



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

**CONTRIBUTION OF LIVELIHOOD DIVERSIFICATION ON RURAL  
HOUSEHOLD FOOD SECURITY: THE CASE OF ADAMI TULU JIDO  
KOMBOLCHA WOREDA, OROMIA REGION, ETHIOPIA**

**BY**

**SOSENA MELLESE**

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**Addis Ababa, Ethiopia**

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**Contribution of Livelihood Diversification on Rural Household Food Security**

**The Case of Adami Tulu Jido Kombolicha Woreda, Oromia region, Ethiopia**

**BY**

**SOSENA MELLESE**

**Advisor**

**Temesgen Tilahun (Dr)**

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As supervisor/co-advisor of the thesis, we certify that we have read and evaluated the thesis by Sosen Mellese entitled ‘Contribution of Livelihood Diversification on Food security of rural Households; The case of Adami Tulu Jido Kombolicha Woreda, Oromia region, Ethiopia’ and recommended for open defense as fulfilling the requirements for the degree of Master of Science in Food Security.

Temesgen Tilahun (Dr) \_\_\_\_\_

Adviser

Signature

Date

As a member of examining board of this thesis open defense, we certify that we have read and evaluated the thesis prepared by Sosen Mellese entitled ‘Contribution of Livelihood Diversification on Food security of rural Households; The case of Adami Tulu Jido Kombolicha Woreda, Oromia region, Ethiopia’ and recommend that it is acceptable as a thesis required for the degree of Master of Science in Food Security and development.

Name, Chairman \_\_\_\_\_

Signature

Date

Name, Internal Examiner \_\_\_\_\_

Signature

Date

Name, External Examiner \_\_\_\_\_

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## DECLARATION

This thesis is not presented and submitted to other institution for the award of higher level education. And it is to confirm that, this thesis is belongs to me as original work. All the source and materials referred throughout the thesis have been properly acknowledged.

Declared by: Sosena Mellese

Signature: .....

Place: Addis Ababa University, College of Developmental Studies, Food Security studies.

Date of Submission: .....

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## **List of Acronyms**

DFID	Department for International Development
DRM	Disaster Risk Management
EFY	Ethiopian Fiscal Year
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
GDP	Gross Domestic Product
HFIAS	Household Food insecurity Access Scale
MoFED	Ministry of Finance and Economic Development
NGO	Non-Governmental Organization
PSNP	Productive Safety Net Program
GFR	General Food Ration
WFP	World Food Program

## **Abstract**

*Rural livelihood demands a paradigm shift from monotype livelihood to mixed type of livelihood. Livelihood diversification would be one of the focus areas to improve the livelihood and food security status of the rural families. This study analyzed the livelihood diversification impact on rural households' food security evidence from Adami Tulu Jido Kombolicha woreda, Oromia regional state, Ethiopia. A multistage sampling procedure was used to select 360 sample households from one woreda and three kebeles were sampled for the study. They were purposefully selected in consultation with woreda experts basing the food assistance data. The number of sample household determined by probability sampling proportional to size of the respondents and followed by simple random sampling. To analyze the data, descriptive statistics used to analyze the explanatory variables along food security status and livelihood diversification. Household Food Insecurity Access Scale (HFIAS) was employed to measure the food security status. Ordered logistic regression model was used to analyze determinants of food in/security. Level of livelihood diversification was computed using Simpson Diversity Index (SDI). Correlation of livelihood diversification with food security status and explanatory variables was performed using Pearson correlation coefficient. Coping strategy in response to food shortage was computed using Coping Strategy Index (CSI.) Household Food Insecurity Access Scale result indicated that 46% of the sample households were food insecure ranges from (32% severely, 5% moderately and 9% mildly food insecure). The result of ordered logistic regression model showed that, educational status of household head, access to credit and household expenditure has significant influence on food security status. The result of Simpson Diversity Index indicated that, 14.17%, 46.3%, 39.4% of the sample households were within the level of high, medium and low livelihood diversification respectively. The result of Pearson correlation coefficient revealed that age of household head; education status of the household head, household size, history of crop failure, access to land, use of modern farm input, access to credit and agriculture extensions service has got correlation with livelihood diversification and in addition those variable also statistically significant to the livelihood diversification. Coping strategy index result indicated that 36.2%, 9.4% and 54.4% of households were practicing high, medium and low coping behavior in response to food shortage respectively. From the households with high coping (83.85% and 11.54%) of the sample households were severely and moderately food insecure. Based on the finding of the result, in order to improve the rural households' livelihood as well as food security status, it is necessary to mark that promotion of education would be vital. The availing credit access to the rural households with low interest and vast coverage would made them to diverse the livelihood base. Overall various livelihood program packages shall be established in the way that to benefit the rural households as well as PSNP beneficiaries.*

*Keyword: Rural households, Food security, livelihood diversification and coping strategy*

# CHAPTER ONE: INTRODUCTION

## 1.1 Background of the Study

Attaining household food security is still remaining to be a challenge and stayed to be a worldwide concern. An estimate of 193 million people acutely food insecure and in need of urgent food assistance (GRFC, 2022). Particularly, Africa as a region is largely affected by food insecurity since around one in four people estimated to be undernourished. It is known that, the primary livelihood base of Africa population is agriculture. But the sector has been affected by multiple factors such as weather and market situations that predisposed the farmer to take unnecessary risk and decisions (Ame et.al, 2016). In Sub-Saharan Africa agriculture is subsistence based and depends on rain fed, results in production loss, recurrent food insecurity and malnutrition. In Ethiopian also, majority rural households are involved in agriculture sector and the country also implemented various agricultural policies and strategies, and focusing for improvement of agriculture's productivity but less emphasis was given to non- agriculture livelihood activities (Kassie et al, 2017).

During the season of food shortage, rural households employ various method to cope with food shortage includes, sale of livestock, labor wage from others farm, employment at nonfarm activities and migration to other places, borrowings grain, sale of wood or charcoal, small business, selling dung and crop residues, reduction of meal portion, consumption of wild plants, dependent on relief assistance and relying on remittances from relatives (Degefa, 2002). The aim of rural livelihood diversification is to minimize risk which is related to agricultural productivity and to complement on- farm income. In Ethiopia, diversifying livelihood activities becoming emerged, certain rural households started to engage and follow diverse non-farm livelihood activities to cope with challenges and risks such as drought and production loss (Kassie et al. 2017). About 25 percent of rural households in Ethiopia make some income from non-farm livelihood (World Bank, 2009).

Off-farm activities are mostly practiced by food-insecure households due to land shortage to produce sufficient food for household consumption (Yishak et al, 2014). A rural household doesn't have any option rather in diversify their livelihoods during the season of food shortage (Start and Johnson, 2004). Diversification to non-farm livelihood strategies instead of depending on subsistence farming alone allows families to improve financial status,

increase production, and cope with consequences occurred due to drought (Hoang et al, 2014). Being engaged in various types of livelihood activities increase cash transaction at the household level as well as, it can be a means of acquiring a new skill from the activity they are involved in (Ellis and Allison, 2004). Engaging in additional livelihood and obtaining income has got a positive impact on household food security (Mensah, 2014). This emerging diverse kind of livelihood activities believed to be promising for mitigating for food insecurity at the rural household level through obtaining of income and utilize food from their own product. The study area, Adami Tulu Jido Kombolicha Woreda known by the history of erratic rain fall and drought for decades (Mussie, 2013). This led to the production loss and occurrence of food insecurity in the community. In fact, there is an opportunity of different livelihood options to be off -farm and non-farm. The researcher interested to conduct this study, in order to have evidence on the relationship between livelihood diversity and food security status of the household. The ultimate aim of study is assess the contribution of livelihood diversification on rural household food security in Adami Tulu Jido Kombolicha Woreda.

## **1.2 Statement of the Problem**

Large number of people has been affected by food insecurity from time to time. Worldwide an estimate of 690 million people was chronically undernourished in 2019 (FAO, 2020). If recent trends continue, the number of people affected by hunger would surpass 840 million by 2030. In Ethiopia, between July and September 2021, an estimated 8.5 million people were forecasted acute food insecurity to be worse including about 1.4 million in emergency in the seven pastoral and agro-pastoral producing rural areas (FAO and WFP, 2020). Being food insecure at the individual level cause illness and suffering. Beyond 70 million people lives have been lost due to food insecurity in the 20th century (Campbell, 2011).

According to Africa vulnerability mapping exercise, Ethiopia was among the countries categorizes as the most vulnerable nation and with less managing capacity to mitigate the drought related consequences (Orindi et al, 2006). The reason of failure of sub-Saharan Africa to feed its population is associated with rapid population growth, poor farmland management, recurrent drought, food prices increment, conflict, crop and livestock disease and low level of modern technology utilization (Meskerem and Degefa, 2015).

Provided that the primary cause of food insecurity for rural household were poor agricultural productivity and low income drawn for the sector, additional livelihood engagement is recommended to cope with the deficit of the food at the household level. However, from small-holder farmers, 27% of them were engaged in non-farm and off-farm livelihood type. While diverse livelihood helps the rural households to earn additional income and to be allocated for fulfilling the family basic demand (Adem et al, 2018).

The existing farm size for agriculture couldn't enable people to produce adequate food required so that many poor households engages in non-farm and off-farm activities when their piece of land does not enable them to supply the required livelihood. Evidence indicates that in Ethiopia, nearly 55% of all smallholder farmers operate on 1 hectare or less (MoARD, 2010). Due to the smaller farm size and low return from farming activities, the rural households are being engaged in diversified income sources.

Rural households dependent on one type of livelihood are tend to be more vulnerable to food insecurity than those who are highly diversified (Mensah, 2014). Because of the primary dependence on subsistence crop production in the country, crop failure leads to household food deficits, during the absence of off and non-farm income opportunities and leads to asset depletion and, increasing levels of poverty at the household level (FDRE, 2002). And in fact, Ethiopia is known by extreme poverty, high population growth rate, severe environmental degradation and recurrent drought. The country is largely affected by multi faced problem such as climate change, population growth and low economic capacity that hinders productivity. This has resulted in unable to be self-sufficient as country to feed their population (Degefa, 2002). The limited opportunity for livelihood diversification, and lack additional income from other non-farm activities has made the rural households food insecure more than ever (Asmamaw, 2005). This need to be addressed in a sustainable manner so that overall development in the region can be enhanced (Todaro et al, 2014).

Oromia region is one of the largest regions in Ethiopia which constitutes 304 rural woredas, among them, 12 are found under East Shewa Zone, and Adami Tulu Jido Kombolicha is one of the woredas selected for this study. There was recurrent crop failure and food insecurity, as a result the woreda was categorized as hot spot woreda and enrolled in a Productive Safety Net Program (PSNP). A total of 23,759 people were targeted for PSNP support in the year 2013EFY (WAO, 2021). Besides, a total of 8,512 people were targeted for General Food

Ration (GFR) in the year 2031EFY in seven high prioritized kebeles of the woreda (WDRMO, 2021). However, the study woreda do have potential livelihood opportunities like agro processing factories, horticulture industries, rivers for the irrigation scheme, better market transaction. The presence of surplus labor in the study area can be taken to use this work force to be engaged in non-farm livelihood activities (Fekadu, 2008).

This research were reviewed some studies conducted so far in relation with livelihood and food security on rural households living in Adami Tulu Jido Kombolicha Woreda. The risk of rainfall variability on crop production were conducted by (Aman, 2017). Vulnerability and Adaptive Capacity in Small Scale Rain Fed Based Agriculture in Ethiopia conducted by (Mussie, 2013). And Impact of Productive Safety Net Programme on Household Food Security were also studies were researched by (Aleka, 2011). Other research were done on food security and livelihood of rural households separately and the linkage on both of the matter were not explored. The rural households' involvement in diverse kind of livelihood and its contribution for food security status is mandated to be looked into for brining improvement at the lives of the rural population. Therefore, this study will be carried out to enhance our understanding by exploring the existing livelihood diversification and how it affects the food security of rural households.

### **1.3 Objective of the Study**

#### **1.3.1 General Objective**

The general objective of this study is to assess the contribution of livelihood diversification on rural households' food security in Adami Tulu Jido Kombolicha Woreda, Oromia region.

#### **1.3.2 Specific objectives**

- To assesses the level of livelihood diversification of rural households in Adami Tulu Jido Kombolicha Woreda;
- To describe the status of food security;
- To explore the association between livelihood diversification and food security of rural households ;
- To identify the determinants of food security among rural households;
- To assess food coping strategy of the rural households.

## **1.4 Research Questions**

The study is designed to answer the following research questions.

- How is the level livelihood diversification of rural household in the study area?
- Does livelihood diversification improve household food security in Adami Tulu Jido Kombolicha Woreda;
- How is the food security status of households in the study area?
- What are the major factors that determine household food security in the study area?
- What are the food copy strategy of rural households in the study area?

## **1.5 Significance of the Study**

The finding of this study will be taken as an added knowledge to the existing literature. Aims to fill the gap in relation with the contribution of livelihood diversification on rural household food security status. Besides, the result obtained will be used as input for government and other actors during policy formulation and forwarding decisions. Particularly, this study will be a plus for program design that aims to improve the rural community livelihood and food security status. The study area participants and the community living in a similar set up will be lastly benefiting from the revised policy and strategy. Additionally, the study tried to explore more ideas on the journey of the research that recommended as an area for further research in the future.

## **1.6. Scope of the study**

This study aimed to assess the contribution livelihood diversification on the household food security in Adamitulu Jido Kombolicha woreda. In this study, type of livelihood diversification considered were on –farm activities which is mainly on agriculture focused duties such as crop production and livestock rearing. Off -farm type of activities are any kind of engagement away from once own farm but still the agriculture focus activities is supposed to be carried out. In addition non -farm activities also taken in account, this referring to kind of non- agricultural task undertaken it could be business, employment, remittance, aid and etc. livelihood type which are not common in the study areas were not considers in this study.

For the determination of household food security status, this study used HFIAS method which address the access part of the food security domain and Coping Strategy Index also computed for understanding how households responds to food shortfalls, that would addresses the food availability component of the food security. However stability and utilization part were not assessed under this study.

### **1.7 Limitation of the Study**

This study was limited in assessing contribution of livelihood diversification on rural households' food security in Adami Tulu Jido Kombolicha Woreda, Oromia region. This study covered one woreda in the region and three representative kebeles from the woreda out of forty three. This study used data gathered from sample households as well as the variables included were focused on socio demographic and other variables related with food security and livelihood. Time and Cost are also other constraints to address other areas and large number of respondents.

### **1.8. Organization of the Thesis**

This thesis has five chapters. Chapter one includes the introduction, which focuses mainly on the background information, statement of the problem, objectives, the scope, limitation, and significance of the study. A review of the literature, empirical studies and conceptual framework related to the concern of the study presented in chapter two. Chapter three described the study methodology that includes a brief description of the study area, data collection procedures, and analytical techniques. Chapter four constitute results of the study along with a discussion. Finally, chapter five includes a summary of the major findings, conclusion, and recommendation.

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

### **2.1 Review of Related Literature**

#### **2.1.1 The Concepts and definition of Livelihood Diversification**

Many scholars agree that the concept of livelihood diversification is the central point of the sustainable livelihood approach. Livelihood strategies are the range and combination of activities and choices that people make to achieve their goals, including productive activities, investment strategies, reproductive choices (DFID, 1999). Livelihood strategies are made out of activities that produce the methods for household endurance and arranged activities that people embrace to assemble their livelihoods (Ellis, 2000).

The objective of livelihood diversification is achieving sustainable livelihood outcomes like obtaining additional income, improved food security, reduced vulnerability, and increased resilience (Dinku, 2018). The adoption of livelihood diversification by a household may signify two things: one reason may be linked to “increased vulnerability”, the other reason being a deliberate effort by households to broaden income streams for the purposes of “accumulation and investment in the future” (Swift and Hamilton, 2001).

There are types of livelihood activities, the first one is On-farm livelihood diversification activities. It encompasses a wide range of activities in the development of crops and livestock that interlock with each other in different ways. It could be mixed crop or intercropping which refers to growing two or more crops on the same piece of land to take advantage of complementarities between crops when using soil nutrients, sunlight and other resources (Ellis, 2000). The other one is off-farm livelihood diversification activities, mostly undertaken away-from-home and away from one’s own property, it can be wage at private or state farm (Barrett et al, 2001). Off farm livelihood options are wages of exchange labour on other farms within agriculture, including payment in kind (Ellis, 2000). Non-farm diversification refers to finding opportunities for business or jobs other than conventional production of crops and rearing of livestock. Non-farm practices often include the provision of utilities, commerce, business and manufacturing, self-employment in small businesses, and other risk-minimization techniques (Losch et al, 2012). Non-farm income are non-agricultural income sources, such as non-farm wages and business income (Ellis, 2000). This includes trade, Handicrafts, service provision, formal employment, provision of rental service and casual labour.

The most known definition of livelihood diversification is framed by Chambers and Conway (1992) where livelihood constitutes of comprises the capabilities, material and social assets, and any tasks need for survival. Many scholars forwarded different definitions for livelihood diversification in a way that fit their intended purposes. According to (Scoones, 1989), the concept of livelihood diversification were defined as the development of “a wide income-earning activities to overcome all types of shocks and the activity may include building responses to handle shock through well-developed coping mechanisms.”

Another author, (Barrett et al, 2001) defines the term as to diversify livelihoods is to “cope ex-post with income shocks”. According to this author, livelihood diversification would include both on -farming and non-farm activities carried out in order to earn extra income from the income obtained from the usually getting agricultural activities. Livelihoods have been depicted in various ways, but perhaps the most enduring is the sustainable livelihood framework of DFID. Livelihood diversification is often defined as a process by which rural households make a more diverse range of activities to survive and advance their standard of living. Livelihood diversification refers to a key system occurring at various degrees of the economy, which are normally however not in every case straight forwardly connected (Start, 2001).

### **2.1.2 Importance of Livelihood Diversification**

The main aim of livelihood diversification for the farm households is attaining food security all round of the season, both during the harvest at the same time in the lean season. In developing countries, such as Ethiopia, where agriculture is highly vulnerable to weather shocks, loss of agricultural production, income diversification from different means of livelihood becomes inevitable to smooth income and consumption. Nationally, livelihood diversification may be used as a strategy for coping or risk management (Kassie, 2017). It is vivid that farm households during the shortage of food, tend to sell the asset, livestock to get income so that they can fulfill the necessary demand including food. The empirical study conducted by (Aman, 2017) recommended that, diversification of economic activities can help minimize the risks of climatic disasters. To increase household food availability, increasing agricultural production and productivity, farmers need to engage in off-farm activities such as petty trade, handicrafts, and other non-farm activities are used to diversify the sources of income and increase household food availability. Besides farm activities by

themselves need to be diverse beyond the annual crop production, where potential exists such as focusing on perennial crops, vegetables, and fruit through small-scale irrigation (Meskerem, 2011). Some of the benefits of livelihood diversification in the process of improving lives and reducing poverty were mentioned by Ellis and Freeman (2004). They argued that farm households diversify their livelihood because of asset-based and insurance-based diversification theories. Asset-based diversification theories argue that the degree and level of diversity in a farm household's income mix indicates the extent of diversity in the resources or assets it owns or has access to it. On the other hand, the insurance-based diversification theory argues that income failures and shocks direct and push the farm household to diversify its activities. Farm households' interest in engagement into other livelihood options could be emanated from obtaining assets such as to have land or livestock or as a way out of the problem facing such as crop failure, death of livestock. (Ellis , 2000), marked that the reasons for livelihood diversification mainly originate from necessity versus choice conditions. In the situation when farm households can't fulfill the household need only by farm activities, at this time it will be a necessity for households to begin another livelihood. This could be obtaining wages from labor, formal employment, petty trade, aircraft, weaving, and others. The study conducted in Burkina Faso in mid-1980, revealed that, there was that, the ability of the household to manage the occurrence of drought has influenced households engagement in non-farm activities (Reardon and webb 2014) cited in (Mensah, 2014). The household farm activities transition into non-farm activities was as the consequences low return of farm activities, market failure, and conflict, it means from ex-ante risk management, and ex-post coping with adverse shocks (Barrett et al, 2001).

There are some positive impacts of livelihood diversification has identified this includes seasonality-induced risk reduction, higher income, asset improvement, environmental benefits, and gender benefits (Ellis, 2000). The study conducted by Barrett et al in 2001 outlines the existence of a positive relationship between nonfarm income and household welfare indicators across most of rural Africa and based on the evidence obtained from across the Africa continent suggests that, greater nonfarm income diversification causes more rapid growth in earnings and consumption. That will end up in fulfilling the food requirement of the household members across all sessions of the year. Therefore, Livelihood diversification matters for the food security of the farm households.

### **2.1.3 The Concept and Definition of Food Security**

The concept of food security is highly flexible and not uniformly explained among many writers, researchers, and policymakers. According to (Maxwell and Smith, 1992) cited in (Andualem and Endris, 2021). The concept of food security emerged some 50 years back, during the worldwide food crises in the early 1970s. Even two decades ago, there were about 200 definitions for food security in published writings showing the contextual dependence features of the definition.

The current widely accepted definition of food security originated from the Food and Agriculture Organization (FAO) annual report on food security. Food security is a situation that exists when all people, at all times, have physical, social, and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO, 2002). The last revision to this definition happened at the 2009 World Summit on Food Security which added a fourth dimension – stability – as the short-term time indicator of the ability of food systems to withstand shocks, whether natural or man-made (FAO, 2009).

According to the world food summit “Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (1996 World Food Summit” (Peng and Berry, 2018). In the World Summit 2009 the phrase “four pillars of food security”, is newly applied to separately mention the four dimensions, namely, availability, accessibility, utilization, and stability, of food security (FAO, 2009). The above definition contains the four dimensions/ pillars of food security. Such as Availability, Accessibility, Utilization, and Sustainability (Peng and Berry, 2018). Food insecurity can be classified as chronic or transitory depending on the intensity of the problem, duration and strategies used to overcome the problem. Chronic food insecurity is persistent lack of household’s ability either to buy or produce enough food due to lack of access to resources (Maxwell, 1992) and manifests itself in the form of market failure due to recurrent drought and other calamities (Debebe, 1995).

#### **2.1.4 Coping Strategies in response to food shortage**

Coping strategies, comprises methods of maintaining consumption when confronted by disaster, it could be reducing savings, utilization of food stocks, receive gifts from relatives and community transfers, sales of livestock and other assets (Ellis, 2000). Often time, coping strategies divided into two basic categories for the purpose of improving food security and sustainable livelihoods of the households. The first is the immediate and short-term change of consumption patterns. This kind of consumption behavior change practiced by the households, when they face acute food shortage, can be considered as the short time is reactions (Berkes and Jolly, 2001). The second is long-term alteration of income earning or food production patterns, and one of the responses could be selling of assets (Maxwell et al, 2003).The change in livelihood system is more of adaptation focused aims to emphasize measures to reduce sensitivity by changing the forms of agriculture that are less climate sensitive (Siri et al, 2005).

Different households within a community respond differently to shocks depends on their level of ownership, social network and availability of community intervention (Webb and Von Braun, 1994) cited in (Bereket, 2013). In addition the household demographic and socio-economic characteristics such as age of the household head, educational status, access to main social service and others do have an associations with the number of coping strategies practiced by the households (Nigatu, 2011).The common coping strategies in Ethiopia in times of natural and economic shocks were manifested in the reduction in food consumption and savings, asset sales and borrowing (Debebe et al, 2013). Food insecure households used both consumption and asset-based coping strategies such as eating less preferred, lower quality or less expensive foods and receiving donation from relatives or friends (Assefa et al, 2018). Farmers who rely on seasonal rains may also engage in other income generating activities to mitigate the risks and impacts of climate change on food security, such as petty trade, selling local drinks, providing traditional healing, creating artisan crafts, keeping livestock, being employed in some sectors, producing and selling wood, charcoal and doing home gardening (Daninga, 2014). Households during the time of food shortage, they experience different method of coping responses, it could be decreasing meal frequency and portions to prolong the small amount of food in their house. When the households experience coping behaviors in response to food shortage, particularly consumption of low diversified

diets, could lead to the manifestation of malnutrition (Belachewu, 2018). These coping responses brings benefits that turns to the family to resilience and able to access food continuously (United Nations, 2015). Some livelihood measures taken to respond to the shock may create an opportunity for starting new livelihood base for the family.

## **2.2. Review of empirical studies**

In a study in West Bengal, (Khatun and Roy, 2012) found out that the degree to which rural households diversify their livelihoods depends on a range of factors, some of which include experience, family size, skills, educational attainment level, physical assets and households', and access to credit. The study also revealed that "low asset holding capacity, lack of credit service, lack of awareness and training facilities, not being a risk taker, poor rural infrastructure, and lack of opportunities in non-farm sector" include the main hindering factors to livelihood diversification at the household level (Khatun and Roy, 2012).

Similarly, (Nghiem, 2010) finds that the capacity of households (education and household size) affect households' diversification away from farming. Similarly, (Owusu et al, 2011), find that access to credit and education influence people to take up non-farm activities. Factors that influence diversification can be categorize into two: pull factors such as maximizing incomes and push factors like "risky farming or land constraints, and missing insurance, consumption, and input credit markets (Reardon et al, 2001).

In discovering the impact of livelihood diversification on household welfare, (Start, 2001), identifies a variety of channels: 'income poverty, vulnerability, and inequality, social and political well-being'. Livelihood diversification improves "human capital in terms of experience, skills and willingness to innovate" and "generates earnings and remittances" for reducing household vulnerabilities that come with seasonality (Ellis and Allison, 2004). Incomes obtained from non-farm activities encourage for the investment in agricultural production, thereby increasing smallholders' productivity (Ellis and Allison, 2004). In the journey to being resilience to shock and being food secured, rural households need to be engage into livelihood diversification (Ellis,1999) cited in (Hanazaki et al, 2012). Responding to shocks and stresses, as discussed above, may rely greatly on households' ability or resilience to cope. In the wake of the 2009 global food price hikes, the concept of resilience has been discussed quite extensively alongside the themes of food security and livelihood (Hanazaki et al, 2012).

Referring to the food security crises that hit southern African countries between 2001 and 2003, (Ellis and Allison, 2004), found out that farm a household doesn't have wide choice of livelihood diversification were largely affected. There was strong connection observed between non-farm diversification and drought in Burkina Faso. (Barrett, 2001). A recent study by (Hanazaki et al, 2012), in the Caiçara of coastal Brazil shown that for households that had higher diversification possibilities, their vulnerability to food insecurity was limited. Similarly, in a study in the Muhoroni Division, Nyando District, Kenya, (Thuo, 2011) found a significant association between farm enterprise diversification and food security. That is, for households that had diversified livelihoods, their vulnerability to food insecurity was minimal as compared to those that did not. Studies by (Turton, 1977) in Ethiopia and (De Waal, 1989) in Darfur have explored that some food insecurity situations could be caused by households don't want to invest available domestic resources for food in order to secure their livelihoods in the future, thus it becomes a kind of livelihood strategy by itself.

While a great deal of studies has surfaced to highlight the importance of livelihood diversification as a relevant poverty reduction strategy, empirical evidence on how it impacts specific dimensions of household food security remains limited. Already, available empirical studies on the extent to which diversification amongst farm households impacts assuring household food security have revealed mixed results. For example, whereas (Thuo, 2011) and (Hanazaki et al, 2012), confirm that livelihood diversification improves food security at the household level. Findings from other studies have revealed the contrary (Kuwornu et al, 2013); (Awotide et al, 2010). Besides, (Maxwell and Smith, 1992) reflected that literature that seeks to examine the linkage between food security and livelihood security is limited. Given, the mixed results of the various studies done so far elsewhere and the limited of studies undertaken in Ethiopian. This study will add insight to the literature by providing empirical evidence on the impact of livelihood diversification to rural household food security in the study Woreda.

### **2.2.1. Determinants of Livelihood Diversification**

Most scholars identified determinant factors that influence livelihood diversification strategies based on the result of their inferential statistics. As reported by (Barrett et al, 2001), diversification among rural households is depending on the resource they owned such as land, labor, capital including access to markets and institutions. Livelihood diversification

opportunities vary among households with asset portfolios determining whether the effects of diversification are positive or negative. Although households have similar resource and opportunities, they may not always select the same portfolio of activities and the difference happen in preferences for income, consumption, wealth and status and risk anticipated from the activities they want to join. Achieving household food security and obtaining incomes encourages the household to engage in other livelihoods. However the livelihood types in which the household want to engage is determined by the factors such as access to markets, climate variability, available asset portfolios, education and skills, access to credit markets, gender relationships, seasonality, adaptation to risk, and local economic boom opportunities.

Many empirical studies in Ethiopia explored determinant factors of livelihood diversification. According to (Kassie et al, 2017) and (Gebru et al, 2018) from the household characteristics that determine participation in livelihood diversification, the age of the household is one of the factors. The study revealed that with an increase in farm household members getting older the probability of participation in livelihood diversification activities will be decreasing.

Other household characteristics like gender were taken as the variable factor for engaging in livelihood diversification and most study reveal that male household heads were prone to have income diversification than the female household head (Bezabih et al, 2010). Other empirical studies were tried to explore the financial status of the household can be treated as a determinant factor of livelihood diversification or not and found out that being rich, or wealthy has positively and statistically affected households' likelihood of involvement in livelihood diversification. (Gebru et al, 2018) and (Loison, 2015).

The household ownership of livestock was also assessed and found out that households having a larger size of livestock are less likely to diversify the livelihood strategies into non-farm and/or off-farm activities compared to those who own the small number of livestock. (Yishak et al, 2014). Exposure to agriculture extension was also investigated and found out that farm households who are benefited from agricultural extension service workers were found to be the ones who are involved in other diversified livelihoods other than farm activities (Gebru et al, 2018).

In regards, to the education status of the household head versus their participation in livelihood diversification, some studies suggested that the education status of the farm

households significantly associated with participation in different livelihoods (Gebru et al, 2018) and (Yishak et al, 2014). Whereas, according to the study conducted by (Beyene, 2008) education status of the households has shown no significant impact even though training skills has a positive impact. On the contrary education attainment of the household has a positive effect according to the study done by (Woinishet, 2010). Households' access to irrigation schemes was also looked at, versus their participation in other livelihood activities other than farm. Studies revealed that access to irrigation has been found to positively and significantly affect households' livelihood diversification strategy (Gebru et al, 2018).

Improved seed and fertilizer use by farm households was found to affect the households' livelihood diversification negatively and significantly into off-farming activities (Yishak et al, 2014). Farm households' perception of land security and being a member of cooperative groups were tried to be investigated explored in association with their participation in other livelihood activities and it has positively influenced the decision to engage in the livelihood diversification activities (Kassie, 2017). Farm size ownership of the framers was investigated about their trend of engagement with alternative livelihood and found out that farmers with large farm size are less likely to diversify the livelihood strategies into non-farm and/or off the farm than those farmers who have small land size (Yishak et al, 2014).

A farm household's access to credit was assessed about their engagement into other livelihood options and found out that, farm households with access to credit opportunities are more likely to be involved in other livelihood activities such as trade (Gebru et al, 2018). According to the study conducted by (Gebru et al, 2018); (Gebru and Beyene, 2012); (Mohammed and Tolossa, 2016) income obtained from remittance make them to participate in on-farm and nonfarm activities. The above determinant factor can be classified and categorized as pull and push factors. Some scholars tried to categorize the factors of diversification of livelihood in two ways, the first one is "push factor perspective", diversification is driven by the vulnerability of the household in association with low economic capacity that create strong incentives to select a portfolio of activities to stabilize income and consumption, by constraints in labor and land markets, and by climatic uncertainty. And the second one pulls factor perspective, residing in the urban area as well as the flourishing of the local economy or market by itself create opportunities for income diversification in production and expenditure-linkage activities (Barrett et al, 2001).

### **2.2.2 Determinants of Household Food Security**

The factors determine the household food insecurity differ from household to household; the major influencing factor of food insecurity in Ethiopia are characterized as demographic, environmental, economic, social, infrastructural, and political factors (Degefa, 2002). From the demographic characteristics, the household head education status was checked in (Kidane, 2005). study , to know how much the education can benefit the food security of the household and found out that, achieving better educational level by the head of household do have high probability in attaining the household food security. A similar result exhibited by (Ramakrishna and Demeke, 2002), being well educated can reduce the level of food insecurity of the household. This could be explained as educated household head can join in to work force as well as has got better awareness about utilization of modern agricultural technologies. The income earned from the job payment as well as from agricultural production would benefited the households in fulfill the food required by the household. Another study showed that, poor educational attainment, has got a negative causal effect on household food production and availability (Meskerem, 2011).

Though resources like human labor are obtained from demographic dynamics, it exerts pressure on natural resources such as land, water, and the like (Bekele, 2006). Family size had a negative influence on the food security of rural households and population pressure was found to be a factor of food insecurity (Agidew et al, 2018). On the contrary, other studies conducted by (Meskerem, 2011), revealed that households with large family sizes obtain higher available dietary energy than with small family sizes. This could be related to when the family member size increase, the agricultural labor force at the same time increase therefore, more agricultural production shall be achieved.

The age of the head of the household was the major factor that causes food shortage in the study conducted by (Abdullah et al, 2019). As the household head age gets older and the probability of supporting the households in terms of meeting the household food consumption will be compromised. Similarly, the study finding reveals that the age of the household head had a negative influence on the food security of the rural households (Agidew et al, 2018).

Environmental/ natural factors like availability or access to productive resources like farming, grazing land, livestock ownership, and condition of soil are often treated as determinant

factors for household food security. Particularly for the farm households their livelihood mainly depends on agricultural production. According to the study conducted by (Kidane, 2005), farm households' access to land, space improves the probability of being food secured. Factors like ownership of livestock, farmland size have reduced the level of food insecurity of the household (Ramakrishna and Demeke, 2002). In the same manner, having adequate fertile land, grazing land, farm oxen, the number and type of livestock owned, significantly determine the household food security (Meskerem, 2011). Besides, there are study identifies food insecurity as a cumulative effect of several factors like shortage of farmland, (Agidew, 2018). The presence of erratic rainfall distribution, recurrent drought, poor soil fertility, deforestation, and pest and disease infestation are the main constraints to crop production, so households affected by shortage of food availability and susceptible to food insecurity (Meskerem, 2011). According to (Agidew et al, 2018), factors like recurrent drought, climate change, and increasing rate of soil erosion have been identified as the cause of food insecurity in the household. Likewise, environmental shocks and trends as termite infestation, the acidity of the soil, the decline in the availability of pasture, deforestation, and weed infestation have also been frequently mentioned as underlying causes of household food security through their impact on agricultural productivity (Dereje, 2019). The above-mentioned biophysical factors also continue to be a challenge that compromises the unanticipated agricultural production, particularity for a country like Ethiopia in which farming is highly dependent on rainfall. According to (Degefa, 2002), some of the economic problems that are considered as constraints to agricultural production in general and can be also caused for food insecurity as well, in particular, are lack of cash income, poor off-farm income, diminishing of farm holding, shortage of draught power, low modern farm input, and traditional farm practices.

Even though some social norms that value collective thinking are good and help to keep an integral part of the society. The unwise utilization of produced agricultural products by itself makes a waste of the available food that is supposed to be consumed by the household member across the year. Empirical study findings explained that poor saving habits due to costly social and religious ceremonies are the main socio-cultural factor that causes an effect on household food production and availability (Meskerem, 2011). Unless practical socio-cultural settings and facilities are established, ensuring food security within a given community is difficult (Hussein, 2006). Access to veterinary services by farm households

was found to have a positive and significant impact on household food security. Households whose livestock had access to animal health services produced more milk and meat (Wali and Penporn, 2013). Thus, this can enhance the consumption of animal products and improve the food security of the household member.

In places where weak agricultural extension services and weak rural organizations and a weak market for output, were found to be declining factor of agricultural production and reason of low food availability in the household (Meskerem, 2011). Likewise, the study conducted by Hussein, 2013 revealed that access to agricultural extension services by the farm households was found to have a positive and significant impact on household food security. Access to fertilizer improves the probability of being food secured (Kidane et al, 2005). According to the study conducted by (Ramakrishna and Demeke, 2002), fertilizer use of the farm households has reduced the probability of being food insecurity of the household. Agricultural technical support provisions by the agricultural agent at the local level would benefit the farm to cultivate more. In Ethiopia, like the farm household consumption is based on agriculture production and this can contribute to the improvement of the food security status of the household.

As the credit schemes are limited in Ethiopia for farm households but in the areas where farmers get an opportunity to be included in the credit programs were beneficial for the household economy. The ability to get credit has a highly significant and positive effect on household food security (Weli and Penporn, 2013). This could be treated as one way of diversifying livelihood in addition to farm activities and engaging in businesses through credit schemes. Access to off-farm sources of income significantly determine household food security (Meskerem, 2011).

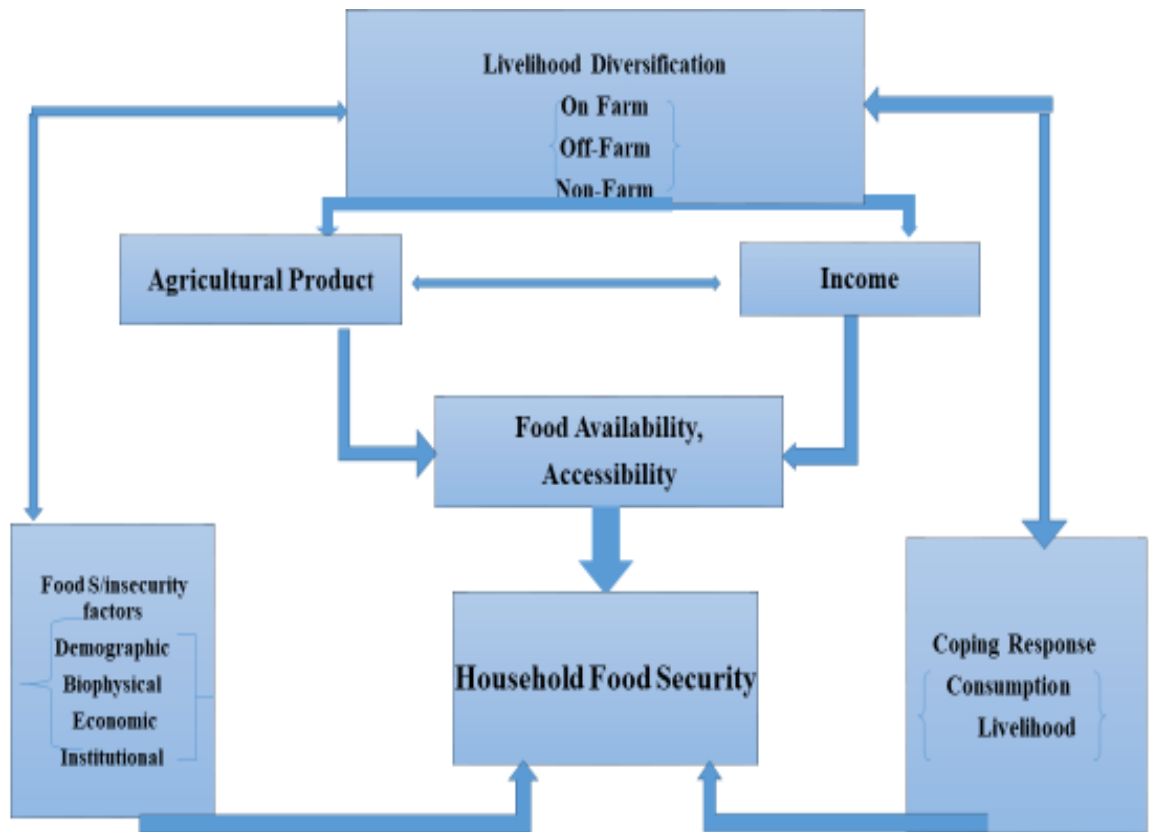
According to (Baiphethi and Jacobs, 2009), there is a consensus that poor households access food mainly through markets, subsistence production, and transfers from public programs or other households. The three sources may be further categorized as production, exchange (barter or purchase), and transfers (Sen, 1981 cited in (Mensh,2014). Food security is therefore not limited to sufficient agricultural food production, but more also livelihoods that can provide enough food for individuals and households sustainably.

As it has been confirmed in numerous studies, there is a problem of food insecurity in Ethiopia with a wide range of areas to be covered and a large number of people to be attended for different identified causes of food insecurity problem. Some of the major and commonly mentioned causal factors are narrated above. Knowing the possible cause of food insecurity can indicate areas of intervention, what to be done. This study will be built on the existing factors of food/security and aims to explore how livelihood diversification could help for improving household food security.

### **2.3. Analytical Framework**

Based on various empirical studies as well as analytical thinking, food security need to be viewed as within the framework of livelihood diversification. The engagement of rural households in to different kinds of livelihood activities it could be on farm, off farm and nonfarm. On-farm type of livelihood is an engagement with agricultural activity such crop production, livestock rearing, forestry, and fishing. It should be from own farm and livestock. Off-farm type of livelihood is engaging in doing labour at state or private farms and obtain wage and it is carried out away from once own farm. Non –farm type of livelihood is performing different type of non-farm activities it could be casual labour, petty trade, charcoal, wood sell, aid and employment.

If the family do have diverse kind of the livelihood, they can able to secure income, and also obtained food sources from own production. Therefore, rural household do have the probability of attaining food needed for the family in continuous bases (through the entire season). The ultimate outcome of food availability and accessibility at the household will be attaining for food security at the household level. On the contrary being dependent in one kind of livelihood activities inhibit the financial status of the household at the same time will limit own production. Results shortage of food and low access to food to the household consumption. Therefore, the household member could be exposed to food insecurity. The cause food security of the household can be determined by different factors such as demographic characteristics of the household, biophysical, economical, institution and others factors. Besides the household when exposed with food shortage in different season, people tend to overcome the problem using various coping responses this includes change in consumption and livelihood pattern.



**Figure 2.1. Analytical framework of the study**

*(Source: Own construction based on the literature)*

## **CHAPTER THREE:RESEARCH METHODOLOGY**

### **3.1 Description of the Study Area**

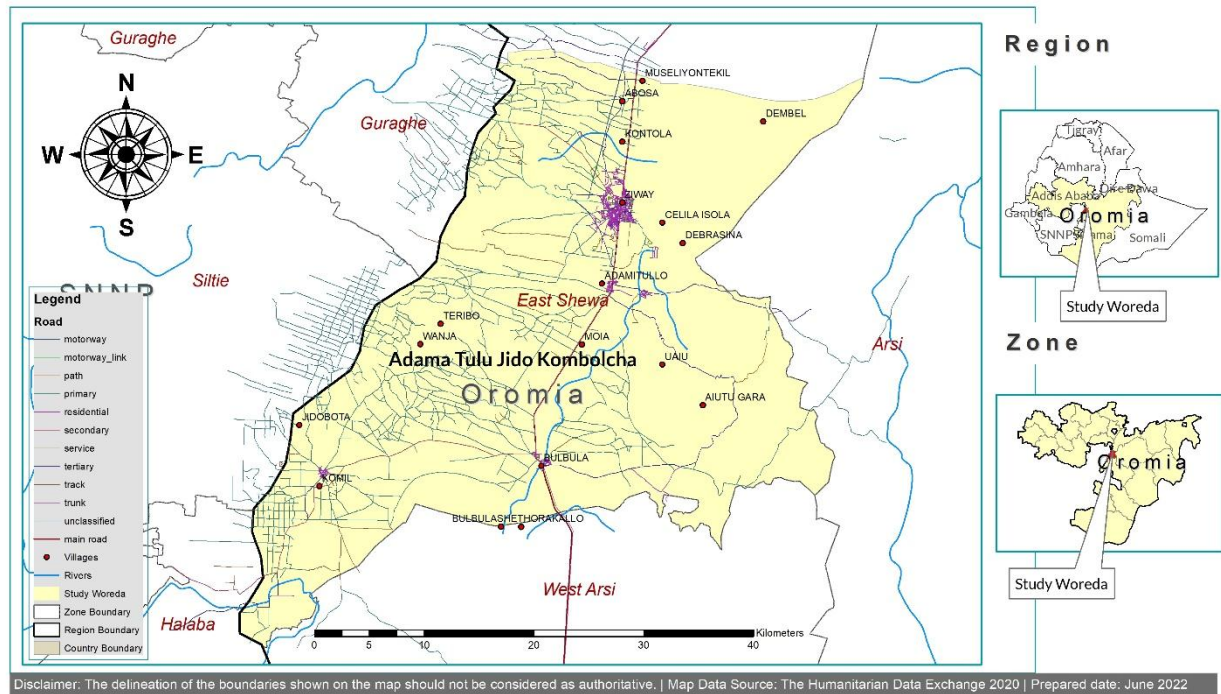
#### **3.1.1. Physical characteristics**

Adami Tullu and Jido Kombolcha is one of the woreda in the Oromia region of Ethiopia. This woreda is Part of the East Shewa Zone located in the Rift Valley. Adami Tullu Jido Kombolcha is bordered on the south by West Arsi Zone, on the west by the Southern Nations, Nationalities and Peoples Region, on the north by Dugda Bora, on the northeast by Hora-Dambal, and on the east by the Arsi Zone. The main town of district is Adami and portion of lake Abijatta and Langano is located in this woreda. Most of the location of the woreda topography ranges in altitude from 1500 to 2300 meters above sea level and Mount Aluto is the highest point in the woreda. Minimum and maximum annual mean temperatures of the woreda were 14 and 27 degree Celsius respectively. There are several seasonal and permanent rivers available in the woreda. Rivers includes were Bulbula, Jido, Hora Kalio and Gogessa. Bulbula, the main river in the woreda, joins Lake Ziway and Lake Abiyata. The woreda is characterized by a bimodal pattern of rainfall; with a short rainy season running from February to April and a long rainy season from June to September. However, the pattern of rainfall is usually erratic with fluctuations at the start and end of the season, in addition to the total absence of rainfall at times (Tesfaye, 2008).

#### **3.1.2. Socioeconomic characteristics**

The total population of the woreda were 212,960. And 65% of the population was engaged in farming , 30% livestock rearing , 1.5% of the population involved in irrigation and 2% engaged in trade and 1.5% of them livelihood depending on employment. About 84% of the rural, 88% of the urban and 85% of the total population have access to drinking water (WAO, 2021). There are different types of small and large-scale irrigated and rain-fed farming available (Scholten, 2007) cited in (Tesfaye, 2008). Usually, crop production and livestock rearing are the common livelihood base of the population residing in this woreda. There are various agro-processing factories established for the processing of foods. The woreda consists of 43 Kebeles among them majority of kebeles have been affected by erratic rain fall and

with frequent crop failure. As a result the woreda was supported by Productive Safety Net Program and General Food Ration.



**Figure 3.1. Study area Location**

*(Source- Humanitarian data exchange,2020)*

### 3.2 Research design and approach

The research design used under this study were descriptive research design. This research design is a method used to observe and describe factor without influencing it, in another direction (Bryman, 2001). It was designed to gain more information about variable in particular field of study. It is purpose was to provide detail information about the situation as it is naturally happened (Burns and Grove, 2007). In this study, this research design employed to understand the demographic, biophysical, institutional and other explanatory variables that supposed to have the role in determining the livelihood diversifications and food security status of the sample households. In addition explanatory research design were employed for the purpose of exploring the contribution of livelihood diversification for household food security status. Including the investigation of the relationship of household

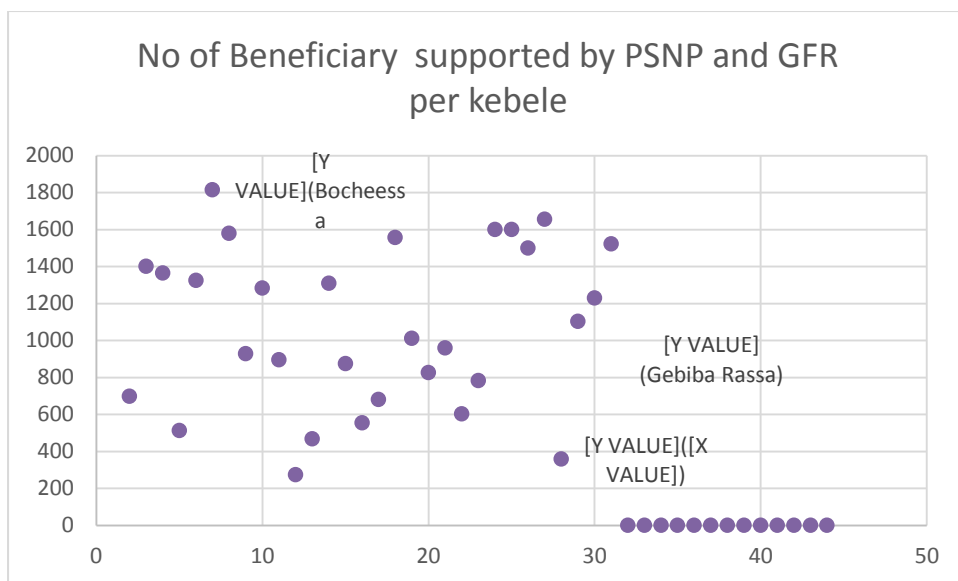
livelihood diversification with household characteristics. The research approach applied were mixed type. Quantitative data obtained from household survey. For the purpose of triangulating the finding obtained from quantitative survey quantitative data were also captured through focus group discussion.

### **3.3. Data source and data type**

The study data type were primary and secondary data. The primary data obtained through household survey and focus group discussion. While secondary data were collected from the study woreda government office. The data sources were household head or active member for the household survey. For the focus group discussion the data source were, community leaders, kebele officials, women and youth.

### **3.4. Sample size determination and sampling techniques**

In order to get representative information, this study used a multi- stage sampling technique. In the first stage, based on the secondary data of food assistance program obtained from the woreda (WDRMO, 2021) and kebeles were listed with its number of food assistance beneficiaries and run through a scattered plot to see the pattern of distribution of the food in/security. Accordingly, one kebele having high number of food assistance beneficiaries, one Kebele with average number of food assistance beneficiaries and one kebele with low number of food assistance beneficiaries were taken in to consideration. Accordingly, out of the total 43 kebele found in the Adamitulu Jido kombolicha woreda three kebeles were purposively selected in consultation with agriculture office expert.



**Figure 3.2. Scatter plot- kebele with number of food assistance beneficiary**

*(Source: own illustration- based on woreda government data, 2021)*

**Table 3.1. Number of Households in the selected**

Name of kebele	No of HH	HH Status of food security(expert perception)
Bocheessaa	604	HH with high number of food assistance beneficiaries
Anannoo Shishoo	611	HH with low number of food assistance beneficiaries
Gabiiba Raasaa	620	HHs with average number of food assistance beneficiaries
<b>Total</b>	<b>1835</b>	

*Source: Computed based on data obtained from ATJK Disaster Risk Management office,2021*

In the second stage, total sample size was determined using the following simplified formula developed by (Yamane, 1967) , this formula is used to calculate an appropriate sample size given a known population size.

$$\begin{aligned} \text{Sample Size formula} &= n \\ &= \frac{N}{1 + N(e)^2} \text{-----(1)} \end{aligned}$$

Where n – is the sample size

N- is the total number of the population (N= 1835(604+611+620))

e- is the level of precision at 0.05

Here, a 95% confidence level and 0.5 P value is considered. P is the estimated proportion of an attribute that is present in the population and shows the degree of variability of the population in terms of the attribute. In this case, livelihood diversification is the attribute. The formula resulted in a sample size of about 328 households. To compensate for non-response and missing of households from the survey, 10% was added to the sample making the total sample households to be 361.

Next, sample size from each kebele determined using probability proportional to the size of the population of each kebele (Table 2).

**Table 3.2. Distribution of sample households in the study area**

S.no	Kebele Name	Total HH	No. of sample HH	Adjusted Sample size (after adding 10%)
1	Anannoo Shishoo	604	604/1845*328=108	119
2	Bocceessaa	611	604/1845*328=109	120
3	Gabiiba Raasaa	620	604/1845*328=111	122
Total				361

Source: *Adami Tulu Jido Kombolicha Woreda Disaster Risk Management office, 2021*

From each kebele, the sample household was selected with simple random sampling technique.

### **3.5. Data collection technique**

The quantitative data were obtained from household survey and collected by close-ended, structured questionnaire in order to capture demographic, socioeconomic, livelihood and food shortage coping response. Besides HFIAS questionnaire were used to gather food security related information. All the questionnaire were designed/adopted in English and was translated to Oromiffa and back-translated to English by different individuals to check consistency and conceptual similarity. Data collectors and survey coordinator were selected with previous experience of data collection and training was given for one day on data collection techniques and in order to familiarize data collection tool. The completeness of the data collected from the survey was checked by the survey coordinator and researcher to maintain consistency. Five percent of the sample was pre-tested to check acceptability and consistency one week before the actual data collection.

The qualitative data were obtained from focusing group discussion, supplemented for the purpose of better understanding of the context and to triangulate the quantitative findings. FGD guide were prepared and used. FGD was conducted in three kebeles, (one FGD per kebele). One FGD were composed of nine individuals (Seven males and two females). Some are community leaders, kebele officials, women and youth who are residing in the kebele for long time and knowledgeable in regards to the context in the community as well as food security matter.

### **3.6 Techniques of Data Analysis**

After generating the data for this study through qualitative and quantitative method. Qualitative and quantitative techniques of analysis were used to analyze data. The quantitative data generated from household survey were coded and entered micro soft excel and imported in "STATA version 14" computersoftware were used to analyze the entire data. Information generated from focus group discussion were captured and framed the information based on the thematic similarity and content analysis. The qualitative data were used as complement and back up for the data obtained through quantitative method. Descriptive statistics such as means, average mean, standard deviations, frequency and percentile was employed for the characters of sample households. Chi- square test were computed for categorical variable and f test use for dummy variables for cross tabulation of the household characteristics versus food security and livelihood diversification.

### 3.6.1. Analysis of food security

There are many indicators that are used for the measure of food security status (Webb et al, 2006) Indicated that there lack of precise measures of household food security and the most commonly used measures of level of food security are based on proxy measures. It is because food security is wider concept with four dimensions (access, availability, utilization and stability) (Maxwell, 2008). Among the widely used measures of household food security are, food consumption score, dietary diversity score, household food insecurity access scale, coping strategy index and household income/expenditure. In this study, food insecurity access scales were used to measure the food security status.

Household Food Insecurity Access Scale (HFIAS):- it is a one of the proxy indicator in measuring food insecurity at the household level in the past one month period. HFIAS includes three elements of household food insecurity, which is anxiety about household food insecurity, insufficient quality and insufficient quantity of food supplies (FANTA, 2004). This food insecurity measure focuses on consumption-related strategies and captures the households' behavioral and psychological responses to food insecurity or perceived food insecurity (Webb. et al, 2006). HFIAS questions has got different response, which is assumed to be experienced by households during food shortfalls. The data to be gathered, quantified and scored. During the survey, the sample households were asked nine occurrence questions that increases its severity across the questions. The occurrence questions summarized as follows: (Q1a) worrying about food adequacy; (Q2a) eating the kinds of less preferred foods; (Q3a) eating limited variety; (Q4a) inability to eat less preferred foods; (Q5a) eating smaller meal than needed; (Q6a) eating fewer meals in a day; (Q7a) failing to get food of any kind; (Q8a) sleeping at night hungry; and (Q9a) going the whole day or night without eating anything. The respondents were asked about list of experiences from question1a to question9a related with the occurrence food shortage and experience of such behavior ever had in the last 1 month period. Respondents were asked to either say yes = 1 if event occurred or no = 0 if the event did not occur. Each anticipated behavioral question do have follow up questions for capturing how frequent the household were experiencing in the past one month. It has got three response category namely rarely (1), sometimes (2) and often times (3).

The minimum HFIAS is zero and occurs when a household responds “no” to all questions on the household food insecurity access scale. Otherwise, 27 is the maximum HFIAS and is

obtained by summing up of all frequencies on the frequency of occurrence questions when a household responds yes to occurrence question and “often” as frequency of occurrence to the nine frequency-of occurrence questions. As per the guidance by (Webb et al.2006) the HFIAS is computed as follows:

HFIAS (0–27) = summation of the frequency of occurrence during the past four weeks for the nine food insecurity-related conditions

$$HFIAS (0 - 27) = q1a * f1 + q2a * f2 + q3a * f3 + q4a * f4 + q5a * f5 + q6a * f6 + q7a * f7 + q8a * f8 + q9a * f9. \dots\dots\dots equation 1.$$

Accordingly, based on the score of the HFIAS, category for each household were computed as 1 = Food Secure, 2=Mildly Food Insecure Access, 3=Moderately Food Insecure Access, 4=Severely Food Insecure

### 3.6.2 Analysis of determinants of food security

To analyze the determinants of food security ordered logistic regression model is selected because food security status are categorical and ordinal in nature so it fit into this model. Ordered logistic regression model applied to the identified demographic and socioeconomic factors affecting household level of food security. Ordinal and categorical variables will be analyzed using this model (Long and Freese, 2003). In ordered logistic regression analysis, the response variable is categorized into more than two having natural order or rank. It is applied when a dependent variable has more than two categories and the values of each category has a meaningful sequential order where a value is higher than the previous one.

Suppose that Y is a categorical dependent variable with categories(c) and  $pr (y \leq j)$  referred as the probability that the response on (Y) falls in category (j) or below (i.e., in category 1, 2... or j). This is named as cumulative probability. It equals the summation of the probabilities in the category j and below:

$$pr(y \leq j) = pr(y = 1) + (pr(y = 2) + \dots pr(y = j) \dots\dots\dots equation 2.$$

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 whole

scale; 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:

$$pr(y \leq 1) \leq pr(y \leq 2) \leq \dots \leq pr(y \leq c) = 1 \dots \dots \dots \text{Equation 3.}$$

In an ordered logit model, an underlying probability score for an observation of being in the  $i^{\text{th}}$  response category is estimated as a linear function of the independent variables and with defined cut off 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.

$$pr(\text{Response category for the } j^{\text{th}} \text{ outcome} = i) = pr(k_{i-1} < b_1x_{1j} + b_2x_{2j} + \dots + b_kx_{kj} + u_j \leq k_j) \dots \dots \dots \text{Equation 4}$$

It is necessary to estimate the coefficients  $b_1, b_2, \dots, b_k$ , along with cut points  $k_1, k_2, k_3, \dots, k_{i-1}$ , where  $(i)$  is the number of possible response categories of the dependent variable. The coefficients and cut points are estimated using maximum likelihood.

### 3.6.3 Analysis of level of livelihood diversification

Level of Livelihood Diversification computed using Simpson Index of Diversity (SID). SID as adopted by (Minot et al, 2006) and (Baird and Gray, 2014).

The Simpson index of diversity is defined as:  $SID = 1 - \sum_{i=1}^k p_i^2$

Where,  $P_i$  as the proportion of income coming from source  $i$ . The value of SID always falls between 0 and 1. If there is just one source of income,  $P_i = 1$ , so  $SID = 0$ . As the number of sources increases, the shares ( $P_i$ ) decline, as does the sum of the squared shares, so that SID approaches to 1. If there are  $k$  sources of income, then SID falls between zero and  $1 - 1/k$ . accordingly, households with most diversified incomes will have the largest SID, and the less diversified incomes are linked with the smallest SID. For least diversified households (i.e., those depending on a single income source) SID takes on its minimum value of 0. The upper limit for SID is 1, depends on the number of income sources available and their relative shares. The higher the number of income sources as well as more evenly distributed the income shares, the higher the value of SID. The Simpson Index of Diversity is affected both

by the number of income sources as well as by the distribution of income between the different sources. The more uniformly distributed is the income from each source, the SID approaches to 1.

### 3.6.4. Analysis of association between food security, other variables with livelihood diversification

In order to analyze the association between household livelihood diversification with food security status and other household variables. Once the livelihood diversification index is calculated for each household, Pearson correlation coefficient were computed in relation with the HFIAS as well as to the other variables to determine the relationship with level of livelihood diversification.

By definition, Pearson correlation coefficient means  $R^2$  that ranges between zero and one.  $R^2$  Can also be shown to equal the squared correlation coefficient between the actual  $Y_i$  and the fitted values  $\hat{y}_i$ . That is,

$$R^2 = \frac{(\sum_{i=1}^n (y_i - \bar{y})(\hat{y}_i - \hat{\bar{y}}))^2}{(\sum_{i=1}^n (y_i - \bar{y})^2 (\sum_{i=1}^n (\hat{y}_i - \hat{\bar{y}})^2)} \dots \dots \dots \text{Equation 5}$$

Where,  $R^2$ = coefficient of determination

n= number of observation

$y_i$ = food security status of household i

$\bar{y}$ = mean value of household food security status

$\hat{y}_i$  = Fitted value of household livelihood diversification

$\hat{\bar{y}}$  = the mean of fitted value of livelihood diversification

Result indicates how strong the relationship between livelihood diversification and household food security. 1 indicates a perfect positive relationship, -1 indicates perfect negative relationship and a result of zero indicates no relationship at all.

### 3.6.5 Analysis of coping strategy responses

In order to analysis the data in relation with coping strategy of the household. This research used ten consumption related coping strategies question and based on the last one week recall period responses were collected. The questions are about what people going to do when they don't have food to eat or money to buy food. The question do have four main components this are :- behavior practiced on consumption changes, includes measures taken when there is no enough food at the household level, to decrease meal portion size, limit number of family member who going to eat and skipping meal times (CARE and WFP, 2003). The frequency of the responses was multiplied by the standard severity weight to calculate the CSI score. Even though there is no universal cut off point for categorizing the level of coping of the household, this study used the CSI cut off point as, low ( CSI= 0-50), medium ( CSI =51-100), high ( CSI=101-154).The CSI score were examined along with the HFIAS mean score in order to understand the sample house hold food security situation.

### 3.7. Ethical Consideration

During the period of data collection, ethical considerations were given priority in order to safeguard the respondent as well as to keep the information taken confidential. The survey respondents' were provided with detailed explanations about the overall objective of the study ahead of time and oral informed consent was secured. Besides all the respondents' identity, personal identification was coded, therefore at the analysis stage all the data were defined anonymously.

### 3.8. Definition of Variables

**Dependent Variable:** the dependent variable considered in the study was food security. Food security is the status of being food secured when an individual or household has accessed and consumed adequate, variety and safe food for active and healthy life. In this study the food security status of the household was measured by household food insecurity access scale (HFIAS). Four categories of the status of food security were considered, food secure, mild , moderate, severe food insecure.

## **Independent variable**

**Livelihood diversification**-is engaging in to different types of activities as means of living to generate income. The income source from: - **Non –farm**:-income from non-agricultural income sources, such as casual labour, petty trade, charcoal and wood sell, aid and employment. **Off-farm** - income from wages at state or private farms in exchange labour. It is carried out away from once own farm. **On farm** – income from agricultural activity such crop production, livestock rearing, forestry, and fishing. It should be form own farm and livestock. Livelihood diversification is defined as the process by which households construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standard of living (Ellis, 2000). Livelihood diversification is considered in the study is the number of income earned from different livelihood.

**Coping strategy**- when household experience food short fall, they forced to practice new behavior to manage the situation. The change in consumption pattern of coping mechanisms are the actual responses to crisis on livelihood systems in the face of unwelcome situations, and are considered as short-term responses (Berkes and Jolly, 2001). All coping mechanisms do have different level of severity so in order to rate the scale of the food insecurity coping strategy index was computed in this study.

## **Socio demographic and explanatory variables**

**Age of the household head:** It is continuous variable and it is measured in number of years. In this study, age of the household head is expected to affect the household livelihood diversification and food security status. The study finding reveals that the, being old in age had a negative influence on the food security of the rural households (Agidew et al, 2018). As per the study finding, age of the household head were observed as factor for determination of engagement in to different types of livelihood diversification. Younger age groups are in better of joining in to various work opportunities. (Andualem and Endris, 2021). The expected effect on food security and livelihood diversification could be positive or negative.

**Sex of the household head:** It is a dummy variable; it is being a male and female of the household head. Irrespective of their biological difference, due to social construction, different role they are assuming. Male and female could be affected or benefited differently for a certain issue. Sex has a negative and significant relationship to on -farm and off-farm; on farm, non-farm and off-farm livelihood types (Misganaw et al., 2019). Sex of the

household head shows a negative effect on food security situation. Male head households were less food insecure than the women headed household (Jemal and Kim, 2014). In this study sex will be expected to impact both food security and livelihood diversification.

**Household size:** It is a continuous variable. It is referring to the number of family member's lives in the household. Families with high number of individual living in the household are prone to food insecurity than the household who has got fewer family size. (Jemal and Kim, 2014). In the reverse, household size was assumed to have a positive effect on the food security of the households. It is related with the increasing number of labor available in the household (Dereje, 2019). In regard to livelihood diversification, those household with high number of family size were working in more livelihood types than those with fewer family size (Tsehaynesh et al., 2021).

**Educational Status of the household head:** - It is a categorical variable divided into three. Illiterate, who didn't attend formal education; Primary education, who attended till 8<sup>th</sup> grade and secondary education, who attended high school and college or university level. According to Magana et al. 2016, education can foster the status of food security of the household. Those farmers with high educational level are more likely diversifying their livelihood than those with in low education level. (Yishak et al., 2014).

**Land ownership:-** It measured as a dummy variable. Ownership of the land and not having land were considered. Access to land encompasses in this study taken were, cultivated, fallow, grazing and forest land. In Ethiopia, as the livelihood base is agriculture, the household access to land indicates the household economic status. This access to land expected to influence livelihood diversification and food security status. According to Nejafi (2003) food production supposed to be increased when the cultivated land is available.

**Livestock ownership:** - it is a dummy variable and having livestock and not having livestock were considered. Household livestock ownership includes, cattle, small ruminants and poultry. The availability of livestock in the household would be treated like a wealth and for the consumption as well as a means of earning income from selling. As per (Muluken, 2005), the food security status is positively influenced by ownership of livestock. Livestock provides not only food for the producers but also other products which could be sold to provide food or income.

**Access to credit-** It measured as a dummy variable, the household get access to credit or not access to credit. The variable were expected to influence livelihood diversification and food security status. Credit opportunity can enhance the financial status of the household and expected to fulfill the access dimension of food security. Credit use were found statistically significant factor for the food security of the household (Fassil and Adem, 2021).

**History of crop failure:** - it is dummy variable and taken as the household experience of crop failure and not experienced crop failure. The occurrence of crop failure for the families whose livelihood is depends on agriculture causes limited food availability at the household level. The study conducted by Assefa, 2018 revealed that climatic shock, crop disease induced crop failure were found an influencing factor food security status.

**Use of farm input:** it is dummy variable, measured as whether the household utilize any farm inputs and not using of farm inputs. It is referring to modern farm inputs of its kind-fertilizers, improved seed, herbicides, insecticides, including agricultural machineries. The use of farm inputs expected to increase agricultural productivity and enhance the food availability at the household level. Any farm input that brings agricultural productivity is expected to boost the overall production; this contributes towards attaining household food security (Brown, 2004; Shiferaw et al., 2003). Utilization of fertilizer found to be significant variable for household food production and food security status of the household. (Wali and Penporn, 2013).

**Utilization of veterinary service:** - it is dummy variable, access to veterinary service and did not access any kind of veterinary service were taken in the study. When the households exposed with veterinary service, they can get access to information and technical support. That results in increase the effectiveness of the livestock and its products. As a consequence the family could be food secured. According to Wali and Penporn 2013, veterinary service to the livestock were significantly affected the status of food security.

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

### **Introduction**

This chapter constitute the result and discussion of the study. It has got four subsections. The socioeconomic and demographic characteristics of the sample households is presented in the first sub-section. The second sub-section narrates the sample households' level of livelihood diversification computed from symposium index of diversity and correlation of livelihood diversification with socio demographic variable. The third sub-section presents the household food security status using Household Food Insecurity Access Scale, the nexus between livelihood diversity and food security status, identification determinants of food security using order logistic regression. The fourth subsection presented about sample households coping strategy behaviors in response to food shortage.

### **4.1. Demographic and socio-economic variables**

This sub-section describes the rural household demographic and socio-economic characteristics namely:- sex and age of the household head ,land ownership, livestock ownership, and educational status of the household head, history of crop failure, utilization of farm input, use of veterinary extension service , access to credit, average annual income and average annual expenditure as depicted in table 4.1. The descriptive statics revealed that, 75% of the study participants were male and 25% of them were female. The education level of sample households was categorized as illiterate, primary and secondary education and 36.1% of them were found to be illiterate, 40.5% of them were attended primary education and 23.3% were attended secondary education. Regarding the land ownership situation of the sample households, 94% of the respondents own land and the rest 6% did not have land. In regards to livestock ownership of the sample households, 85% of them have got livestock of any type (It could be cattle, small ruminants and poultry) and the rest 15% did not access any kind of livestock.

Concerning history of crop failure experienced by the sample households, about 92.50% of them witnessed that they have faced crop failure however small proportion (7.50%) of them responded that did not experience crop failure in the past. The farm input utilization aspects of the sample households, 79% of them were used farm input of any kind such as fertilizer,

improved seed, insecticides, herbicides and agricultural machinery. The remaining (21%) of the respondents did not utilize farm inputs so far.

In regards, to access to veterinary extension service, most (85%) of the study population has got veterinary extension service, While 15% of them did not obtain such kind of service. Concerning access to credit opportunity 57.2% of the study participants has accessed credit and 42.7% of those did not get an opportunity for credit.

**Table 4.1. Sociodemographic characteristics of the sample households (categorical)**

List of variables	Category	Frequency (%)
Sex	Male	270(75%)
	Female	90(25%)
Education status	Illiterate	130(36.1%)
	Primary	146(40.5%)
	Secondary	84(23.3%)
Land access	Yes	337(94%)
	No	23(6%)
Livestock ownership	Yes	305(85%)
	No	55(15%)
History of crop failure	Yes	333(92.5%)
	No	27(7.5%)
Utilization of farm input	Yes	284(79%)
	No	76(21%)
Use of veterinary extension service	Yes	305(85%)
	No	55(15%)
Access to credit	Yes	206(57.2%)
	No	154 (42.7%)

*(Source computed from own survey, 2022)*

In terms of continuous variable and showed in table 4.2, the descriptive statistics showed that the age of the sample households ranges from 18 years to 78 years. And average age of the household head in the study area was 41.1 years. Concerning the household size of the sample households ranges from 2 person to 12 person and the overall average of household size were 5.2 person. The average annual income of the sample households were 6046.9 ETB and ranged from maximum income from 122,300 ETB to the minimum income of 400ETB.

The annual average expenditure of the respondents were 3222.2 ETB and ranging from the minimum expenditure from 120ETB to the maximum 4704ETB.

**Table 4.2 Sociodemographic characteristics of sample households (continuous)**

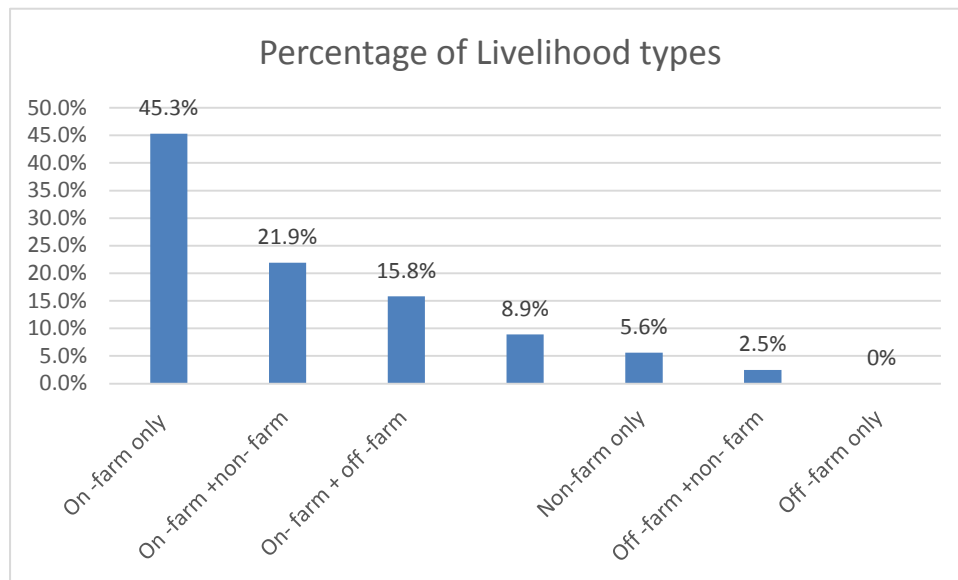
Name of variable	Food Secured	Mildly food insecure	Moderately food insecure	Severely food insecure
	Mean value (SD)	Mean value (SD)	Mean value (SD)	Mean value (SD)
Age ( years)	40.2 (10.6)	38.5 (10.1)	40.5 (12.0)	43.4 (11.4)
Household size (family member)	4.98 (1.7)	5.7 (2.3)	5 (2.5)	5.4 (2.3)
Total income per month (ETB)	8486.8 (11640.5)	3863.4 (2708.3)	5038.4 (4872.7)	2654.5 (1879.4)
Total expenditure per month (ETB)	4203.5 (4875.1)	3187.6 (2150.3)	3209 (3653.78)	1555.6 (1191.8)

*(Source computed from own survey, 2022)*

#### **4.2. Livelihood Diversification**

This section narrates the livelihood types in which the sample households engaged in, the levels of livelihood diversification of the sample households computed by Simpson diversify index. Results (figure 4.3) showed that majority (45.3%) of sample households were engaged only in on- farm kinds of livelihood activities such as crop production, livestock rearing and fish farming. Around (5.6%) of them base their livelihood on only non-farm activities, like that of self and formal employment, petty trade, charcoal and fire wood sell, relying on aid, selling of local beverage and etc. However none of the sample households were engaged in only off-farm activities, it could be hired in other person farm or on state farm and obtaining wage out of it but still in combination with other on and non-farm types. Some of the study participants also making their livelihood in mixed type of activities, almost (21.9%) of them

are doing on- farm and non -farm livelihood opportunity to support their family. Around (15.8%) of them were engaged in on-farm and off-farm activities. While (89%) of them found out that performing the three type of livelihood activities (on-farm, non-farm and off -farm). However only (2.5%) of them were working in both off -farm and non- farm livelihood types.



**Figure 4.1 Livelihood types of sample households**

*(Computed form own source,2022)*

In order measures livelihood diversification of sample households number income sources of sample households were taken. The Simpson index of diversity (SID) is mostly used to measure the diversity (Hill, 1973) used Simpson index to measure diversity (Joshi et al, 2003) also adapt the Simpson index to compare crop diversification in South Asian countries. This study also used it to measure livelihood diversity. The share of income coming from different income source is taken into account. The livelihood diversification of sample households reflected in Table 4.5. The mean livelihood diversification Index was 0.38. The large proportion of the sample households (46.39%) had medium level of Diversification Index, followed by 39.4% of the households with low level of diversification. Besides only 14.17% of the households categorized as high level of diversification. Livelihood diversification index ranges from 0 to 1. The household who score 0 have got one income source and the

households who score 1 entails that this family had multiple type of income sources as means of livelihood. As the diversification index goes from 0 to 1 the number of livelihood activities will be increasing and as the index goes from 1 to 0 number of livelihood activities will be decreasing.

**Table 4.3. Livelihood diversification Index of sample households**

Category	Diversification Index	Frequency	Percentage
low	<0.38	142	39.44
Medium	0.38-0.63	167	46.39
High	>0.63	51	14.17
Total		360	100

*Source -computed from own survey, 2022*

#### **4.2.1. Livelihood Diversification in relation with sociodemographic characteristics (Categorical)**

The relationship between livelihood diversification some categorical variables were observed. As per the below table 4.6, from those respondent who within the high level of livelihood diversification (72.5% of them are male, while the rest are female (27.4%). It is also the same for medium (72.5%) and low (78.8%) level of livelihood diversification majority of them are male. It is due to that the large proportions of the respondents are male.

In regards to education status of the household head, from those high diversifiers most of them (20% and 17.8%) has been attended primary and secondary education. From the low diversifiers majority (47.7%) of them were illiterate, followed by 32.1% and 39% of them were attended primary and secondary education. This implies that, when the level of education increases, the likelihood of engaging in different livelihood would be high. The output of the qualitative study also indicated that, those individual who educated at some level is preferable to be hired in the factory and most of the time they are engaged in self-employment too.

Coming in to the occurrence of crop failure, those households with high livelihood diversification, 78.4% faced crop failure in the past and 21.5% did not. From those household with medium level of livelihood diversification 93.4% has faced crop failure and the rest 6.5% did not. From those household who are within the category of low level of livelihood diversification similarly majority (96.4%) of them have faced crop failure and the rest 3.5% did not. This result indicated that, when there is the occurrence of crop failure in a certain area individuals are pushed in to additional livelihood option for the purpose of fulfilling the basic need like that of food. This finding is in conformity with other study. When crops fail households must reallocate labour to non-farm diversification, whether employment off-farm or nonfarm activities (Geremew et al,2017).

Concerning land ownership of the household, from those found within the category of low diversification most of them (96.4%) owned land and 3.5% did not access land. And from the respondent who own land 96.4% and 76.4% were found within the category of medium and high level livelihood diversification. This can be explained as, when the household doesn't have land there is tendency of being engaged in different livelihood alternatives. This finding is in consistence with previous study. Off-farm activities are mostly experienced by food-insecure households due to land shortage to produce sufficient food for household consumption (Yishak, 2014). It is complemented with the FGD findings and reflected as the reason of selling charcoal, fire wood, hired in others farm, starting small trade and so are undertaken as a response to fulfill the household demand.

Livestock ownership also another variable taken in to consideration, from the sample households who has got any kind of livestock 86.6% and 89.2% of them are found within the category of low and medium level of livelihood diversification respectively. Whereas, 64.7% of highly diversified households do have livestock. This result showed that, having livestock particularly, if there is large in number, the household inclined to manage the large cattle, ruminants and poultry than engaging in to other livelihood.

In reference to table 4.4. Majority 74.5% of the households who are within the category of highly diversified livelihood has obtain credit opportunity, 25.5% did not. The households within the range of medium livelihood diversification 43.7% of them were accessed credit. In another hand from those lowly diversified one most of them did not access credit. From the finding, can be inferred that credit access is means of getting startup capital, training on marketing and entrepreneurship and encourages saving. Therefore individual can easily join in to additional livelihood options.

**Table 4.4. Sociodemographic characteristics cross tabulation with Livelihood Diversification (categorical)**

Name of Variable	Category	Low (SDI) Frequency (%)	Medium SDI) Frequency (%)	High SDI Frequency (%)
Sex	Female	30 (21.1)	46 (27.5)	14 (27.4)
	Male	112 (78.8)	121 (72.5)	37 ( 72.5)
Education Status	Illiterate	62 (47.7)	58 (44.6)	10 (7.7)
	Primary	47 (32.1)	73 (50)	36 (20)
	Secondary	33 (39)	36 (42.8)	15 (17.8)
History of crop failure	Yes	137 (96.4)	156 (93.4)	40 (78.4)
	No	5 (3.5)	11 (6.5)	11 (21.5)
Access to land	Yes	137 ( 96.4)	161 (96.4)	39 (76.4)
	No	5 (3.5)	6. (3.5)	12 (23.5)
Livestock Ownership	Yes	123 (86.6)	149 ( 89.2)	33 (64.7)
	No	19 (13.3)	18 (10.7)	18 (35.2)
Access to credit	Yes	76 (36.8)	110 (53.3)	20 (9.7)
	No	66 (42.8)	57 (37)	31 (20.1)

*(Source -computed from own survey, 2022)*

#### **4.2.2. Livelihood Diversification in relation with sociodemographic characteristics (Continuous)**

As it is reflected in the table 4.7, the mean age of high, medium and low livelihood diversified groups of the study participants are 38.58 years, 39.49years and 43.92years respectively. The mean age of low livelihood diversifier groups is higher than the mean age of who had high livelihood diversification. Hence, mean age difference was statistically significant with p value of <0.001 within the categories of livelihood diversification. From the result, can be realized that younger age groups are in better chance of attracted in to diverse kind of livelihood.

Another variable examined with livelihood diversification level of the sample households is household size. The mean household size of high, medium and low diversified households was 5.71 person, 5.06 person and 4.23 person respectively. The mean household size of highly diversified household is smaller than the other two. This indicated that, the family with few members the household do engage in different livelihood activities. This finding reflects the newly formed households with limited access to land are prone to engaged in to different livelihood for the sake of survival. On the contrary the other study concluded that household size did not shown patterned influence on livelihood diversification (Wallole et al, 2021).

**Table 4.5. Livelihood Diversification in relation with sociodemographic characteristics (continuous)**

<b>Variable Name</b>	<b>Low Diversification</b>	<b>Medium Diversification</b>	<b>High Diversification</b>
	<b>Mean value</b>	<b>Mean value</b>	<b>Mean value</b>
Age ( year)	43.9	39.4	38.5
Household size (person)	5.7	5	4.2
Average annual income (ETB)	5835.1	6785.9	4216.9
Average annual expenditure	2990.4	3734.9	2188.7

*(Source computed from own survey, 2022)*

The age of the household head were considered with the level of livelihood diversification, and found out that the youngest age groups (39.4years and 38.5years) were engaged in medium and high livelihood diversification. And the older (43.9years) of the respondent were involved in low level of livelihood diversification. This has pointed out that, the younger age groups are more affiliated with engaging in to different livelihood types than the older ages.

The mean household size of high, medium and low diversified households was 5.7 person, 5 person and 4.2 person respectively. The mean household size of highly diversified household is smaller than the other two levels of livelihood diversification. This indicated that, the family with few members the household do engage in different livelihood activities. This finding could reflect the newly formed households with few family member. This kind of nuclear family have got limited access to land and involved in to different livelihood for the sake of survival. The result is in consistence with the study conducted by (Geremwu, 2017) and found out that the younger households heads were active and involved into different livelihood diversifications activities available in the area.

Average annual income of the household has got mean value 5835.1ETB, 6785.9ETB and 4216.9ETB for the low, medium and high livelihood diversifier households respectively. This result showed that, there was no patterned relationship between the livelihood diversification and average annual income of the household. Considering average annual expenditure of the household, the mean value of the expenditure were 2990.4ETB, 3734.9ETB and 2188.7ETB for the low, medium and high livelihood diversifier households respectively. This result showed that, there was no patterned relationship between the livelihood diversification and average annual expenditure of the household.

#### **4.2.3 Correlation of Livelihood diversification with variables**

As it is indicated in table 4.6. Age of the household head was found to be correlated with livelihood diversification and has got statistically significant negative association ( $r=-0.1939$ ,  $P=0.0002$ ). This entails the younger age groups do have the probability of running diversified livelihood. The age of the household head were found negatively and statistically significant with the level of rural household livelihood diversification (Andualem and Endris, 2021)

Educational status of household head founded to be correlated and also statistically positively significant with the livelihood diversification at ( $r=0.1189$ ,  $P$  value = 0.024). When the scale of education increase from literacy to primary and then to secondary level, the engagement into different livelihood activities would be vast. The result is in conformity with the study conducted by (Tsehaynesh et al, 2021) “Year of schooling of the house hold were found to have significantly determined livelihood diversification”.

Household size has shown correlation with livelihood diversification and has got statistically negative association with the livelihood diversification at ( $r=0.2383$ ,  $P$  value = 0.0000). Being large in family sizes would have the probability of involving in to diverse livelihood. This result is in consistence with (Tsehaynesh et al, 2021).

History of crop failure has been correlated with livelihood diversification and has got negative significant association with the livelihood diversification at ( $r=-1.968$ ,  $P$  value = 0.0002). The occurrence crop failure induces the engagement in to different livelihood alternative. When the expected crop harvest is less productive, People tends to do available jobs to continue living. As per the information obtained from FGD discussant, loss of crop production were predispose the household members to look for another opportunity of getting income.

Concerning Access to land and modern farm input were also examined for their correlation with livelihood diversification and has shown correlation at  $r$  value of  $-0.2118$  and  $-0.1705$  respectively. Access to land and utilization of modern farm input has negative significant association at  $p$  value of 0.001 and 0.0012. Lack of land ownership has got likelihood of being engaged in to various type of livelihood, as there will not be access of food from own resource. Land holding significantly determined the livelihood diversification (Tsehaynesh et al, 2021). In the time, farm input utilization increases, the chance of involving in different types of livelihood would be decreased.

The relationship between access to credit with livelihood diversification were checked with Pearson correlation and recorded that both of them exhibited correlation at  $r$  value of (0.2835 and). In addition the access to credit was found to be statistically significant with livelihood diversification at  $p$  value of (0.000). The accessibility of obtaining credit will increase the probability of doing different types of business and jobs, therefore the livelihood alternative becomes wide. This finding is in consistence with (Tsehaynesh et al, 2021).

The correlation of utilization of agricultural extension service with livelihood diversification were checked with Pearson correlation and showed correlation at  $r$  value of ( $-0.218$ ). In addition utilization of agricultural service was found to be a negative statistical significant with livelihood diversification at  $p$  value of (0.0001). When the households obtain agricultural extension service, advice on modern technology utilization, the likelihood of

increasing productivity is high. Therefore, people may not strive to do more job to fulfill the household demand. The number of times the household received extension service were shown influence on livelihood diversification (Titay, 2017).

The rest of variables namely, food security status, sex, household income, household expenditure and access to irrigation were not shown significant correlation with livelihood diversification. Similarly those variables were not statistically significant with livelihood diversification.

**Table 4.6. Correlation of livelihood diversification with sample households' characteristics**

List of Variables	Level of household Diversification	
	Correlation Coefficient value (r)	P value
Food security status(HFIAS)	0.0570	0.28
Age of the Household head	-0.1939*	0.0002***
Sex of the house hold head	0.0630	0.2330
Educational status of the household head	0.1189*	0.024***
Household size	-0.2383*	0.0000***
Crop failure	-0.1968*	0.0002***
Access to land	-0.2118*	0.0001***
Access to Livestock	-0.1450*	0.0059***
Farm input	-0.1705*	0.0012***
Credit	0.2835*	0.0000***
Agriculture extension service	-0.2118*	0.0001***

Note, \*\*\*  $P < 0.01$ , Source: Computed from own survey (2022)

### 4.3. Food Security Status of the Sample Households

One of the objective of the study was to assess the food security status of the sample households. In order to measure the food security status, Households Food Insecurity Access Scale (HFIAS) were used. HFIAS scores of the sample households is presented in table 4.7. The sample households were categorized into four levels food security/insecurity based on their HFIAS scores. About 54.1% of the sample households are food secured whereas about 31.6% of the sample households are severely food insecure. Besides about 5.2% of the sample households are under the category of moderately food insecure and about 8.8% of the sample households are mildly food insecure. Over all from the sample households 45.8% of them are food insecure. For the reason that the area is food insecure for the last couple of years but the magnitude of food insecurity recorded in this study were not worse.

**Table 4.7. Distribution of sample households' food security status**

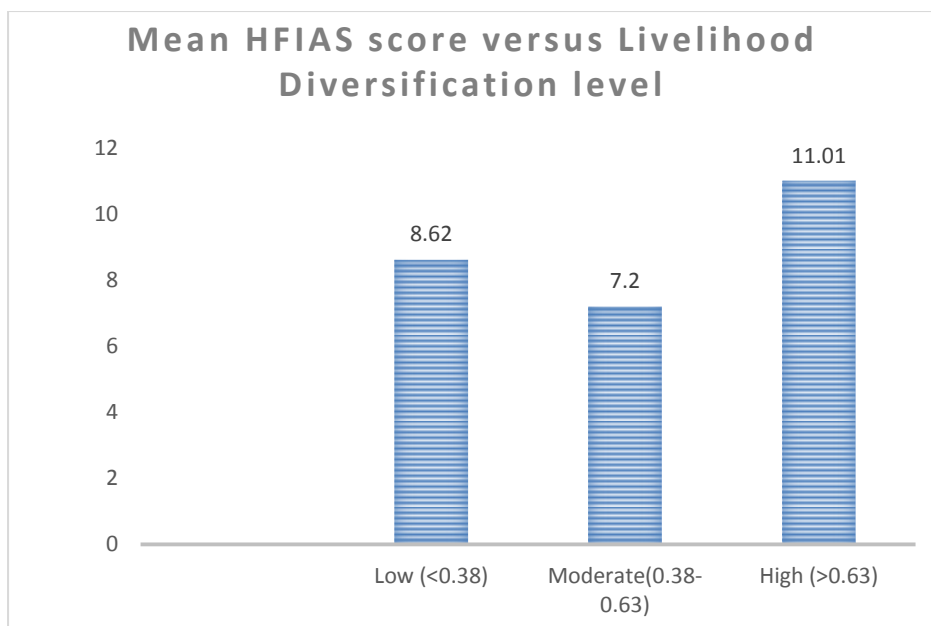
<b>Level of Food security</b>	<b>Average HFIAS score</b>	<b>Frequency</b>	<b>Percent</b>
Food Secure	3.35	195	54.17
Mild Food Secure	7.44	32	8.89
Moderate Food insecure	9.79	19	5.28
Severe Food insecure	16.78	114	31.67

*Source computed from own study, 2022)*

The food secured households have got the mean HFIAS score of 3 whereas the severely food insecure households mean value was 18 HFIAS score. Mildly food insecure and moderately food insecure households have got a mean HFIAS score of 7.5 and 10 respectively. It is vivid that when the level of food insecurity increases, HFIAS score increases that illustrate the situation of food insecurity in the sample household becoming is getting worse.

### **4.3.1 Nexuses between Food Security and Livelihood diversification**

As indicated in Figure 4.2 households with high livelihood diversification index (14.7%) had high score of mean HFIAS (11.01) in comparison with the group. Households with low livelihood diversification index had a mean of HFIAS (8.62). Besides those households within the range of medium livelihood diversification index do have a mean of HFAS (7.2). Those households with high score of HFIAS and in state of food insecurity have been experienced diversified kind of livelihood. And those households who recorded low score of HFIAS are in better state of food security. This can be explained that, those households who are food insecure from the beginning often times tends to find out different livelihood option and engaged in whatever the type of the livelihood could be. The FGD result also revealed that, farm households were complemented their income from causal labor, doing business like small shops, selling of charcoal, local drinks and getting employed in the factory in order to complement the income earned. Based on the FGD discussants, most of the food insecure households are supported by Productive Safety Net Program. The benefits obtained from PSNP such as cash and food items is used to be back up for their food shortage at household. However those households' has got low score of HFIAS and found in better state of food security are engaged in a limited kind of livelihood or in one kinds of livelihood. The households who have better access to vast resource like land, livestock, they tend to stay within the same livelihood types and the management of this livelihood also need more labour from the household. So that this households can access food items from their own production and as the time can generate income by selling agricultural and livestock product. Therefore, maintaining food security will not be much deal. This finding is in conformity with work of (Dereje, 2019).



**Figure 4.2 Mean HFIAS score with Livelihood diversification level (Source -computed from own survey, 2022)**

#### **4.3.2 Determinants of food security**

Order logistic regression model used to identify the determinants factors of food insecurity and results presented in Table 4.4. Of the fifteen variables included in the model, five variables found statistically significant on food security status. These variable are educational status, history of crop failure, access to credit, annual average income and annual average expenditure of the household. To go in depth, educational status of the head of the household found to be negatively and statistically significant with food insecurity at p value of <0.01. The marginal effect of education status of the household head on food security was 0.87. This indicates that attending school would decrease the tendency being food insecure by 87%. This is true that when an individual educational is increase, the job opportunity, income for the family would be better. Therefore can easily allocate the income for food items purchase and fulfill the food demand of the household, thus the food security situation can be maintained. This finding is in consistence with the study conducted in Ethiopia, Damot Gale woreda. Educational level of the household heads could also have an influence on the food security status of the households (Adimasu et al, 2019).

**Table 4.8. Average marginal effect ordered logistic regression factor influencing level of household food insecurity**

Average marginal effect ordered logit regression factor influencing level of household food insecurity					
Variable	Coefficient ( S.E)	Level of Food Security ( HFIAS) Marginal Effect ( P value )			
		Food Secured X (p value)	Mild X (p value)	Moderate X (value)	Severe X (P value)
Household Age (year)	0.014 (0.110)	41.11 (0.200)	41.11 (0.246)	41.11 (0.228)	41.11 (0.200)
Household head sex(0=male)	0.013 ( 0.257)	0.25 (0.957)	0.25 (0.956)	0.25 (0.956)	0.25 (0.957)
eudcational Status(2=secondary)	_-0.738 (0.224)	0.87 (0.001)**	0.87 (0.008)**	0.87 (0.008)**	0.87 (0.007)***
Household size	0.057 (0.057)	5.205 (0.318)	5.205 (0.351)	5.205 (0.335)	5.205 (0.318)
Total land size	0.030 ( 0.079)	1.389 (0.702 )	1.389 (0.705 )	1.389 (0.704)	1.389 (0.702)
History of crop failure ( 0=No)	_-0.726 (0.597)	0.925 (0.203)	0.925 (0.839)	0.925 (0.015)**	0.925 (0.253)
Acees to livestock (0=No)	_-0.603 (0.268)	0.847 (0.052)	0.847 (0.619)	0.847 (0.737)	0.847 (0.109)
Utilization of farm input	_-0.385 (0.333)	0.788 (0.246)	0.788 (0.134)	0.788 (0.200)	0.788 (0.265)
Access to Irrigation (0=No)	_-0.004 ( 0.310)	0.183 (0.989)	0.183 (0.989)	0.183 (0.989)	0.183 (0.989)
Access to credit service (0=No)	_-4.410 (0.419)	0.572 (0.000)**	0.572 (0.010)	0.572 (0.000)**	0.572 (0.000)**
Access to land ( 0=No)	0.064 (0.677)	0.138 (0.924)	0.936 (0.929)	0.936 (0.926)	0.936 (0.923)
Access to Veterinary service ( 0=No)	1.385 (1.116)	0.847 (0.128)	0.847 (0.280)	0.847 (0.200)	0.847 (0.095)
Annual average household income	_-0.000 ( 0.000)	6046.98 (0.002)***	6046.98 (0.028)**	6046.98 (0.004)**	6046.98 (0.001)***
Annual average household expenditure	_-0.000 (0.000)	3222.24 (0.023)***	3222.24 (0.064)	3222.24 (0.031)	3222.24 (0.025)***
/cut1	_-0.311 (0.708)				
/cut2	0.123 (0.707)				
/cut3	0.406 (0.707)				
log likelihood	_-350.739				
LR chi2(15)	66.5				
prob>chi2	0.000				
pseudo R2	0.086				
Number of Obs	360				

Note \*\*\*,\*\* showed significance at  $P<0.01$  and  $p<0.05$  respectively, ( ): percentage Source computed form own survey (2022)

The result of model analysis reveals that history of crop failure has shown a negative and statistically significant influence on household food insecurity at the p value of  $<0.05$ . The marginal effect of access to credit on food security was 0.925. This indicates that, the decrease in the occurrence crop failure have the got the tendency of increasing being food secured by 92.5%. The finding also confirmed by empirical researches conducted in Sidama region. While reasons for the farmers 'food insecurity are complex, crop failures the main one caused by unpredictable and inadequate rainfall (Gezahegn, 2018). This result is also reflect in the FGD, in the season of harvest loss most of the rural households pushed into the new livelihood for the sake getting income for the household. This includes, charcoal seeing, fishing, hired in other farm.

The sample households' access to credit service was considered as independent variable to the food security status. The result of order logistic analysis reveal that access to credit service has a negative and statistical significant influence on household food insecurity at the p value of  $<0.01$ . The marginal effect of access to credit on food security was 0.572. This indicates that, when the probability of obtaining credit scheme increase and the situation food insecurity will be decrease by 57%. It is sure that, opportunity of getting credit by the household could make the household run business and get income. That increase the purchasing power of the household particularly food item procurement. This is an addition to the family food need and can benefits the household members in to being food security. This finding is in conformity with other research conducted in north east rift valley of Ethiopia. The survey results confirmed that, access to credit is significantly and positively associated with food security (Yemataw, 2022).

Annual average income were also taken and treated in the model and found out that it is negatively and statistically significant with food insecurity status at p value of  $<0.01$ . The marginal effect of annual average the income on food security was 1461.08. This indicates, the household annul average income increment would decrease the chance of the occurrence of food insecurity.

The household average annual expenditure were also checked and found out that it is negatively and statistically significant with the status of food insecurity at p value of  $<0.05$ . The marginal effect of average annual expenditure on food security was 3222.24. Particularly, if expenditure prioritizes food purchase for the household consumption. This

indicated that, when the household expenditure increases, the food security situation of the family would get improving. As per the FGD discussants, those households do have better financial transaction can fulfill the families basic demand like that of food. This finding is in consistence with the study conducted by (Abraham, 2015).

#### 4.4. Food shortage coping strategy responses

This section narrates the coping strategy of the sample rural households practiced during the season of food shortage particularly for last one week period. It is focused on consumption related coping mechanisms carried out in order to respond to the immediate food shortage people have faced. Examining coping behavior is undertaken in order to understand the situation of the sample respondent and triangulate with the food security findings of the study. The standard coping strategy questions basing one week recall period used to capture the level of coping behavior exhibited by the sample respondent. While coping strategy index is constructed coping behavior frequency and severity of the behavior were taken in to consideration. From the entire respondents 36.1% of them were found at the level of high coping strategic index, 9.4% of them were found at the category of medium and 14.2% of them were at low coping strategy index.

**Table 4.9 Distribution of sample household coping strategy and food security status**

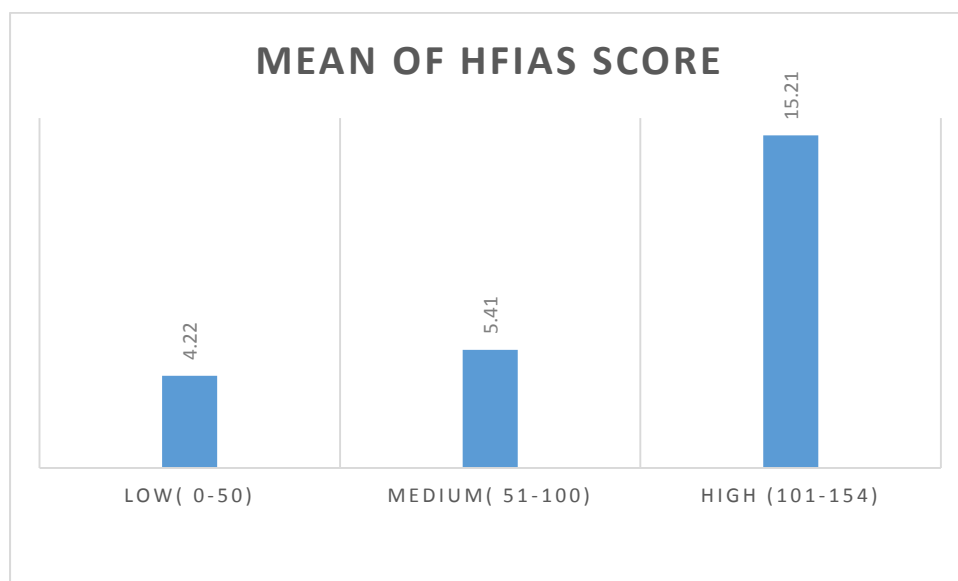
<b>Coping Strategy Index</b>	<b>Mild food insecure frequency (%)</b>	<b>Moderate food insecure Frequency (%)</b>	<b>Severe food Insecure Frequency (%)</b>	<b>Total Frequency (%)</b>
low	25(12.6)	2(1.0)	1(0.5)	196 (14.2)
Medium	7(20.5)	2(5.8)	4(11.7)	34 (9.4)
High	0(0.0)	15(11.5)	109(83.8)	130 (36.1)

*Source: Computed from own survey (2022)*

Based on the table 4.9. From the households found in high coping strategy index level, majority (83.8%) of them are food severely insecure, followed by moderate (11.5%). From the households found in low coping strategy index, majority of them were mildly food insecure (12.7%) and followed by moderate food insecure. This entails that as food insecurity

level getting worse the coping strategy also increases where as food security level is ensured, the tendency of experiencing coping behavior also decrease. This result is in consistence with the finding by (Assefa et al, 2018).

For the purpose of further understanding the relationship between coping strategy index were checked along with HFIAS mean score. As it is reflect in the figure 4.3 those households with high level of coping strategy index has got mean HFIAS score of 15.21 which is categorized as severely food insecure. Whereas those household with medium and low coping strategy index do have the mean HFIAS score of 5.41 and 4.22 respectively. These groups of sample household are within the category of food secured. This implies that when the household passed through in shortage of food, they will going to experience coping behavior for the sake of overcoming the challenge. However, households who are food secured did not practice any kind of coping habits as they can obtain the required food at any spot. In the reverse the food secured households are not practicing the consumption related coping behaviors because they are not worried of about the shortage of food.



**Figure 4.3. Mean HFIAS score with coping strategy index (Source: Computed from own survey (2022))**

Further to the coping strategy index, the detail coping behavior is presented as follows. From the behaviors practiced in all days of the week:- 41.3% of the respondent were relying on less preferred and less expensive foods. Focusing on consumption of *zengada*, *Boloke*, *shana*

(*gommen*) as per the FGD finding. Another common coping behavior were borrowing of food, or relying on help from a friend or relative by (40%) of the sample households. Particularity, borrowing from neighbors, relatives and lenders is most of time arranged and the food quantity borrowed to be returned during harvest season. Consumption of seed stock held for next season by (37.7%) of the respondent also practiced. Gathering of wild food, hunting or harvesting immature crops were practiced by (36.3%) of them. In the context to the study area local weed, wild crops such as *dallo*, *shale*, *chemerda*, *gonde* and hunting of fish were experienced by the respondents. Limiting portion size of the meal at mealtimes were reported by (31.94%) of them for the purpose of saving to the next days. From the behaviors practiced in often times of the week: sending household members to eat elsewhere were recorded by 31.11% of the sample households, families tend to send children to the relatives, boys started to work as a herder during the period of food shortage at the household level as per the finding of FGD discussion. Feed working members of household at the expense of nonworking members is another coping strategy often times practiced by (24.1%) of the respondents. As per the FGD finding, particularity women / mothers prefer to eat lastly after making sure that the available food at home is enough for the working members of the family). Restriction consumption by adults in order for small were also observed in 21.9% of the respondents.

## CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATION

### 5.1. Summary

This study has been conducted in Adamitulu Jido Kombolicha woreda, East Zone of Oromia Regional State. Descriptive and explanatory research design and multi stage sampling procedure was used. The sampling selection method under taken was the probability sampling proportional to size of the respondents followed by simple random sample to select the sample households. The data was collected from 360 rural household constitute 25% (90) female and 270 (75%) male. Data collection tools were structured questionnaire and focus group discussion guide.

Household level of livelihood diversification was computed using Simpson Diversity Index (SDI). From the sample households 14.1% and 46.3% of them were high and medium livelihood diversifier. The rest 39.4% are within the category of low livelihood diversification.

Household food insecurity access scale was employed as a proxy to measure food security status. The study showed that 46% of the sample households are food insecure ranges from (32% severe, 5% moderate and 9% mild food insecure) as measured by the household food insecurity access scale.

The ordered logistic regression model revealed that educational status of household head, access to credit and average annual income and expenditure has got statistical significant influence on household food insecurity.

The result of Pearson correlation coefficient revealed that, age of household head, education status of the household head, household size, history of crop failure, access to land, use of modern farm input, access to credit and agriculture extensions service has got correlation with livelihood diversification and in addition this variables appeared to be statistically significant to the livelihood diversification.

Coping strategy response towards food shortage was analyzed using coping strategy index. From the respondents 36.2% of them were found at high coping strategic index level, 9.4% of them were found at the category of medium and 54.4% of them were at low coping strategy

index. From the households found in high coping strategy index level, majority (83.85%) of them were severely food insecure, followed by moderate (11.54%).

## **5.2. Conclusion**

Rural livelihood demands a paradigm shift from monotype livelihood to mixed type of livelihood. Livelihood diversification would be one of the focus areas to improve the rural household livelihood and food security status. This study examined the contribution of livelihood diversification to household food security in Adami Tulu Jido Kombolicha woreda. According to this study, more than half (60.4%) of the study population diversified their livelihood at different level.

From the empirical studies reviewed so far, the involvement into diversified livelihood options benefits the household in terms of addressing food demand and improves the food security status. For instance, households having non and off-farm sources of income tend to easily become food secured than households that do not have access (Titay, 2017). On the contrary this study revealed that, those households diversified their livelihood were found to be food insecure. This is likely, because those households who are food insecure from the beginning often times tends to find out different livelihood option and engaged in whatever the type of the livelihood could be. The FGD result also revealed that, farm households were complemented their income by performing causal labor, petty trade, selling of charcoal and local drinks, participating in cash for work programs (PSNP) and getting employed in the factory in order to complement the income earned. It was also observed that the return of this livelihood was not rewarding therefore, the households were unable to fulfill the household food requirement. The livelihood and food security situation of the beneficiary of Productive Safety Net Program would improves if they can access diverse livelihood activities with large scale.

Based on this study, among the factors tends to affect the household livelihood diversification, access to credit has got paramount role. When the household has got an opportunity of credit scheme, pave the way to start a business and could be treated as an additional livelihood activity. Credit opportunities were found an influencing factor for household involvement into various into livelihood strategies (Amevenku, 2019).

As per the result in this study, educational status of the household head were found influential factor for the improvement of food security. When the level of education increases, the household food security situation would be getting better. Educated person can earn more income, can decide on the choice of better agricultural technologies and can get informed about importance of allocating income for the household consumption. Illiterate head of the household were shown exposure for being food insecure (Alem and Assefa, 2019).

This study inferred that the most common type of coping experience by the household in the time of food shortage were consumption of less preferred and less expensive foods, 41.39% , borrowing of food, (40%) and Consumption of seed stock held for next season by (37.78%). Through FGD, it was observed that the households often times do engaged into additional livelihood activity like that of doing casual work, petty trading, hired in the nearby factories as well as sell of fore wood and charcoal.

### **5.3 Recommendation**

Considering the results of the study, the below recommendations forwarded to be incorporated in the upcoming policy formulation, strategy development and program design aiming at reduction of food insecurity and livelihood improvement of rural households. Particularly the person living in the study woreda as well as other community living in the same characteristics believes to be benefitted from the result obtained and if absorbed by any government initiative. The below are some recommendations:-

- The result of the finding pointed out that educational status is an influencing factor for improving the food security of the household. Thus, it a necessary step to work toward literacy and creating access to education for all individual. As the nation is invasion for the attainment of optimal nutrition and food security of the citizen, in this journey treating education as the vital element a must. Besides, it is important to see education beyond school performance rather, it is key step in improving the food security of household. Adult education could be another opportunity in educating adult to fill the missed opportunity happened earlier. Education sector from the federal to school level, other stakeholder working in education sector must strengthen their effort in promoting education for all. As well as the community living in the area also shall play their role for promotion learning.

- Access to credit found as a pertinent factor for food security improvement of the household in this study. FGD finding also indicated that, most of the community do engage in petty trade as means of survival but at small scale due to lack of startup capital, high interest rate and low coverage of the credit schemes. Therefore, facilitating credit opportunity to the community could support in starting new business and it should be complemented by capacity building on entrepreneurship, marketing and saving habit. In order to realize the above recommendation, government relevant bodies, private credit and saving organization need to upgrade credit scheme with low interest rate and working at scale to fulfill the demand. And other stakeholder and community members shall have the role also.
- The study finding revealed that, those food insecure households were engaged in mixed type of livelihood. But still living in food insecurity situation. This implies that, the livelihood they engaged are small scaled and not able to generate enough income up to the level that to satisfy household food demand. Designing of rural based livelihood diversifications programs by the relevant government sectoral offices and stakeholders is necessary. And community also need take part in being proactive in joining the existing and upcoming livelihood opportunity.
- Productive Safety Net Program shall include livelihood element in to the program packages so that targeted beneficiary can quickly graduate and being resilience and food sufficient. Ministry of labour and social affairs could play significant role in the above suggested recommendation.

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## Annex 1.

### Household Questionnaire

This questionnaire is prepared with the aim of collecting data for a study focusing on “**Contribution of livelihood Diversification on rural household food security in Adami Tulu Jido Kombolicha Woreda**”. It is designed to get information from households of selected kebeles of Adami Tulu Jido Kombolicha Woreda. You are kindly requested to provide accurate information for the reliability of the final document that will be produced based on the information you provide. It is expected to serve for academic purpose and to be used for Thesis in Addis Ababa University.

Region []	Zone []	Woreda []	
Name of kebele []	Kebele ID: []		Enumerator ID:[]
House hold ID []			Date of Interview:[]

The researcher wants to assure you that the information you provide will be kept confidentially.

**PART I- Demographic Characteristics of Households**

1. Age of household head in completed years. [ \_\_\_\_ ]

2. Sex of household head. 01=female [ ] 02= male [ ]

4. What was the highest grade that the household head completed? [\_\_\_\_\_]

00=None 01=Primary education 02=Secondary education 03=vocational  
04=University 05=Adult literacy

5. Household size. Enter the total number of household members currently living in the family. [\_\_\_\_\_]

6. Age group of the household members:-----,-----  
-----,-----,-----  
-----,-----,-----

## PART II. Factors of Food I/Security

1. Do you have access to land for agricultural use? 1=Yes 2=No [\_\_\_\_]
2. What is the total size of the land the household used?

Land Type	Size in Timad/ Hectare/ any local measurement
Cultivated land	[]
Fallow land	[]
Grazing Land	[]
Forest Land	[]
Others, specify.....	[]

3. How is the fertility status of your farm land?

Poor [ ] Moderate [ ] Good [\_\_\_\_]

4. How do you evaluate the condition of rainfall in your area for crop production and livestock rearing?

Normal [\_\_\_\_] Sufficient [\_\_\_\_] Insufficient [\_\_\_\_]

5. Did you experience crop failure due to shortage of rainfall? 1=Yes [ ] 2=No [ ]

6. Do you have livestock, poultry, and beehives resource? 1=Yes [ ] 2=No [ ]

7. Do you experience livestock death due to livestock disease? 1=Yes [ ] 2=No [ ]

8. Do you have oxen for ploughing? 1=Yes [ ] 2=No [ ]

10. Do you use modern farm input to produce better yields? 1=Yes [ ] 2=No [ ]

11. If your response is 'yes' to question no 10 which one do you use? Multiple answer is possible

Type of input used	1=Yes 2=No
Improved seeds	<input type="checkbox"/>
Chemical fertilizer	<input type="checkbox"/>
Herbicides	<input type="checkbox"/>
Insecticides	<input type="checkbox"/>
Others, specify	<input type="checkbox"/>

12. Do you have irrigation access for cultivating vegetable and fruits? 1=Yes   
2=No

13. Do you get agriculture extension services support from the nearby government office?  
1=Yes  2=No

14. Do you get Veterinary extension services support from the nearby government office?  
1=Yes  2=No

15. Do you have access to credit services from micro-institutions to supplement your Livelihoods? 1=Yes  2=No

16. Do you afford to buy food stuffs from market for your household consumption? 1=Yes  2=No

17. How much did you spend for the following purposes in the year 2013 EFY crop year?

Expense Type	Amount In Birr	Expense Type	Amount In Birr
Grain purchase for consumption	<input type="text"/>	Purchase of modern farm input	<input type="text"/>
Land use tax	<input type="text"/>	Clothing expenses	<input type="text"/>
Ceremonial expenses ( <i>senbete, teskar, mahber</i> )	<input type="text"/>	School expenses	<input type="text"/>
Wedding	<input type="text"/>	Medical expenses	<input type="text"/>
Payment of credit	<input type="text"/>	Other Specify	<input type="text"/>

18. Did this household enrolled in PSNP program? 1=Yes [ ] 2=No [ ]

19. If yes to question No.18. Would you specify the amount of support received in 2013 EFY?

Type of support	Type/use the code below/	Amount/converted in to cash/
Free handout	[ ]	[ ]
Food for work	[ ]	[ ]
Cash for work	[ ]	[ ]
Other specify .....	1. Wheat 2. Maize 3. Oil 4. Cash kg/birr	

### PART III - Household Food Insecurity Access Scale

S.no	Question	Response Options	Code
Q.1	In the past four weeks, did you ever <b>worry that your household would run Out of food</b> before you get money to buy or could acquire more?	2=No ► Skip to Q.2 1=Yes	[ _ _ ]
Q.1a	How often did this happen?	01 = Rarely (once or twice in the past four weeks) 02 = Sometimes (three times to ten times in the past four weeks) 03 = Often (more than ten times in the past four weeks)	[ _ _ ]
Q.2	In the past four weeks, were you or any household member <b>not able to eat the kinds of foods</b> you want because of lack of money/resources? (For example, no meat, no vegetable, no fruit)	2=No ► Skip to Q.3 1=Yes	[ _ _ ]
Q.2a	How often did this happen?	01 = Rarely (once or twice in the past four weeks) 02 = Sometimes (three times to ten times in the past four weeks) 03 = Often (more than ten times in the past four weeks)	[ _ _ ]
Q.3	In the past four weeks, did you or any household member have to eat a <b>Limited variety of foods</b> due to a lack of money/resources? (For example,	2=No ► Skip to Q.6 1=Yes	[ _ _ ]
Q.3a	only injera and „shirwot“ no vegetables or meat)  How often did this happen?	01 = Rarely (once or twice in the past four weeks) 02 = Sometimes (three times to ten times in the past four weeks) 03 = Often (more than ten times in the past four weeks)	[ _ _ ]
Q.4	In the past four weeks, did you or	2=No ► Skip to Q.5 1=Yes	[ _ _ ]

	any household member have to eat some foods that you really <b>did not want to eat</b> because of a lack of money to Obtain other types of food? (For example, wild foods such as „hamli“, immature crops, discarded food such as „dirkosh“)		
Q.4a	How often did this happen?	01 = Rarely (once or twice in the past four weeks) 02 = Sometimes (three times to ten times in the past four weeks) 03 = Often (more than ten times in the past four weeks)	[ _ _ ]
Q.5	In the past four weeks, did you or any household member have to <b>eat less (Portion size) meal</b> than you wanted because there was not enough food?	2=No ► Skip to Q.6 1=Yes	[ _ _ ]
Q.5a	How often did this happen?	01 = Rarely (once or twice in the past four weeks) 02 = Sometimes (three times to ten times in the past four weeks) 03 = Often (more than ten times in the past four weeks)	[ _ _ ]
Q.6	In the past four weeks, did you or any household member <b>have reduce the Number of meals eaten a day</b> because there was not enough food? (For example skip breakfast or lunch)	2=No ► Skip to Q.7 1=Yes	[ _ _ ]
Q.6a	How often did this happen?	01 = Rarely (once or twice in the past four weeks) 02 = Sometimes (three times to ten times in the past four weeks) 03 = Often (more than ten times in the past four weeks)	[ _ _ ]
	In the past four weeks, was there	2=No ► Skip to Q.8 1=Yes	[ _ _ ]

Q.7	ever <b>no food to eat</b> in your household Because of lack of money/resources to get food?		
Q.7a	How often did this happen?	01 = Rarely (once or twice in the past four weeks) 02 = Sometimes (three times to ten times in the past four weeks) 03 = Often (more than ten times in the past four weeks)	[ _ _ ]
Q.8	In the past four weeks, did you or any household member <b>go to sleep at Night hungry</b> because there was not enough food?	2=No ► Skip to Q.9 1=Yes	[ _ _ ]
Q.8a	How often did this happen?	01 = Rarely (once or twice in the past four weeks) 02 = Sometimes (three times to ten times in the past four weeks) 03 = Often (more than ten times in the past four weeks)	[ _ _ ]
Q.9	In the past four weeks, did you or any household member go <b>a whole day and night without eating anything</b> because there was not enough food?	2=No (questionnaire is finished) 1=Yes	[ _ _ ]
Q.9a	How often did this happen?	01 = Rarely (once or twice in the past four weeks) 02 = Sometimes (three times to ten times in the past four weeks) 03 = Often (more than ten times in the past four weeks)	[ _ _ ]

## PART IV. Livelihood Activity of the Household

1. What kind of livelihood activity is being carried out by any household member?

(Choose multiple answer)

On -farm  off -farm  Non -farm  other  Specify

.....

If the response is On-farm proceed to question no. 2

If the response is Non-farm skip to question no.3

If the response is Off- farm skip to question no.4

2. Which of the following on-farm activity carried out by the household to produce food and /or generate income?

Type of farm activity	Quantity produced per year(2013EFY)	Quantity consumed per year (2013EFY)	Quantity sold per year ( 2013 EFY)	Income earned in 2013EFY ( ETB)		Income allocated for based on HH prioritization		
				Cash	In kind	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
Grain (kg)	[_____]	[_____]	[ _____ ]	[ _____ ]	[ _____ ]	[ ]	[ ]	[ ]
Fruit &Vegetable	[_____]	[_____]	[ _____ ]	[ _____ ]	[ _____ ]	[ ]	[ ]	[ ]
Livestock (No.)	[_____]	[_____]	[ _____ ]	[ _____ ]	[ _____ ]	[ ]	[ ]	[ ]
Livestock and poultry product	[_____]	[_____]	[ _____ ]	[ _____ ]	[ _____ ]	[ ]	[ ]	[ ]
Forestry product	[_____]	[_____]	[ _____ ]	[ _____ ]	[ _____ ]	[ ]	[ ]	[ ]
Fish in	[_____]	[_____]	[ _____ ]	[ _____ ]	[ _____ ]	[ ]	[ ]	[ ]

number								
Honey /kg/	[_____]	[_____]	[_____]	[_____]	[_____]	[ ]	[ ]	[ ]
Other specify	[_____]	[_____]	[_____]	[_____]	[_____]	[ ]	[ ]	[ ]
<b>Note-</b> Income allocated for. 1. Purchase of food, 2. Saving, 3. Building a house, 4. Farming input, 5. Buy clothes, 6. Medication, 7. Pay loan, 8. school fee 9. pay tax,								

3. Which of the following non-farm activity carried out by the household to produce food and /or generate income?

S.no	Type of non- farm activity	Yes=1 No=2	Income earned per month (ETB)	Income allocated for		
				1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
1	Petty trade	[ ]	[_____]	[ ]	[ ]	[ ]
2	Self-employment	[ ]	[_____]	[ ]	[ ]	[ ]
3	Formal employment	[ ]	[_____]	[ ]	[ ]	[ ]
4	Wage from non- farm activity	[ ]	[_____]	[ ]	[ ]	[ ]
5	Charcoal sell	[ ]	[_____]	[ ]	[ ]	[ ]
5	Wood sell	[ ]	[_____]	[ ]	[ ]	[ ]
6	Remittance ( local and International)	[ ]	[_____]	[ ]	[ ]	[ ]
7	PSNP	[ ]	[_____]	[ ]	[ ]	[ ]
8	OtherSpecify .....		[_____]			
<b>Note-</b> income allocated for. 1. Purchase of food, 2. Saving, 3. Building a house, 4. Farming inputs, 5. Buy clothes, 6. Medication, 7. Pay loan, 8. School fee, 9. pay tax						

4. Which of the following off-farm activity carried out by the household to produce food and /or generate income?

S.no	Type of off- farm activity	Yes =1 No=2	Income earned per month ( ETB)	Income allocated for		
				1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>
1	Wage labour in other farm	[ ]	[ ]	[ ]	[ ]	[ ]
2	Wage labour in state farm	[ ]	[ ]	[ ]	[ ]	[ ]
3	Other Specify ----- ---	[ ]	[ ]	[ ]	[ ]	[ ]



## PART V. Coping Strategy Index Questionnaire

### Section -1 – Coping strategy responses

S.no	Consumption Coping Strategy Responses (CSI)  In the past one week , if there have been times when you did not have enough food or money to buy food, how often has your household had to:-	Relative Frequency		
		All the time (Every day )	Often times ( 3-6 days/week)	Once in awhile (1-2days/week)
1	Rely on less preferred and less expensive foods?	[_____]	[_____]	[_____]
2	Borrow food, or rely on help from a friend or relative?	[_____]	[_____]	[_____]
3	Purchase food on credit?	[_____]	[_____]	[_____]
4	Gather wild food, hunt, or harvest immature crops?	[_____]	[_____]	[_____]
5	Consume seed stock held for next season?	[_____]	[_____]	[_____]
6	Send household members to eat elsewhere?	[_____]	[_____]	[_____]
7	Send household members to beg?	[_____]	[_____]	[_____]
8	Limit portion size at mealtimes?	[_____]	[_____]	[_____]
9	Restrict consumption by adults in order for small	[_____]	[_____]	[_____]
10	Feed working members of HH at the expense of nonworking members?	[_____]	[_____]	[_____]

## Section 2 -Coping strategy response

Q1. What other non-consumption coping strategies do you practice in time of food shortage in the household?

<b>Coping strategies</b>	<b>Yes =1 No=2</b>	<b>Coping strategies</b>	<b>Yes =1 No=2</b>
Changing others livestock to milk cow/donkey etc	[_____]	Sell of small animals	[_____]
Grow faster ripe crops	[_____]	Selling charcoal?	[_____]
Work on off farm activities (labour wage on others farmland)	[_____]	Sell of farm oxen?	[_____]
Work on non-farm activities ( trade , employment ...)	[_____]	Sell of jewelry?	[_____]

## **Annex 2**

### **FGD Guide**

1. What type of livelihood activities are common in this area? Please list and describe?
2. Is there any experience by the household members engaging in number of livelihood activities? If yes, please list and explain.
3. Do you think there is livelihood activities opportunity in this area? If yes, please list and explain. Probe: access to credit, residing near to the market, infrastructures, presence of factories, labor wage, living at the side of the river for irrigation and fishing, livestock rearing forest and etc.
4. Is there any barrier for engaging in different kinds of livelihood activities in this area? Please list and explain?
5. Do you think that involving in multiple type of livelihood is helpful for fulfilling the house hold food demand? And how?
6. Do you think that the people residing in this area is food sufficient throughout the year?

If Yes, explain its severity and frequency and since when,

If No, why please explain.

7. Is this kebele categorized as food insecure area by the government? Or is this kebele enrolled in PSNP or other program like by food aid interventions? Probe: What is the type of support they are receiving and how much it is helpful for meeting the household food requirement?
8. What do you think is the main cause of household food insecurity in the area? List and describe the causes?
9. During the session of food shortage, how is the people residing in this area responding to overcome the problem?
10. What is your recommendation in order solve the problem of food insecurity in this area?

**Annex 3**

**CONSENT FORM**

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

My name is \_\_\_\_\_ and I am working as data collector for the research titled as contribution of Livelihood Diversification on Rural Household Food Security, The case of, Adami Tulu Jido Kombolicha Woreda, Oromia region Ethiopia. This research is being under taken as partial fulfillment of Degree of Master of Science in Food Security.

The overall aim of this research is to analyze the impact of livelihood diversification for rural households food security, to assess the determinants factor of food security and explore the coping mechanisms in response to food shortage.

This question /guide is meant to obtain your opinions and whatever information you may provide will be kept strictly confidential and will not be shared with anyone other than on an anonymous basis for the purposes of this study.

You can withdraw at any stage of the participation without being penalized or disadvantaged in any way. Any data that the researcher extracts from you will not contain names or identifying characteristics for the use in reports or published finding. The interview will take approximately 40 minutes—1 hour to complete. Your participation is voluntary and you will not have any payment and your participation will not have adverse effect on you and your families.

We hope you will participate in this study since your view is very important with regard to improving the livelihood of rural community.

Would you like to participate in this study?	Yes	1 ( Thank Respondent and Continue)
	No	2 ( Thank Respondent and Terminate)

## Annex 4. Multi collinearity test

```
. cor agehead sex edustatus hhsize totallandsize raincondition acceslivestok cropfailure farminpu acc
> irrigatn credit accessland landfertility agriextser vetextser
(obs=360)
```

	agehead	sex	edusta~s	hhsize	total~e	rainco~n	accesl~k	cropfa~e	farminpu
agehead	1.0000								
sex	-0.1127	1.0000							
edustatus	-0.2177	-0.0735	1.0000						
hhsize	0.2860	-0.1995	-0.0621	1.0000					
totallands~e	0.1277	-0.1262	-0.1660	0.2531	1.0000				
raincondit~n	-0.0086	0.0236	0.1475	-0.1960	-0.0950	1.0000			
acceslives~k	0.1826	-0.0758	-0.0621	0.1910	0.1635	0.0502	1.0000		
cropfailure	0.0135	-0.0792	-0.1482	0.1604	0.0290	0.0748	0.3188	1.0000	
farminpu	0.1241	-0.1415	-0.1480	0.2055	0.3228	0.0913	0.4803	0.3179	1.0000
accirrgation	-0.1002	-0.0083	-0.0025	-0.0089	0.0639	0.1973	0.1413	0.1349	0.1923
credit	-0.2096	0.0616	0.1784	-0.1556	-0.0571	0.3408	-0.2909	-0.0965	-0.1886
accessland	0.0750	-0.0590	-0.1255	0.1518	0.2097	0.1905	0.3942	0.7018	0.4493
landfertility	-0.0689	0.0580	0.1053	-0.1461	-0.2072	-0.1802	-0.3782	-0.6838	-0.4303
agriextser	0.0750	-0.0590	-0.1255	0.1518	0.2097	0.1905	0.3942	0.7018	0.4493
vetextser	0.2086	-0.0401	-0.0942	0.2059	0.1635	0.0340	0.9356	0.3188	0.4614

	accirr~n	credit	access~d	landfe~y	agriex~r	vetext~r
accirrgation	1.0000					
credit	0.2026	1.0000				
accessland	0.1238	-0.1430	1.0000			
landfertility	-0.0890	0.1440	-0.9776	1.0000		
agriextser	0.1238	-0.1430	1.0000	-0.9776	1.0000	
vetextser	0.1014	-0.3065	0.3942	-0.3782	0.3942	1.0000

## Annex 5. Normality test

```
. swilk agehead sex edustatus hhsize totallandsize cropfailure raincondition acceslivestok farminpu a
> ccirrgation credit accessland landfertility agriextser vetextser
```

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
agehead	360	0.96854	7.883	4.889	0.00000
sex	360	0.98884	2.797	2.435	0.00744
edustatus	360	0.99815	0.462	-1.827	0.96612
hhsize	360	0.93532	16.206	6.595	0.00000
totallands~e	360	0.68524	78.865	10.342	0.00000
cropfailure	360	0.93975	15.096	6.427	0.00000
raincondit~n	360	0.99581	1.049	0.113	0.45511
acceslives~k	360	0.97770	5.588	4.074	0.00002
farminpu	360	0.98792	3.026	2.622	0.00437
accirrgation	360	0.97974	5.075	3.846	0.00006
credit	360	0.99862	0.346	-2.512	0.99399
accessland	360	0.92694	18.306	6.884	0.00000
landfertility	360	0.91789	20.574	7.160	0.00000
agriextser	360	0.92694	18.306	6.884	0.00000
vetextser	360	0.97770	5.588	4.074	0.00002

## Annex 6. Order logistic regression and Marginal effect

```
. ologit FSS agehead sex edustatus hhsizetotallandsizeraincondition cropfailure acceslivestok
> farminpu accirrgation credit accessland vetextser totalexpmoth incomoth
```

```
Iteration 0: log likelihood = -383.98802
Iteration 1: log likelihood = -351.13772
Iteration 2: log likelihood = -350.74014
Iteration 3: log likelihood = -350.73974
Iteration 4: log likelihood = -350.73974
```

```
Ordered logistic regression                Number of obs    =        360
                                           LR chi2(15)      =         66.50
                                           Prob > chi2      =         0.0000
                                           Pseudo R2       =         0.0866

Log likelihood = -350.73974
```

FSS	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
agehead	.0140841	.0110023	1.28	0.201	-.0074799	.0356482
sex	.0139944	.2570843	0.05	0.957	-.4898816	.5178704
edustatus	-.9213815	.2471825	-3.73	0.000	-1.40585	-.4369127
hhsizetotallandsizeraincondition	.0571506	.0572346	1.00	0.318	-.0550272	.1693284
cropfailure	.0305016	.0797197	0.38	0.702	-.1257461	.1867493
acceslivestok	-.7041391	.2784136	-2.53	0.011	-1.24982	-.1584586
farminpu	-.7260491	.597809	-1.21	0.225	-1.897733	.4456349
accirrgation	-1.715016	1.117591	-1.53	0.125	-3.905453	.475421
credit	-.3853766	.333412	-1.16	0.248	-1.038852	.2680989
accessland	-.0043857	.3106109	-0.01	0.989	-.6131719	.6044005
vetextser	.664275	.2679805	2.48	0.013	.1390428	1.189507
totalexpmoth	.0647464	.6771806	0.10	0.924	-1.262503	1.391996
incomoth	1.385027	1.116805	1.24	0.215	-.8038702	3.573924
	.0002809	.0001024	2.74	0.006	.0000802	.0004816
	-.0000182	.0000349	-0.52	0.602	-.0000865	.0000502
/cut1	-.3116071	.7081283			-1.699513	1.076299
/cut2	.1232435	.7074544			-1.263342	1.509829
/cut3	.4068736	.7075084			-.9798174	1.793565

```
. mfx, predict(outcome(1))
```

```
Marginal effects after ologit
y = Pr(FSS==1) (predict, outcome(1))
= .53504744
```

variable	dy/dx	Std. Err.	z	P> z	[ 95% C.I. ]		X
agehead	-.0035037	.00274	-1.28	0.200	-.008867	.00186	41.1139
sex*	-.0034822	.06398	-0.05	0.957	-.12889	.121925	.25
edusta~s*	.2263477	.05868	3.86	0.000	.111329	.341367	.638889
hhsizetotallandsizeraincondition	-.0142175	.01423	-1.00	0.318	-.042115	.013681	5.20556
cropfailure	-.0075879	.01983	-0.38	0.702	-.046457	.031281	1.38939
acceslivestok	.1716662	.06554	2.62	0.009	.043219	.300113	.347222
farminpu	.178322	.14011	1.27	0.203	-.096286	.45293	.925
accirrgation	.3872174	.19926	1.94	0.052	-.003326	.777761	.847222
credit	.096027	.0827	1.16	0.246	-.066071	.258125	.788889
accessland	.0010909	.07726	0.01	0.989	-.150328	.152509	.183333
vetextser	-.1642306	.06527	-2.52	0.012	-.292159	-.036303	.425
totalexpmoth	-.0160707	.16765	-0.10	0.924	-.344663	.312521	.936111
incomoth	-.3059438	.20101	-1.52	0.128	-.699926	.088038	.847222
	-.0000699	.00003	-2.74	0.006	-.00012	-.00002	1461.08
	4.52e-06	.00001	0.52	0.602	-.000012	.000022	2124.58

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

. mfx,predict(outcome(2))

Marginal effects after ologit

y = Pr(FSS==2) (predict, outcome(2))  
= .10493101

variable	dy/dx	Std. Err.	z	P> z	[ 95% C.I. ]	X
agehead	.0002587	.00022	1.16	0.246	-.000178 .000695	41.1139
sex*	.0002547	.00464	0.05	0.956	-.008839 .009348	.25
edusta~s*	-.0104113	.00539	-1.93	0.053	-.020972 .00015	.638889
hhsize	.0010496	.00113	0.93	0.351	-.001156 .003256	5.20556
totall~e	.0005602	.00148	0.38	0.705	-.002336 .003456	1.38939
rainco~n*	-.0157468	.0086	-1.83	0.067	-.032606 .001113	.347222
cropfa~e*	-.0018325	.009	-0.20	0.839	-.019474 .015809	.925
accesl~k*	.0170275	.03429	0.50	0.619	-.050178 .084233	.847222
farminpu*	-.0049246	.00329	-1.50	0.134	-.011371 .001521	.788889
accirr~n*	-.0000808	.00575	-0.01	0.989	-.011342 .01118	.183333
credit*	.0102525	.00521	1.97	0.049	.000045 .02046	.425
access~d*	.0012738	.01421	0.09	0.929	-.02657 .029118	.936111
vetext~r*	.0440839	.04077	1.08	0.280	-.03582 .123988	.847222
totale~h	5.16e-06	.00000	2.06	0.039	2.5e-07 .00001	1461.08
incomoth	-3.34e-07	.00000	-0.51	0.608	-1.6e-06 9.4e-07	2124.58

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

. mfx,predict(outcome(3))

Marginal effects after ologit

y = Pr(FSS==3) (predict, outcome(3))  
= .06245249

variable	dy/dx	Std. Err.	z	P> z	[ 95% C.I. ]	X
agehead	.0003012	.00025	1.21	0.228	-.000188 .000791	41.1139
sex*	.0002983	.00546	0.05	0.956	-.010407 .011003	.25
edusta~s*	-.0160573	.00563	-2.85	0.004	-.027101 -.005014	.638889
hhsize	.0012221	.00127	0.96	0.335	-.001262 .003706	5.20556
totall~e	.0006523	.00172	0.38	0.704	-.002709 .004014	1.38939
rainco~n*	-.0159252	.00768	-2.07	0.038	-.030986 -.000865	.347222
cropfa~e*	-.0094934	.00389	-2.44	0.015	-.017125 -.001862	.925
accesl~k*	-.0057811	.01721	-0.34	0.737	-.039502 .02794	.847222
farminpu*	-.007218	.00564	-1.28	0.200	-.018263 .003827	.788889
accirr~n*	-.0000939	.00666	-0.01	0.989	-.013146 .012958	.183333
credit*	.0131007	.00595	2.20	0.028	.001429 .024772	.425
access~d*	.00142	.01521	0.09	0.926	-.028398 .031238	.936111
vetext~r*	.034112	.02664	1.28	0.200	-.018098 .086322	.847222
totale~h	6.01e-06	.00000	2.21	0.027	6.8e-07 .000011	1461.08
incomoth	-3.89e-07	.00000	-0.52	0.606	-1.9e-06 1.1e-06	2124.58

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

. mfx,predict(outcome(4))

Marginal effects after ologit

y = Pr(FSS==4) (predict, outcome(4))  
 = .29756905

variable	dy/dx	Std. Err.	z	P> z	[	95% C.I.	]	X
agehead	.0029439	.0023	1.28	0.200	-.001561	.007449		41.1139
sex*	.0029293	.05388	0.05	0.957	-.102683	.108542		.25
edusta~s*	-.1998791	.05478	-3.65	0.000	-.307253	-.092505		.638889
hysize	.0119457	.01195	1.00	0.318	-.011479	.03537		5.20556
totall~e	.0063755	.01666	0.38	0.702	-.026281	.039032		1.38939
rainco~n*	-.1399942	.05193	-2.70	0.007	-.241768	-.03822		.347222
cropfa~e*	-.1669962	.14612	-1.14	0.253	-.453384	.119392		.925
accesl~k*	-.3984639	.24866	-1.60	0.109	-.88582	.088892		.847222
farminpu*	-.0838844	.0752	-1.12	0.265	-.231272	.063503		.788889
accirr~n*	-.0009162	.06485	-0.01	0.989	-.128021	.126189		.183333
credit*	.1408775	.05733	2.46	0.014	.028518	.253237		.425
access~d*	.0133768	.13824	0.10	0.923	-.257578	.284331		.936111
vetext~r*	.227748	.13624	1.67	0.095	-.039277	.494773		.847222
totale~h	.0000587	.00002	2.71	0.007	.000016	.000101		1461.08
incomoth	-3.80e-06	.00001	-0.52	0.602	-.000018	.00001		2124.58

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

## Annex 7 Pearson Correlation Coefficient

```
. pwcorr LDICatgo FSScat agehead sex edustatus hssize raincondition cropfailure acceslives~k
> farminpu accirrgation credit accessland agriextser vetextser totalexpmoth incomoth,sig sta
> r (.05)obs
```

	LDICatgo	FSScat	agehead	sex	edusta~s	hssize	rainco~n	cropfailure	acceslives~k	farminpu	accirrgation	credit	accessland	agriextser	vetextser	totalexpmoth	incomoth
LDICatgo	1.0000																
	360																
FSScat	0.0570	1.0000															
	0.2804																
	360	360															
agehead	-0.1939*	0.1314*	1.0000														
	0.0002	0.0126															
	360	360	360														
sex	0.0630	0.0047	-0.1127*	1.0000													
	0.2330	0.9288	0.0326														
	360	360	360	360													
edustatus	0.1611*	-0.2525*	-0.2177*	-0.0735	1.0000												
	0.0022	0.0000	0.0000	0.1643													
	360	360	360	360	360												
hssize	-0.2383*	0.0990	0.2860*	-0.1995*	-0.0621	1.0000											
	0.0000	0.0605	0.0000	0.0001	0.2398												
	360	360	360	360	360	360											
raincondit~n	0.0390	-0.1723*	-0.0086	0.0236	0.1475*	-0.1960*	1.0000										
	0.4603	0.0010	0.8707	0.6557	0.0051	0.0002											
	360	360	360	360	360	360	360										
cropfailure	-0.1968*	-0.1096*	0.0135	-0.0792	-0.1482*	0.1604*	0.0748	1.0000									
	0.0002	0.0376	0.7986	0.1339	0.0048	0.0023	0.1569										
	360	360	360	360	360	360	360	360									
acceslives~k	-0.1450*	-0.1085*	0.1826*	-0.0758	-0.0621	0.1910*	0.0502	0.0748	1.0000								
	0.0059	0.0397	0.0005	0.1513	0.2401	0.0003	0.3420	0.1569									
	360	360	360	360	360	360	360	360	360								
farminpu	-0.1705*	-0.0904	0.1241*	-0.1415*	-0.1480*	0.2055*	0.0913	0.0502	0.0748	1.0000							
	0.0012	0.0867	0.0185	0.0072	0.0049	0.0001	0.0835	0.3420	0.1569								
	360	360	360	360	360	360	360	360	360	360							
accirrgation	0.0071	-0.0134	-0.1002	-0.0083	-0.0025	-0.0089	0.1973*	0.0913	0.0748	0.0835	1.0000						
	0.8926	0.7999	0.0576	0.8755	0.9624	0.8666	0.0002	0.0835	0.1569	0.0001							
	360	360	360	360	360	360	360	360	360	360	360						
credit	0.2835*	0.0493	-0.2096*	0.0616	0.1784*	-0.1556*	0.3408*	0.0913	0.0748	0.0835	0.1973*	1.0000					
	0.0000	0.3510	0.0001	0.2434	0.0007	0.0031	0.0000	0.3408*	0.1569	0.0001	0.0002						
	360	360	360	360	360	360	360	360	360	360	360	360					
accessland	-0.2118*	-0.1145*	0.0750	-0.0590	-0.1255*	0.1518*	0.1905*	0.0913	0.0748	0.0835	0.1973*	0.3408*	1.0000				
	0.0001	0.0298	0.1557	0.2640	0.0172	0.0039	0.0003	0.1905*	0.1569	0.0001	0.0002	0.0000					
	360	360	360	360	360	360	360	360	360	360	360	360	360				
agriextser	-0.2118*	-0.1145*	0.0750	-0.0590	-0.1255*	0.1518*	0.1905*	0.0913	0.0748	0.0835	0.1973*	0.3408*	0.1905*	1.0000			
	0.0001	0.0298	0.1557	0.2640	0.0172	0.0039	0.0003	0.1905*	0.1569	0.0001	0.0002	0.0000	0.0003				
	360	360	360	360	360	360	360	360	360	360	360	360	360	360			
vetextser	-0.1337*	-0.0629	0.2086*	-0.0401	-0.0942	0.2059*	0.0340	0.0913	0.0748	0.0835	0.1973*	0.3408*	0.1905*	0.0340	1.0000		
	0.0111	0.2337	0.0001	0.4479	0.0742	0.0001	0.5201	0.0835	0.1569	0.0001	0.0002	0.0000	0.0003	0.0003			
	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360		
totalexpmoth	-0.0783	0.2251*	0.1187*	-0.0421	-0.2234*	0.1960*	-0.0681	0.0913	0.0748	0.0835	0.1973*	0.3408*	0.1905*	0.0340	0.0340	1.0000	
	0.1383	0.0000	0.0243	0.4257	0.0000	0.0002	0.1975	0.0835	0.1569	0.0001	0.0002	0.0000	0.0003	0.0003	0.0003		
	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	
incomoth	-0.0465	-0.0041	0.0632	-0.0542	0.0853	0.2140*	0.1085*	0.0913	0.0748	0.0835	0.1973*	0.3408*	0.1905*	0.0340	0.0340	0.0340	1.0000
	0.3788	0.9385	0.2313	0.3048	0.1060	0.0000	0.0396	0.0835	0.1569	0.0001	0.0002	0.0000	0.0003	0.0003	0.0003	0.0003	
	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360