with family size and decreases with agricultural production and the number of dependents. On the other hand, self-employment increases with agricultural production and is not affected by demographic factors.

They argue that the results imply that households engage in self-employment to gain attractive returns while they engage in wage employment because of push factors. Their study does not find significant effect of education. Van den Berg and Kumbi (2006) estimated tobit models for income from handicraft, food/drink and trade separately. They found that own cultivated land is positively correlated. This is similar to the result from woldenhanna and Oskam (2001). Moreover, they also found that households with heads who are married and literate are more likely to engage in food/drink production and trade.

## **2.7. Non-farm employment and household welfare**

Whether or not nonfarm activities result in income growth depends on several factors. One has to acknowledge not only the heterogeneity of activities in rural nonfarm economy but also the heterogeneity in households' incentives to engage in nonfarm activities Reardon et al., (2007) and Barrett et al., (2005). Earlier studies have shown that the income earned from the rural nonfarm economy has a direct impact on welfare through increased food consumption and reducing intra-year and inter-year income variability Ellis (1998). Nonfarm income has a potential to contribute to welfare indirectly through the linkage with agricultural activities by providing finance for input expenditure Ruben and Van den Berg (2001) and by serving as self-insurance to encourage farmers to take up high-yielding, high-risk inputs Collier and Lal (1984).

## **2.8 Conceptual framework of household food security determinant factors**

A household's food security can be influenced by a variety of factors. These include; demographic characteristics (household head's age, sex, education level, marital status, household size and farming experience) Babatunde *et al.* (2007); Basukuba (2007); Dauda (2010); Obayelu (2010); Kuwornu *et al.*, (2012). Institutional factors category includes access to credit, health status, and food aid. Farming characteristics such as farm size, livestock holding, and household's access to extension services FAO *et al.*( 2013); Adeniyi and Ojo (2013). The dependent variable (food security) is influenced by various variables, these include; household's background characteristics, involvement in income generating activities, farming activity, institutional factors and household's income which are important in ensuring food security. Literature Babatunde *et al.*( 2008); Amaza *et al.* (2009) shows that sex of a household's head can influence its food security. According to Babatunde *et al.* (2007); male-headed households (MHHs) possess more resources than female-headed households (FHHs) as a result, FHHs are more vulnerable to food insecurity than MHHs. In addition, literature Obayelu (2010) marital status can affect a household's food security status. For example, Obayelu (2010); reports that in the North Central Nigeria a slightly larger percentage of married household heads were reported to be food secure compared to the single (unmarried) class.

Education level of household heads is another important background variable that can affect a household's agricultural production and food security in general. Households with more educated members and other forms of human capital stand a better chance of accessing nonfarm income and/or credit. According to Idrisa *et al.* (2007), an increase of one's education is likely to increase ones related skills and, hence, the ability to acquire new skills. In addition, education is also associated with production of higher quality crops and greater participation in non-farm activities all of which could enhance a household's food security status.

According to literature institutional factors (agricultural extension services, access to credit, health status and food aid) do also influence a household's food security. Literature also shows that food security is determined by various socio-economic, natural and political factors. According to Mano *et al.* (2003) and Makombe *et al.* (2011) as cited by Oni and Fashogbon (2013) these include; income, availability of credit, availability of extension services, government policies on trade, agricultural land area under cultivation, and social safety net.

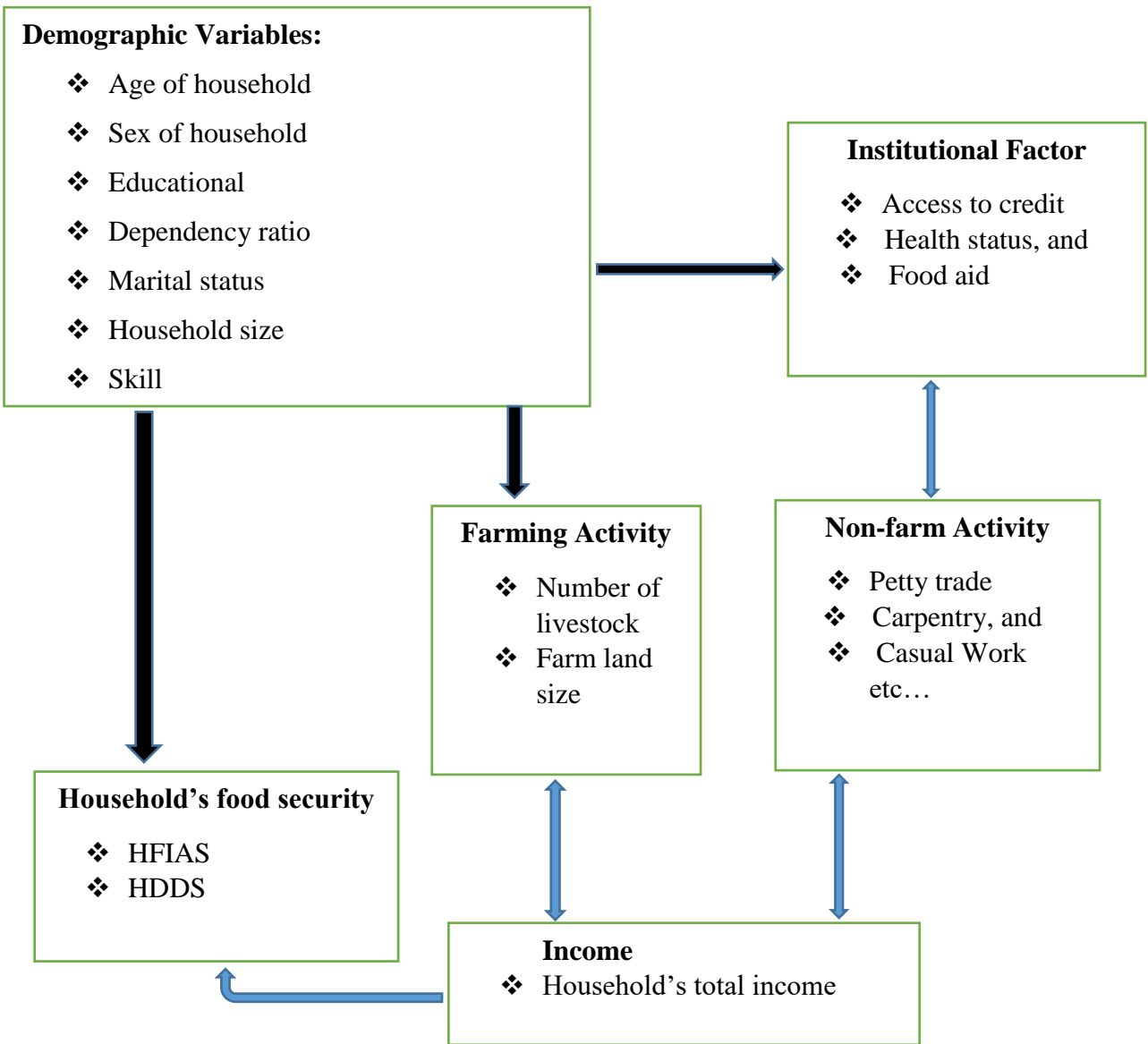


Figure 1; Conceptual framework of household food security determinant factor

## CHAPTER THREE: DESCRIPTION OF THE STUDY AREA AND THE RESEARCH METHOD

### 3.1 Description of the study area

#### 3.1.1. Demographic profile and location area of Ganata\_Afeshum Woreda

The study area, *Ganta-Afeshum* is one of the woredas in the Tigray region of Ethiopia. The Woreda comprises 19 *Tabias* administrations. It lies between latitudes 14°7'15"N and 14°22'30"N and longitudes 39°12'45"E and 39°33'45"E. Part of the Eastern Zone, *Ganta-Afeshum* is bordered on the south by *Hawzen*, on the west by the Central Zone, on the north by the *Gulomahada* and on the east by *Saesi Tsaedaemba*. It is found at a distance of about 989 km north of Addis Ababa. Based on the population projection of Ethiopia for all Regions at Wereda level since, 2014 national census projected by the Central Statistical Agency of Ethiopia (CSA,2013), this Woreda have a total population of 97,233, an increase of 3.79% over the 1994 census, of whom 45,828 are men and 51,405 women; 5,162 are urban inhabitants.

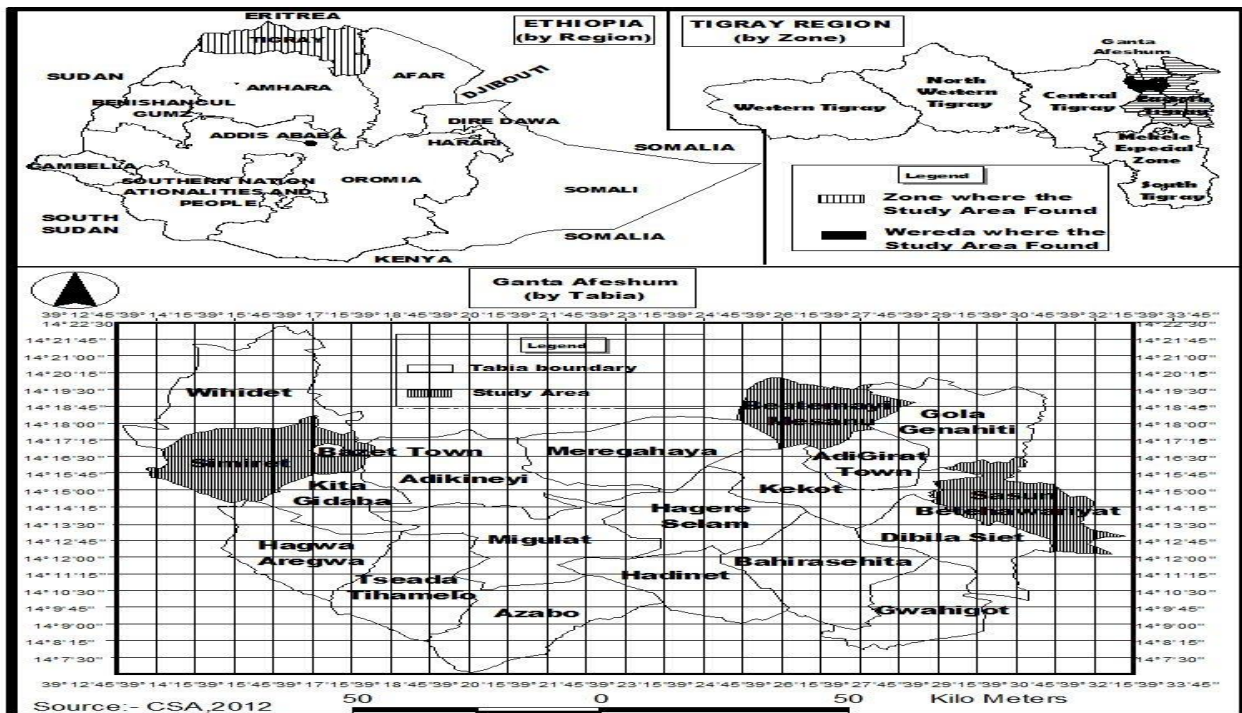


Figure 2: Location Map of the Study Area

There is no adequate and reliable meteorological data to describe the climatic condition of Ganta-Afeshum Woreda. However, little data reveals the climatic zone in the study area is temperate

(woyina daga) (GWFED, 2014). Annual rainfall ranges between 350-700 mm while annual range of temperature varies between 15°C to 25°C (GWOA, 2015). The altitude of the woreda is 2200 meters above sea level. The area has one cropping season called *Meher* also known as the major rainy season (starting from June to September).

A sample enumeration performed by the CSA in 2001 interviewed 20,704 farmers in this woreda, who held an average of 0.37 hectares of land. Of the 7,710 hectares of private land surveyed, 83.38% was under cultivation, 2.67% pasture, 5.15% fallow, 1.95% in woodland, and 6.86% was devoted to other uses. For the land under cultivation in this woreda, 64% was planted in cereals, 8.9% in pulses, 0.61% in oilseeds, and 13 hectares in vegetables.

### **3.1.2. Food security situation of the *Woreda***

Food shortage continuously occurs in the woreda due to shortage and erratic distribution of rain fall, and lack of farming land which is caused by an ever increasing number of population sizes. In addition to this, inability of the society to use the improved technologies is also cited as the causes of food shortage. Traditional and backward farming system of the community has contributed to the problem of getting enough food (GWVC, 2008). Most members of the community do not possess oxen to plough with. A pair "*Timad*" of oxen serves for more than ten farmers. This shows people have faced shortage of farm tools. Due to this reason, time of sowing elapses. Besides, unwise consumption of what they have harvested and selling of their product with a very low price is the additional reason for the food shortage.

Even selling of livestock is common with those who are under safety-net packages. Shortage of rain fall at the time of cropping season, ever increasing price of food, lack of non-farm and off-farm work opportunities and poor access to basic needs and infrastructures are also seen as the major reasons for food shortage (GWVC, 2008).

## 3.2. Research methods

Ganta-Afeshum *Woreda* is one of the 19 *Woredas* of Eastern Tigray zone, Tigray National Regional State (TNRS). According to the data obtained from the *Woreda* Administration Office, there are 19 rural *Tabias* and one urban center (Bizet town) in the *Woreda*.

### 3.2.1. Research design

The research design of this research was household-based cross sectional research and the research approach will be quantitative and qualitative.

### 3.2.2. Sampling technique and sample size determination

A multistage sampling technique has been used for this study; where in the first step Eastern Zone was selected purposively, and second step Ganta-Afeshum *Woreda* was selected to know the effect of non-farm activity on food security issue. Then at the third step, three *Tabias* namely: *Simret*, *Sasun* and *Maymesanu* were selected by using simple random sampling followed by probability proportional sampling technique i.e. proportionally allocating respondents into three *Tabias*. Household heads were selected randomly from a list to be obtained from corresponding *Tabia* administrative. A total of 181 sample size was selected and among them are 76, 56 and 49 households were selected from *Simret*, *Sasun* and *Maymesanu* respectively. Sample size allocation for each *Tabia* was based on number of on-farm household heads and non-farm household heads that were dominantly participating in agricultural activities and non-farm activities available during data collection period.

There were several methods for determining the sample size of respondents from finite population. But, for this study it was used a simple formula from Kothari's formula of (2004:179) as follows.

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2 (N-1) + z^2 \cdot p \cdot q}$$

Where, N= size of household heads population

p=Sample proportion of successes or the proportion of a population with a particular characteristic;

n=size of sample,                      q=1-p (denote the proportion of the population not having particular characteristics);

z=the value of the standard deviate at a 95% confidence level

e=acceptable error (the precision)

Thus, N=4,806 p=0.5 z= 1.96 e=0.07

$$\text{Therefore, } n = \frac{(1.96)^2 \cdot (0.5) \cdot (0.5) \cdot 4806}{(0.07)^2 \cdot (4806 - 1) + (1.96)^2 \cdot (0.5) \cdot (0.5)} \quad n = 181$$

This sample size allotted to the three *Tabias* was based on proportionate sampling method. Though with this method each *Tabia* has been fairly represented, Proportional allocation of the sample had made on the basis of the size. The required sample households were selected randomly within each *Tabia*, because every member of the population had an equal chance of selection in the sample.

This sample size was allotted to three *Tibias* using proportionate stratified sampling formula. Through this formula each *Tabia* have fairly represented as follows:

1. Sample size for *Simret*  $\frac{2020 \cdot 181}{4806} = 76$
2. Sample size for *Sasun*  $\frac{1498 \cdot 181}{4806} = 56$
3. Sample size for *Maymesanu*  $\frac{1288 \cdot 181}{4806} = 49$

As already mentioned above, among the target population of 4806 the researcher taken 181 respondents as calculated based on the above formula.

**Table 1.** Sample distribution and population of the study area

Tabia	Total households of Tabia	Household sample size	Type of sampling
<i>Simret</i>	2020	76	Proportionate stratified sampling method
<i>Sasun</i>	1498	56	Proportionate stratified sampling method
<i>Maymesanu</i>	1288	49	Proportionate stratified sampling method
Total sample		181	

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**Note:** *Tabia* is the lowest administrative unit of settled rural area.

### **3.2.3. Tools and techniques of data**

The research employed household survey, focus group discussion (FGD), Key Informants (KIIs) and field observation in primary data collection.

#### **a) Household survey**

To generate quantitative and qualitative information at household level, household survey was undertaken by using structured questionnaire. The household survey covered personal data, household assets, food consumption and income, issues related to non-farm activities, and food security. The questionnaire was first prepared in English and later translated into the local language (Tigrigna), so that the respondents can easily understand the questions. Three enumerators, one for each *Tabia*, were employed based on their ability of local language and culture, and experiences in data collection. Training was provided to the enumerators on the procedure to follow while conducting interview with respondents and deep discussion was also held to make the questionnaire clear.

#### **b) Focus group discussions**

The focus group discussions (FGD) members composed of both men and women those were not involved in the individual interviews. One focus group discussions at each study areas were conducted and each focus group comprised six to eight individuals. The output of the discussion was used as a guide the design of household questionnaire and to get additional supporting qualitative evidence of the on current situation of household food security and challenges that farmers have been faced non-farm activity.

#### **c) Key informant interview**

The primary data collected from sample on-farm and non-farm participant household need to be further enriched by additional information gathered through key informants. Thus, intensive interview has been conducted with key informants. Thus, two experts from two different departments, such as job opportunity creation and Productive Safety Net Program expert, one development agents (DA) from each three *Tabias*, and one committee member of labour association from each *Tabias* was included as a key informant interview.

#### **d) Secondary data sources**

Besides the aforementioned data collection techniques and procedures, intensive desk review of published literatures such as books, journals, articles, reports and e-resources would carry out. Documents from various Eastern Tigray bureaus, Central Statistical Agency (CSA), and Websites of non-farm activity related to food security would reviewed.

#### **3.2.4. Techniques of data analysis**

Both descriptive and econometric analysis was employed to examine factors affecting food insecurity and household food security status, and also to identify impact of non-farm activity on the food insecurity status of rural households. STATA 14 was used to analyze the overall statistical data.

##### **a) Descriptive statistics**

Descriptive statistics such as means, percentile and frequency distributions was employed to characterize sample responds non-farm activities status. Moreover, t-test and chi square statics was used to differentiate between on-farm and non-farm activities specific characteristics. Household dietary diversity status was identified by using Household Dietary Diversity Score (HDDS) and Household status of food insecurity was identified by household food insecurity experience scale (HFIES).

##### ***T-test statistics***

Both demographic and socio-economic variables which are continues in nature like age, family size, educational status, livestock holding, farmland size, and so on were tested by t-test statistics. Equation to compute t-test statistic is a follows (Hamilton, 2013). Where  $\bar{X}_1$  and  $\bar{X}_2$  are mean of the samples;  $\mu_1$  and  $\mu_2$  are mean of the population;  $\sigma_1^2$  and  $\sigma_2^2$  are variance of sample distribution;  $n_1$  and  $n_2$  are number of observation of the two sample; and  $df = (n_1+n_2)-2$  is degree of freedom for t-statistic.

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} \dots\dots\dots 1$$

### ***Chi-square test***

The remaining demographic and socio-economic dummy and categorical variables like sex, non-farm income, credit access and so on were tested by chi-square statistics. The formula to calculate chi-square test as follows (McDonald, 2014). Where (*O*), observed number and (*E*), expected number.

$$X^2 = \sum \frac{(O-E)^2}{E} \text{-----} 1$$

### ***b) Household dietary diversity score (HDDS)***

Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods FAO (2011). Data on household dietary diversity was collected using 24 hours of recall dietary intake. The information that collect on dietary consumption allowed to calculate a dietary diversity score, defined as the number of different food groups consumed by household members over 24 hours. A list of meals, all food items and beverages consume in the last 24 hours were recorded.

The twelve food groups, recommended by (FAO, 2006) were used to assess household dietary diversity scores (HDDS). The consumed foods are allocated to the following food groups as composed : Cereals (1) White tubers and roots (2), Vegetables( 3), Fruits (4), Meat (5), Eggs (6), Fish and other seafood( 7), Pulse/ Legumes( 8), Milk and milk products (9), Oils and fats (10), Sugar or Honey (11), Spices, condiments and beverages (12). Yes and No categories have been used. Yes was gave a score of one (1) to each food group for the household consumed at least one food item within 24 hours. No was gave zero (0) score for a particular food group household who did not consume any food item from that food group.

Finally the scores were counted from each food group and household dietary diversity scores (HDDS) were calculated based on the FAO (2011) guidelines for measuring household dietary diversity. A HDDS of less than or equal to three food groups were regarded as low household dietary diversity. Four to five food groups were regarded as medium dietary diversity and more than 6 food groups were regarded as high dietary diversity.

The following 12 food groups are used to calculate the HDDS indicator:

- A. Cereals
- B. Roots and tubers
- C. Vegetables
- D. Fruits
- E. Meat, poultry, offal
- F. Eggs
- G. Fish and seafood
- H. Pulses, legumes, nuts
- I. Milk and milk products
- J. Oil/fats
- K. Sugar/honey
- L. Miscellaneous

Each food group is assigned a score of 1 (if consumed) or 0 (if not consumed). The household score will range from 0 to 12 and is equal to the total number of food groups consumed by the household:

The formula to calculate HDDS is as follows;

$$\text{HDDS (0- 12)} = \text{Sum (A + B + C + D + E + F + G + H + I + J + K + L)} \text{ -----} 1$$

Table 2: Distribution of food group in their level of dietary diversity

Level of HDDS	Range of food groups
High HDDS	$\geq 6$
Medium HDDS	4 to 5
Low HDDS	$\leq 3$

*Source: Adopted from FAO (2011)*

### **c) Household food insecurity access scale (HFIAS)**

Food and Nutrition Technical Assistance (FANTA) Project and its partners have identified a set of questions. Household food insecurity access scale generic questions that was used to distinguish the food secure from food insecure households. The HFIAS consists of two types of related questions. The first question type was called an occurrence question.

There were nine occurrence questions that ask whether a specific condition associated with the experience of food insecurity ever occurred during the previous four weeks (30 days).

Each of the questions in table 3 were asked with a recall period of four weeks (30 days). The respondents were first asked an occurrence question – that is, whether the condition in the question happened at all in the past four weeks (yes or no). If the respondent answers “yes” to an occurrence question, a frequency-of-occurrence question is asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) in the past four weeks, (FANTA, 2007).

Example:

1. In the past four weeks, did you worry that your household would not have enough food?

0 = No (skip to Q2)

1 = Yes

1.a. How often did this happen?

1 = Rarely (once or twice in the past four weeks)

2 = Sometimes (three to ten times in the past four weeks)

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

Table 3: HFIAS Occurrence Questions

No.	Occurrence Questions
1.	In the past four weeks, did you worry that your household would not have enough food?
2.	In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?
3.	In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?
4.	In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?
5.	In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?

6.	In the past four weeks, did you or any household member have to eat fewer meals in a day because there was not enough food?
7.	In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?
8.	In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?
9.	In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?

The HFIAS indicator categorizes households into four levels of household food insecurity (access): food-secure, mild food insecure, moderately food insecure and 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.

Table 4: Distribution of HFIAS category Score in their range of food security

<b>HFIAS category</b>	<b>HFIAS category Score</b>	<b>Range of food security (0 to 27)</b>
<b>Food secure(1)</b>	HFIAS category = 1 if [(Q1a=0 or Q1a=1) and Q2=0 and Q3=0 and Q4=0 and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0]	0 to 1
<b>Mildly Food Insecure Access(2)</b>	HFIAS category = 2 if [(Q1a=2 or Q1a=3 or Q2a=1 or Q2a=2 or Q2a=3 or Q3a=1 or Q4a=1) and Q5=0 and Q6=0 and Q7=0 and Q8=0 and Q9=0]	2 to 8
<b>Moderately Food Insecure Access(3)</b>	HFIAS category = 3 if [(Q3a=2 or Q3a=3 or Q4a=2 or Q4a=3 or Q5a=1 or Q5a=2 or Q6a=1 or Q6a=2) and Q7=0 and Q8=0 and Q9=0]	9 to 16

<b>Severely Food Insecure Access(4)</b>	HFIAS category = 4 if [Q5a=3 or Q6a=3 or Q7a=1 or Q7a=2 or Q7a=3 or Q8a=1 or Q8a=2 or Q8a=3 or Q9a=1 or Q9a=2 or Q9a=3]	17 to 27
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*Source: Adopted from Jennifer, C., Anne, S., and Paula, B., (2007).*

#### **d) Econometric model**

Estimating Factors that Affect Household Food Insecurity Access Scale (HFIAS) and Household Dietary Diversity Score (HDDS) using ordered logit Model

Ordered logit regression model was used to econometrically identify demographic and socioeconomic factors affecting household level of dietary diversity and food insecurity. The model is applied to perform analysis of ordinal and categorical variables (Long & Freese, 2003). This model was selected because, the two dependent variables are categorical and ordinal in nature as a result they fit to the model.

The dependent variable in this study are household food security and dietary diversity, grouped into four and three ordered categories respectively. The four generic categories were formulated, in that during a survey a household can fall into any one of the four categories depending on the household's socio-economic condition. The categories are Q1 (food secure; there were no food shortages for the past 30 days and there is food surplus), Q2 (mildly food secure: there were no food shortages for the past 30 days, but there is no food surplus), Q3 (moderately food insecure: there is food shortages for some of the 30 days) and Q4 (severely food insecure: there are food shortages for most of the 30 days).

In the above specifications of food security category shows that the dependent variable has some order. The same to that dietary diversity has formulated three generic categories in that during a survey, a household can fall into any one of the three categories depending on the household's socio-economic condition. The categories are Q1 (high; there were high dietary diversity food groups consumed within 24 hours), Q2 (Medium: there were medium dietary diversity food groups consumed within 24 hours), and Q3 (low: food groups was regarded as low household dietary diversity consumed within 24 hours).

In this study, the ordered logit model was used to establish the factor affecting household food security and household dietary diversity in rural areas. Based on the review of the literature, the model is estimated as follows.

A. Household food insecurity =  $f(\text{sex, age of household, marital status, dependency ratio, education, total land size, total livestock holding etc.}) \dots \dots \dots [1]$

Suppose that Y is an ordinal dependent variable with (c) categories, and  $pr(y \leq j)$  denotes the probability that the response on (Y) falls in category (j) or below (i.e., in category 1, 2... or j).

This is called a cumulative probability. It equals the sum of the probabilities in category j and below:  $(y \leq j) = pr(y=1) + (y=2) + \dots pr(y=j) \dots \dots \dots (2)$

A category(c) and dependent (Y) variable” has cumulative probabilities (c):  $pr(y \leq 1), pr(y \leq 2) \dots pr(y \leq c)$ .

The final cumulative probability uses the entire scale; as a consequence, therefore,  $pr(y \leq c) = 1$ . The order of forming the final cumulative probabilities reflects the ordering of the dependent variable scale, and those probabilities themselves satisfy:  $pr(y \leq 1) \leq pr(y = 2) \leq \dots \leq pr(y \leq 1) = 1 \dots \dots \dots (3)$

Ordered logit model underlying probability score for an observation of being in the  $i^{th}$  response category is estimated as a linear function of the independent variables and a set of cut points. The probability of observing response category i corresponds to the probability that the estimated linear function, plus random error, is within the range of the cut points estimated for that response.

$$Pr(\text{Response category for the } j^{th} \text{ outcome} = i) = Pr(k_{i-1} < b_1x_{1j} + b_2x_{2j} + b_kx_{kj} +$$

$$u_j \leq k_j \dots \dots \dots (4)$$

It is necessary to estimate the coefficients  $b_1, b_2 \dots b_k$ , along with cut points,  $k_1, k_2, \dots k_{i-1}$ , where (i) is the number of possible response categories of the dependent variable. The coefficients and cut points are estimated using maximum likelihood.

## **Description of explanatory variables**

Based on the review of the literatures and practical experiences, explanatory variables which have logical and justifiable rational in determining household food security status are identified. These are presented as follows:

**Age of a household head (HHAGE):** Age is a continuous variable measured in years. It will be one of the factors that determine household food security status. Thus, younger farmers are more innovative and open to technological advances and be more willing to adopt a new technology (Diederer *et al.* 2003). Babatunde (2007) and other related studies stated that young head of households are stronger and are expected to cultivate larger-size farm than old heads. Hence, the expected effect of age on household food security could be positive or negative.

**Educational level of a household head (HHEDUC):** It is a continuous variable measured in formal schooling years completed by the household head. Education is expected to have a positive effect on household food security status. Households with better education level will be believed to have a chance to apply scientific knowledge and better manage their non-farm activities in good manner, hence boost domestic production to fulfil household consumption needs. Based on Amaza *et al.* (2006) and other literatures, the higher the educational level of household head, the more food secure the household is expected to be. Hence, education has positive contribution to household food security.

**Household size (HSIZE):** It is measured in the number of peoples living in the household converted in to adult equivalent. For farming activity, the labour force in the family is essential in order to be food secured. A household who have more number of family members could share the work load to them and contribute a lot to the food security situation of the specific household. Hence it is expected to influence the food security situation of the household positively.

**Dependency ratio (DEPRATIO):** Household members aged below 15 and above 64 are considered as dependent and dividing it by household members whose age is between 15 – 64 resulted in dependency ratio John (2002). These groups are economically inactive and became burden to other

member of household to full fill their immediate food demands. Hence, it is expected that dependency ratio have a negative impact on food security situation of the household.

**Health status of the household head (HSHH):** To work non-farming activity, physical wellbeing of the participant is mandatory. The participant household will be able to involve in non-farming work and management aspect of the work if he/she is healthy. So, health status of the household head is influence the food security situation. It will be measured if the household head have any health problem (out of farming work). Good health status will be expected to influence the food security situation of the beneficiaries positively.

**Access to credit (ACREDIT)** is a dummy variable that takes the value 1 when the household takes loan and 0 otherwise. Credit is very much useful to purchase inputs such as improved seeds, other important inputs including staple food. 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. Moreover, households with access to credit may purchase food when the need arises. Both pathways indicate that a direct relationship of credit access and household food security.

**Tropical livestock holdings /TLU/:** This refers to total number of livestock measured in tropical livestock unit (TLU). Livestock is important source of income, food and draught power for crop cultivation in Ethiopian agriculture. Household with more number of livestock have a chance to obtain more direct food or income to purchase foods commodities, particularly during food crisis. Therefore, higher livestock size would increase significantly the status of food security.

**Participation in non-farm activity (NON-FARM):** It is a measure of any household member participated in non-farming activities and generated an income in Birr. It will assumed that non-farm income earned by a household is primarily spent on food items such as on food grains, and nonfood items required for household members. Therefore, in this study it was hypothesized in that non-farm income is positively associated with household food security status.

**Food aid (FOODAID):** The food aid amount kilogram is used as one of the explanatory variables. The existing Productive Safety Net Program (PSNP) and other emergency program increases access to food availability for vulnerable households. Therefore, households received food commodities would fulfill their food gap needs, hence, in this study, it will hypothesized that food aid is positively associated with household food security.

Based on the reviewed literatures, some of the common predictors that are expected to influence non-farm household food security status of households in the study area are presented in table below.

**Table 5:** A summary of explanatory variables, their measurement and expected sign

Code	Description of Variables	Measurement	Expected sign
EDHH	Educational level	level in number	+ve
HHAGE	Age of a household head	Years	-/+ve
TUL	Livestock holding	TLU	+ve
ACCRED	Access to credit	Dummy, yes= 1, no= 0	+ve
HHSEX	Sex of household head	Dummy, yes= 1 and No= 0	+/-ve
HHSIZE	Total number of HH	Continuous, level in number	+ve/-
DEPRATIO	Dependency ratio	Continuous, level in number	+ve/-
HEALTHYHH	Health status HH head	Dummy, yes= 1 and No= 0	+ve
RFOODAID	Received to food aid	Dummy, yes= 1 and No= 0	+Ve
THHINCOME	Total household income	In Birr	+Ve
SKLHH	Skill Status of the Household	Dummy, yes= 1 and No= 0	+Ve
HHMS	Marital Status of Household	Dummy, Married= 1 and Others = 0	+Ve
(HHLSIZE)	Household Land Size	Continuous, level in number/ <i>Tsimad/</i>	+/-ve

## **4 CHAPTER FOUR: RESULTS AND DISCUSSION**

This chapter presents the results and discussion of the study. It is divided into four subsections; the first sub section summarizes results by using descriptive and inferential statistics such as means, percentages, frequencies, t-test and chi-square to describe the characteristics of sampled households by using explanatory variables. The second sub- section focuses on the measuring of food security using household food insecurity access scale in order to determine the food security status of sample households and focus on household dietary diversity of sample households. The third sub section presents the results from econometric analysis that identifies the factors affecting household food security. Finally, the fourth sub section discusses constraints that affect farm households' involvement in non-farm activities in the study *Woreda*.

### **4.1 Description of the sampled household characteristics**

This section describes the household characteristics by using descriptive statistics such as mean, percentage, and standard deviation and inferential statistics such as Chi-square test for categorical variables and independent t-test for continuous variables. The two groups (on-farm and non-farm) of sample respondents were compared and contrasted with respect to independent variables.

#### **4.1.1 Chi-square distribution of household heads in terms of non-farm activates**

The sample composed of both male and female household heads. Out of 181 sample household heads, male and female household heads take 68.5% and 31.5% respectively (Table 6). The majority of households in the sample are headed by males. Among female headed households, 25.3% and 38.4% are on-farm and non-farm activity participants, respectively, while 74.7% and 61.6% were male on-farm and non-farm activity participants, respectively. The statistical test shows that there is 10% significance difference with regard to sex household among on-farm and non-farm household activities. From the total household 69% of the respondents were male. This indicate that most men have the sole responsibility to carter for the family and female headed households are fewer in relation to male headed households in the study area. This can be attributed to cultural and religious factors. This finding is in consonance with that of Oluwatayo, 2012 who revealed that there are more male-headed households in rural Nigeria than female-headed households.

Marital status influences the level of participation in non-farm economic activities and household food security status Olayemi, (1998); Gordon and Craig, (2001). The study shows that, majority 74%

of the respondents were married, while about 5.5%, 8%, and 12.2% were single, divorced and widowed respectively as shown on Table 6. This indicates that, married people constitute bulk of the household-heads in the rural areas due to tradition and social orientation. This may encourage diversification of livelihood to meet up with family responsibilities. The Chi-square test show that there is no significant difference in marital status between on-farm household and non-farm households.

The household with special skill increases the probability of involvement in non-farm activities and suggests that skilled households are likely to engage themselves in more paying self-employment activities and became food secured as well. The study shows that majority of the non-farm household about 86% were possessed different kind of skills like, Masonry & Painting, Weaving machine, Petty trade and Pottery making on the other hand 83.2% of the on-farm households were have no any skill. The chi-square revealed that there is significance difference between on-farm and non-farm households at 1% significance level (Table 6).

The annual Income of on-farm and non-farm households is a major determinant of per capita household expenditure and food security status. Majority of the respondents (56.84%) and (50%) had on-farm and non-farm income of between 15,001 and 25,000Birr per year respectively (Table 6). Amongst the respondents that have non-farm income, 6.9% of them had income less than 15,000 Birr and 22.1% of on-farm income had less than 15,000 Birr. The reason for this relatively low income could be due to the fact that farm household usually satisfy their food needs before excess are sold in the market and lack of non-farm activity in the study Woreda. Only 10.53% and 29.09% of on-farm and non-farm of these respondents have income between 25,001 to 35,000 Birr, while only 3.49% had non-farm income above 45,000 Birr. The chi-square revealed that there is significance difference between on-farm and non-farm households at 1% significance level (Table 6).

Table 6: Demographic and socioeconomic characteristics for category variables

Household feature(variables)		Household Participated in Farm Activity		Household Participated in Non-farm Activity		Total		Chi-2
		No.	Percent (%)	No.	Percent (%)	No.	Percent (%)	
Household head sex	Male	71	74.74	53	61.63	124	68.51	0.058*
	Female	24	25.26	33	38.37	57	31.49	
	Total	95	100.00	86	100.00	181	100.00	
Marital status of household head	Single	5	5.26	5	5.81	10	5.52	0.831
	Married	73	76.84	61	70.93	134	74.03	
	Divorced	7	7.37	8	9.30	15	8.29	
	Widowed	10	10.53	12	13.95	22	12.15	
	Total	95	100.00	86	100.00	181	100.00	
Skill of household head	Yes	16	16.84	74	86.05	90	49.72	0.000* **
	No	79	83.16	12	13.95	91	50.28	
	Total	95	100.00	86	100.00	181	100.00	
Household annual income	<15,000Birr	21	22.11	6	6.98	27	14.92	0.001* **
	15,001-25,000Birr	54	56.84	43	50.00	97	53.59	
	25,001-35,000Birr	10	10.53	25	29.07	25	29.07	
	35,001-45,000Birr	10	10.53	9	10.47	9	10.47	
	>45001Birr	0	0.00	3	3.49	3	1.66	
	Total	95	100.00	86	100.00	181	100.00	
	Note: ***, ** and * are significance level at 1%, 5%, and 10% respectively.							

Source: Own field survey (2019)

The survey results in Table 7 shows that out of the total sampled households only 23% of households had received food aid as the form of safety-net program. On the other hand 77% of household respondents had not received food aid. On the other hand 37 % of on-farm households had received food aid while only 6.9% of the non-farm households received food aid. This indicates on-farm households received more food aid than non-farm households. The Chi-square test revealed that there is significant difference in food aid between on-farm household and non-farm households, at 1% significant level.

The results in table 7 indicated that in the study area out of sampled households 85.5% reported not have health related problem currently while 15.5% of them were suffering from certain sickness. Among the total household respondent 22% of on-farm households and 8% of non-farm household heads were exposed to health problems. The Chi-square test in table 7 revealed that there is significant difference in household health status between on-farm household and non-farm households, at 1% significant level.

Credit is an important institutional service to finance poor farmers for input purchase and diversified in to different non-farm activities. However, some farmers have access to credit while others may not have due to problems related to high interest rate. As indicated in Table 7, out of the total household sampled only 49% of households had access to credit. The majority of sample households 51% had no access to credit service. From the total sampled households, only 49.5% of the on-farm households and 47.7% of the non-farm households had received credit in the last one years. The Chi-square test shows that there was no significant difference in credit access between on-farm household and non-farm household participants.

Table 7: Demographic and socioeconomic characteristics for category variables

Household feature(variables)		Household Participated in Farm Activity		Household Participated in Non-farm Activity		Total		Chi-2
		No.	Percent (%)	No.	Percent (%)	No.	Percent (%)	
Access to credit	Yes	47	49.47	41	47.67	88	48.62	0.809
	No	48	50.53	45	52.33	93	51.38	
	Total	95	100.00	86	100.00	181	100.00	
Household Food-Aid	Yes	35	36.84	6	6.98	41	22.65	0.000***
	No	60	63.16	80	93.02	140	77.35	
	Total	95	100.00	86	100.00	181	100.00	
Household health Problem	Yes	21	22.11	7	8.14	28	15.47	0.009***
	No	74	77.89	79	91.86	153	84.53	
	Total	95	100.00	86	100.00	181	100.00	
Note: ***, ** and * are significance level at 1%, 5%, and 10% respectively.								

Source: Own field survey (2019)

## **4.2 Description of the sampled household characteristics of continuous variable**

### **T-test distribution of household heads in terms of non-farm activity**

T-test distribution of household heads in terms of non-farm activities demographic and socio-economic characteristics of both on-farm and non-farm have been examined. The result revealed that there is significance difference in the mean age, education level, household size and TLU (Table 8).

Age has been found to affect the ability of households to diversify their livelihood income activities, which in turn, affects household's productivity and general well-being Dary and Kuunibe, (2012); Oluwatayo, (2012). At younger age the probability of working non-farm will increase, at older ages the overall labor hour will diminish and the demand for leisure will increase (Beyene, 2008). The age structure has also significant implication on the economic activity of the household. Table 8 shows the mean age of the sample household heads was found 46 with standard deviation of 6.58.

The survey result depicts that the average age of sample respondents is about 46 years with the minimum and maximum ages of 26 and 66 years, respectively. Average age for on-farm and non-farm households were 48.90 and 43.23 with standard deviation of 6.9 and 4.7 respectively. This by implication means that, majority of the respondents are more energetic and could afford to engage in non-farm economic activities that will contribute towards improved household food security. The statistics result shows that there is significant difference at 1% with regard to age of respondents among on-farm and non-farm activity households. This was further elaborated using three age clusters. The average number of members whose age less than 14, between 15 and 64 and greater than 64 was 2.13, 3.86 and 0.08, respectively. The majority is found in the cluster whose age is between 14 and 65. Based on the result mean of members whose age less than 14 and between 14 and 65 show statistical difference at 1% significant level. This indicates that families having household members whose age less than 65 years tends to participate in different non-farm activities.

Livestock production plays an important role in the study area. Farmers rear livestock for various purposes such as for food (source of egg, milk and meat), means of transport, animal dung for fuel wood and organic fertilizer, and means of transport and source of cash for urgent needs. Livestock is also considered as a measure of wealth in the rural area. Farm households having a number of livestock are considered as wealthy farmer in the farm community. Livestock holding widely varied

among the sampled households (Table 8). The average size of livestock holding in tropical livestock unit (TLU) for the total sampled households was found to be 2.4 with standard deviation 2.5. Average holdings for on-farm and non-farm households were 4.32 and 0.35 TLU with standard deviation of 1.97 and 1.13 respectively. The survey result shows that on-farm households possessed relatively higher number of livestock than non-farm households and the t-value 6.5 shows that there is significant mean difference between two groups at 1% significance level.

There are many research findings, which asserts that, household size or dependency ratio affects household food security status Bashir *et al.*,( 2012); Adepoju and Adejere, (2013). The mean household size of on-farm and non-farm were 6.5 and 5.6 with standard deviation of 1.5 and 1.3 respectively, which relatively on-farm households were large (Table 8). Adebayo (2012) reported that large family size affects food availability per head in the family. The T-value 4.2 shows that there is significant mean difference between two groups at 1% significance level.

The dependency ratio shows the ratio of economically active persons compared to economically dependent household members. Economically active members of households, whose age is from 14 to 64, were assumed to be the principal productive force and sources of income for the household John, (2002). Household members whose age was between 0-14 and above 64 were considered as economically inactive and dependent members of the household. The mean dependency ratio of on-farm households was 0.619 with standard deviation of 0.68 and that of non-farm households were 0.86 with standard deviation of 0.51 in Table 8. This shows that non-farm households had less dependency ratio than on-farm households. Therefore, non-farm households were more economically active as compared to on-farm households. The t-test shows that there is difference in mean dependency ratio between on-farm and non-farm households, at 1% level of significant.

The average sum of HDDS was 5.8 with the minimum and maximum size of 3 and 10. The average sum of HDDS for on-farm and non-farm were 5.3 and 6.3 respectively, with significant difference in their mean at 1% significant level. The result shows that non-farm participants consume more diversified diet than on-farm.

The result shows that the average education status of the sampled household heads was 3.6 with minimum and maximum education level of 0 and TVET, respectively. Average education status of

on-farm and non-farm were 1.9 and 5.5, respectively with statistically significant difference at 1 percent.

Food production can be increased extensively through expansion of areas under cultivation Van der Veen, (2010). Farm size in the context of this study refers to the land area that was actually used for crop production during the survey year. The finding revealed that farmers in the study area are mainly small scale farmers and most of them were had no access to farm land, hence food production is at subsistence level which could lead to diversification into non-farm activities to be food secure. This finding corroborates with the finding of Arene and Anyeaji (2010) and Oni and Fashogbon (2013) that majority of Nigerian farmers are small scale farmers who cultivate less than 5 hectares.

The result further indicated that farmland size shows statistical difference in terms non-farm activities at 1% significant level. The average household farm land size of sample respondents was 1.8 with the minimum and maximum size of 0 and 4 *Tsimad*, respectively. The average household farm size distribution of on-farm and non-farm were 5.3 and 0.5, respectively.

This implies that households who participate non-farm activities tend to have lower farm size than their counter part.

Table 8: Demographic and socioeconomic characteristics for continuous variables

Variables	On-farm activity (N=95)	Non-farm activity (N=86)	Total mean	t-value	p-value
	Mean value(SD)	Mean value (SD)			
Age(Year)	48.90526 (6.866622)	43.2325 (4.72459)	46.20994 (6.57521)	6.5330	0.0000***
TLU	4.326316 (1.970215)	.3488372 (1.124774)	2.436464 (2.567445)	16.4491	0.0000***
Household size	6.484211 (1.270476)	5.616279 (1.480609)	6.071823 (1.437719)	4.2431	0.0000***

Sum of HDDS	5.263158 (1.524345)	6.325581 (1.918589)	5.767956 (1.79854)	-4.1431	0.0001***
Household farm land size in <i>Tsimad</i>	5.263158 (1.073972)	.5 (1.155549)	3 (2.631012)	28.7405	0.0000***
Household member age less than 14	1.947368 (1.161148)	2.337209 (1.164277)	5.767956 (1.79854)	-4.1431	0.0001***
Household member age between 14 and 65	4.431579 (1.555037)	3.232558 (1.243093)	3.861878 (1.533962)	5.6910	0.0000***
Household member age greater than 65	.1052632 (.3987663)	.0581395 (.3200975)	.0828729 (.3632944)	0.8709	0.3850
Household educational status	1.947368 (2.795773)	5.5 (4.549725)	3.635359 (4.125755)	-6.3941	0.0000***
Dependency Ratio	.6198947 (.6808701)	.8601163 (.5132927)	.7340331 (.6172365)	-2.6585	0.0086***
Note: ***, ** and * are significance level at 1%, 5%, and 10% respectively. 4 <i>Tsimads</i> are equivalent to one hectare					

Source: Own field survey (2019)

### **4.3 Food security status of sample households**

**4.3.1 Household food insecurity access scale:** The first objective of the study was to assess household food security between on-farm activity and non-farm activity households. Household food security was assessed and the results are present in Table 9. The categorical household food security status was based on the household food insecurity access scale (HFIAS) developed by the Food and Nutrition Technical Assistance (FANTA) project of USAID.

The scale provides a continuous measure of household food insecurity which can be categorized into four levels of household food insecurity (access) prevalence. The result in table 9 shows that out of total sampled households 76 (42%) households were food secured and 105 (58%) of households were food insecure. Majority about (62%) households participated in non-farm activities were food secured, 22% of non-farm households were mildly food insecure while 16.3% households participated in non-farm activities were moderately food insecure and there were no households severely food insecure. Similarly, out of total households participated on-farm activities 24% were food secure, 53% of on-farm households were mildly food insecure while 22% of on-farm households were moderately food insecure and 1% of on-farm households were severely food insecure. The result indicates that non-farm participant households more food secure than on-farm participant households. The Chi-square test shows that there was significant difference food security status between on-farm activities and non-farm activities at 1% level of significant.

**4.3.2 Household dietary diversity:** The results of survey in Table 9 show that more than half (58%) of non-farm households and 37% of on-farm households had consumed high dietary diversity of greater or equal to 6 food groups. Similarly, 47% and 33% on-farm households and non-farm households, respectively, had medium dietary diversity of 4-5 food groups. It is found that only 8% of non-farm households had consumed low dietary diversity of less than 3 food groups as compared to 15% of on-farm households that consumed the same amount. The Chi-square test shows that there is significant difference food security status between on-farm activities and non-farm activities at 5% level of significant. According to this result, non-farm activity is related with high diversity diet and minimal food insecurity experience. Therefore, one can infer that non-farm activities can be taken as effective tool to ensure household food security.

Table 9: chi-square distribution of household dietary diversity and food insecurity access scale in terms of on-farm and non-farm activities.

Level of household dietary diversity	ON-farm		Non-farm		Chi-2
	No.	Percent (%)	No.	Percent (%)	
High HDDS	35	36.84	50	58.14	0.014**
Medium HDDS	45	47.37	29	33.72	
Low HDDS	15	15.79	7	8.14	
Total	95	100.00	86	100.00	
Level of household food insecurity access scale	ON-farm		Non-farm		Chi-2
	No.	Percent (%)	No.	Percent (%)	
Food Secure	23	24.21	53	61.63	0.000***
Mildly Food Insecure	50	52.63	19	22.09	
Moderately Food Insecure	21	22.11	14	16.28	
Severely Food Insecure	1	1.05	0	0	
Total	95	100.00	86	100.00	

Source: Own survey result, 2019 Note: \*\*, \*\*\*, Significant at 5% and 1% level, respectively

#### 4.4 Factors that influence farm households' involvement in non-farm activities

Though the economy of the household is depending on farming, substantial numbers of farmers are involved in nonfarm activities to supplement income. Non-farm income is the income derived from source other than farming, like petty trade, handicraft, daily labor, masonry etc. From data as shown below majority of household heads are involved in nonfarm employments because they believe that agricultural income is not sufficient enough to stand households food security. About 32 percent of the household head participated in nonfarm activity tell that household head with no access to agricultural land is the major push factor for such involvement (see Table 10). In addition to this about 19 percent small size of land holding, obtain income to support agricultural activities and market opportunity, around 7 percent Support from cooperatives and relatives/friends advice are the other major reason.

About 2 percent as a result of favorable demand for goods/services and buy farm inputs. Our study points, among others, the three main reasons that explain the extent and involvement in nonfarm activities are insufficiency of income from agriculture, decline land size, and market opportunity. From this, one can observe that farmers in the area participated basically due to push factor.

Table 10 Reasons of household's for participate in nonfarm activities

What was your most important motive for starting non-farm activity	Freq.	Percent (%)	Cum.
Small size of land holding	13	7.18	49.17
No access to agricultural land	57	31.49	80.66
Obtain income to support agricultural activities	10	5.52	86.19
Market opportunity	11	6.08	92.27
Support from cooperatives	7	3.87	96.13
Advice from relatives/friends	5	2.76	98.90
Buy farm inputs	2	1.10	100.00
Missing System(household participate on-farm activities)	76	41.99	41.99
Total	181	100.00	

## **4.5 Econometric results**

The third objective of the study was to determine the effect that influence household food insecurity and dietary diversity score involvement in non-farm activity. In order to compute determinants of food insecurity and dietary diversity scores, ordered logit model has been used.

### **4.5.1. Determinants of household's dietary diversity score**

The most important issue that should be addressed here is analyzing the effect of non-farm activity on different food insecurity status of households. Since the dependent variable is ordered in nature, ordered logit model was used to run the regression. The estimated results of the model of the maximum likelihood and the marginal effects are tabulated in Appendix 2 and Table 11 respectively. Marginal effects are interpreted relative to the category and sign. A positive coefficient for a category indicates an increase in that variable increases the probability of being in that category, whereas, a negative coefficient indicates a decrease in probability of being in that category. The dependent variable was obtained by making use of food security measurement tool called household dietary diversity score, and the households were organized in to three groups; namely high , medium and low dietary diversity. A total of 12 explanatory variables were used to compute the econometric model in order to identify factors that determine household's level dietary diversity. Among those explanatory variables, only age, educational level, health status, skill status and credit access was found to have significant relationship with the level of HDDS.

The results revealed that age was one of the most important factor that took its place of influence on improvement of household dietary diversity that age of household head was positive and significant at 5% level. By implication, as the head of household grows older the dietary diversity status of the household increases. This observation agrees with the a priori expectation of the study. Increase in age tend to provide superior experience in resorting to measures that could diversify the income or food sources as the same time use of diversity foods. The marginal effect implies that a year increase in the age of a household head has a probability of decrease high level of food diversity by 1.6% holding all other factors constant, whereas increased the mild and moderate food insecurity at 0.08%.

The household educational status was found to be positive and significant at 5% significance level. This implies that, households with educated heads are more likely to be food secure than households

with uneducated household heads. Obtaining higher education has the probability of increasing food security status of the household by approximately 2.8% holding all other factors constant. This result agrees with the findings of Babatunde et al., (2007) who pointed out that household heads with higher education are more likely to ensure food security in the households of North Central Nigeria.

Results from the regression analysis shows access to credit by smallholder households had a positive effect on food security in the study area. It met a priori expectation and was significant at 10%. This was expected because households that received credit had a relatively higher probability of being used diversified foods since it could be used to procure more inputs to expand their production frontiers. The value of the marginal effect implies that increase in credit access had a probability of decrease household high diversified food by about 11% holding all other factors constant and increased mild and moderate food insecurity by 5.6%. This result corroborates the findings of Kuwornu et al., (2013) who concluded that credit access could improve the food security status of smallholder farmers in the Central Region of Ghana.

The model result in Table 10 shows that health status of household heads has positive relationship with food security of dietary diversity food household and significantly at 1% significance level. This implies that, healthy households were more active and motivated for any work than unhealthy ones. Hence, they were better in food security and consume more diversified foods than unhealthy ones. This finding is similar with the findings of Regassa (2011) and Bedeke (2012). The marginal effect shows that increase in household illness was decrease by 23.5% of the household high dietary diversity consumption and increase by 11.8% of the medium and low dietary diversity consumption of the household.

Table 11: Determinants of household dietary diversity food score (HDDS)

Independent variables Value Robust St. Error	Coefficients	Marginal Effects		
		High(dy/dx)	Medium(dy/dx)	Low(dy/dx)
Age	.0901912 (.0405848) **	.0160491 (.0067569) **	.0080315 (.0035294)**	.0080176 (.0036443)**
HH size	.0426165	-.0075834	.003795	.0037884

	(.1701541)	(.0303086)	(.0151693)	(.0151607)
Total land size	.0949079 (.1952986)	-.0168884 (.0347618)	.0084516 (.0174155)	.0084369 (.0174388)
Educational level	-.1590418 (.0664705) **	.0283008 (.0110101)***	-.0141627 (.0055511)***	-.0141381 (.0062321)**
Marital status	-.6343933 (.4596998)	.1128874 (.0819762)	-.0564928 (.042521)	-.0563946 (.0411835)
Gender/Sex	.3756014 (.4221616)	.0746777 (.0746777)	.0334474 (.0369256)	.0333892 (.038409)
TLU	-.1298942 (.1105584)	.0195435 (.0195435)	-.0115671 (.0099032)	-.011547 (.0099467)
Health Status	1.322331 (.4618013) ***	-.2353027 (.0799989) ***	.1177538 (.0468254) ***	.1175489 (.0404141)***
Skill Status	1.314805 (.4303232) ***	.2339635 (.0713621) ***	-.1170836 (.0397399)***	-.1168799 (.0398175)***
Access to Credit	-.6258117 (.3383155) *	.1113603 (.0579926) *	-.0557286 (.030694)*	-.0556317 (.0296581)*
Non-farm HH	.7310096 (.8778982)	-.1300798 (.1551795)	.0650965 (.0780772)	.0649833 (.0783289)
Dependency Ratio	.3100165 (.251288)	-.055166 (.0442466)	.027607 (.0229739)	.027559 (.0220341)

/cut1 3.404706 2.196539

/cut2 6.162766 2.246212

N=181 Wald chi2(12) = 51.94 Prob > chi2 = 0.0000 Pseudo R2 =0.1893

Log pseudo likelihood = -143.3314

**Note:** Numbers in brackets are standard errors

\*, \*\*, \*\*\*, means the coefficient is statistically significant at 10%, 5% and 1% levels, respectively:  
Household Survey (2019)

#### **4.5.2. Determinants of household food insecurity access scale**

The estimated results of the ordered logit model of the maximum likelihood and the marginal effects are tabulated in Appendix 3 and Table 12, respectively.

The dependent variable was derived by making use of food security measurement tool called Household Food Insecurity Experience Scale, and the households were organized in to four groups; namely severely, moderately, mildly food insecure and food secure households. A total of 12 explanatory variables were used to compute the econometric model in order to identify factors that determine household's level of food insecurity.

The household educational status was found to be negative and significant at 1% of significance level (Table 12). The negative sign suggests that the probability of a household being food insecure decreases with an increase in educational attainment. According to, Benjamin & Joseph, (2012:209) and Kuwornu *et al.*( 2013:35) found a negative and significant relationship between education and household food insecurity. Furthermore this suggested that the higher the educational level by the household head, the less food insecurity the household experience. Better educated people are able to engage in income-generating activities and improve the quality of labour. This implies that, households with educated heads are more likely to be food secure than households with uneducated household heads. The marginal effect shows that obtaining higher education has the probability of increasing food security status of the household by approximately 3.7% holding all other factors who pointed out that household heads with higher education are more likely to ensure food security in the households of North Central Nigeria. This result also suggests that the level of formal education could impact positively the household production and nutrition decision thereby reducing food insecurity intensity.

Results from the regression analysis shows access to credit by smallholder households had a positive effect on food security in the study area which is  $P < 0.017$  (Table 12). It met a priori expectation and was significant at 5%. This was expected because households that received credit had a relatively higher probability of being food secure since it could be used to procure more inputs to expand their production frontiers. The value of the marginal effect implies that increase in credit access had a probability of increasing household food security by about 12% holding all other factors

constant. This result corroborates the findings of Kuwornu et al., (2013) who concluded that credit access could improve the food security status of smallholder farmers in the Central Region of Ghana.

Marital status showed negative relationship on being moderately food insecure household at 5% significant level, while the opposite being true on the case of being food secure at 5% significant level (Table 12). The model indicates that the marital status of the head of the household is a significant determinant of household food security ( $p < 0.045$ ). The marital status variable was modelled as 1=married and 0=others. The result indicated that being married reduced the probability of being moderately food insecurity by 11.7%, and increased the probability of being food security by 14.8%. This might imply that household led by married parents support each other all their way to food sufficiency while the singles and widows lack mutual support. Single headed households were reported to be vulnerable to severe food insecurity as compared to married ones (Nord *et al*, 2004). The result is also consistent with a similar study by Cancian and Reed (2009:255), where household headed by people who are not married were likely to rely on the earnings of one adult, thus increasing their likelihood of food insecurity.

Access to non-farm activity offers an important pathway towards addressing food insecurity and represents income diversification opportunities of households. Participation in non-farm activities positively affected household food security at significance level of ( $p < 0.033$ ) which is 5% (Table 12). This indicates that households who participate in the non-farm activities were more likely to be food secured as compared to non- participating households. The marginal effect revealed that participating in non-farm activity increase the food secured household at 24.7% (table 12). Since the income that they earn from non-farm activity would increase the household's liquidity to make on-farm investments or increase its income to purchase food and, thereby, improve household food security. This is consistence with the finding of study conduct by Regassa, (2011) and Bedeke (2012).

This study found that livestock holding has a significant negative impact on household food security ( $p < 0.003$ ); this result is in opposite line with the findings of Rahman and Poza (2010), and Amaza, Umeh, Helsen and Adejobi (2006). This was due to the reason of poor livestock access and poor livestock holding of the non-farm study area. However, many farm households were found to use animal power for agricultural purposes including cultivation of land. This indicates their backwardness as well as inability and reluctance to adopt modern agricultural practices. The marginal

effect shows that a unit increase in livestock holding had a probability of decreasing food security status of the mildly and moderately food insecure household by about 0.08% and 3.7% at 10% and 1% significance level respectively. Livestock owned is a proxy to wealth status and households with large numbers of livestock were expected to have diversified the quantity which may in turn lead to increased consumption and household food security of the non-farm participants.

A special skill positively and significantly influences the food security status of household, i.e. it increases the probability of involvement in non-farm activities and suggests that skilled households are likely to engage themselves in more paying self-employment activities and became food secured as well. More specifically possessing skills such as masonry, handcrafts and merchants increase the probability of involvement in non-farm activities. The marginal effect result revealed that increasing skill status of household by one unit the household of food secure increase by 21.7% at significance 1% level. Whereas the mildly and moderately food insecure reduce by 3.9% and 17% at 10% and 1% significance level respectively.

Table12: Distribution table for household food insecurity access scale (HFIAS)

Independent variables	Coefficients	Marginal Effects			
		Food Secure(dy/dx)	Mildly Food Insecure(dy/dx)	Moderately Food Insecure(dy/dx)	Severely Food Insecure (dy/dx)
Age	.0481555 (.0363561)	-.0072686 (.0055419)	.0012894 (.0012554)	.0057124 (.0041876)	.0002668 (.0003719)
HH size	.0295501 (.1884178)	-.0044603 (.0283326)	.0007912 (.0049602)	.0035053 (.0223475)	.0001637 (.0010525)
Total land size	-.260742 (.1823059)	.0393564 (.0277786)	-.0069817 (.0063618)	-.0309301 (.0214477)	-.0014447 (.0017438)
Educational level	-.2443678 (.0604408) ***	.0368849 (.0082536)***	-.026335 (.0030754)**	-.0289877 (.0078409)***	-.0013539 (.0013005)

Marital status	-0.9835225 (.4907752) **	.148453 (.0716718)**	-.026335 (.0181112)	-.1166688 (.0567483)**	-.0054493 (.0059479)
Gender/Sex	-.0624304 (.4274824)	.0094233 (.0644811)	-.0016716 (.0115979)	-.0074057 (.0505525)	-.0003459 (.0023847)
TLU	-.3128985 (.1035829) ***	.047229 (.0147094)	-.0083782 (.0050226)*	-.0371171 (.0113889)***	-.0017336 (.0018038)
Health Status	.5537074 (.4357327)	-.0835767 (.0663026)	.0148262 (.0147755)	.0656826 (.0503771)	.0030679 (.0042768)
Skill Status	-1.438278 (.4361095) ***	.2170939 (.0652006)***	-.0385116 (.0218483)*	-.1706134 (.0539286)***	-.0079689 (.007789)
Access to Credit	-.7952662 (.3324155) **	.1200376 (.0460672)***	-.0212942 (.011988)*	-.0943372 (.0385052)**	-.0044062 (.0046346)
Non-farm HH	-1.635495 (.7650301) **	.2468618 (.1130247)**	-.0437923 (.0319998)	-.1940079 (.0852539)**	-.0090616 (.0098787)
Dependency Ratio	.0389053 (.2045578)	-.0058724 (.0309522)	.0010417 (.0056464)	.0046151 (.0241852)	.0002156 (.0011625)

/cut1 | -2.704311 2.044427      N=181      Wald chi2(12) = 84.87      Prob > chi2 = 0.0000  
/cut2 | -.2924219 2.023592      Pseudo R2 =0.2421  
/cut3 | 4.024121 2.021263      Log pseudo likelihood = -148.79283

**Note:** Numbers in brackets are standard errors,

\*, \*\*, \*\*\*, means the coefficient is statistically significant at 10%, 5% and 1% levels, respectively:

Household Survey (2019)

The results of the ordered logit regression has shown that participation in non-farm activity increase the probability of households to be food secure and reduce the probably of households to be in a moderate food insecurity status. Household head's educational level is the one factor that had positive influence on food secure households, while it showed negative relationship with mildly and moderately food insecure households at 1% and 5% significant level respectively. The result revealed that increment in the school level of the household head increased the probability of households being food secure by .037, and decreased the probability of households becoming moderately and mildly food insecure by .028 and .026, respectively. Even though, the effect is not worthy of consideration, it signifies that non educated people are the one that are susceptible to severe food insecurity.

As the computed report showed education reduced severity and by promoting moderate and mild food insecurity, it works towards achieving food security. The positive effects of these variables indicate that the importance of the household's education in terms of avoiding food insecurity. Thus, the possible explanation is that education is a fundamental instrument to develop their skills how to use and control non-farm activates. According to Farhadian (2015) tried to explain the fact that a person with a diploma or a degree holder is able to secure a good job and has a higher income. It can also be observed that the households with household heads that have a low level of education (never attend school, primary school, and secondary school) tend to have the worst scores in comparison to the households with a better schooled household head (institution of higher education).

Based on this paper, mildly and moderately food insecurity has negative relationship with attributes like, TLU, skill status, and access to credit at 1% and 10%, 1% and 10%, 5% and 10% significant level respectively that it reduces prevalence of mild and moderate food insecurity by 0.008 and 0.037 TLU, 0.038 and 0.17 skill status and 0.21 and 0.09 access to credit respectively. Furthermore, the probability of households being food secure was positively influenced by factors like skill status of household at 1%, access to credit at 1% and participating in non-farm activity at 5% significant level. Based on the figure in the above table, the probability of households being food secure was increased skill status by 0.217, access to credit by 0.12, and participating in non-farm activity by 0.247.

#### **4.6. Constraints preventing household head from opening non-farm activities**

The fact that rural non-farm activities are varied by their very nature, the constraints also have varying nature. The constraints to self-employed engagements are the main focus, because the entry barriers in terms of start-up capital, skill level, access to infrastructure, limited market demand and other factors are higher than to wage-employment. In this connection, Warren (2002:10) observes “rural enterprise development is a form of diversification requiring higher investment and entailing higher risk. Household heads of the study sample were asked to tell the primary constraint preventing household members from opening a non-farm enterprise by choosing among pre-coded answers in the questionnaire.

Table 13 illustrates that 3.31% responded that insufficient startup capital is the primary constraint. Inadequate access to capital is the most commonly reported barrier to investment and entrepreneurship; however, the startup capital requirement of non-farm activity varies: many types of non-farm participants do not have specific or substantial assets in terms of building, machinery, land etc, and thus require very limited, if any, start-up capital. For example local drink sales and petty trade at local markets.

Key informants have emphasized that skill were key inhibitors of diversification. However; it would be incorrect to assume all non-farm activities are liable to skill constraints. Certain activities, by their very nature, require special skills. For example, coble stone, handicrafts, weaving, carpentry, metal works, pottery and blacksmithing. On the other hand, activities such as simple food processing, local drink sales and petty trade are not likely to be constrained by high or specialized skill requirements. Access to training is one way of mitigating skill deficit but is found to be very limited in the study *Tabias*. As shown earlier, 20.99% have not received any formal education. This is a high illiteracy rate which is a serious obstacle to expansion of non-farm businesses. Local infrastructure is important constraint identified by the study area.

Key informants of the study have also stressed the limitation of poor infrastructure places on non-farm business development. The most severe handicap to local non-farm business development identified by the respondents were insufficient startup capital, road access problem, and lack of electricity. *Sasun* one of among the study sample *Tabias* characterized by high potential area for stone

Quarry but the road is difficult for transportation as the producers have limited market demand. *Tabias* are covered by a mobile telephone services network. As per the focus group discussion participants; they have indicated that fear of loss of land is another restraint to non-farm rural diversification. Other constraints commonly cited in the literature, such as lack of market opportunities and shortage of demand.

Table 13 Constraints preventing household head from opening non-farm activities

<b>Constraints</b>	<b>Frequency</b>	<b>Percent %</b>	<b>Cum.</b>
Insufficient startup capital	6	3.31	65.75
Poor infrastructure	23	12.71	78.45
Lack of appropriate skills	38	20.99	99.45
Limited market demand	1	0.55	100.00
Missing System	113	62.43	62.43
Total	181	100.00	

Source: Field Survey (2019)

#### **4.7 Primary activities of the household head**

Table 14 illustrates that about 8.84% of the non-farm respondents are engaged in Petty trade. This is the activity which contains large number of the samples respondents. Petty trade is nowadays believed to be a means to initiate non-farm agricultural activities in the rural area. The Petty trade project is planned and backed by the government to enable the rural landless to engage themselves in non-farm activities it is believed that the rural household can accumulate initial capital through the Petty trade engagement and thereby proceed to establish other petty non-farm occupation .On the basis of this principle, many rural household, especially those who are landless or currently not working in on-farm, were made to be organized in developmental groups at a number of 5-10. The livelihoods of all participants have changed because, they used the opportunity offered by their *Tabias* and saved their money. The saving helped them as start-up capital for diversifying their activity as a result the individual income has increased and hence, their livelihood have significantly improved since they became members of the developmental group as the non-farm participants.

Table 14: Primary activities of household head

Primary Activities of HH Head		Frequencies	Percent (%)
Agriculture/Farm Activities	Crop production	89	49.17
	Poultry	3	1.66
	Livestock	2	1.1
	Bee keeping	1	.55
	Missing System(non-farm)	86	47.51
Total		181	100.00
Nonfarm Activities	Construction	9	4.97
	Masonry & Painting	9	4.97
	Sand & stone quarrying	5	2.76
Nonfarm Activities	Weaving machine	14	7.73
	Pottery	1	.55
	Petty trade	16	8.84
	Food preparation	11	6.08
	Civil servant and Security	21	11.6
	Missing System(on-farm)	95	52.49
Total		181	100.00

Source: Field survey (2019)

## CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION

### 5.1 Summary

This study was conducted to determine the food security status of non-farm households, to identify factors that influence farm households' involvement in non-farm activities and to identify the determinant factors that affects the household food insecurity in Ganta-afeshum *Wereda*, Eastern Zone of Tigray, Ethiopia. Both primary and secondary sources were used to carry out the study. A total of 181 household heads from the *wereda* were selected by random sampling method from three *Tabias* of the Woreda.

Sample size allocation for each *Tabia* was based on number of on-farm household headed and non-farm household heads that were dominantly participating in agricultural activities and non-farm activities available during data collection period. Quantitative data were collected from sample respondents through a structured questionnaire. Qualitative data were also collected through FDG and KII. Moreover, secondary data were obtained from published sources. The collected data were analyzed using descriptive, inferential statistics and stata Software version 14.0.

The sample households were classified into primary source of occupation that were on-farm and non-farm activities. Then, the households were classified into food secure and food insecure groups based on household food insecurity access scale. As a result, household food insecurity access scale was employed as a cut-off point between food secure and food insecure households

The descriptive statistics results showed that out of the total respondents, 52.5% of participate in on-farm activity while 47.5% of them were participated in non-farm activities. Accordingly, the result of the study showed that about 41% and 59% of sample households were food to be food secure and food insecure respectively. Among those households 22(23%) households who participate in on-farm and 52(61%) households who participate in non-farm activities were food secured respectively. On the other hand, 73(77%) households participated in on-farm and 34(39%) households participated in non-farm activities were food insecure respectively. Among the food insecure households 46(48%) who participate on-farm and 20(23%) who participate non-farm activities were mildly food insecure, 26(27%) who participate on-farm and 14(16%) who participate non-farm activities were moderately food insecure, and 1(1%) who participate on-farm activities were severely food insecure.

The t-test showed that there was a significant difference between on-farm and non-farm participants in terms of household labor whose age less than 14 and whose age in between 14 and 65, household education status, livestock holding (TLU), farm size, sum of dietary diversity score, and dependency ratio. The chi-square test also revealed a significant difference between on-farm and non-farm participants in terms of sex, skill status of household, credit access, household food aid, household health status, household level of diet diversity and food insecurity experience score.

Ordered logit regression model was used to identify determinants of household dietary diversity and food insecurity experience. Educational status, skill and access to credit showed its contribution for consumption of high diversity diet, at the same time reducing eating medium to low diversity food. These might be due to the fact that households having good skill and education level can get better income, and this in turn could be used to purchase diversified items of food from market. And at last, but not the least, diversifying in non-farm activities enhancing inputs bring food and monetary sufficiency as a result what they produce they eat, what they lack they buy to diversify their diet.

Educational status with in the household, marital status, TLU, skill status, access to credit and non-farm participants had negative relationship with mildly and moderately food insecurity whereas, positive relationship with food secure level, as a result it reduce it and in turn promote moderate and mild food insecurity working its way towards security. The remaining possible explanations are; education is an instrument to develop their skills how to use and control non-farm activity, apply different activities and developing new skills, applying family planning, and drive away food insecurity; household led by married parents support each other all their way to food sufficiency; additional household members' shares the limited resources that leads to resource exhaustion and food insecure; self-supporting household member within the household would promote food security; and adopting yield enhancing farm inputs is likely to increase productivity, as a result it tend to decrease the probability of being food insecure.

Insufficient start-up capital, poor infrastructure, lack of appropriate skills and limited market demands were the major constraints of preventing on-farm households from opening or participating in non-farm activities.

## 5.2. Conclusion

The objective of this study was to assess the effect of non-farm on household food security. Food security was measured using a commonly known measure of food security status known as household food insecurity and access scale. The results based on this measurement revealed that 41% of the households in the study area were food secure while 59 % were food insecure. From total non-farm participants 52(61%) households were food secure and 22(23%) of on-farm households were food secure. Household diet diversity score between non-farm and on-farm had significant chi-square difference at 5% significant level.

The result indicated that, non-farm participant households were more food secure than non-users households in the study area. Thus, the food insecurity occurrence households with on-farm practice are greater than households practicing in non-farm. This suggests that non-farm activity has an important influence on rural household food security. And it is observed that non-farm activity is one of the viable solutions to secure household food needs in the study area.

The results of the determinants of food security indicate that educational status of the household head, TLU, non-farm activity, skill status, access to credit and marital status were the major factors that significantly influence household food security. Education status, TLU, non-farm activity, skill status, access to credit and marital status negatively affected the household food security in the study area. On the other hand, the results of the factors of dietary diversity foods indicate that age, educational level, health status, skill and access to credit were the major factors that significantly influence household dietary diversity foods. Finally the results of this study indicate, the main constraints for non-farm engagement and performance of the non-farm activity in the study area were, insufficient startup capital, poor infrastructure, lack of appropriate skills and limited market demand

The results imply that policy must focus on promoting non-farm employment opportunities in rural farming communities in *Woreda Ganta-Afeshum*, given its impact on food security and incomes. Not only is diversification into non-farm work a dependable supplementary source of income for rural households, it also helps in smoothing income and consumption. Policy should therefore focus on making non-farm work opportunities available to rural households and help them overcome entry

barriers. Improving access to education in rural communities would also enhance non-farm employment opportunities, particularly, non-farm wage employment.

### **5.3. Recommendations**

Based on the findings of the study the following recommendations are forwarded in order to improve household food security in the study area.

- The finding reveals that non-farm activity and food security are positively and significantly related in the study area. Participation in non-farm activity helps the households to generate additional income and diversification of household food consumption. Therefore, development strategies and programs related with food security through diversification activity should think about the importance of non-farm activity. Hence, the governmental and non- governmental organization should expand access of other than on-farm practice like, non-farm activity to households in poverty reduction and to improve their food security.
- Strong regulatory mechanism should be designed to overcome problems related to non-farm activity to provide incentives to committed and disciplined households.
- The empirical result reveals that non-farm activities used to diversify the sources of income and increase household food availability. Therefore, the policy makers have to focus on increasing non-farm activities such as petty trade, self-employment and the like.
- Based on the study, household with the educated heads are better in food security status than households with non-educated heads in the study. Therefore, it is recommended that the regional and federal governments should provide access to education for both non-farm and on-farm participants.

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## Appendix 1: Questionnaire for Respondents



### **Letter of introduction to Non-Farm household's questionnaire Dear Respondent**

My name is Welay G/Mariam a student at the University of Addis Ababa pursuing Masters of Science degree in Food Security and Developmental studies. I am requesting you to furnish me with the following information .The research is About “**The Effect of Non-Farm Activity on Food Security in Woreda Ganta-Afeshum**” as a requirement of the qualification for the award. The findings will contribute to the general understanding of effect of non-farm activity on food security. Your honest response to the questionnaire below and other tools of data collection will make you a contributor to the improvement of food security in the area. The information obtained in the research will be used for the intended purpose and will be held in strict confidence. Kindly answer all questions in the questionnaire accurately. Your assistance will be highly appreciated.

Thank you.

Yours Faithfully,

Welay G/mariam.



**General Instruction:**

1. Please put a tick mark (√) that appropriately represents your response in multiple choice questions.
2. To open-ended questions, please write your response on the space provided. Your genuine response is critically invaluable for the better result of the study.

Thank you in advance!

**I. Demographic characteristics**

**II. General information on Respondent's**

1. Tabia ID \_\_\_\_\_
2. Household head's Name: \_\_\_\_\_ Sex: 1= Male, 2= Female
3. Household Characteristics: Please list *all* household member

3.1 HHH ID	3.2 HHH Sex1	3.3 HHH Age (in years)	3.4 Marital status of HHH2 ( yrs)	3.5 Education status3	3.6 Income source4 (> 15 yrs)	3.7 Skill5 (> 15 yrs)5	3.8 Number of children<14 age	3.9 Number household 14-64 age	3.10 Number of household member >64	3.11 Total number of people in your household
							M F T	M F T	M F T	M F

**CODES FOR HOUSEHOLD CHARACTERISTICS:**

1 Sex	2 Marital status	3 Educational status	5 Special skill
1=Male	1= single	1=Illiterate	0= No special skill
2=Female	2=married	2=Church/mosque education	1=Mason
4 Income source	3=divorced/separated	3=Adult literacy prog	2=Trader/merchant
1=Farming	4=widowed	4=Elementary school	3=Handicraft
2=Civil servant	5=other (specify)	5=Junior complete	4=Carpenter
3=House wife		6= 10-12 complete	5=Traditional healer
4=Daily laborer		7= Vocational training	6=Other (specify)
5=Tabia official		8= degree	
6=Hand craft		10= Other (specify)	
7=Trader			
8=Other specify			

4. Primary occupation of the house hold A. On-Farm  B. Non-farm

5. If your answer for question number 4 is on-farm, which one of the following is the activity of the household?

- If not please go to question 8    A. Crop production     B. Poultry   
 C. livestock     D. Bee keeping     E. Other specify \_\_\_\_\_

6. What is the size of cultivable land possessed by the household?

LH6. Land Category	Total Area (acre) /(Tsimad)
6.1. Owned land	
6.2. Rented-in/Borrowed	
6.3. Rented-out land	
6.4. Total land size	

6.5 (Ask question if LH6.1 who owns the land?)

- A.  Male Head of Household    B.  Female Spouse/ Head of Household    C.  Both

7. If your answer for question number 4 is non-farm, which one of the following is the activity of the household?

- A. Construction     B. Masonry & Painting     C. Coble stone   
 D. Sand and Stone quarrying     E. weaving machine     F. Pottery     G. Machine   
 H. Petty trade     I. Food preparation     J. Other specify \_\_\_\_\_

8. Secondary occupation of the house hold: A. On-farm     B. Non-farm

9. If your answer for question 8 is on-farm, which one of the following is the activity of the household?

- A. Crop production     B. Poultry     C. livestock   
 D. Bee keeping     E. Other, specify \_\_\_\_\_

10. If your answer for question 8 is non-farm, which one of the following is the activity of the household? A.

- Construction     B. Masonry & Painting     C. Coble stone   
 D. Sand and Stone quarrying     E. weaving machine     F. Pottery   
 G. Machine     H. Petty trade     I. Food preparation     J. Other specify \_\_\_\_\_

### III. The livelihood resources/assets of the house hold

12. Do you have an access to credit services?    A. yes     B. No

13. If your answer is yes for question 12 what are the sources of credit institutions?

- A. Microfinance institutions     B. Cooperatives     C. Community based institutions   
 D. Relative     E. NGOs     F. Traditional lenders     G. Bank     H. Other \_\_\_\_\_

14. What was the amount of money you borrowed in the last two years?

- A. 2009 E.C \_\_\_\_\_ (Birr)    B. 2010 E.C \_\_\_\_\_ (Birr)

15. Amount of profit you gained from the credit

16. For what purpose did you take the credit in the last two years?

- A. Petty trade     B. Cover food gap     C. Purchase agricultural inputs   
 D. School fee service     E. health fee services     F. Buy livestock

G. Other specify, \_\_\_\_\_

17. If your answer for Question 12 is No, what was the reason?

A. I have not any interest to take it  B. Due to high interest rate of repayment

C. Couldn't get it  D. Credit services is not available  E. Other specify \_\_\_\_\_

18. Do you save money? A. Yes  B. No

19. If the answer for no 18 is yes, how much money have you saved so far (in Birr)?

A. 1-999  B. 1000-4,999  C. 5000-9,999  D. 10,000-19,999

E. 20,000-49,999  F. above 50,000  G. Not willing to tell

20. How much is your annual household gross income now approximately?

A. On-farm gross income \_\_\_\_\_ B. non-farm gross income \_\_\_\_\_

#### IV. Option and opportunities of non-farm livelihood diversification strategy

21. Do you believe you will be food secure and self-sufficient if you do farming alone?

A. Yes  B. No

22. Do you think you can survive without farming? A. Yes  B. No

23. If no, what kind of livelihood strategies do you use to improve your livelihood?

A. Agriculture intensification by producing high value products B. Sending some family members to some other towns C. Developing a wide income earning portfolio to cover all types of shocks

D. Other, specify \_\_\_\_\_

24. If non-farm activities are one of your livelihood diversification strategies, what are the specific sources?

Multiple answers is possible A. Construction Work  B. Masonry & Painting  C. Coble stone  D. Sand and Stone quarrying  E. weaving machine

F. Pottery  G. Machine  H. Petty trade  I. Food preparation

J. Other specify \_\_\_\_\_

25. What was your most important motive for starting non-farm activity?

A. Small size of land holding  B. No access to agricultural land

C. Obtain income to support agricultural work  D. Market opportunity

E. Support from cooperatives  F. Advice from relatives/friends

G. For agricultural input H. Other, specify \_\_\_\_\_

26. What was your start-up capital to establish non-farm activities?

A. Crop sale  B. Livestock sale  C. Tapped resources from Microfinance

Institutions for non-farm investment purpose  D. Cooperatives  E. Other, specify \_\_\_\_\_

**V. the contribution of non-farm activities existing in the study area**

27. The employment status of members of the household is \_\_\_\_\_
- A. Self-employed nonfarm business  C. Wage and salary employment   
 B. Both farming and Self-employed nonfarm business  D. Daily laborer   
 E. Cooperative engagement in nonfarm activities
28. For what purpose do you use the income you acquired from non-farm activity?
- A. For consumption and essential household expenses  C. To invest on-farm   
 B. Invest it to expand non-farm business activity  D. Purchase farm inputs   
 E. Other purposes, specify \_\_\_\_\_
29. Do you think non-farm activities are an essential component for your survival?
- A. Yes  B. No

**VI. Constraints and opportunities for non-farm rural diversification?**

30. Do you have an opportunity for participation in to non-farm activities?
- A. Yes  B. No
31. If yes, in which of these non-farm activities A. self-employment  B. Wage employment   
 C. Opportunity for cooperatives engaged in non-farm activities   
 D. Other Specify, \_\_\_\_\_
32. If No Q 30, what are the constraints preventing household members from opening non-farm activities? A. Insufficient startup capital  B. Poor infrastructure  C. Lack of appropriate skills   
 D. Limited market demand  E. Other, specify \_\_\_\_\_

**VII. Non-Farm Sources of Income (SI)**

33. Please provide the average annual income from the following sources during the past 12 Months.

SN		Income source	Did you/your household receive income from...? (1=Yes, 2=No)	Amount (BIRR)
1	Non/off-farm employment	Self-employment: petty trading (hairdresser, carpenter, sale of beverages, handicrafts, etc.)		
		Salaries/labour wages of resident household member		
		Charcoal/ fuel wood sales		
2	Migrant remittances/ transfer from other households	From elsewhere in Tanzania (friends, relatives, eighbours, etc.)		
3	Pension payments	From another country (friends, relatives, etc.)		

4	Renting out/leasing of house, land, equipment, etc.			
5	Other income sources (Specify)			
	<b>Total estimated annual income</b>			

**VIII. Health related factors**

34. Do you have access for health services? A. Yes  B. No
35. If anybody in your household is sick? A. Yes  B. No
36. If the answer for no 21 is yes which of the following places do you first contact for a solution?  
 A. Clinic/Hospital  B. Dispensary  C. Traditional healer  D. Spiritualists   
 E. Others, specify
37. What is the distance between your house and clinic or hospital \_\_\_\_\_ km?

**IX. Food Aid**

38. Have you received any aid in the last year? A. Yes B. No
39. If yes to question 43, please indicate the type and amount receive

Type of aid items received	Amount of Aid Received per month	Unit price	Total income received
Total			

Code: 1.Wheat 2.Cash 3.Oil 4.Other

**X. Livestock holding**

40. Does your household own livestock? A. Yes B. No
41. If yes to Q. 45, give details on the table below

Code no	Type of Livestock	Number of Owned	Code no	Type of Livestock	Number of Owned
1	No Livestock		6	Goats	
2	Oxen		7	Chicken	
3	Cows		8	Horse/Mule	
4	Calves		9	Donkey	

5	Sheep		10	Others	
---	-------	--	----	--------	--

**XI. SOCIAL CAPITAL**

Now we would like to ask you some questions about how you feel about this village, and how you take part in the community activities

42. Have you/someone in your household joined any groups/organizations in 2010E.C?  
 A. Yes                                      B. No
43. If 'Yes' to SC1, list up to three in order of importance

Group	Type of group (Write the option and name of group)	Participation
	1 = Religious group 2 = Youth Group 3 = Farmers' Association 4 = Women's group 5 = Development Committee 6 = Other (specify)	1= An active member with position (e.g. Chairperson, Secretary, Treasurer) 2= Active member but no formal position 3= Not an active member
Group A		
Group B		
Group C		

44. Do you think your social ties are strong?      A. Yes       B. No

45. What is the value of these groups listed above to your household wellbeing?

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**XII. Household food security Questionnaires**

**Household Food Insecurity Access Scale (HFIAS) Measurement Tool**

46. For each of the following questions, consider whether they have happened in the past 30 days. If the answer is 'Yes' to a question, please indicate how often this happened.

No.	Question	How often did this happen?
		(0) Never= it did not happen in the past 30 days (1) Rarely= once or twice in the past 30 days (2) Sometimes = three to ten times in the past 30 days (3) Often = more than ten times in the past 30 days
AF1	In the past (30 days), did you worry that your household would not have enough food?	

AF2	In the past [30 days], did it happen that you or any household member were not able to eat the kinds of foods you would have preferred to eat because of lack of resources?	
AF3	In the past [30 days], did it happen that you or any household member had to eat a limited variety of foods because of lack of resources?	
AF4	In the past [30 days] did it happen that you or any household member had to eat some foods that you really did not want to eat because of lack of resources?	
AF5	In the past [30 days] did it happen that you or any household member had to eat a smaller meal than you felt you needed because there was not enough food?	
AF6	In the past [30 days] did it happen that you or any household member had to eat fewer meals in a day because there was not enough food?	
AF7	In the past [30 days] did it happen that there was no food to eat of any kind in your house, because of lack of resources to get food?	
AF8	In the past [30 days] did it happen that you or any household member went to sleep at night hungry because there was not enough food?	
AF9	“In the past [30 days] did it happen that you or any household member went a whole day and night without eating anything at all because there was not enough food?”	

### XIII. HOUSEHOLD DIETARY DIVERSITY SCORE (HDDS)

47. Please describe the foods (meals and snacks) that you (or your household members) ate yesterday during the day and night. Start with the first food eaten in the morning.

SN	FOOD GROUP	EXAMPLES	1 = YES 2= NO
HDD1	CEREALS	Maize, rice, wheat, sorghum, or any other grains or foods made from these (e.g. bread, ugali, porridge etc.)	
HDD2	VITAMIN A RICH VEGETABLES AND TUBERS/ WHITE TUBERS AND ROOTS	pumpkin, carrots, or sweet potatoes that are orange inside + other locally available vitamin-A rich vegetables white potatoes, white yams, white cassava, or other foods made from roots	
HDD3	DARK GREEN LEAFY VEGETABLES /OTHER VEGETABLES	Any dark, green, leafy vegetables such as cassava leaves, bean leaves, spinach, amaranth, spinach, incl. wild veges etc. Other vegetables (e.g. tomato, onion, eggplant) , including wild vegetables	
HDD4	VITAMIN A RICH FRUITS OTHER FRUITS	ripe mangoes, ripe papaya + other locally available vitamin A-rich fruits other fruits, including wild fruits	
HDD5	ORGAN MEAT (IRON-RICH) FLESH MEATS	liver, kidney, heart or other organ meats or blood-based foods beef, pork, lamb, goat, rabbit, wild game, chicken, duck, or other birds	
HDD6	EGGS	chicken, duck, guinea hen or any other egg	
HDD7	FISH	fresh or dried fish or shellfish	

HDD8	LEGUMES, NUTS AND SEEDS	beans, peas, lentils, nuts, seeds or foods made from these	
HDD9	MILK AND MILK PRODUCTS	milk, cheese, yogurt or other milk products	
HDD10	OILS AND FATS	oil, fats or butter added to food or used for cooking	
HDD11	SWEETS	sugar, honey, sweetened soda or sugary foods such as chocolates, candies, cookies and cakes	
HDD12	SPICES, CONDIMENTS, BEVERAGES	spices(black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages or local examples	

**XIV. Checklist for focus group discussion**

1. What is your general opinion on the role of small scale to household non-farm activity on household food security? \_\_\_\_\_
2. What are the determinant factors do affect your household food security? \_\_\_\_\_  
\_\_\_\_\_
3. What are the major factors constraining non-farm activities in your area? \_\_\_\_\_
4. Which do you prefer on-farm activity or non-farm activity? Why? \_\_\_\_\_
5. Is there any difference food security status between on-farm and non-farm activities? What is the difference between these two groups? \_\_\_\_\_

**XV. Questions Used to Key Informants interview (KII)**

1. What are the major factors constraining non-farm activities in your area? \_\_\_\_\_  
\_\_\_\_\_
2. Is there any difference food security status between on-farm and non-farm activities? \_\_\_\_\_  
\_\_\_\_\_
3. If yes, what are the main differences between these two groups? \_\_\_\_\_
4. What are the major determinant factors that affect the household food security? \_\_\_\_\_  
\_\_\_\_\_
5. What is the importance of accessibility of finance for non-farm diversification?  
\_\_\_\_\_
6. What are the opportunities for diversifying the non-farm activities in your Tabia?  
\_\_\_\_\_

7. What are the constraints for non-farm activities, which is one of your livelihood options, in sustaining your livelihood? \_\_\_\_\_

## **Appendix 2: Conversion Factor Used to Estimate Tropical Livestock**

<b>Animal</b>	<b>TLU</b>
Cattle	1
Sheep and goat	0.15
Horse	1
Mule	1.15
Donkey	0.65
Camel	1.45
Poultry	0.005

Source: Ramakrishna and AssefaDemeke, 2002



## Appendix 4: Likelihood ration of level of food insecurity experience score for ordered logistic regression model

Iteration 0: log pseudolikelihood = -196.33377  
 Iteration 1: log pseudolikelihood = -150.34423  
 Iteration 2: log pseudolikelihood = -148.79789  
 Iteration 3: log pseudolikelihood = -148.79283  
 Iteration 4: log pseudolikelihood = -148.79283

Ordered logistic regression	Number of obs	=	181
	Wald chi2(12)	=	84.87
	Prob > chi2	=	0.0000
Log pseudolikelihood = -148.79283	Pseudo R2	=	0.2421

HFIAS_Catt	Robust		z	P> z	[95% Conf. Interval]	
	Coef.	Std. Err.				
Age	.0481555	.0363561	1.32	0.185	-.0231011	.1194121
Total_HHNum	.0295501	.1884178	0.16	0.875	-.339742	.3988421
Farmland_size	-.260742	.1823059	-1.43	0.153	-.618055	.0965709
Level_Education	-.2443678	.0604408	-4.04	0.000	-.3628296	-.125906
Marital_HHstatus	-.9835225	.4907752	-2.00	0.045	-1.945424	-.0216208
Sex	-.0624304	.4274824	-0.15	0.884	-.9002805	.7754197
TLU	-.3128985	.1035829	-3.02	0.003	-.5159172	-.1098798
Household_sick	.5537074	.4357327	1.27	0.204	-.3003131	1.407728
Skill_Status	-1.438278	.4361095	-3.30	0.001	-2.293037	-.5835191
Access_Credit	-.7952662	.3324155	-2.39	0.017	-1.446789	-.1437438
Nonfarm_HH	-1.635495	.7650301	-2.14	0.033	-3.134926	-.1360634
Dep_Ratio	.0389053	.2045578	0.19	0.849	-.3620206	.4398313
/cut1	-2.704311	2.044427			-6.711315	1.302693
/cut2	-.2924219	2.023592			-4.258589	3.673745
/cut3	4.024121	2.021263			.062518	7.985723